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The Effects of Graphic Organizer Instruction on Multiple Choice Assessments for Remedial Secondary Readers Reading Nonfiction Texts

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Abstract

Adding to the body of research supporting graphic organizer instruction in a variety of classroom settings, a study was conducted to determine the effectiveness of graphic organizer instruction with a group of remedial secondary students in a class specifically designed to improve reading skills as shown through a variety of standardized, multiple-choice assessments. In the study, a group of remedial secondary students read nonfiction texts and took multiple-choice quizzes. Each week, one half of the students in the group alternated using graphic organizers to record main ideas and important details from the text, prior to taking the quiz. The group that used the graphic organizers continually performed better on the quizzes, showing that graphic organizer instruction is an effective intervention with this population of students.

CHAPTER ONE

One of my biggest challenges in pursuing remedial reading instruction with adolescent learners is that the students often have a history of failure in their subject area courses (i.e. biology, US history, Psychology). Consequently, many struggling readers at the secondary level carry negative attitudes towards subject-area courses that require significant amounts of reading. These hostilities are misplaced, however, since the deficiencies holding the students back from achieving at a high level are not related to the content, but to reading comprehension itself. A related concern is the widespread notion among subject-area secondary teachers that since reading literature plays such a large role in English curriculums, reading instruction is the sole domain of English teachers. However, the text structures common in subject area coursework bear little resemblance to the mostly narrative text structures commonly used in secondary-level English classes. All of these situations point to a need for a reading strategy that can be employed by students reading texts in subject area classrooms with a minimal amount of interventional and instructional time taken away from the subject area curriculum.

Graphic Organizer Instruction

For decades, instructors have used the graphic organizer as a method of note taking, as a study resource, or as an assessment in and of itself. Graphic organizers allow the instructor to visually match the notes to a pattern of organization found within a text, which is important when dealing with non-narrative nonfiction texts that lack the linear, “movie-like” narrative structure of most literature. Just as students are taught to diagram the plot of a story on a linear diagram in terms of rising action, climax, and denouement, they can also learn to compare and

contrast two concepts via the intersecting circles of a Venn Diagram. In this regard, graphic organizers can help students create a map of text structures that are not as familiar to students. In fact, graphic organizers are most effective when they allow the reader to reorganize the structure of the text in a fashion that is understandable and meaningful for him or herself. (Alvermann, 1981.).

Personal Connection

Throughout much of my career as a reading teacher in the West Allis-West Milwaukee School District in Suburban Milwaukee County, Wisconsin, I have been working with students who struggle in their subject area classes. While they are initially placed in the remedial reading classes based on deficient standardized test scores, many of these students seem to have one or more of the same reading deficits in common. For example, many students have difficulty in reading comprehension with nonfiction articles longer than a couple pages. Additionally, when reading these texts, remedial reading students often either skip through unfamiliar vocabulary or jargon, or get frustrated by it and give up trying to make meaning of the text. Both of these problems contribute to poor performance not only in courses where they are expected to read large amounts of information independently, such as high school history and science courses, but also in standardized tests that determine future course placement and college acceptance. As part of the remedial reading program at my home school, I encourage students to implement reading strategies into their study routine for their content-area classes. These strategies include the use of graphic organizers to outline text structure, find main ideas and supporting details, and analyze claims and evidence in arguments. Throughout the process of guiding the students, from

direct instruction to independent practice, texts that mimic content-area reading are often used as part of the remedial reading program.

Connection to Standards

To go along with the prescribed curricular standards and targets spanning both the Wisconsin State standards and the Common Core standards, it has been a goal of mine to alleviate some of the frustrations that the remedial reading population traditionally harbors for lengthy reading in nonfiction. In doing so, I hope to foster improved attitudes towards reading in the subject areas, and to facilitate greater stamina for this kind of reading, as measured by interest surveys and improved scores on both formal and informal classroom assessments and standardized tests. In addition to satisfying the requisite curricular standards, graphic organizer instruction provides a map toward understanding complex texts, which can instill a sense of satisfaction and boost intrinsic motivation for the next reading task. Graphic organizer instruction can also help to reverse a trend of poor performance on reading related assessments for students as they learn to use graphic organizers independently (Robinson et. al, 2006.).

Using a graphic organizer to aid comprehension of nonfiction texts fits into several Common Core standards for tenth grade students, most notably the reading/informational text standards. In the case of the science and social studies texts used in this study, all were linked to standard two, which asks that students be able to "determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details…" When completed properly by the students, the graphic organizers that accompany all of the texts in the study will have outlined the main ideas and supporting details made by the authors of the articles. For example, graphic organizers that asked students to

compare and contrast two concepts would include singular qualities of each item being compared, as well as similarities.

However, in the case of the texts that focused on current civic issues such as voter ID laws, the graphic organizers helped students identify arguments including claims and evidence, as these articles had a component of argumentation not found in the science articles. Identifying the parts of arguments fit with Common Core standard eight, which states that students will "delineate and evaluate the argument(s) and specific claims in a text…" The graphic organizers that accompanied these texts asked students to present two differing sides of a "hot button" political issue, and find the evidence that backed each sides' claims. When compared side-by-side, on the graphic organizer, the arguments contained within the texts were laid bare for students to analyze and evaluate.

Purpose of the Study

This study is focused on the effectiveness of graphic organizer use in situations mimicking standardized reading comprehension tests (i.e. WKCE). In a high school classroom with remedial ninth and tenth grade reading students, passages are given to students to read and take notes, and a short multiple-choice assessment is administered upon completion of the passage. The guiding question of the study centered around adding a graphic organizer to this testing protocol: would students using a graphic organizer to record important ideas and supporting details from the passages outscore their classmates who took linear (outline)-style notes or none at all? It was my hypothesis that the students who took the time to fill out the graphic organizer would significantly outperform the others. Several previous studies contributed to this hypothesis. For instance, a 1995 study by Robinson and Kiewra confirmed

advantages in studying graphic organizers versus linear or no notes at all. Another study that contributed to my hypothesis was a study completed by Ozmen (2011), which found that learning disabled students (who also traditionally have experienced difficulty in reading comprehension with non-narrative nonfiction) performed better when they completed the graphic organizer after reading the text versus being given a completed graphic organizer prior to reading. Over the course of my six week study, different graphic organizers were used with different texts that encompassed a variety of organizational patterns (i.e. topical, chronological, compare/contrast, etc.). I did not expect the variety of materials to have a significant effect on the performance advantages of the students utilizing graphic organizers, due in part to a synthesis of research done with learning disabled students (Kim, et. al 2004.) which found that no matter what type of graphic organizer or method of graphic organizer instruction was used, the students receiving graphic organizer instruction consistently outperformed groups not receiving instruction.

As I began to put together research for my own study, I focused on finding research that fit three specific criteria. First, I looked for studies that explored the use of different types and presentations of graphic organizers in a variety of reading tasks and classroom settings. I wanted to see how graphic organizers could be used as an interventional strategy, and to find the best practices for graphic organizer instruction. Furthermore, I focused on a handful of studies that pointed to specific skills that graphic organizer instruction would reinforce, improve, or in some cases, teach. I wanted to determine if the use of graphic organizers would be expected to help students achieve higher scores in the kind of reading comprehension assessments that accompanied the texts that I chose for use with my students. Finally, I looked at studies that utilized populations similar to what I work with in my career as a reading intervention teacher,

that is to say, struggling readers. These studies were conducted with regular education, special education, and remedial students, all of whom I regularly encounter in my own practice.

CHAPTER TWO

For decades, instructors have utilized graphic organizers to help move readers toward deeper comprehension. Instruction in and use of graphic organizers has been shown to increase reading comprehension scores when compared to other forms of note taking (Robinson and Kiewra, 1995) (DiCecco and Gleason, 2002). Additionally, graphic organizers have been shown to be an effective intervention and reading strategy in teaching learning disabled and otherwise remedial students, both in and out of the mainstreamed classroom (Horton, Lovitt, & Bergerud, 1990.) (Boyle and Weishaar, 2001.) (Kim et al., 2004.). Research for this chapter focused on three questions surrounding this practice. First, how does the format and delivery of the graphic organizer impact student performance? Second, what specific skills and knowledge can instructors expect to see increase when graphic organizers accompany subject-area narrative and expository texts? Finally, what populations of secondary-level students were most likely to achieve greater gains in assessments through graphic organizer instruction?

Effects of Different Types of Graphic Organizer Instruction

One group of studies focused not only on the effectiveness of graphic organizer instruction, but also tried to determine which types of graphic organizer or instructional strategies yielded the best results. When investigating whether students performed better when asked to create their own graphic organizers, versus being given a teacher-generated version, Stull and Mayer (2007) found that the creation of graphic organizers produced no significant advantage on transfer and recall, as measured by short answer and sentence completion assessment questions. This finding was contrary to studies by Robinson, et al. (2006), and Katayama and Robinson (2000), who found that giving students partial instead of completed

graphic organizers not only resulted in increased learning, but also had the effect of teaching students to take notes graphically. In this case, the students studying graphic notes significantly outperformed students studying outlines in measures where they needed to apply the concepts in the text to a descriptive example. This may be attributed to the visual organization of the concepts in the graphic organizer, versus a list of facts in the outlines. In the remaining study included in this section, Ozmen (2011) found that there were several benefits to providing a graphic organizer after the reading was completed when teaching compare/contrast texts to learning disabled students. For example, when students completed the graphic organizer after reading instead of simply studying a completed graphic organizer before reading, the author found that the students not only scored better on recall measures, but also actively looked for important details and visually reorganized the text for more efficient recall.

Effects of Graphic Organizer Instruction on Specific Skills and Knowledge

The advantage of graphic versus linear or no notes at all formed the basis of experiments by Robinson and Kiewra (1995), who determined a few areas (hierarchical relations, coordinate relations, application of knowledge, and integrating concept relations into writing) where students studying graphic organizers performed higher than those studying outlines or the text alone, a result that directly informed the design of this study (graphic organizers versus text alone). These findings were echoed by DiCecco and Gleason (2002), whose experiments with learning disabled (LD) students confirmed that while the effectiveness of graphic organizers is limited in factual knowledge assessments, it results in deeper understanding of relational knowledge, which was described by the authors as an understanding of how concepts from the texts are connected and related to one another. In this case, relational knowledge was assessed

with writing, and the increased scores in this area show that graphic organizer instruction could be an effective intervention with students struggling with written assessments. A 1981 study by researcher Donna Alvermann concluded that students receiving graphic organizer instruction showed significant gains in immediate and delayed recall when using descriptive text, and a 2005 article by McMackin and Witherell pointed to the effectiveness of graphic organizer instruction in teaching the reading strategy of drawing conclusions, related to inferencing, which the authors describe as a blending of text and background knowledge to facilitate a deeper understanding of the text than simply comprehending the text on the surface level. Concluding the discussion of what skills could be expected to improve through graphic organizer instruction was a 2007 study by Ives, who found that the reading comprehension benefits of graphic organizer instruction could be extended to mathematics concepts, since many of the critical thinking skills inherent in the reading process are also vital to solving high-level mathematics problems.

Effects of Graphic Organizer Instruction on Different Groups of Students

The final group of studies includes research dealing with specific groups of students. Horton, Lovitt, and Bergerud (1990), mimicking today's "mainstreamed" classrooms, implemented graphic organizer instruction with a heterogeneous population including regular education, learning disabled, and remedial students, and found that students receiving graphic organizer instruction performed significantly higher than self-study groups no matter what their designation. Learning disabled and educable mentally retarded high school students receiving strategic note taking instruction in a study by Boyle and Weishaar (2001) performed significantly higher in a variety of measures than students using conventional note taking, such as modified or

formal linear outlines. Finally, Kim et al. (2004) synthesized available research into a study of the benefits of graphic organizer instruction for learning disabled students. They found that regardless of the type of graphic organizer or method of graphic organizer instruction, learning disabled students receiving graphic organizer instruction consistently outperformed groups that did not receive similar treatment on measures of reading comprehension.

Outline:

I. Studies on graphic organizer format and usage: What usage is most successful for graphic organizers: partial, complete, learner-generated (written entirely by students), author-provided (written by either the instructor or the author of the text), or none at all?

   a. Summary One: Findings from Stull and Mayer (2007)

   b. Summary Two: Findings from Robinson et al. (2006)

   c. Summary Three: Findings from Katayama and Robinson (2000)

   d. Summary Four: Findings from Ozmen (2011)

II. Studies on the benefits of graphic organizers: What knowledge is improved through graphic organizer instruction?

   a. Summary Five: Findings from Robinson and Kiewra (1995)

   b. Summary Six: Findings from DiCecco and Gleason (2002)

   c. Summary Seven: Findings from Alvermann (1981)

   d. Summary Eight: Findings from McMackin and Witherell (2005)

   e. Summary Nine: Findings from Ives (2007)

III. Studies on the effects of graphic organizer instruction on different groups of students: Which students benefit the most from graphic organizer instruction?

   a. Summary Ten: Findings from Horton, Lovitt, and Bergerud (1990)

   b. Summary Eleven: Findings from Boyle and Weishaar (2001)

   c. Summary Twelve: Findings from Kim et al. (2004)

IV. Final Conclusions/Summary

Studies on Graphic Organizer Format and Usage

The studies within this heading all center around the format and usage of graphic organizer instruction, answering the question of what is the best way for students to use graphic organizers to increase learning and understanding of text.

Summary One

Stull and Mayer (2007) set out to explore the differences in reading retention and transfer when students attempt to construct their own graphic organizers versus studying a graphic organizer that is provided. At the heart of their experiments was the question of whether students learn more deeply by doing or by viewing. The authors established a research base for their experiments that validated both the activity theory, which posits that the reader-generated organizers would result in deeper understanding, and cognitive load theory, which posits that extraneous activity could disrupt processing and impede performance on comprehension measures.

The researchers tested this question with three experiments. In each experiment, the sample group of students read a 1,133 word passage from a biology text augmented with graphic organizers. In the author-provided group, complete graphic organizers were provided to students, and in the learner-generated group, students were either asked to create graphic organizers from scratch (experiment one), complete a mostly empty graphic organizer (experiment two), or complete a graphic organizer with few empty slots (experiment three). Experiments contained multiple dependent variables, including identical retention and transfer tests in all three experiments.

The purpose of the first experiment was to see if students better understood the passages

when asked to produce their own graphic organizers after instruction and modeling in graphic notetaking, or when they were provided with graphic organizers by the author. A control group did not receive or construct graphic organizers. One hundred fifty-six college students participated in the experiment, with the control group consisting of 54 students and the learner-generated and author-provided groups consisting of 51 students each.

The materials for the two experimental groups included a sample passage with instructions, examples and descriptions of several types of graphic organizers accompanying the text. The text was all that was given to the control group. The reading passages for the three groups included one with 27 graphic organizers (author-provided), one with space to complete graphical notes (learner-generated) and one with just the text (control). After five minutes of training and instructional reading, the students were allowed to read the article at their own pace. The learner-generated group was told to complete graphical notes on the passage and the other two groups were not. At the completion of the reading, all groups were given an identical set of questions, six short answer and eight sentence completion. Students were given three minutes to answer each short answer question and one minute to answer each sentence completion question.

The results showed that there was not a significant difference in transfer or retention between the author-provided and learner-generated groups. However, there was a considerable study time difference showing that the author-provided group spent a lot less time studying. The results were contrary to the prediction that creation of graphic organizers would facilitate learning, and the graphic organizers created by the learner-generated group varied greatly. The researchers hypothesized that creating graphic organizers contributed to an extraneous cognitive load that had an adverse effect on test performance, but also acknowledged that the author-provided graphic organizers, 27 in all, could have also contributed to an extraneous cognitive

load. As a result, they decreased the complexity for the next experiment.

The second experiment reduced the complexity of materials for both the author-provided group and the learner-generated group. The researchers hypothesized that the amount of graphic organizers for the author-provided group and the instructions for the learner-generated group in the first experiment could have contributed to a cognitive overload affecting performance. In this second experiment, the researchers reduced the author-provided graphic organizers from 27 to 18. Additionally, the researchers provided partially completed graphic organizer frameworks for the learner-generated group in lieu of just giving them instructions to complete graphic organizers on their own. One hundred and sixteen undergraduate college students made up the sample, with 39 students comprising the author-provided group, 38 students comprising the learner-generated group, and 39 students comprising the control group. The only difference in procedure from the first experiment was that the learner-generated group received pre-training in which they filled in templates and compared their answers to an expert completed graphic organizer key.

The results of experiment two showed that the author-provided group exhibited higher transfer scores than the learner-generated group. The author-provided and learner- generated group did not differ significantly in retention, and, as in experiment one, the learner-generated group required considerably more study time. These results were consistent with experiment one in that they were contrary to the activity theory which posits that constructing graphic organizers (as opposed to studying author-provided examples) would facilitate deeper learning.

In the first and second experiments, the author-provided group outperformed the learner-generated group on transfer. Consequently, the researchers decided to reduce the complexity even further for a third experiment. In this third experiment, the researchers reduced the author-

provided graphic organizers to 10, down from 27 in the first experiment, and 18 in the second experiment. They also provided scaffolding for the learner-generated group in the form of partially completed graphic organizers and pre-training similar to the procedures of experiment two. Ninety-eight undergraduate college students made up the sample, with 33 students comprising the author-provided group, 33 students comprising the learner-generated group, and 32 students comprising the control group. Procedures and scoring were identical to experiment two.

The results of the third experiment were consistent with the first two experiments. The author-provided group not only outscored the learner-generated group in transfer and retention, but took considerably less time doing it.

The conclusion of the experiment validated cognitive load theory and contradicted activity theory. The groups constructing graphic organizers in all three experiments did not show evidence of deeper learning than the groups creating their own graphic organizers. Putting research into practice, the researchers recommended that teachers supplement their texts with graphic organizers, but to keep the complexity level low so as not to create a cognitive overload.

The results of this study suggest that as long as the complexity level is low, providing graphic organizers to students was superior to asking them to create their own; in both time and performance benefits. This is an important consideration for the instructor who not only is in a time crunch, but also can safely assume that his or her students are adept at studying for assessments. However, the next researchers' study suggests that the use of partially completed graphic organizers not only increased performance but also taught students how to take notes graphically, which makes partial graphic organizers a powerful tool for instructors seeking to simultaneously teach content knowledge and reading/study strategies.

Summary Two

Robinson, et al. (2006) conducted four experiments to explore the effects and implications of using partial and complete graphic organizer style notes with students in lieu of linear (outline) note taking. Based on their research, the authors believed they would increase comprehension scores in college level students through introducing and training the students in spatially organized (graphic organizer) notes. Additionally, the researchers felt as though partial graphic organizer notes, as opposed to complete or skeletal graphic organizers, were superior in producing increased comprehension scores and encouraging students to continue to take notes graphically.

The first experiment measured comprehension and whether or not students switched from linear to graphic note taking. The researchers conducted the experiment in two consecutive semesters in an undergraduate educational psychology course, taught by the same instructor, where approximately 90% of the students were female. Based on random draw (quasi-experimental), students in the sample groups were assigned to either receive partial or complete graphic organizer notes for the course. The researchers then created graphic organizers for each group. The "complete" group received a complete set of notes for the two chapters of the text, whereas the "partial" group received the same structural notes, but with gradually less information given per page to the point of the graphic organizer being just headlines. The dependent variables were a series of quizzes followed by a final exam at the end of the 95 day trial period. Additionally, subjects had their notes scored and classified as to whether they took graphic or linear (outline) notes.

The researchers found that the students who received the partial graphic organizer notes

not only scored higher on the quizzes than the group receiving complete graphic organizer notes, but they were also more likely to switch from taking linear notes to taking graphic notes. In this experiment, half the treatment group switched from linear to graphic note taking. The researchers attributed the partial graphic organizer group's performance advantage and increased conversion to the graphic style of note taking to the scaffolding process "built in" to the partial graphic organizer format. In other words, students receiving partial notes had to learn how to take graphic notes to complete the graphic organizer.

The second experiment replicated the first experiment with one key difference: instead of receiving the notes as a paper packet, the students logged on to a computer program and were either given complete graphic organizers (control group) or partial graphic organizers with the option to select and drag information into the appropriate columns. The researchers hypothesized that the motivational aspect of this format would convert more students to switch to a graphic note taking style. The procedures for this experiment were identical to the first: two consecutive semesters in an undergraduate educational psychology class, same instructor. A series of quizzes were used as dependent variables, and final notes were categorized. However, students in the treatment group were encouraged to first attempt to sketch out the graphic organizer notes on paper prior to completing the organizers on the computer, where their choices of notes to fill the empty columns would be scored.

Consistent with the first experiment, the students who completed partial graphic organizers scored higher than the group that received complete graphic organizers. A higher conversion rate of note taking from linear to graphic with the partial graphic organizer group was also consistent. However, the researchers attributed the higher conversion rate (80%) to the computer presentation.

The third experiment transitioned from quasi-experimental design to experimental design by taking measures to control for variables that might have affected the results. For example, the researchers wanted to eliminate the possibility that the class and not the treatment account for some of the difference in results in the previous experiments. In this experiment, students were given a pretest prior to the experiment so that the researchers could then run regressions to test for homogeneity within groups. Other than that, the procedures were identical to the second experiment, with a partial graphic organizer group that was scored on their completion of a graphic organizer on the computer, and the control group, who were given a completed graphic organizer to study. Results from this experiment verified the researchers assumption of homogeneity and arrived at the same conclusion as the prior two experiments. The partial graphic organizer group scored higher on the quizzes, and the rate of conversion to graphic from linear note taking in the student groups was also higher in the partial (treatment) group: roughly 80%, which was the same rate as in the second experiment.

Finally, a fourth experiment was conducted that also used experimental design. A group of 58 students from one course were randomly assigned into 12 groups. Groups 1-6 were the control group with 7-12 serving as the treatment group. Combining the materials from previous experiments, the researchers used web based graphic organizer notes for the first part of the course with the treatment group, and paper notes for the second part of the course. This order of computer-paper class notes was reversed for the control group. In order to control for the possibility that students might share materials, a survey was administered at the completion of the experiment that asked whether students shared materials, with whom, and how often. The procedures were similar to the first three experiments, with students being graded on the web-based notes as well as on a series of quizzes culminating in a larger test.

The researchers found that 7 of the 58 students had shared their materials, and they did not consider this number to be excessive. The results were consistent with the first three experiments, although the effect of increased quiz scores was not as pronounced with the treatment group as in other experiments. The researchers attributed this to the shorter time period of treatment. Due to the switchover design of this experiment, the treatment group saw a larger number of students switch from taking linear notes to graphic notes after the first part of the course, but these numbers became similar after the crossover, when the control group was exposed to the treatment strategy. Conversion rates were around 53%, which was closer to the number from the first experiment, and again attributed to the shorter period of treatment.

Further evidence that supports the results and conclusions of these experiments on the benefits of partial graphic organizers was also provided through experiments by Katayama and Robinson (2000), who conducted a similar experiment but added additional independent variables to confirm their predicted results that partial graphic organizers have an advantage as a study tool over linear notes as well as complete graphic organizers in certain dependent measures.

Summary Three

Katayama and Robinson (2000) created an experiment based on the encoding and external storage functions, which posit that taking and reviewing notes is better than not doing either. The question that they asked was, “What form of notetaking is best?” The authors made several hypotheses for the experiment. First, they predicted that the groups of students provided with partial notes would outperform groups of students provided with complete notes or skeletal notes. The authors also predicted that for both the groups receiving complete notes and partial

notes, the graphic organizer group would outscore the outline group on application but not factual information.

The participants in the experiment were 117 undergraduate students whose ages ranged from 18-40. Sixty-five were female and 52 were male. The text used in the experiment with all groups was a chapter from a science text on sleep disorders. There were six conditions that students were randomly assigned to (independent variables): complete, partial, or skeletal outlines, or complete, partial, or skeletal graphic organizers. Skeletal notes for either graphic organizer (GO), or outline conditions consisted of headings only, and partial notes for either GO or outline conditions consisted of approximately one half of the notes deleted from the complete notes.

Procedurally, students were given envelopes with the text and one of the six types of notes. They were given 40 minutes to read and complete their GO/outline, or in the case of the complete notes groups, study their materials. After time had expired, they put their materials back in their envelopes and were dismissed. Two days later they had a similar 40 minute study session, and two days after that, they were given a 10 minute review session with their materials followed by a 35 minute testing session. This procedure was designed to replicate typical studying conditions and class time periods. Dependent variables consisted of a 30 item multiple choice test measuring factual knowledge and a 10 item testing application of the concepts to descriptive examples.

For the measures of factual knowledge, neither study notes (GO or outline) nor amount of information given (complete, partial, or skeletal) had a significant affect on student scores. However, in the measures of application knowledge, students studying GO's had higher scores than students studying outlines. Furthermore, students studying partial notes scored higher than

those studying complete notes for both GO and outline conditions. The largest advantage in application measures was students studying partial graphic organizers over students studying partial outlines.

Summary Four

In a 2011 study based in Ankara, Turkey, researcher Ruya Guzel Ozmen compared the effectiveness of two different presentations of graphic organizers. The purpose of the study was to compare the effects on recall when graphic organizers were presented and completed by learning-disabled students before and after reading an expository text (in this case, a compare/contrast text was used).

The participants for this study were selected from a group of LD students that ranged in age from 11 to 14 years old, or middle school-age. Five students were chosen to participate in the study. The dependent variable in this study was the recall of similarities and differences of the comparison concepts in the texts. The dependent variables were the presentation of a teacher-constructed graphic organizer before reading the texts, and having the students complete the teacher-constructed graphic organizer after the reading was completed.

Materials for the study consisted of 13 compare and contrast expository texts, as well as accompanying graphic organizers for each text. The texts were selected from social studies and science textbooks written at a 4^{th} and 5^{th} grade reading level, which was determined to be an appropriate instructional level through a reading pretest administered to the study's participants during the selection process. The texts covered a variety of compare and contrast concepts: lung vs. heart, planet vs. moon, sea vs. lake, city vs. village, etc. Each one of the texts consisted of four parts: an introduction to the concepts, a paragraph detailing the similarities, a paragraph

detailing the differences, and a conclusion. Each concept had between four and six similarities and differences that could be explicitly or implicitly derived from the text. Similarly, the graphic organizers were based on a modified Venn diagram, with spaces to write the singular qualities of each concept being compared (differences) along with a space to list the similarities.

The experimental process was carried out over a four week period. The first condition was a "baseline" assessment, where students received instruction in compare/contrast text structures and finding similarities and differences between concepts. The second phase of the experiment involved the before reading treatment. Students were provided with a teacher-constructed graphic organizer containing all of the similarities and differences determined to exist in the text. This graphic organizer was read by the class. Subsequently, the students silently read the text and were given a post-assessment as a measure of recall. Finally, the third phase of the experiment involved completing the graphic organizer after reading the text. In this phase, a skeletal version of the teacher-constructed graphic organizer was given to the students along with the text. Students were instructed to fill out the graphic organizer, one section at a time, beginning with similarities and finishing with the differences between the concepts. After completing their organizers, in some cases with teacher prompting and encouragement, the students were given the post assessment as a measure of recall.

The results of the experiment were as follows: four of the five students showed better recall of both similarities and differences in compare/contrast concepts when the graphic organizer was completed by the students after the initial reading. The author concluded that the completion of the graphic organizer after reading text had several benefits over simply showing the students a graphic organizer before reading, such as guiding students to important details, facilitating active participation while reading the text, and helping students visually organize the

information for more efficient recall.

Conclusions:

Of the research in this section, three of the four sets of experiments suggest that partial graphic organizers have benefits over complete graphic organizers or other forms of notetaking, and the experiment (Stull and Mayer, 2007), that did not support this conclusion offered evidence that cognitive load theory plays a role in the effectiveness of studying with graphic organizers. A practical implication for the instructor might be to vary the type of graphic organizer used in the classroom to fit the level of complexity of the text that it accompanies. The study by Katayama and Robinson (2000) also suggests that there are certain types of assessments (application and relations between concepts) wherein students who use graphic organizers might expect to see greater gains. This leads into the second subtopic, which asks, "For what types of knowledge does the use of graphic organizers have the greatest benefit?"

Studies on the Benefits of Graphic Organizers

The remaining studies used a range of dependent variables to show the specific types of knowledge most affected through a treatment that involved graphic organizer instruction. In the studies conducted by Robinson and Kiewra (1995) and DiCecco and Gleason (2002) , students who received graphic organizer treatment showed increased performance in knowledge of relations between concepts and the ability to organize those relations, and application knowledge as assessed through writing, but in other dependent measures, did not show significant advantages over control groups not receiving graphic organizer treatments. Similarly, in the study conducted by Alvermann (1981), students made significant gains when provided graphic

organizers designed to facilitate mental reorganization of a text's top-level organizational pattern, but did not show the same increased performance when reorganization of the text was not necessary. Finally, the article by McMackin and Witherell (2005) presents graphic organizer instruction as a means not only of differentiating instruction to a wide range of students and ability levels, but also of improving performance on the specific reading skill of drawing conclusions.

Summary Five

Robinson and Kiewra (1995) set out to answer the question, "What types of text information do graphic organizers and outlines help college students learn?" According to the authors, the common adjunct aids used as text features in textbooks and other academic material are graphic organizers and outlines. The researchers hypothesize that graphic organizers are the superior of the two, but acknowledge that there have been problems with graphic organizer research, such as short and poorly organized text, and single displays that fail to represent the complex hierarchical structures present in longer texts. Two experiments were conducted. The independent variables for the experiments involved arrangement of groups studying text only, text with outline, and text with graphic organizer, as well as being tested either immediately or with a two-day delay. The dependent variables addressed what the researchers felt were the previously mentioned shortcomings with previous research into graphic organizer usage, and included multiple choice tests that tested for knowledge of text facts represented in the text only or in the adjunct displays, a cued recall test to assess knowledge of text structure, and an essay test to assess knowledge of relations between concepts and the ability to organize those relations.

Before the first experiment began, the researchers made a series of predictions. They

hypothesized that students studying the text only materials would outperform students studying the outlines and graphic organizers in knowledge of knowledge that was not represented They predicted that the groups studying adjunct displays (GO and outline) would outperform the text only group in measures of knowledge of hierarchical structures. Finally, they predicted that the graphic organizer group would outperform the text only and outline group on the essay tests.

The sample for the experiment consisted of 111 undergraduate students enrolled in several sections of an educational psychology course, divided and placed into the three materials conditions (text only, outline, and GO), and the testing delay conditions (immediate testing or two-day delay). The materials, in terms of content, were the same for each group: a 6500 word chapter from a psychology textbook. However, both the outline and GO group's materials included 7 additional adjunct displays each, both containing the same information.

Procedurally, the experiment advanced as follows: for the immediate testing group, students were given 45 minutes to read the text and 15 minutes to study before testing for an additional 45 minutes. For the delay testing group, the 45 minute testing session followed the one hour reading/study session by two days. In the testing period, students spent 14 minutes on hierarchical relations, 10 minutes on the essay, 8 minutes on the application test, and 10 minutes on the factual test.

Results were analyzed and an ANOVA was conducted. In all measures, students performed better when immediately tested. Students studying text only learned more nonrepresented facts than students studying graphic organizers. There were no significant differences in study materials in testing of represented facts, or hierarchical relations. In coordinate relations and contrasting premises testing, the students studying graphic organizers performed better than the other groups. In application, it was found that the performance of the

text only and outline groups decreased more between immediate and delayed testing than the performance of the graphic organizer group.

The results for this first experiment matched the predictions that the researchers made prior to the testing in several areas: nonrepresented facts, coordinate relations, and contrasting premises. For the other three measures, the results between the groups were not significantly different where the researchers predicted the superiority of the adjunct display groups' performance over the text only group.

The researchers conducted a second experiment using forty-two students in cells of 14. The students were randomly assigned to the text only, outline, and graphic organizer group. Materials and scoring procedures were identical to the first experiment, but procedurally, the students were given their materials to read and study alone for one hour, and one day later were given a 15 minute review session followed immediately by testing (the same assessments as experiment one). These differences between experiments were intended to provide an accurate range of experiences that more closely replicate the way students study in authentic testing situations, and to address some of the shortcomings of prior research in usage of graphic organizers such as tests and time intervals that are not realistic to the classroom experience.

In terms of results, the students scored as predicted in the areas of represented facts, coordinate relations, and application. The changes in method between the first and second experiment, the authors concluded, with a review before the test on the second day, favored the group using graphic organizers. In fact, the result in experiment one of students scoring better on nonrepresented facts when given text only, disappeared in experiment two due to the increased time students had to review their adjunct displays. In both experiments, groups using the graphic organizers benefitted when it came to the writing test, showing a better understand of concept

relations. A final conclusion of the researchers was that graphic organizers are superior to text alone or outlines in the areas of hierarchical relations, coordinate relations, application of knowledge, and integrating concept relations into writing, when readers have adequate time to review and study the materials.

This experiment tested the effectiveness of graphic organizer instruction across a variety of dependent measures. It was found that the scores that increased the most from graphic organizer instruction were in the area of relational knowledge. DiCecco and Gleason (2002) arrived at a similar conclusion, although their work was with middle school LD students, a very different sample from the undergraduate psychology students used by Robinson and Kiewra (1995).

Summary Six

DiCecco and Gleason (2002) explored the effects of graphic organizer instruction on middle school students with learning disabilities. Their research attempted to answer the question of whether students with learning disabilities would increase factual and relational knowledge when educators used graphic organizers as an instructional tool. The authors provided a rationale for their experiment, explaining that although graphic organizer research had been done for decades, relatively little work was done in regards to its effectiveness with LD students.

Students involved in the experiment were 26 middle school students with LD, from two schools. One of the schools that subjects were drawn from was labeled as low SES, and the other was middle SES. Each student in the experiment was identified as LD, was a current participant in special education programs with an IEP in reading, and had permission granted

from parents to participate in the research. Participants were divided into treatment (GO) groups and control (no GO) groups. The GO group and no GO groups included 12 students each, after two students were dismissed from the study due to attendance issues. Four measures were used to assess homogeneity across the groups: the Word Attack and Word Identification subtests of the Woodcock Reading Mastery Test was used to determine reading skills, a multiple choice pretest was used to determine if participants had extensive background knowledge that would be grounds for exclusion from the study, and a writing sample was taken from each participant to assess general writing ability and relational knowledge. The two groups did not show significantly different results on the pretest measures, and equivalence was established. Additionally, instructors accounted for the extraneous variable of attendance by creating makeup lessons for students who missed a session.

Procedurally, participants received instruction for a period of four weeks in both regular reading periods and special education resource rooms. To account for instructor differences, six instructors were rotated among the groups within their buildings five times over the four week period (for each new graphic organizer introduced to the students). Two chapters of the social studies text were selected as materials for the study. A total of five graphic organizers were developed to cue relational knowledge of the concepts. Instructor scripts were used for each lesson to accompany both the treatment and control groups, with the only difference being that the script accompanying the GO group focused students' attention to the GO. The scripts ensured that the control group received instruction in the same relational concepts and knowledge, just without the GO. Additionally, four observers were present in the classrooms to check for instructional fidelity to the scripts, to make sure that the instructors in both groups delivered the same content and did not deviate significantly from the lessons. There were three

dependent variables to measure the intervention effects: pre and post tests in content knowledge (multiple choice), eight content knowledge quizzes, and two domain knowledge quizzes.

Results of the experiment yielded several conclusions about the effectiveness of using GO instruction with LD students. In the measures of factual knowledge, there was not a significant difference between the GO and no GO groups. However, in the domain knowledge measures, students in the GO groups provided more relational knowledge statements than the students in the no GO groups. In the second essay, eight students in the GO group provided five or six relational knowledge statements, whereas only two students from the no GO group provided five or six statements. Additionally, based on the domain knowledge measures, there was evidence showing that the LD students benefitted from a longer treatment, as their numbers of relational statements increased throughout the entire treatment period. The researchers also concluded that while GO instruction has limited effectiveness when instructors are focusing solely on factual knowledge, GO instruction has significant performance advantages over non GO training in the area of relational knowledge and writing. Finally, the researchers warned that GO instruction for LD students needs to be intensive, with modeling, guided practice, and review.

Summary Seven

Researcher Donna Alvermann (1981) began her research by explaining that most text found in secondary level textbooks follows a descriptive organizational pattern, which is less facilitative to comprehension and retention than texts based on comparison as an organizational method. According to the author, texts organized by comparison frequently contain cues which allow the author to relate the information to a “superordinate” idea as well as to other pieces of

information within the text, therefore aiding in recall and recognition of ideas and concepts. As a result of her findings, Alvermann concluded that graphic organizer instruction that would force the reader to reorganize the structure of the accompanying text, from a descriptive pattern to a comparison pattern, would yield improved comprehension and retention of expository text. She hypothesized that students receiving graphic organizer instruction would recall more than the control group while reading descriptive text. Additionally, the author hypothesized that the students at the lower levels of reading comprehension would improve more than other students when receiving graphic organizer instruction.

Alvermann selected the population for her experiment by randomly choosing 128 tenth-grade students from a small high school in Upstate New York. Students were assessed with a diagnostic reading test and ranked based on their comprehension scores. Students were then placed into four treatment groups assigned randomly: Graphic organizer/descriptive, graphic organizer/comparison, no graphic organizer/descriptive, and no graphic organizer/comparison. Three independent variables were present in the design of the experiment: reading comprehension level, graphic organizer instruction, and text structure. The dependent variables were the number of "idea units" recalled from the texts both immediately following reading, and one week later. Materials for the experiment consisted of two articles containing identical information, but with the information organized differently. Students in the experimental groups received instruction via a brief discussion of recalling prior knowledge, and were shown a partially completed graphic organizer of the information in the texts. Conversely, students in the control groups were simply told to try to remember what they'd read.

The results of the experiment supported one of the author's hypotheses: that the students given graphic organizer instruction recalled more than the control group when given a text with

descriptive organization. However, the students at the low end of the comprehension scores did not perform at a significantly higher level than their counterparts.

There were a number of instructional implications of this study. The author conceded that graphic organizer instruction, in this instance, did not have an effect when reorganization of text is unnecessary, but was extremely beneficial when the top-level organization of a text is less than optimal (descriptive text that simply lists facts). Given that many secondary level textbooks are written with a descriptive organizational pattern, according to the author, providing graphic organizer instruction and materials that coerce students into independently reorganizing the text structure will yield increased depth of processing as well as improved performance on immediate and delayed recall measures.

Summary Eight

McMackin and Witherell (2005) present a bevy of research in order to make the case for reading instructors to incorporate tiered graphic organizer instruction into reading lessons centered around inferencing and drawing conclusions. According to the authors, the need to differentiate instruction is driven by a host of factors: legal concerns, the increased percentage of students needing special services and English Language Learners (ELL), and tight budgets forcing more students into mainstream classrooms.

After a brief introduction to the reasons for and theories behind differentiating instruction, the authors present a definition and explanation of the cognitive process of drawing conclusions. They categorize the process of drawing conclusions as “backward”, in that the result is already known, and the reader must determine what caused this result. Additionally, the process of drawing conclusions is described as a blending between what is read in the text and

what is already understood by the reader (background knowledge).

In order to facilitate this skill in students, the authors recommend “think-alouds” as a method for explicit direct instruction. This process involves verbalizing exactly what questions and thoughts would be on the mind of the active reader. For example, the instructor might say, “What was I able to figure out from this section?’, or, “What do we know for sure at this point in the article.” The next step in the process is assigning a text that students will be able to read independently with either an introductory or intermediate-level graphic organizer. These graphic organizers would be set up to accommodate different comprehension levels. For example, the introductory article might simply ask students to list what literal information they have learned from a text, then determine what they could figure out based on this information, whereas the intermediate graphic organizer, in addition to the instructions present on the introductory-level organizer, might also ask for explicit connections between background knowledge and textual information.

Although this article does not present findings from a specific experiment, it presents graphic organizer instruction as a means for the classroom instructor to achieve gains in reading comprehension through a very specific skill present in the reading process (drawing conclusions).

Summary Nine

A 2007 study by researcher Bob Ives expanded the usage of graphic organizers into the realm of mathematics instruction. Years of work in the secondary math classroom informed the author of the need for instructional methods that addressed students’ difficulties in reading and language as applied to math concepts. Borrowing from research in the use of graphic organizers

in reading instruction, Ives designed two studies. The purpose of the experiments were to determine whether attention-deficit and learning disabled students receiving graphic organizer instruction would outperform students without graphic organizers in solving two and three-variable equations, and whether any performance advantages would be maintained for two or three weeks after the initial instruction and assessment.

The studies took place in a private school in Georgia with 200 learning-disabled students. The experimental group consisted of 14 students and the control group consisted of 16 students. Prior to the beginning of the experimental procedures, a prerequisite skills test was administered. The results of the pre-test were used to guide review of the basic skills necessary to complete the equations in the experimental procedures, and to minimize discrepancies in background knowledge that might influence the dependent variable results. The independent variables for the experiment were instruction with graphic organizers and instruction without graphic organizers. The dependent variable was a post test that followed four lessons in the classrooms immediately, as well as another version of the post-test that was administered between two and three weeks after the first post-test. Both post tests assessed two critical areas: concepts and problem-solving.

The results of the first experiment showed that the mean scores for the students receiving graphic organizer instruction were significantly higher than the control group in the concepts section of the assessment. This result was consistent on both the initial and the follow-up post-test. However, the mean scores of the two groups were not significantly different on the system solving portion of the assessment, on both the post-test and the follow-up.

A second experiment was conducted after the first experiment was complete. The researcher wanted to replicate some of the conditions with a new population and more complex

mathematical equations. From a procedural standpoint, the experiment was the same, except for a few differences. The equations in the second experiment had three variables instead of two, and there was no follow-up assessment given weeks after the initial post-test. Additionally, the groups in the second experiment consisted of ten students each, which was a smaller size than the first experiment.

As in the first experiment, the mean scores for the graphic organizer group were higher in the area of concepts. However, in the second study, the mean scores for the graphic organizer group were also significantly higher in the area of system solving, a result that was not seen in the first experiment.

Several conclusions were drawn from the research. First, the results showed that the students who received graphic organizer instruction had a stronger understanding of the conceptual foundations of the content, both immediately following instruction and two weeks later. Additionally, while the students receiving graphic organizer instruction did not perform better than the control group in actually solving the problems in the first study, in the second study the students receiving graphic organizer instruction improved in the area of problem-solving. The researchers concluded that this may be because the students referred to the graphic organizer more often when the complexity of the equations was increased, an advantage that the students in the control group did not have.

Conclusions

The research studies in this section made use of a range of dependent variables to see exactly which skills were augmented by the use of graphic organizer instruction, whereas the first section looked at the independent variables of instructional methodology and materials.

Whether testing LD students (DiCecco and Gleason, 2002) (Ives, 2007), or college undergraduates (Robinson and Kiewra, 1995), studies in this section showed that graphic organizer instruction resulted in gains in the area of relational knowledge and foundational concepts, which holds benefits for educators looking to facilitate deeper understanding than factual knowledge. Furthermore, in the study conducted by Alvermann (1981), students performed at a significantly higher level when asked to reorganize the structure of a text, in both immediate and delayed recall measures. Finally, the article by McMackin and Witherell (2005) presents graphic organizer instruction as a method that will yield gains in drawing conclusions for a variety of students at different levels.

Studies on the Effects of Graphic Organizer Instruction on Different Groups of Students

The remaining studies involve the effects of graphic organizer instruction on specific populations. Whereas prior studies have highlighted which type of organizers are most effective, and which skills are best facilitated through the use of graphic organizer instruction, the following studies examine if and how graphic organizer instruction can benefit students with learning disabilities (Horton, Lovitt, & Bergerud, 1990.) (Boyle and Weishaar, 2001.) (Kim et al., 2004.), remedial students (Horton, Lovitt & Bergerud, 1990.), regular education students (Horton, Lovitt & Bergerud, 1990.), and special education students (Boyle and Weishaar, 2001.).

Summary Ten

In a study conducted by Horton, Lovitt, and Bergerud (1990), the researchers investigated

the effectiveness of graphic organizer instruction for three classifications of students: remedial students, regular education students, and students with learning disabilities (LD). According to the authors, a problem faced by the modern educator is the difficulties that students with reading deficits have with the reading material (textbooks) in mainstreamed courses. The authors present graphic organizer instruction as a viable means of reaching multiple levels of students in secondary classrooms with heterogeneous groups of remedial, regular, and LD students. The researchers set up three experiments with several questions in mind. First, is graphic organizer instruction more effective than self-study for heterogeneous middle and high school classes? Secondly, does graphic organizer instruction produce consistent effects in different subject areas? Finally, can teachers implement graphic organizer instruction in heterogeneous classrooms through teacher and student-directed procedures?

The first experiment utilized three regular education classes each in middle school science and social studies, and high school social studies in a suburban Seattle school district. Two groups from each subject were experimental, and the third was designated as the "neutral" group. The classrooms contained a mix of remedial, LD, and regular education students. The neutral group was first given two reading passages, and directed to complete a graphic organizer for each. The passage on which the students in the neutral group scored lowest was designated as the "difficult" passage and assigned to the experimental group that would receive GO instruction, and the other passage assigned to the self-study group.

Within the self-study group, students were given a passage, told to read and reread the passage within a 15 minute time period, take notes in any format of their choosing for 20 minutes, and finally, complete a 15 item diagram, scored on amount of key ideas recalled, from the passage, which served as the dependent variable for the experiment. Students receiving

graphic organizer instruction were given the same amount of time to read the article, however, the 20 minute note taking session that preceded the testing was replaced by a period of instruction in which the teacher displayed a version of the graphic organizer on the overhead and discussed the relationships between key ideas from the passage.

Results of this experiment showed that students in each category (remedial, LD, and regular ed.) scored higher when provided with the teacher-led graphic organizer. LD students scored an average 74% correct with this treatment vs. 30% with self-study. Remedial students averaged 80% with GO instruction and 39% with self-study. Finally, the regular education students also exhibited higher scores when exposed to teacher-led GO instruction, but also a tighter range of scores when this treatment was applied.

The second experiment that the researchers conducted was very similar to the first experiment in the areas of design and procedures. The difference between the experiments was that the teacher-led GO was replaced by a GO accompanying the passages that students could record notes on. The student-directed GO in this experiment also contained page number references that the students could use as a reading guide to help them find where the key ideas were present in the passages. As with the first experiment, students receiving the GO treatment saw increased average scores as well as a tighter range of scores for LD, remedial, and regular education students.

The final experiment once again closely followed the implementation and design of the first two, with the difference being that in the third experiment, the graphic organizer used with the student-directed GO experimental group replaces the page number text references with clues designed to lead the reader to the correct responses. This change was implemented to determine if a variation of GO formats would lead to the same results. As hypothesized, the students

receiving the GO treatment with reading clues saw increased average scores and a tighter range of scores with the LD, remedial, and regular education students.

Summary Eleven

Boyle and Weishaar (2001) sought to examine the effects of strategic notetaking strategies on groups of high school students with learning disabilities (LD) or educable mentally handicapped (EMR). According to the authors, proficient notetaking is especially important for these populations due to the fact that much of the information in secondary classrooms is delivered via lecture, and that almost half of students' grades were derived from test scores. Additionally, the importance of strategic notetaking instruction is multiplied for LD and EMR students because of the well-documented deficits in written language that these groups have exhibited: slower writing speeds, "verbatim" style of notetaking, difficulty differentiating important from unimportant information, and fewer notes recorded when compared to non-disabled peers.

The sample for the experiment was a high school class in Illinois consisting of 26 students, 22 of whom were classified as LD, and 4 of whom were classified as EMR. In order to ensure that the experimental and control groups were equivalent, the researchers conducted an initial T-test, and found no significant differences in IQ or writing sample scores. Materials for the experiment consisted of two videotaped lectures, approximately 30 minutes in length, one for training and the other for testing.

The independent variable in the researchers' study was strategic notetaking. Students either received training in strategic notetaking or were in a "no-treatment" group. Whereas the students in the no-treatment group received neither instruction nor a notetaking form, the

students who received training in strategic notetaking used a “cued” form to record information during the lectures. This form consisted of prompts that asked students to not only write and record main points and supporting details, and new vocabulary, but also to relate the topics to their own prior knowledge. Finally, the students were instructed, on the form, to summarize the notetaking “clusters” of main points and supporting details.

The experiment proceeded across two training sessions for the experimental group, followed by a session where both the treatment and control group were assessed across four dependent variables: measures of immediate free recall (IFR), long-term free recall (LFR), a comprehension test, and the number of vocabulary words found in students’ notes. For the IFR, students were asked to write down as many ideas and vocabulary from the videos immediately upon completion. Students were given five minutes to complete the IFR measure. LFR measures were identical to the IFR measure, with the difference being that the LFR measure was conducted two days after the completion of the video lecture. As with the IFR measure, students were given five minutes to complete the LFR measure. The comprehension test consisted of 18 multiple choice questions and was administered immediately following the IFR measure. Finally, the students’ notes were evaluated based on the number of vocabulary words used.

As the researchers hypothesized, the students in the experimental treatment group significantly outperformed students in the control group on all dependent variables. The largest discrepancies between the experimental and control groups were found in the areas of long term free recall, and amount of vocabulary words found in notes. In fact, the researchers found that the students using the strategic notetaking performed on average five times better than conventional notetakers on the LFR measure, and that the total number of notes taken by the experimental students ranged from six to eight times greater than the number of notes taken by

the control group students. The researchers followed their results with a discussion of the instructional implications of their findings, concluding that the benefits of strategic notetaking instruction are well worth the small initial investment of class time, especially for students with learning disabilities or other difficulties in notetaking.

Summary Twelve

Kim et al. (2004) compiled a synthesis of research regarding the usage of graphic organizer instruction with students with learning disabilities. According to the authors, previous syntheses on the effects of graphic organizer instruction have yielded inconclusive findings. On one hand, graphic organizer instruction had been touted not only as an effective method for having students connect background knowledge to texts, but also as a means to facilitate better understanding of complex expository texts. On the other hand, these previous syntheses showed that the results of using graphic organizer instruction varied greatly, based on a variety of conditions. For example, the level of the text, student vs. teacher-generated graphic organizer, partial vs. skeletal graphic organizer, and before, during, or after reading implementation were all factors that influenced a wide range of results. One thing that the authors found lacking, however, was analysis of how the use of graphic organizer instruction with expository text would affect students with learning disabilities. Compiling and reviewing the available studies with this specific population became the purpose and the focus of the authors' synthesis.

The authors chose studies for inclusion in their synthesis based on the following criteria: the participants must be k-12 students with learning disabilities, the research must be treatment-comparison or single-group design with graphic organizer instruction as an independent variable, and the dependent variable must be a measure of reading comprehension. In total, 15 journal

articles were chosen for the synthesis, representing 21 different research studies. These studies included results for 848 LD students in elementary, middle, and high school. In the cases where non-LD students were assessed, the results were disaggregated for LD students. Each study included in the synthesis employed either a treatment vs. comparison group or a single group with multiple treatments. There were, however, several variables in the interventions themselves, including type of intervention (graphic organizer type), duration of interventions, person implementing the intervention, and student vs. teacher generated graphic organizer.

In looking at the results of the studies, the authors began with the different types of graphic organizers. In this group of studies, the authors found that students with LD outperformed comparison and control groups in measures of reading comprehension in studies where they utilized all of the following types of graphic organizers: semantic organizers, cognitive maps with and without mnemonics, and framed outlines. Additionally, the authors found that the use of graphic organizer instruction with LD students consistently related to large effect sizes in treatment-comparison studies regardless of participant grade level, person implementing instruction/intervention (teacher or researcher), or whether the graphic organizer was generated by students or by educators. However, studies did show that graphic organizers generated by students yielded higher scores compared to educator-generated graphic organizers.

In a discussion of the educational and instructional implications of their research synthesis, the authors came to several conclusions. First, the large effect sizes between intervention and comparison groups in a variety of categories shows that graphic organizer instruction is an effective intervention for LD students. However, the authors of the synthesis did warn that a majority of the assessments of reading comprehension that followed the graphic organizer instruction were developed by the researchers specifically for use with the intervention

materials and content, and despite seeing improvements when using graphic organizers, few students in the studies reached a level of proficiency of answering 80% of the test items correctly.

Final Conclusions/Summary

The research gathered here can be divided into three categories: experiments testing what type of spatial notes/graphic organizers and instructional strategy works best, experiments that test what type of dependent measures are most affected by instruction in graphical notetaking, and experiments designed to assess the benefits of graphic organizer instruction on specific populations of students with a variety of abilities. According to Robinson, et al. (2006), partial graphic organizers are superior to complete graphic organizers not only in performance measures, but as a method of teaching students how to take better notes. Katayama and Robinson (2000) supported this research with an experiment that showed that graphic organizers outperformed outlines as a study notes, and that partial notes outperformed complete or skeletal notes in both conditions. However, Stull and Mayer (2007) found that partial graphic organizers did not outperform complete notes, particularly when the task and text was complex. Ozmen (2011) found that in most cases, the order of presentation of the graphic organizer favored providing the organizer after students had read the text.

In terms of what kind of knowledge is best supported and increased through the use of graphic organizers, both Robinson and Kiewra (1995) and DiCecco and Gleason (2002) found that while graphic organizers may not have tangible benefits over other notes in the area of factual knowledge, studying graphic organizers has been shown to increase performance on measures of relational knowledge and application. Alvermann (1981) found that immediate and

long-term recall knowledge was improved when the graphic organizer facilitated reorganization of the text structure. McMackin and Witherell (2005) advocated for the use of graphic organizers as a means to facilitate drawing conclusions, and Ives (2007) found that the benefits of graphic organizer instruction extended not only to reading comprehension and recall, but also to mathematics problem solving.

Finally, a group of studies was selected that attempted to show the effects of graphic organizer instruction on specific populations, mainly students with learning disabilities. Horton, Lovitt, and Bergerud (1990) conducted studies with heterogeneous groups consisting of regular, remedial, and LD students, and found that graphic organizer instruction had a positive effect for all groups. In a study by Boyle and Weishaar (2001), learning disabled and educable mentally retarded students receiving strategic notetaking instruction outperformed students using conventional note taking strategies in several measures., and finally, learning disabled students in a variety of studies showed high performance effects when utilizing a variety of graphic organizers, as explained in a synthesis by Kim et al. (2004).

CHAPTER THREE

The study was completed in the Spring Semester of the 2011-2012 school year, over a six-week period in April and May. The purpose of the study was to determine the effectiveness of graphic note taking as compared to linear notes or no notes at all on measures of reading comprehension with remedial secondary reading students. Students were chosen for the study based on their enrollment in the West Allis-West Milwaukee School District's reading intervention program for 9th and 10th graders. All texts and assessments were derived from the Achieve 3000 program.

Population:

Students were chosen for the study based on their enrollment in the West Allis-West Milwaukee School District's reading intervention program. Ninth and tenth grade students, ages 15-16, are selected for this program based on several data points: Biannual Measure of Academic Progress (MAP) test scores in reading, Wisconsin Knowledge and Concepts Examination (WKCE) scores in reading from eighth grade, and anecdotal evidence from classroom teachers such as letter grades or performance on classroom assessments. Students who fit these criteria are further divided into three groups: remedial reading block, reading I, and reading II. The twelve (six male, six female) students chosen for inclusion in this study came from the reading II pool of students, who represented the highest scoring and performing students still deemed in need of a reading intervention class. When choosing which students to include in the study, consideration was given to daily attendance, as any prolonged gaps in attendance may interfere with participation in the collected activities. Students in this group, according to MAP testing, scored, at worst, at a 6th grade equivalent reading level based on Lexile (grade level reading

equivalent) ranges. Of the female students, four were Caucasian, one was African-American, and one was Hispanic. Of the male students, five were Caucasian, and one was African-American.

One of the key curricular components in the class was the Achieve 3000 online program. This is a program sold in a subscription package to school districts. The company boasts of being a "leader in differentiated instruction". Each student has an account with a home page, and the program delivers texts written at different Lexile levels to an "inbox" for each student daily. The Lexile levels of the texts delivered to each student are dependent on student scores in a pre-test that is very similar to other standardized measures such as WKCE and MAP. As students complete activities related to the articles, the Lexile level is adjusted up or down, and results are sent to teachers to monitor progress, adjust levels, create enrichment activities, or provide remediation. According to the website, "The results of a nationwide, year-long study that looked at the achievement of more than 252,113 students in 2,728 schools showed that students using Achieve3000 nearly doubled their expected Lexile growth." For the purposes of this study, however, the program was used to generate texts and accompanying assessments that would mimic high-stakes standardized tests.

The comprehensive Achieve 3000 program includes daily articles followed by polls, writing activities, multiple-choice reading comprehension quizzes, and extension articles. For this study, the texts were used only with the accompanying multiple-choice reading quizzes (see Appendices A-F). The texts delivered by Achieve 3000 are nonfiction, and are updated to reflect current events and trends as well as history, science and technology, and biography of popular figures. The program rewarded students' participation via a points system that would unlock achievements such as custom avatars and games. A school wide leaderboard was visible on each

student's home screen, showing the individual points as well as the accumulated points of the entire class. The administrative access to the website offered the opportunity to manipulate the Lexile level of each article to differentiate materials for a class with a wide range of reading levels. However, all the materials used in this study were delivered to students at a sixth grade equivalent Lexile range, to ensure uniformity.

Procedures:

Beginning in April of 2012, students in the reading II class began a six-week long unit on reading strategies specific to particular text types. For example, when reading texts organized in different patterns (i.e. cause and effect, problem and solution, etc.), students learned to determine the pattern of the text by identifying transitions, and generate questions appropriate to specific text frames that if answered, would help them to understand the main ideas of the text. This instruction often incorporated modeling a reading strategy out loud, followed by guided practice, and eventually independent student work. Some of the strategies included questioning, summarizing, and finding the meaning of unfamiliar words in context. Typically, this strategy instruction would take place on Tuesdays, and the completion of the activities/assessments would take place on Wednesdays. The instructional sessions would focus on specific vocabulary in the articles and background knowledge on the subjects of the articles. However, the primary objective in the lessons leading up to the activities was instructing the students to find important concepts, main ideas, and supporting details within the texts.

At the completion of each lesson, the students were given the texts. The texts were similar in theme for two weeks at a time. For example, the first two articles were about natural science, the second two were about technology, and the last two articles were about

political/civic issues. The texts were printed from the Achieve 3000 website at a sixth grade reading level, in order to ensure that fluency and other reading deficiencies would not interfere with comprehension. Since students were enrolled in the class on the basis of having Lexile levels at a sixth grade equivalent or better, as determined by MAP and Achieve 3000 level set testing, the texts and accompanying questions were printed at a sixth grade level. As students' enrollment in the class was contingent on being able to read at a sixth grade level or higher, using materials at a sixth grade level ensured that every student would be able to read the texts. The students then read the texts independently.

It was at this point where the instructions differed on the texts. For the first reading, half of the students received instructions to simply record main ideas and important details however they saw fit. The other half of the students received a graphic organizer to record their notes on. The graphic organizers that accompanied the texts were skeletal in structure, meaning that they were simply a graphic representation of the key organization and structure of the information and arguments contained in the articles, however, they did contain one example to serve as a reference for what kind of information the students should be writing in the spaces of the organizer. The students who were told to take their own notes did not know that the other students received a graphic organizer, and the students who received the graphic organizer did not know that their classmates were instructed to take notes independently. Students were spread throughout the class room in an every-other-desk arrangement and given a packet that had their name on it. The assessment period was conducted in the typical fashion of a classroom test: no talking, text messaging, looking at classmates' work, etc. This procedure was reversed with every other text, so that students completing graphic organizers one week would be asked to take notes independently the next week. This was done to ensure that the independent variable of

graphic vs. linear notes (or no notes at all) would be applied to all students, rather than the same six students throughout the course of the experiment. Each of the graphic organizers used in the assessments were previously modeled during a class period with another similarly organized text.

Upon completion of the note taking task included with the texts, students were given an eight question, multiple-choice assessment. These assessments, the dependent variables in the study, were a measure of reading comprehension as well as understanding of the key terms and concepts within each text.

Data Collection:

During normal biweekly use of the Achieve 3000 program in the remedial reading courses, the entire procedure (reading, writing a summary/responding to the text, and answering the multiple choice questions) would be done online, in a school computer lab, on a laptop or mobile device. For this study, all materials were printed out and done on paper with pen or pencil. There were multiple reasons for doing this. First, using paper eliminated unfamiliarity with the navigation of the website, such as bouncing back and forth between screens to look back on the text or the graphic organizer for answers to the assessment questions. Furthermore, having the data on paper would eliminate an inadvertent deletion of student data in the case of student scheduling changes (at semester, for example), which would result in the student's online account being transferred to the jurisdiction of another teacher's password-protected administrator account.

When students completed a packet, their answers on the multiple-choice reading assessments were scored according to the answer key available on the administrator version of

the Achieve3000 website. The assessments for each week were then separated into two groups: students who used a graphic organizer, and students who took other notes or no notes.

CHAPTER FOUR

As outlined in the previous chapter, the research for this study was conducted over a six week time frame, with weekly texts and assessments assigned to the students. Each time a new text and assessment were given, half of the students were instructed to complete a graphic organizer after reading and before taking an eight item multiple choice quiz covering such areas as drawing inferences and conclusions, and identifying important terminology and author's intent. The other half of the students in the study were given no instructions to complete a graphic organizer, but were given a blank area on the page after the text in order to write a brief summary or other notes, which most of the time, they chose not to do. What follows is a week-by-week presentation of the results of the study, illustrating the effects of graphic organizer use in the assessments versus other notes or no notes.

Week One:

The text for the first two weeks of the study dealt with what could be considered controversial legal and civic issues. The first week's text dealt with Voter ID, and the students received instruction on reading articles where opposing viewpoints are introduced. The lesson prior to the assessment included modeling reading a text, identifying details that supported one claim or the other, and writing those details on a two-column graphic organizer so that readers could see the key arguments of each side of the issue next to each other. This same kind of graphic organizer was part of the packet for the students in the treatment group for this assessment. Here are the results:

	Students using graphic organizers (# correct/% correct)
Student A	3/38%
Student B	4/50%
Student C	3/38%
Student D	4/50%
Student E	4/50%
Student F	4/50%
Average scores/%	3.66/45.8%

	Students not using graphic organizers (#correct/% correct)
Student G	2/25%
Student H	3/38%
Student I	3/38%
Student J	2/25%
Student K	4/50%
Student L	2/25%
Average scores/%	2.66/33.3%

This was the first week that two groups of six students each completed the assessment, one with and one without graphic organizers. Therefore, individual growth could not be measured. However, the group of students using the graphic organizers performed at a higher level than the group not using the graphic organizer, with an average score that was one point higher at 3.66 to 2.66, respectively. Additionally, four of the six students using graphic organizers on this assessment scored a 50%, which was the highest score among all the participants.

Week Two:

The second week of the study used the same type of graphic organizer as week one: a two-column chart outlining the key arguments of two opposing sides of an issue. This week's text focused on a lawsuit over affirmative action in college admissions. Here are the results of the assessment:

	Students using graphic organizers (# correct/% correct)
Student G	4/50%
Student H	5/63%
Student I	2/25%
Student J	6/75%
Student K	6/75%
Student L	6/75%
Average scores/%	4.83/60.4%

	Students not using graphic organizers (# correct/% correct)
Student A	3/38%
Student B	3/38%
Student C	4/50%
Student D	4/50%
Student E	4/50%
Student F	2/25%
Average scores/%	3.3/41.6%

Week two saw average scores improve, compared to the first assessment, in both the treatment (graphic organizer) and non-treatment group. Additionally, the group using graphic organizers averaged a higher score by a wider margin than in the first week. However, the students using the graphic organizers and the students not using the graphic organizers switched, making this improvement even more significant. For example, in the first week's assessment,

the six students not using graphic organizers in the first week, who used graphic organizers in this assessment went from an average score of 2.66 out of 8, to 4.83. Individually, five of the six students (all but student C) using graphic organizers in week two improved their scores on the assessment, with students D and F going from 25% correct to 75% correct.

Week Three:

The texts for the second unit of study fit into a compare and contrast pattern. The third text in the study gave an overview of Ipads replacing books in a growing number of American classrooms. The graphic organizer demonstrated for usage with articles that compare two things was the Venn diagram, and the modeled lesson was based on finding singular qualities of compared items, then similarities, and making a judgment based on each item's advantages and disadvantages. A Venn diagram was included in the text packet for the students in the treatment group for this text and assessment. Here are the results:

	Students using graphic organizers (# correct/% correct)
Student A	5/63%
Student B	6/75%
Student C	6/75%
Student D	3/38%
Student E	5/63%
Student F	3/38%
Average scores/%	4.66/58.3%

	Students not using graphic organizers (# correct/% correct)
Student G	4/50%
Student H	3/38%
Student I	5/63%

Student J	3/38%
Student K	4/50%
Student L	3/38%
Average scores/%	3.66/45.8%

This week the students in the study completed assessments with new graphic organizers, and were in the same groupings as in week one. As with the first two assessments, the students using graphic organizers performed higher than the non-organizer group by one full question out of eight average (4.66 to 3.66, respectively). This is the second time that the students were in these groups for assessment and since the first week, the average scores went up for all students. The group using graphic organizers scored 45.8% average in the first week, and 58.3% in this week, while the group not using graphic organizers went from a 33.3% average in the first week to a 45.8% average this week. Of the students using graphic organizers, only students D and F had lower scores on the second assessment that they took with organizers. Every other student using graphic organizers for the second time on this assessment improved their score.

Week Four:

As with the first two week period of the study, the fourth text fit the same pattern as the third, and the same graphic organizer was used in the assessment, so that every student used the graphic organizer in the two-week cycle. The text compared the advantages and disadvantages of self-checkout scanners and employee scanning and bagging at grocery stores, in particular, how the grocery stores used customer feedback to make decisions on their checkout practices. Here are the results of the assessment:

	Students using graphic organizers (# correct/% correct)
Student G	4/50%
Student H	3/38%
Student I	5/63%
Student J	5/63%
Student K	4/50%
Student L	5/63%
Average scores/%	4.33/54.2%

	Students not using graphic organizers (# correct/% correct)
Student A	4/50%
Student B	4/50%
Student C	3/38%
Student D	3/38%
Student E	2/25%
Student F	4/50%
Average scores/%	3.33/41.6%

Although week four saw a similar trend as the other weeks in terms of comparative performance averages from the graphic organizer and non-graphic organizer group (i.e. the one point average score advantage to the group that used graphic organizers), there was bit of a drop in individual scores in this week's assessment. For example, even though the overall score averages were similar, four of the six students using graphic organizers on this assessment actually saw their scores go down from the last assessment that they answered with the graphic organizers (week two). However, this assessment did have a different type of text structure and graphic organizer. Additionally, the largest drop in score for any of the students using graphic organizers was two points. The average score of the students not using graphic organizers

remained the same as in week two, when the students in this group last completed an assessment without a graphic organizer.

Week Five:

In the last two week unit in the study, students read texts that fit into a cause and effect pattern of organization, and were taught to use a modified flow chart starting with the effect and working backwards through all the causes leading up to that effect, and listing important details such as names, dates, and statistics. This type of graphic organizer and its use were modeled to the students prior to their reading the fifth text and assessment, which was a science text about the unusual phenomenon of mass bird die-offs. Here are the results of this assessment:

	Students using graphic organizers (# correct/% correct)
Student A	3/38%
Student B	7/88%
Student C	5/63%
Student D	2/25%
Student E	4/50%
Student F	5/63%
Average scores/%	4.33/54.2%

	Students not using graphic organizers (# correct/% correct)
Student G	4/50%
Student H	5/63%
Student I	3/38%
Student J	5/63%
Student K	3/38%
Student L	2/25%
Average scores/%	3.66/45.8%

The results of this assessment showed the least difference between the average scores of the graphic organizer and non-graphic organizer groups: two thirds of a point. The range of scores was also the widest for the group using graphic organizers, with student D scoring a 25% and student B scoring an 88%. In the last assessment that these same students used graphic organizers for, the scores ranged between 38% and 63%. The group using graphic organizers scored an average of 4.33 out of 8, and this was lower than the 4.66 average that these same students exhibited on the week three assessment. However, the group using graphic organizers still performed higher than the group that did not use graphic organizers, which was a result seen in all of the studies, regardless of groupings.

Week Six:

The sixth and final text and assessment followed the same graphic organizer and cause/effect organizational pattern as the fifth. This article and assessment focused on the recent changes to the US government's dietary guidelines. Here are the results of the assessment:

	Students using graphic organizers (# correct/% correct)
Student G	3/38%
Student H	7/88%
Student I	7/88%
Student J	7/88%
Student K	5/63%
Student L	5/63%
Average scores/%	5.66/70.8%

	Students not using graphic organizers (# correct/% correct)
Student A	3/38%
Student B	3/38%
Student C	4/50%
Student D	4/50%
Student E	3/38%
Student F	4/50%
Average score/%	3.5/43.75%

In a contrast to week five, week six saw the average scores on the assessments have the largest discrepancy between the group using graphic organizers and the group not using graphic organizers. Additionally, while the students using graphic organizers in week five showed a decline in average scores, the students using graphic organizers in week six showed improvement, with four of the six students (B, C, D, and E) improving their scores, and student F matching the week four assessment score. Only student A had a lower score from the last time this rotation of students used graphic organizers on an assessment. Students not using graphic organizers had an average score of 3.5, up slightly from the week four assessment when they had an average score of 3.33. Overall, the students using graphic organizers outperformed the students not using graphic organizers, which was a consistent trend throughout the entire six-week assessment regimen, regardless of which rotation of students was using graphic organizers on their assessments.

Conclusions:

There were a number of conclusions that could be reasonably drawn from analyzing the data in this experiment. For example, one consistent trend throughout all assessments was that the students using graphic organizers outperformed the students not using graphic organizers.

Combining all the weeks of assessments, the average score out of eight for students using graphic organizers was 4.58, or 57.28%. The students that did not use graphic organizers had an average score of 3.36 or 42%. However, that figure is reached by combining all the assessment scores. Since students alternated weeks of using graphic organizers on the assessments, individually evaluating the effectiveness of the intervention required breaking down the data for every other week. For example, the same students completed the assessment with graphic organizers in weeks one, three, and five. Here are the results for the first rotation of students:

Using Graphic Organizers

	Week 1	Week 3	Week 5	Average
Student A	3/38%	5/63%	3/38%	3.66/45.8%
Student B	4/50%	6/75%	7/88%	5.66/70.8%
Student C	3/38%	6/75%	5/63%	4.66/58.3%
Student D	4/50%	3/38%	2/25%	3/38%
Student E	4/50%	5/63%	4/50%	4.33/54.12%
Student F	4/50%	3/38%	5/63%	4/50%
Average	3.66/45.8 %	4.66/58.3%	4.33/54.2%	**4.22/52.7%**

Not Using Graphic Organizers

	Week 2	Week 4	Week 6	Average
Student A	3/38%	4/50%	3/38%	3.33/41.6%
Student B	3/38%	4/50%	3/38%	3.33/41.6%
Student C	4/50%	3/38%	4/50%	3.66/45.8%
Student D	4/50%	3/38%	4/50%	3.66/45.8%
Student E	4/50%	2/25%	3/38%	3/38%
Student F	2/25%	4/50%	4/50%	3.33/41.6%
Average	3.3/41.6%	3.3/41.6%	3.5/43.75%	**3.39/42.3%**

These two charts represent the same six students' assessment scores over the course of the six week experiment. This group of students had an average score that was nearly 10% higher when using graphic organizers on their assessments. From an individual standpoint, only one student in this rotation scored lower when not using graphic organizers (Student D). Every other student

showed improved scores when using graphic organizers, with Student B having the largest margin between average scores. Here are the results of the other rotation of six students who took the assessments and used the graphic organizers on weeks two, four, and six:

Using Graphic Organizers

	Week 2	Week 4	Week 6	Average
Student G	4/50%	4/50%	3/38%	3.66/45.8%
Student H	5/63%	3/38%	7/88%	5/63%
Student I	2/25%	5/63%	7/88%	4.66/58.3%
Student J	6/75%	5/63%	7/88%	6/75%
Student K	6/75%	4/50%	5/63%	5/63%
Student L	6/75%	5/63%	5/63%	5.33/66.6%
Average	4.8/60.4%	4.33/54.2%	5.66/70.8%	**4.94/61.7%**

Not Using Graphic Organizers

	Week 1	Week 3	Week 5	Average
Student G	2/25%	4/50%	4/50%	3.33/41.6%
Student H	3/38%	3/38%	5/63%	3.66/45.8%
Student I	3/38%	5/63%	3/38%	3.66/45.8%
Student J	2/25%	3/38%	5/63%	3.33/41.6%
Student K	4/50%	4/50%	3/38%	3.66/45.8%
Student L	2/25%	3/38%	2/25%	2.33/29.1%
Average	2.66/33.3%	3.66/45.8%	3.66/45.8%	**3.33/41.5%**

This rotation of students actually had a more pronounced improvement in scores compared to the first group of six students, when using the graphic organizers on the assessments, as their average scores were over 20% higher. Individually, every student in this assessment rotation had higher average scores when using graphic organizers on the assessments. Student D had average scores go from 41.6% to 75% when the graphic organizer was implemented, and student F had average scores go from 29.1% without graphic organizers to 66.6% when using graphic organizers.

The data collected in this experiment yields several implications for the secondary reading teacher, which will be discussed in the concluding chapter.

CHAPTER FIVE

As shown in Chapter Four, the results of the weekly experiments indicated a strong performance advantage for students who used graphic organizers. These results were not only consistent across six weeks of assessments, but they were also consistent with the research studies cited in Chapter Two: the review of literature.

Connection to Research:

The research studies that were used to inform the design and implementation of the experiments in this study were categorized according to three specific criteria: studies that showed the effectiveness of different types of graphic organizer instruction, with different groups of students (ability levels, SPED status, etc.), and studies that explored what skills would likely be enriched through GO instruction. As such, the results of this study, in which each group using graphic organizers outperformed the group not using graphic organizers, did not come as a surprise, given the trends observed in the review of literature.

One of the reasons that graphic organizer instruction was chosen as the basis of an experimental study was that there was a variety of research showing that it would be a beneficial intervention technique for use with remedial students. In a study conducted by Horton, Lovitt, and Bergerud (1990), students receiving a graphic organizer treatment outperformed students in a self-study group. What was significant about this study was that the group of students in the experiment included secondary remedial, regular, and special education students; a group makeup that closely resembled the heterogeneous secondary classroom with whom this study was conducted. Furthermore, the results of the study showed increased scores and a tighter range of scores for students receiving graphic organizer instruction under a variety of conditions:

teacher led, student-directed with page cues, and student-directed without page cues. I hypothesized that the students using graphic organizers would have a similar performance advantage to the students in this experiment, and they did.

Additionally, in a study by Boyle and Weishaar (2001), special needs high school students receiving strategic note taking instruction performed significantly higher than students taking linear notes on a variety of assessment measures. While the students in this research study were not cognitively or learning disabled, they did show similar results to the students in Boyle and Weishaar's (2001) study.

In a study by Robinson, et al. (2006), students who received partially completed graphic organizers outperformed students who studied outlines on a series of assessments. The researchers hypothesized that using graphic organizers to prepare for an assessment had a dual benefit of teaching students to take notes graphically as well as forcing students to visually organize key text concepts. Similarly, in this study, the performance of students receiving graphic organizers was also compared to students taking a self-study approach on a quiz assessment. It was therefore not a surprise to see similar results to the experiments conducted by Robinson, et al. (2006), in which students completing graphic organizers on their own, prior to assessment, scored higher than students studying prepared notes or linear notes.

Another piece of research that influenced my expectations of the outcomes of this experiment was from Kim et al. (2004), who compiled a synthesis of the results of many experiments dealing with the benefits of graphic organizer instruction for learning disabled students. Their work showed that regardless of the type of graphic organizer or method of graphic organizer instruction, learning disabled students receiving graphic organizer instruction

consistently outperformed groups that did not receive similar treatment on measures of reading comprehension. Again, while the students in this study may not have been learning disabled, they were placed in a reading remedial course due to reading below grade level, so the expectation was that the advantages that graphic organizer instruction had for the learning disabled students in the Kim et al. (2004) synthesis would also hold true for the students receiving graphic organizer instruction in this research.

Explanation of Results

As previously stated in the conclusion to chapter four, there are several implications that could reasonably be drawn from the results of this research, the most important of which is the fact that the students using graphic organizers performed higher than students not using graphic organizers on each of the six weekly assessments. More specifically, all but one of the twelve students had higher average scores on the quizzes when using a graphic organizer.

The data for the first group of six students shows an average score of 52.7% when using graphic organizers and 42.3% when not using graphic organizers on the quizzes. For the alternating group of six students, the average score when using graphic organizers was 61.7%, and 41.5% when not using graphic organizers.

Although both groups of students saw their scores increase when using graphic organizers, the second group of students had much higher average scores when using graphic organizers, and also contained the two individual students who exhibited the highest percentage of change between GO and non-GO assessments. This may have been due to the fact that they had an extra week between in-class instruction in the graphic organizer format used for that week's assessment, and the actual assessment itself. In other words, they took an assessment

first without the GO, then with the GO in the second week, so they knew what to prepare for. Another reason for the exaggerated difference between first and second rotation students is that they may have discussed the assessments with classmates, not in terms of specific content, since the quizzes differed from week to week, but in terms of what kind of questions to prepare for when completing the graphic organizers and reading the texts.

Additionally, the scores for the assessments, both with and without the graphic organizers, were lower overall than the 75% proficiency level recognized by the website. However, one contributing factor is that with the online work, the students have the article to look back on, as well as two tries to get their responses correct. For the assessments used in the study, students looked at their graphic organizers instead of back on the articles, and filled out one answer per question in a much quicker time frame than if they were working online at their own pace.

Despite some of these concerns, the overall performance of students with and without graphic organizers reinforces the original hypothesis that graphic organizer instruction would lead to improved comprehension scores. Furthermore, graphic organizer instruction can be utilized as an effective interventional strategy with remedial readers in preparing for assessments/exams.

Strengths and Limitations

The research process afforded the time to reflect on some of the strengths and limitations of this action research study. In particular, some of the strengths of the project became apparent when the project was still in the design phases, whereas many of the limitations became apparent only after the experiment was completed. While the overall project supported the hypothesis that

graphic organizer instruction would be an effective intervention for remedial secondary students, there were several additional areas that could have been explored, such as the types of skills that GO instruction would improve, and to what degree GO instruction might improve written/short answer responses.

For example, one thing that was not taken for granted during the design of the research project was the fact that the school had already created, essentially, a population of remedial students, verified through several pretests, that were all within a couple grade levels of each other in terms of reading ability. This made the initial process of gathering consent forms and choosing students much simpler than if it were a literature survey course where students had a much wider array of reading levels. If this were the case, only certain students would have been eligible to be included in the study, since it was primarily concerned with graphic organizer instruction as an intervention for remedial readers. Additionally, crucial to the success of this project was the degree of autonomy granted as a teacher of this course. If it were necessary to choose students for the experimental procedures from a literature survey course, the research and experiments would have been competing against a curriculum that mandates specific coursework in a set time frame. With this in mind, it was a strength of the project to be able to choose a population entirely made up of remedial readers with a specific reading level range, and conduct the research within six consecutive weeks without delays, implementing the experimental procedures as if they were part of the class and not something “extra”.

The Achieve 3000 website was not without its flaws, but it also was a strength of the research. It eliminated some potential inconsistencies between texts in weekly assessments, that may have had an effect on the final results, by automatically leveling the texts at a given grade level. Without the program, it would have been difficult to find appropriate secondary level

nonfiction articles at a low enough Lexile level to minimize difficulty reading the texts for the students enrolled in the class.

However, utilizing the Achieve 3000 website could also be considered a potential limitation of the project, as well. For example, it was somewhat difficult to find articles that matched nicely with the graphic organizers, since the texts on the website are classified by subject/topic and not by text frame. As a result, topics were selected that the students may not have been particularly familiar with, such as Voter ID laws. Because the students may not have been familiar with the subjects of the texts, and because I did not want this unfamiliarity to lead to inconstancies in the scoring, I found myself having to do quite a bit of building of background knowledge before the assessments took place.

Another limitation of the project was the quizzes that accompanied the leveled texts. Each quiz typically contained a number of questions that fell into several categories: recall, drawing conclusions/inferences, and determining the meaning of technical vocabulary through context. However, these different types of questions were interspersed throughout each quiz, with different numbers of each type of question accompanying each text. It would have been helpful if the quizzes were broken down into mini-sections so that each skill could be analyzed separately to see a more focused picture of the effects of the treatment, rather than simply categorizing the quiz with a broad heading of “reading comprehension”. On a related note, students could have more specifically articulated their knowledge of the texts if there were short answer sections or some kind of writing component to the assessments. However, one of the objectives of the study was to determine the effectiveness of graphic organizers as pertains to the kind of high-stakes tests common to secondary education, and the assessments utilized the multiple-choice format most common in these types of tests.

Recommendations for Future Research

Several of the limitations of the project could potentially be addressed in future research. Changing some of the timelines associated with the design of the experiment as well as utilizing some different assessment formats could add to the body of knowledge on graphic organizer instruction as an effective intervention with remedial readers.

In order to efficiently conduct this research project, assessments were conducted over a six-week period with one assessment given per week. Therefore, each of the twelve students completed three assessments with graphic organizers and three assessments without graphic organizers. Since the reading and note taking instruction and procedures were all conducted within a week's span for each assessment, the assessments did not provide information on how the use of graphic organizers might improve recall and comprehension over a longer wait time between reading and assessment. A further version of this experiment might account for long term recall measures in addition to immediate recall/comprehension if a longer period of time elapsed between the reading and completion of the graphic organizer, and the subsequent assessment. This long-term delay measure was used in the study by Alvermann (1981), who found that the students who completed graphic organizers did recall more main ideas of a text, one week after reading, particularly when the graphic organizer involved reorganizing information. Similar results were also found in the research from Ives (2007), who saw increased performance from students receiving graphic organizer instruction up to three weeks after the initial post-tests.

The students who received graphic organizer instruction and used graphic organizers to aid in their reading prior to the assessments consistently performed higher than the students who

were not given any accompanying materials with their texts. However, the assessments themselves were only identified as reading comprehension measures as a brief check for understanding for the short (one to two pages) articles. Although previous research, such as the 1995 study by Robinson and Kiewra, showed that graphic organizers can improve student performance across a number of dependent variables, this research project only counted one dependent variable: the multiple-choice quiz. Future study of graphic organizer use with this population could include a range of dependent variables, such as teacher generated pen and paper assessments of different format and length, short answer and essay questions, or even scored discussion. A range of dependent variables would lend more specific results in terms of the skills improved through the treatment.

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APPENDIX A

COLUMBIA, South Carolina (Achieve3000, February 9, 2012). The attorney general of South Carolina has filed a lawsuit against the U.S. Justice Department. In the lawsuit, the attorney general takes issue with the department's decision to turn down a South Carolina law. The law requires voters in the state to show photo identification (ID) at the polls.

What the South Carolina Law Says

The law was enacted in 2011. It requires voters to show poll workers a state-issued driver's license. They can also show an alternative form of photo ID. The law also states that the Department of Motor Vehicles (DMV) will issue free photo ID cards to voters who need them.

The new law allows voters without the required photo ID to cast ballots. Yet, those voters must return with an ID for their ballots to count.

Since 1988, South Carolina's law has required voters to show either a voter registration card or some sort of government-issued ID. South Carolina is among five states that passed laws in 2011 requiring some form of photo ID at the polls. Now, at least 31 states require voters to show an ID at the polls. Of those states, 15 require photo IDs.

Why are photo IDs required? Those who support the laws say they prevent voter fraud. The laws are meant to keep people from voting twice. They also prevent people from pretending to be a different person at the polls.

Why the U.S. Justice Department Does Not Like the Law

However, not everyone agrees that voter ID laws are a good idea.

In December 2011, the U.S. Justice Department blocked implementation of South Carolina's new law. The department has the right to approve or reject changes to South Carolina's election laws under the 1965 Voting Rights Act. That's because in the past, the state had failed to protect the rights of African-American voters. (South Carolina is one of nine states that require the department's approval.) The Justice Department concluded that many minorities in South Carolina might not be able to cast ballots under South Carolina's law. That's because they don't have the right photo ID. The IDs are available from the DMV. Still, not everyone has the transportation or information necessary to go to one of those offices.

"Minority registered voters were nearly 20 percent more likely to lack DMV-issued ID than white registered voters, and thus to be…disenfranchised," said Thomas Perez. Perez is the federal government's assistant attorney general. He believes South Carolina's law could prevent some minorities from voting.

The Justice Department's decision stopped South Carolina's law from going into effect.

Opponents of voter ID laws applauded the Justice Department's decision. These opponents reject the idea that voter ID laws are put in place to prevent voter fraud. They claim that voter fraud is extremely rare. They say that the real purpose of the laws is to prevent certain groups of people from voting. They say this is discrimination against minorities. Studies have shown that minorities are less likely to have the proper photo ID.

Victoria Middleton heads the American Civil Liberties Union (ACLU) for South Carolina. She praised the Justice Department. Middleton said the law represented a "setback to voting rights in our state." She said the ACLU was "pleased to see it stopped in its tracks."

What South Carolina Says Now

Many South Carolina lawmakers are not happy. In February 2012, South Carolina Attorney General Alan Wilson filed a lawsuit against U.S. Attorney General Eric Holder. Holder is head of the Justice Department. The lawsuit stated that the U.S. Justice Department was wrong to block South Carolina's law.

"Nothing in this [law] stops people from voting," Wilson argued. "The changes have neither the purpose nor will they have the effect of denying or [limiting] the right to vote on account of race…."

Wilson asked three federal judges consider the case. He wants them to declare that the law is fair. Wilson pointed out that there are rules in the law that allow any voter to obtain a free photo ID. In addition, he noted that South Carolina's law is similar to one in Indiana. The U.S. Supreme Court has already looked at the Indiana law and declared it constitutional. According to Wilson, the photo ID laws "are not a bar to voting but a temporary [hassle] no greater than the [bother of] voting itself."

Activity

PAGE 1

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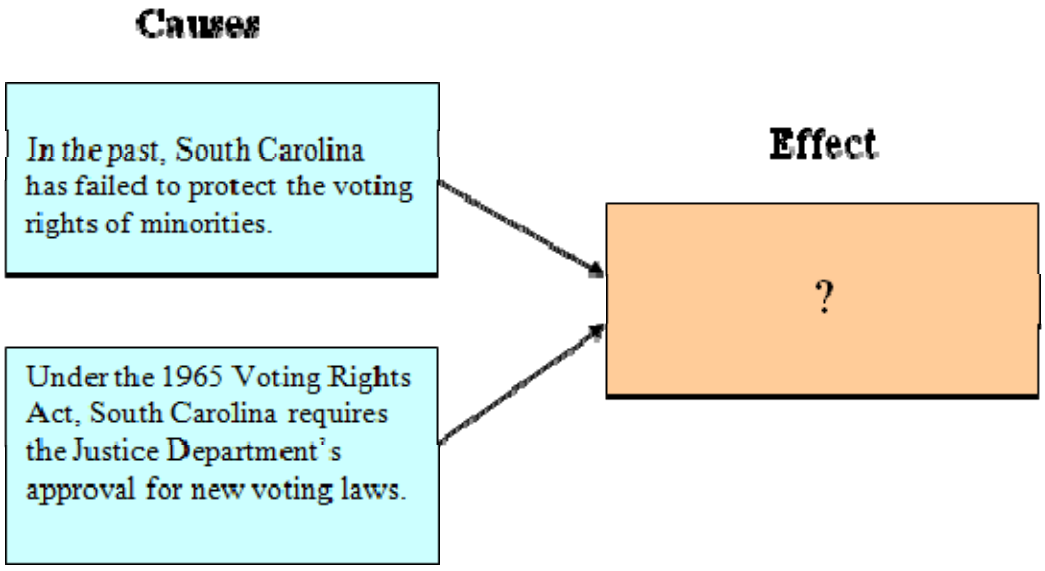

Based on the article, which best replaces the question mark in the diagram above?

(A) South Carolina's new law makes it harder for minorities to get to the polls.
(B) The Justice Department was able to block South Carolina's new voter photo ID law.
(C) The U.S. Justice Department is bringing a lawsuit against South Carolina.
(D) South Carolina's Department of Motor Vehicles will give people free photo IDs.

---

2. Suppose that this article could have a different title. The best one would be _____.
(A) South Carolina Voter ID Law Is Under Dispute
(B) South Carolina Issues Free Photo IDs to Residents
(C) South Carolina Files Lawsuit Against DMV Officials
(D) South Carolina Seeks To Register More Minority Voters

---

3. Which two words from the article are the closest **antonyms**?
(A) Deny and limit
(B) Block and stop
(C) Approve and reject

(D) Ballot and identification

---

4. The reader can tell from the article that _____.
(A) South Carolina's residents will not be affected by what happens with the voter ID law.
(B) South Carolina residents are divided in their support of the new voter ID law.
(C) South Carolina's government officials will not need to show ID at the polls.
(D) South Carolina officials are planning to expand the hours that DMV locations are open.

---

5. This article is placed in the group of news called "Across the U.S." In which other group would this article fit best?
(A) Legal Conflicts
(B) The Supreme Court & You
(C) Educational Opportunities
(D) Business & Technology

---

6. The article states:

> **Opponents of voter ID laws *applauded* the Justice Department's decision. These opponents reject the idea that voter ID laws are put in place to prevent voter fraud.**

Which is the closest **synonym** for the word *applaud*, as it is used above?
(A) Regulate
(B) Delegate
(C) Criticize
(D) Praise

---

7. Based on the article, the reader can predict that _____.
(A) Some South Carolina residents who do not have photo IDs will obtain free ones from the DMV.
(B) The ACLU will bring a lawsuit against South Carolina's attorney general regarding the new law.
(C) A law that requires voters in all states to show photo IDs will be enacted by the U.S. attorney general.
(D) Indiana will decide to make it more costly for residents to obtain photo identification.

---

8. Think about the following statement made by South Carolina Attorney General Alan Wilson:

> **"[The photo ID laws] are not a bar to voting but a temporary [hassle] no greater than the [bother of] voting itself."**

The author included the quote above in the article in order to _____.
(A) Suggest that most people in South Carolina find voting to be a bother
(B) Highlight Wilson's belief that obtaining photo ID is time consuming
(C) Highlight one of Wilson's key arguments in favor of the new law

Ⓓ Suggest that South Carolina residents vote less often than other Americans

APPENDIX B

WASHINGTON, D.C. (Achieve3000, March 9, 2012). Abigail Fisher says the University of Texas treated her unfairly because of her race. She has filed a lawsuit against the school. Fisher, who is white, applied for admission to the school in 2007. She was denied. At the same time, minority students with the same grades were accepted. Fisher argues that this is unconstitutional. Not everyone, however, agrees.

The University of Texas (UT) is clear about its admissions policies: It first accepts students who are among the top 10 percent in their high school classes. (Fisher's grades did not put her in that category.) In filling whatever openings might remain, the school says that it considers other student data. This includes racial background. UT says that considering race is part of its affirmative action program. Such programs provide minority students with an equal opportunity to attend college. They also increase the diversity of the student body.

Affirmative action policies have been in place in the U.S. since 1961. That year, President John F. Kennedy signed an order. The order made it against the law for employers to discriminate against workers or job applicants because of race, beliefs, color, or national origin. Since then, workplaces and colleges across the country have put affirmative action policies in place. The programs are designed to provide equal opportunities for members of minority groups that have been treated unfairly in the past.

Bill Powers, UT's president, defends his university's policy. "We must [be allowed] to consider each applicant's...experiences and background so we can [best educate] our nation's future leaders," said Powers.

Abigail Fisher sees things differently. After she was denied admission, Fisher filed a lawsuit against UT. She claimed that the school's affirmative action policy was unconstitutional. Fisher asked the court to make the school admit her. In 2009, a Texas district court reviewed the case. The court ruled in favor of the university. Fisher appealed the ruling. In 2011, federal appeals court judges supported the district court's decision. The judges pointed to a 2003 case in their decision. In that case, the U.S. Supreme Court considered another college's affirmative action policies. That college's policies were similar to UT's. The Court declared the policies constitutional. The Court also supported the use of race in determining admissions.

Now, Fisher is taking her complaint to the U.S. Supreme Court. Supreme Court judges have agreed to hear the case. They will consider whether such programs are still necessary. They will also decide whether colleges should continue to include race in their admissions policies.

Brian Fitzpatrick is a law professor at Vanderbilt University. Fitzpatrick supports affirmative action programs. He worries that a Supreme Court ruling in favor of Fisher could threaten such policies at many of the nation's colleges.

"The vast majority of schools that are selective are using affirmative action," Fitzpatrick said.

Others, however, are critical of affirmative action programs. These people argue that the programs are not fair to all students. They argue that students should compete equally for college admission. These individuals say that race should not be taken into account by admissions officials.

The Project on Fair Representation (PFR) opposes the consideration of race in college admissions. The PFR has helped pay Fisher's legal bills. The group is glad that federal judges will revisit the issue.

Edward Blum is the head of the PFR. "[Fisher's] case presents the Court with [a chance to] reconsider whether race should be permitted...under the Constitution's guarantee of equal protection," said Blum.

The Supreme Court will consider Fisher's case in the fall of 2012.

The Associated Press contributed to this story.

Activity

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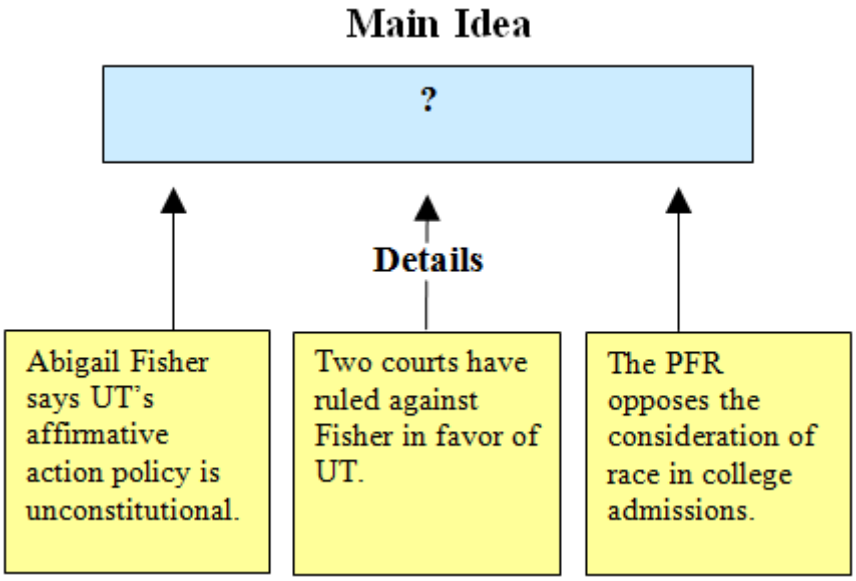

Based on the article, which best replaces the question mark in the diagram above?

(A) Brian Fitzpatrick supports affirmative action programs.
(B) Some people consider UT's admissions policy fair to most students.
(C) People disagree on whether UT's affirmative action policy is constitutional.
(D) The University of Texas is clear about its admissions policies.

---

2. Which statement from the article best supports the belief that UT should maintain its affirmative action policy?
(A) They will also decide whether colleges should continue to include race in their admissions policies.
(B) Affirmative action policies have been in place in the U.S. since 1961.
(C) UT says that considering race is part of its affirmative action program.
(D) Such programs provide minority students with an equal opportunity to attend college.

---

3. According to the article, why did Abigail Fisher bring a lawsuit against the University of Texas?
(A) Because she believed the school treated her unfairly because of her race
(B) Because she wanted the Supreme Court to consider whether to include race in their admissions policies
(C) Because she wanted the university to admit students based only on grades

(D) Because she believed her grades put her among the top 10 percent in her high school class

---

4. According to the article, the reader can tell that _____.
(A) President Kennedy was concerned that white students were being discriminated against in the 1960s.
(B) Fisher believes that white students should be given special treatment over minority students.
(C) The Supreme Court hears most cases that have to do with affirmative action programs.
(D) Before President Kennedy's order, many employers discriminated against job applicants because of race.

---

5. Which is the closest **antonym** for the word *discriminate*?
(A) Separate
(B) Include
(C) Identify
(D) Favor

---

6. This article is placed in the group of news called "Education." In which other group would this article fit best?
(A) Presidential Notions
(B) National Debates
(C) Comparing Colleges
(D) Paying for School

---

7. Which of these should **not** be included in a summary of this article?
(A) The Supreme Court will decide whether affirmative action programs are necessary.
(B) The University of Texas defends its policy to consider an applicant's race.
(C) Abigail Fisher claims that UT's affirmative action policy is unconstitutional.
(D) Edward Blum is the director of the Project on Fair Representation.

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8. Which two words from the article are the closest **synonyms**?
(A) Complaint and ruling
(B) Issue and admission
(C) College and university
(D) Applicant and student

APPENDIX C

NEW YORK, New York (Achieve3000, March 2, 2012). Apple Inc. is making it easier for schools to adopt electronic textbooks (e-textbooks). On January 19, 2012, the company launched its attempt to make its iPad tablet a replacement for multiple textbooks. Apple is now selling electronic versions of four standard high school textbooks. However, not everyone thinks that electronic textbooks will sell well to schools.

The new electronic textbooks include *Biology* and *Environmental Science* from Pearson and *Algebra 1* and *Chemistry* from McGraw-Hill. They contain videos and other interactive elements. Users must download the free iBooks application (app) to see the textbook content. Apple also released an app that will let teachers present outlines, post notes, and communicate with students in other ways.

Major textbook publishers have been making electronic versions of their products for years. Until recently, however, there hasn't been any hardware suitable to display them. PCs are too expensive and large to be good e-book machines for students. E-book readers like the Kindle have small screens. So while electronic versions of novels, biographies, and other books became quite popular, electronic textbooks didn't sell well. Then, in 2010, Apple released the first version of its iPad tablet device. The iPad is small and light. It has a fairly large screen.

With the iPad available, some schools have begun using electronic textbooks. Many students say this makes sense. After all, students are used to technology.

"I really don't know anybody in high school [who] wouldn't want to get an iPad," said 15-year-old Christian Woods. He goes to school in Massachusetts. "We're always using technology at home, then when you're at school it's textbooks. So it's a good way to put all of that together."

There are other reasons to believe that e-textbooks will sell well, supporters say. Unlike printed textbooks, sleek iPad e-textbooks are easy to carry. They also come with all the features of the iPad. This includes calculators and dictionaries. iPads also have interactive programs to demonstrate problem-solving in math and scratchpad features for note-taking and bookmarking. They can also immediately send quizzes and homework to teachers. In addition, they give students the chance to view videos or tutorials on everything from important historical events to foreign languages.

Despite all of these benefits, some people say Apple's new e-textbooks are not practical for many schools. For one thing, there's the issue of cost. A printed textbook costs about $105. It can be used for about five years. What would it cost to replace printed textbooks with iPads? Each of the devices costs at least $499. Each textbook is an additional $15. Most likely, the license to use an iPad textbook would last only one year. Even if an iPad were to last for five years, the e-textbooks plus the iPad would cost schools more than a hardback textbook.

What about letting students pay for their own iPads? Not all students can afford the costly devices, said Albert Greco. Greco is a professor and a former high school principal. It wouldn't work, Greco explained, to let students who can afford to buy their own iPads use them in class with e-textbooks, alongside other students using printed textbooks. If one student uses an iPad, all students would need to do the same. Otherwise the materials in the classroom wouldn't be equal.

"If you don't have the iPad, you can't do the quiz, [and] you don't get instant feedback [from the software] . . .," said Greco. "I would be shocked if any principal or superintendent would let that system go forward."

Jay Diskey is the executive director of the Association of American Publishers' schools division. He believes that traditional textbooks will stick around, at least in the short term.

"I think one of the real key questions that will be answered over the next several years is what sort of things work best in print for students and what sort of things work best digitally," Diskey said. "I think we're on the cusp of a whole new area of research...about what digital learning means."

Activity

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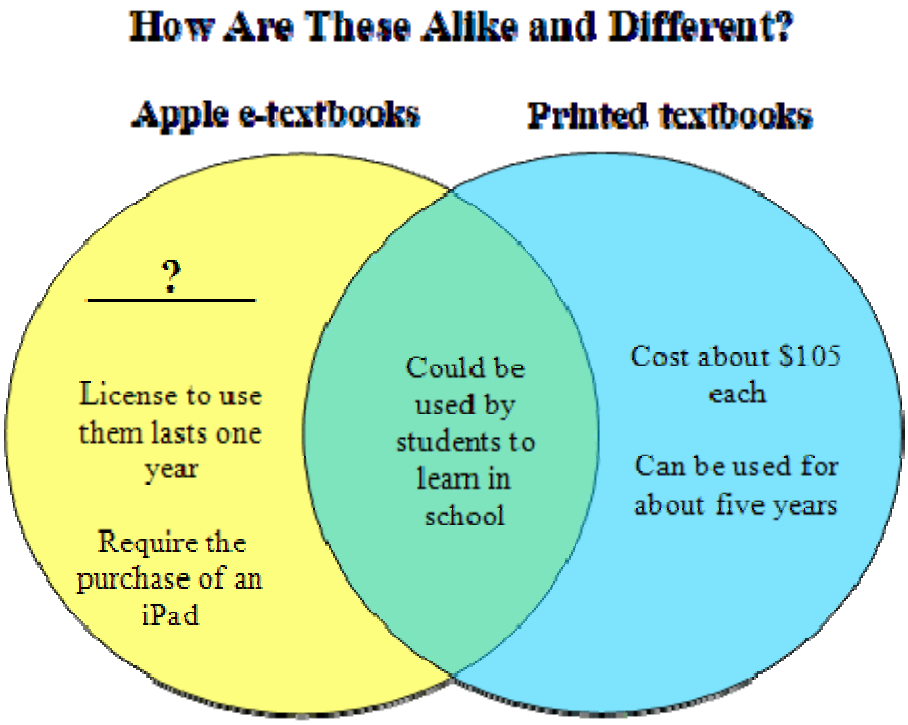

Based on the article, which best replaces the question mark in the diagram above?

(A) Cost $15 each
(B) Cost about $499 for five years
(C) Cost $499 for a school
(D) Cost about $100 each

---

2. What is this article mainly about?
(A) People disagree about whether e-textbooks will sell well to schools.
(B) People can read electronic versions of novels and biographies on e-book readers.
(C) Many students today like to use technology when they are at home.
(D) McGraw-Hill and Pearson are two companies that put out some e-textbooks.

---

3. Which is the closest **synonym** for the word *version*?
(A) Verse
(B) Catalog
(C) Picture
(D) Edition

---

4. Based on the article, the reader can predict that _____.
(A) Public schools will require students to use iPads to take tests.
(B) Apple will donate an iPad to every school in the U.S.
(C) Public schools will ask all parents to buy iPad textbooks.
(D) Apple will promote iPad textbooks across the U.S.

---

5. Which question is **not** answered by the article?
(A) How many schools does Apple hope to sell iPads to?
(B) What do e-textbooks have that printed textbooks don't have?
(C) What is one way that iPad and Kindle screens are different?
(D) How does Albert Greco feel about the use of iPads in school?

---

6. The article states:

> **On January 19, 2012, the company launched its *attempt* to make its iPad tablet a replacement for multiple textbooks.**

Which would be the closest **synonym** for the word *attempt*, as it is used above?
(A) Contract
(B) Struggle
(C) Assignment
(D) Effort

---

7. Which of these should **not** be included in a summary of this article?
(A) The iPad could possibly replace several paper textbooks.
(B) The iPad and e-textbooks may be too expensive for some schools.
(C) Apple Inc. first sold its iPad tablet device in stores in 2010.
(D) Apple Inc. made electronic textbooks available for schools in 2012.

---

8. The article states:

> **A printed textbook costs about $105. It can be used for about five years. What would it cost to replace printed textbooks with iPads? Each of the devices costs at least $499. Each textbook is an additional $15.**

The author's purpose for writing this passage was to _____.

(A) Prove that printed textbooks offer handy tools that teachers can use for any high school subject
(B) Specify how many schools will be able to take advantage of lower prices on upcoming models of the iPad
(C) Explain that even if iPads could last as long as printed textbooks, they cost about five times more
(D) Share the opinion that printed textbooks are quickly going out of style in favor of cheaper options

APPENDIX D

MANCHESTER, Connecticut (Achieve3000, November 11, 2011). When Keith Wearne goes grocery shopping, he bypasses the self-serve checkout. The self-serve checkout is where customers scan, bag, and pay for their items on their own. They get little to no assistance from store employees. This does not appeal to Wearne. He would rather take a few extra minutes to go through a lane with a cashier. He's not alone. Recent studies show that most shoppers prefer the traditional lanes to the automated checkouts. With that in mind, some grocery stores nationwide are bagging the do-it-yourself option. It was once considered the wave of the future, in the name of customer service.

Studies have found that only 16 percent of supermarket checkouts in 2010 were done at self-serve checkout lanes in stores that provided the option. This number is down from a high of 22 percent in 2008. Overall, people reported being much more satisfied when they used traditional cashier-staffed lanes.

Wearne, age 39, can relate. The Tolland, Connecticut, man tends to avoid self-serve lanes. He's concerned that the machines might make an error. He feels that these lanes might delay him more than the traditional ones. He also appreciates the human contact at a regular checkout.

"It's just more interactive," Wearne said during a recent shopping trip at Manchester, Connecticut's Big Y Foods. "You get someone who says hello. You get a person to talk to if there is a problem."

Big Y Foods has 61 locations in Connecticut and Massachusetts. It became one of the latest chains to announce it was phasing out the self-serve lanes. The supermarket chain conducted a study of its own stores that found delays in its self-serve lines. The delays were caused by customer confusion over coupons and payments, among other things. The study also showed issues of theft, both accidental and on purpose. These included mistakes ringing up produce and baked goods as less-expensive varieties. These and other problems led to Big Y's decision to get rid of its self-serve lanes.

Big Y Foods is not alone. Some other local chains have also cut or reduced their unstaffed lanes and added more clerks to traditional lanes. Some big chains, including some Albertsons locations, are doing the same.

Still, not everyone is pleased with the shift. Time-crunched Greg Styles is a busy father of 7-year-old twins. The self-described "get-it-and-go type of guy" doesn't want to hang out or chat at the checkout lane. He will be sorry to see the self-serve lanes go.

"I'm not happy about it. Not at all," Styles said of the change. While shopping at Big Y's store in Manchester, Connecticut, Styles rang up baked goods and chicken breasts at the self-serve lanes. He went on, "I like to get in and get out. These lanes are quick and really easy, so I use them all the time."

Styles' speedy checkout was the type of experience supermarket chains had in mind when they introduced self-serve lanes about 10 years ago. Stores promoted the lanes as an easy way for shoppers to scan their own items' bar codes, bag their bounty, and head out. Stores also expected that the self-serve lanes would save on labor costs. The number of cashier shifts could potentially be reduced when customers were doing the work themselves.

Reactions were mixed from the start. Some shoppers loved the new lanes and were quick to switch to self-serve checkouts. Other reactions ranged from disinterest to outright loathing. These feelings were sometimes expressed on Internet bulletins or via Facebook groups devoted to criticizing the self-serve lanes.

Still, while some stores are bagging the self-serve lanes completely, others don't see the choice as all or nothing. These stores are keeping both types of lanes. They think giving shoppers the choice is an important part of customer service.

"[We believe in] giving customers options. People shop in different ways, and we want to [give them what they want]," said Suzi Robinson. Robinson is a spokesperson for Stop & Shop Supermarket Company. The chain has self-serve lanes in about 85 percent of its nearly 400 stores in the Northeast.

Customer service isn't the only issue when it comes to deciding whether or not to keep the self-serve lanes. Phil Lempert is a food industry expert. He points out that supermarkets will eventually need to replace their checkout computers. New computers will need to read new types of bar codes. This, Lempert says, means there's little business sense in keeping and replacing self-serve machines that aren't being used. Furthermore, Lempert explains, the growing trend toward using bar-code reading programs on smartphones is likely to revolutionize supermarket shopping.

In the meantime, though, stores must decide which types of lanes are right for them and their customers.

"I think some of the stores are just deciding that, on the balance, [the self-serve option is not good]. Other stores, because they have a different composition of shoppers, are deciding to keep it," said John Stanton. Stanton is a professor of food advertising at St. Joseph's University. "I don't think this is as much a [decision about] the technology as much as it is a match between the technology and the customer base."

Activity

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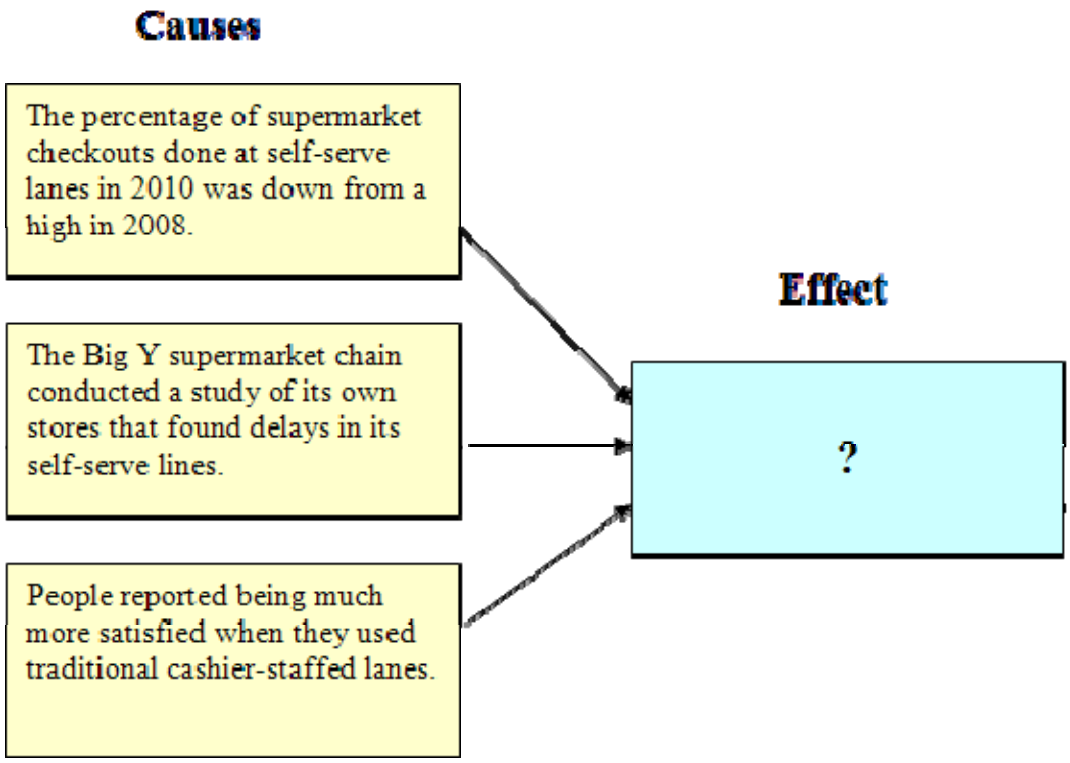

Based on the article, which best replaces the question mark in the diagram above?

Ⓐ Supermarkets are reducing the number of cashier-staffed checkouts.
Ⓑ Supermarkets are using bar-code reading programs on smartphones.
Ⓒ Supermarkets are phasing out self-serve checkout lanes.
Ⓓ Supermarkets are using the Internet to praise self-serve lanes.

---

2. What is this article mainly about?
Ⓐ Stores promoted self-serve checkout lanes as an easy way for shoppers to scan their own items, bag their groceries, and head out.
Ⓑ Some customers expressed their feelings about the self-serve checkout lanes on Internet bulletins and Facebook.
Ⓒ Supermarkets are phasing out self-serve checkout lanes after a study showed that customers prefer cashier-staffed lanes.

(D) Self-serve checkout caused many delays for customers confused about coupons, payments, and other things.

---

3. Based on the article, the reader can predict that _____.
(A) Customers will stop going to grocery stores that only offer cashier-staffed checkout lanes.
(B) Smartphones that read bar codes will quickly replace all cashier-staffed checkout lanes.
(C) The number of Big Y supermarkets open in Massachusetts will drop sharply.
(D) Stores will update their checkout computers in response to new technologies.

---

4. Which is the closest **antonym** for the word *loathing*, as it is used in this article?
(A) Fatigue
(B) Adoration
(C) Anxiety
(D) Dislike

---

5. According to the article, how are self-serve checkout lanes and traditional checkout lanes different?
(A) There are fewer delays resulting from coupon confusion at self-serve checkout lanes.
(B) Self-serve checkout lanes have computers that use updated bar-code scanning technologies.
(C) Only major supermarket chains offer customers the option of self-serve checkout lanes.
(D) At self-serve checkout lanes, customers can scan, bag, and pay for their own items.

---

6. The article states:

> **The self-serve checkout is where customers scan, bag, and pay for their items on their own. They get little to no *assistance* from store employees. This does not appeal to Wearne. He would rather take a few extra minutes to go through a lane with a cashier.**

Which is the closest **synonym** for the word *assistance*?
(A) Competition
(B) Aid
(C) Benefit
(D) Envy

---

7. The news article says all of the following **except** _____.
(A) Recent studies show that most shoppers prefer the traditional lanes to the automated checkouts.
(B) Big Y Foods conducted a study of its own stores that found delays in its cashier-staffed lanes.
(C) At first, some shoppers loved self-serve checkout lanes and were quick to switch to them.
(D) Bar-code reading programs on smartphones are likely to revolutionize supermarket shopping.

---

8. Which statement from the article best supports the idea that some stores had problems with the self-serve checkout lanes?

(A) The [Big Y Foods] study also showed issues of theft, both accidental and on purpose.

(B) Phil Lampert] points out that supermarkets will eventually need to replace their checkout computers.

(C) Stores promoted the lanes as an easy way for shoppers to scan their own items' bar codes, bag their bounty, and head out.

(D) The self-serve checkout is where customers scan, bag, and pay for their items on their own.

APPENDIX E

WASHINGTON, D.C. (Achieve3000, March 15, 2011). First, 3,000 blackbirds fell out of the sky in Arkansas on New Year's Eve of 2011. In the months that followed, other wildlife mysteriously died in big numbers. Many people thought there was something terrible going on, and some blamed the environment for the die-offs. The truth, biologists say, is that these mass die-offs happen all the time. And they are usually unrelated to one another.

Since the 1970s, the U.S. Geological Survey's National Wildlife Health Center has tracked mass deaths among birds, fish, and other critters, says wildlife disease specialist LeAnn White. Federal records show that on average, mortality events happen every other day somewhere in North America. At times, the sky and the streams just turn deadly.

In late 2010 and early 2011, the U.S. Geological Survey (USGS) logged 95 mass wildlife die-offs in North America, and that's probably an undercount, experts say. On average, 163 such events are reported to the federal government each year, according to USGS records. In many cases, the public never hears about them.

There are many causes of these mass die-offs. Sometimes they occur because of disease. Other times, pollution is to blame. Weather, like the cold and wet weather Arkansas was experiencing on New Year's Eve when the birds fell out of the sky, is often associated with mass bird deaths, ornithologists say. Studies blame New Year's Eve fireworks for the Arkansas die-offs. These studies say that the birds were startled by the loud noises and ended up flying into objects. Sometimes, though, the reason for a die-off remains a mystery, even to experts.

Whatever the cause, we usually don't notice these events. And we don't try to link them to one another.

"Depending on the species, these things don't even get reported," said White.

If that's true, then why the news was reporting mass die-offs in late 2010 and early 2011? Blame technology, says famed Harvard biologist E.O. Wilson. With the Internet, cell phones, and worldwide communication, people are noticing these events. And then they are concluding that similar events must be connected to one another.

"[With] this instant and global communication, it's just a human instinct to read mystery and portents of dangers and wondrous things [into] events that are unusual," Wilson explained. "Not to worry. These are not [signs that we are in danger.]"

Wilson says that there's a lesson to be learned here. Mass die-offs are usually of animals with large populations. These animals are not normally at risk. Yet the deaths receive a great deal of attention. Wilson believes that more attention should be devoted to slower die-offs that occur because of hunting, habitat loss, and other human activities. It is the slower die-offs that could lead to extinction. And in many cases, humans could prevent them.

Activity

PAGE 1

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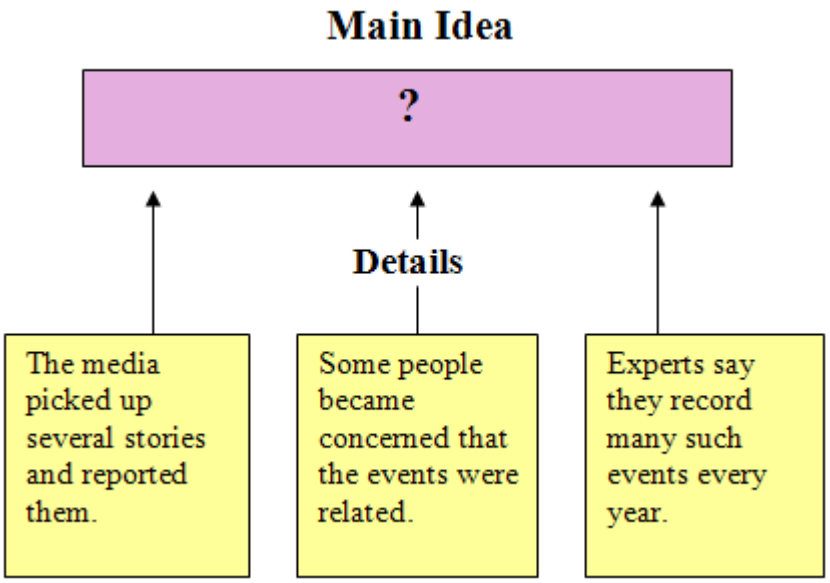

Based on the article, which best replaces the question mark in the diagram above?

(A) Large numbers of birds dropping out of the sky is an event that can frighten people.
(B) The U.S. Geological Survey's National Wildlife Health Center is responsible for tracking bird deaths.
(C) Pollution, bad weather, disease, and other things can cause animals to die in large numbers.
(D) In late 2010 and early 2011, several animals experienced what experts say were normal die-offs.

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2. The reader can tell from the article that _____.
(A) The National Wildlife Health Center works to save animals from extinction.
(B) The National Wildlife Health Center does not have enough scientists to research die-offs.
(C) The National Wildlife Health Center wants people to report every animal death.
(D) The National Wildlife Health Center is concerned about blackbirds dying out.

---

3. Which is the closest **synonym** for the word *associate*, as it is used in this article?
(A) Emerge
(B) Connect

(C) Deposit
(D) Separate

---

4. Which of these is a statement of opinion?
(A) The U.S. Geological Survey logged 95 mass wildlife die-offs.
(B) On average, 163 die-offs are reported each year.
(C) Three thousand blackbirds fell out of the sky in Arkansas.
(D) People need to take immediate action to limit hunting.

---

5. Which passage from the article best explains why mass die-offs are receiving more attention recently?
(A) With the Internet, cell phones, and worldwide communication, people are noticing these events.
(B) Wilson says that there's a lesson to be learned here. Mass die-offs are usually of animals with large populations.
(C) There are many causes of these mass die-offs. Sometimes they occur because of disease.
(D) On average, 163 such events are reported to the federal government each year, according to USGS records.

---

6. The author probably wrote this article to _____.
(A) Suggest that many blackbirds are killed by cold weather each year
(B) Explain the problems that habitat loss causes for some kinds of animals
(C) Inform readers that mass animal die-offs happen often and are normal
(D) Describe why the North American blackbird is a threatened species

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7. The article states:

> **Wilson believes that more attention should be *devoted* to slower die-offs that occur because of hunting, habitat loss, and other human activities. It is the slower die-offs that could lead to extinction.**

Which would be the closest **synonym** for the word *devoted*, as it is used above?
(A) Alternated
(B) Dedicated
(C) Restored
(D) Simplified

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8. Which question is **not** answered by the article?
(A) How do many people react when they hear about mass die-offs?
(B) Where have the most mass die-offs in North America taken place?
(C) What's the average number of mass die-offs reported to the government each year?
(D) How often do biologists say mass animal die-offs take place?

APPENDIX F

SEATTLE, Washington (Achieve3000, September 22, 2011). Have you been eating your vegetables? Perhaps not, and a recent study may indicate why. The study found that following the federal government's new nutritional guidelines is expensive. Therefore, researchers say, getting all of the recommended nutrients is difficult for some. Some health experts disagree, however. They maintain that a healthy diet can be affordable. It depends on the choices a consumer makes.

The federal government released new nutritional guidelines in 2010. These guidelines urged Americans to get more potassium, dietary fiber, vitamin D, and calcium. However, a study was recently conducted at the University of Washington (UW) in Seattle. It found that increasing consumption of these four nutrients would cost more. It could add hundreds of dollars to a consumer's annual grocery bill. UW professor Pablo Monsivais was the lead researcher of the study. He said that just adding more potassium could add $380 per year to the average consumer's food costs.

The study was published August 4, 2011. For the study, researchers asked about 1,300 adults in the Seattle area to list the foods they ate. Researchers later analyzed the lists. They looked for nutrient content and estimated costs. The study found that the people who spent the most on food came closest to meeting the federal guidelines for potassium, dietary fiber, vitamin D, and calcium. People who spent the least, the study found, had the lowest intake of those four nutrients. These people also had the highest consumption of unhealthy fats and added sugar. Americans are advised to limit both of these in their diets.

Monsivais criticized some U.S. advertising that shows a healthy diet. He said the meals shown are out of reach for many people. For example, an image of a plate of salmon, leafy greens, and rice pilaf is displayed on the federal government's nutritional Web site. A meal like that, Monsivais said, is too expensive for many Americans. He believes the government should provide more help for meeting the nutritional guidelines in an affordable way.

"We know more than ever about the science of nutrition," Monsivais said. "And yet we have not yet been able to move the needle on healthful eating."

Hilary Seligman is an assistant professor of medicine at the University of California in San Francisco. She's not surprised by the study's findings. According to recent estimates, she said, 49 million Americans make food decisions based on cost. Many people, she said, would make better choices if they could afford to do so.

"Right now, a huge chunk of America just isn't able to [follow the U.S. nutritional] guidelines," Seligman said. "Almost 15 percent of households in America say they don't have enough money to eat the way they want to eat."

Despite this research, other health experts say that meeting the federal nutritional guidelines doesn't have to be expensive. It's possible to get proper nutrition at an affordable price, they say. It's all about the choices a consumer makes. Eating potatoes, for example, is one of the least expensive ways to get potassium. Eating beans is an inexpensive way to get fiber.

Parke Wilde, a professor at the Friedman School of Nutrition Science and Policy at Tufts University, weighed in on the debate. What's expensive, he said, are the choices that Americans make in their attempt to eat healthy foods. Some consumers, he said, voluntarily raise their food costs by choosing naturally grown foods. Some people pay more for out-of-season fruits and vegetables, he said. In-season produce tends to cost less. The cost of a healthy diet, Wilde concluded, is up to the consumer.

"The longer your [grocery] list gets, the more expensive your list will be," Wilde said.

Activity

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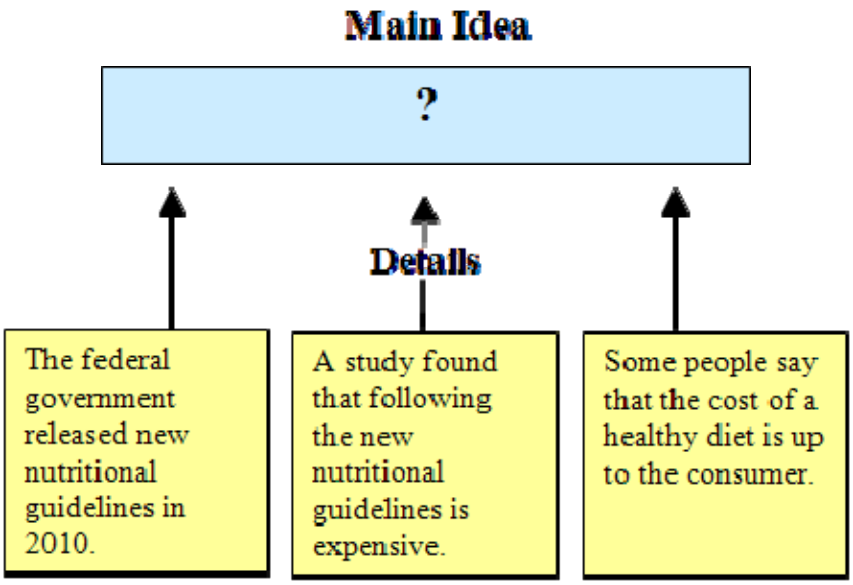
1.



Based on the article, which best replaces the question mark in the diagram above?

(A) Experts disagree about a study that says following the government's nutritional guidelines costs too much.
(B) Some experts have questioned the choices that people make in an attempt to eat healthy foods.
(C) Some experts have criticized advertising for a healthy diet on a federal government Web site.
(D) Experts disagree about the health benefits of following the government's nutritional guidelines.

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2. According to the article, why are some people paying more to eat healthy foods?
(A) Some people buy naturally grown and out-of-season fruits and vegetables.
(B) Some people buy only potatoes and beans to meet nutritional guidelines.
(C) Some people buy only salmon, leafy greens, and rice pilaf.
(D) Some people buy their healthy foods at small stores that have higher prices.

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3. Which is the closest **synonym** for the word *analyze*?
(A) Write
(B) Examine

(C) Ignore
(D) Organize

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4. Based on the article, which is most likely to happen?
(A) The government will look for ways to tell people about less costly foods that can be used to meet nutritional guidelines.
(B) The government will change the nutritional guidelines to allow people to eat more foods with fats and sugars.
(C) Hilary Seligman will support the government's 2010 nutritional guidelines and Web site.
(D) Pablo Monsivais will no longer criticize the government's nutritional guidelines and Web site.

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5. According to the article, how are people who spend the most money on food different from people who spend the least money on food?
(A) People who spend the most money on food often don't eat as many naturally grown foods.
(B) People who spend the most money on food often buy foods like potatoes and beans.
(C) People who spend the most money on food are more likely to eat healthy foods and meet the nutritional guidelines.
(D) People who spend the most money on food are less likely to know about the nutritional guidelines.

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6. The news article states:

> **[Monsivais] said the meals shown are out of reach for many people. For example, an image of a plate of salmon, leafy greens, and rice pilaf is *displayed* on the federal government's nutritional Web site.**

Which would be the closest **synonym** for the word *displayed*?
(A) Deleted
(B) Disguised
(C) Presented
(D) Prepared

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7. Which question is **not** answered by the article?
(A) What is the government's response to Pablo Monsivais' criticisms about the study?
(B) What role did Pablo Monsivais play in the study done at the University of Washington?
(C) What does Pablo Monsivais think about the 2010 government nutritional guidelines?
(D) What does Pablo Monsivais want the government to do about its nutritional guidelines?

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8. The author's purpose for writing this article was probably to _____.
(A) Describe the eating habits of people who live in the Seattle, Washington, area
(B) Summarize the professional career of Professor Pablo Monsivais
(C) Highlight two different views about the federal government's nutritional guidelines

Ⓓ Outline the health benefits of buying out-of-season fruits and vegetables