Implementation of the PLAN Reading Strategy

In a Secondary Science Classroom

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Abstract

The purpose of this project was to determine if textbook reading comprehension increased when the PLAN reading strategy was implemented in a tenth grade biology classroom. The PLAN reading strategy was defined as “a study-reading strategy…which helps students develop strategic approaches to reading” (Caverly, Mandeville, & Nicholson, 1995, p. 190). The PLAN acronym was represented by the steps of Predict, Locate, Add, and Note. This strategy involved before, during and after reading activities. Direct instruction was the main instructional method used to teach this reading strategy. Instruments used for data collection during this study included analysis of base and PLAN scores for each student, a post-PLAN student survey, and field notes. Twenty-six tenth grade biology students enrolled in a small, Midwestern school district participated in this study. The study covered a ten-week period in which the students completed successive phases of implementation of the PLAN reading strategy. Results showed marginal increases in the achievement level of all students, but seemed to have a larger effect on the lower achieving students. Many positive behaviors and implications were noted during the course of this study and included, more student centered learning, a more positive classroom environment, and the availability of useful teaching and planning tools. Students indicated that they were largely undecided as to the benefits of the PLAN reading strategy. While overall results showed a slight increase in reading comprehension, a longer study time may result in more favorable results.
This work is dedicated to all teachers who strive to enrich the lives of children through education. As an educator, you have accepted a beautiful challenge. May each day bring you renewed faith in the potential of our students, and renewed dedication to help them achieve their goals.
Acknowledgements

I wish to acknowledge all of the people who offered their support, guidance, and effort toward the successful completion of this project. The faculty at Defiance College has been especially influential during this time, namely Dr. JoAnn Burkhardt and Dr. Suzanne McFarland. A sincere thank you to my husband for his patience and kind words while completing this study.
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Chapter I: Introduction

Introduction

As a pre-service teacher, the researcher had read numerous articles on the difficulties that secondary students encounter when reading science textbooks. In addition, the researcher had heard many middle school and secondary students express their dislike for science. It was the researchers' hope that in conducting this project, the use of an instructional reading strategy could help change this negative attitude toward science. By implementing this instructional strategy, the researcher hoped that students would find science texts less apprehensive, more comprehensible, and develop an interest in the content.

Statement of the Problem

The purpose of this project was to determine if textbook reading comprehension increased when the PLAN (Predict, Locate, Add, Note) reading strategy was implemented in a tenth grade biology classroom. The research questions were: (1) How did the professional literature define the PLAN reading strategy? (2) According to the professional literature, what were the benefits of the PLAN reading strategy? (3) According to the professional literature, how has the PLAN reading strategy been implemented? (4) How did the professional literature define reading comprehension? (5) Did textbook reading comprehension increase in a tenth grade biology classroom when the PLAN reading strategy was implemented?

Justification

The researcher was interested in determining if the implementation of the PLAN reading strategy in a tenth grade biology classroom would increase textbook reading comprehension. This topic was of specific importance to the researcher in that science textbooks contain a form of informational writing that many high school students struggle to fully comprehend. In
conducting the review of professional literature, the researcher was provided with a methodology to implement the PLAN reading strategy that was shown to increase textbook reading comprehension. By showing how the PLAN reading strategy was implemented, the researcher hoped to assist other science educators in integrating the PLAN reading strategy into their classrooms to increase their student’s textbook reading comprehension.

**Definition of Terms**

- **Base Score** – the average grade that an individual student had received during this first two nine-weeks of the school year, prior to the implementation of the PLAN reading strategy.

- **PLAN reading strategy** – “a study-reading strategy…which helps students develop strategic approaches to reading” (Caverly, Mandeville, & Nicholson, 1995, p. 190). The PLAN acronym was represented by the steps of **Predict, Locate, Add, and Note**. This strategy involved before, during and after reading activities.

- **PLAN Score** – the grade that an individual student had received during the third nine-weeks of the school year, during which the PLAN reading strategy was implemented.

- **Reading Comprehension** – “the ability to obtain meaning from written text for some purpose” (Vellutino, 2003; as cited in Best, Rowe, Ozuru, & McNamera, 2005, p. 66).

- **Textbook** – any school adopted text that was to be used primarily for classroom instruction.

**Limitations and Appropriate Use of Results**

The results of this project were limited in several ways. First, this project was conducted in a small, Midwestern school district with a limited number of tenth grade students. Moreover, this project was carried out with a sample of students that was mainly Caucasian and English-
speaking. Second, the researcher contributed bias to the project, in that the PLAN reading strategy was expected to show improvement in textbook reading comprehension. Third, the project was conducted by a pre-service teacher who had very little experience in implementing strategic reading procedures. Finally, the project was conducted over a relatively short period of time, which may not have allowed the full benefits of the PLAN reading strategy to be realized. Due to these limitations, the results of this project should not be generalized to other grade levels or school systems.
Chapter II: Review of Literature

Introduction

The purpose of this project was to determine if textbook reading comprehension increased when the PLAN (Predict, Locate, Add, and Note) reading strategy was implemented in a tenth grade biology classroom. The research questions were: (1) How did the professional literature define the PLAN reading strategy? (2) According to the professional literature, what were the benefits of the PLAN reading strategy? (3) According to the professional literature, how has the PLAN reading strategy been implemented? (4) How did the professional literature define reading comprehension? (5) Did textbook reading comprehension increase in a tenth grade biology classroom when the PLAN reading strategy was implemented?

The PLAN reading strategy has been implemented in science classrooms and has been shown to be valuable to secondary students. For example, Radcliffe, Caverly, and Peterson (2004) implemented the PLAN reading strategy with 29 seventh and eighth-grade students over a three-month period. Through their research, the PLAN reading strategy was shown to promote student responsibility for reading as well as create an independent and individualized use of the strategy. Caverly, Mandeville, and Nicholson (1995) conducted a similar study and found that higher level thinking skills improved and overall testing scores increased when the PLAN reading strategy was implemented. Furthermore, Mandeville and van Allen (as cited in Caverly et al., 1995) explained that a reading strategy, such as the PLAN, was valuable for secondary students due to the difficult shift from narrative reading to reading for information that occurs at this age.
Research Question # 1: How Did the Professional Literature Define the PLAN Reading Strategy?

In order to answer research question #1, and obtain a clear definition of the PLAN reading strategy, a review of literature was conducted. According to Radcliffe et al. (2004), the PLAN reading strategy was defined as an instructional approach designed to aid students in understanding and analyzing a textbook. Caverly et al. (1995) further explained the PLAN as a “study-reading strategy” (p. 190) that promoted student development of a strategic approach to reading. The PLAN reading strategy was defined in greater detail as an approach intended to start with an evaluation of students’ prior knowledge and conclude with an appropriate culminating activity (Radcliffe et al.).

The PLAN reading strategy was recognized as an acronym represented by the four steps of Predict, Locate, Add, and Note (Caverly et al., 1995; Radcliffe et al. 2004). Caverly et al. (1995) reported that this strategy involved before, during, and after reading activities. As stated by Radcliffe et al., the PLAN reading strategy began by first activating students’ prior knowledge though a pre-test, written assignment, or class discussion. The importance of this step, as described by Anderson & Pearson (as cited in Caverly et al., 1995), was to trigger student’s existing schema and allow them to adapt and add to these schema as they read.

Predict

As indicated by the authors, the first step in the PLAN reading strategy was Predict (Caverly et al., 1995; Radcliffe et al., 2004). During this stage it was explained that students would skim the assigned reading for main headings and then predict the content of the text (Radcliffe et al.). In executing this step the authors pointed out that the students created a tentative concept map, which could be modified as the process continued. Fordham, Wellman,
and Sandmann (2002) suggested that the importance of this step was that the integrated reading/writing approach allowed for deeper understanding of the material. Casteel and Isom (1994) offered another key benefit to the Predict step in stating that, when students were engaged in the prediction of text content, that they were simultaneously developing cognitive abilities and interest in the content. By developing interest in the content, the authors indicated that reading motivation was increased (Casteel & Isom, 1994).

Locate

The next step of the PLAN reading strategy identified in the professional literature was Locate (Caverly et al., 1995; Radcliffe et al., 2004). During this step, the authors explained that students would place check marks next to topics that were known and question marks by topics that were unknown. The authors elaborated that this marking system gave students a clear list of the topics to focus on during the reading. Caverly et al. (1995) revealed that the Locate step enabled students to determine the speed of their reading and depth to which they must read to fully complete the reading task.

Add

The authors described the next step, Add, as validating check marks and clarifying question marks (Caverly et al., 1995; Radcliffe et al., 2004). In doing this, the authors noted that students explored the text and recorded key words and phrases that applied to each topic. Caverly et al. (1995) noted that students were responsible for verifying the accuracy of their prior knowledge for the check marked topics and building their knowledge of the topics that were question marked. The value in this step, as espoused by Caverly et al. (1995), was metacomprehension. The authors clarified that this step required reading to be an active form of learning as the students confirmed their comprehension.
The final step of the PLAN reading strategy, as reported by Caverly et al. (1995) and Radcliffe et al. (2004), was *Note*. The authors established that during this step students would demonstrate reading comprehension by revising the concept map, writing a summary, or completing some other relevant task. Caverly et al. (1995) explained that this step was of particular importance because students took notice of their understanding and applied it to complete the learning task.

In summary, a review of the professional literature provided the researcher with an explicit definition of the PLAN reading strategy. The PLAN reading strategy was designed to increase reading comprehension by activating prior knowledge, creating graphic representations of a selected text, and proceeding through sequential steps that foster active reading (Caverly et al., 1995). The authors stated that beginning with pre-tests and continuing through the steps of *Predict, Locate, Add,* and *Note,* students were interacting with the text in order to promote a deeper understanding of the written word (Caverly et al., 1995; Radcliffe et al., 2004).

**Research Question # 2: According to the Professional Literature,**

*What Were the Benefits of the PLAN Reading Strategy?*

In order to answer research question #2, and determine the benefits of the PLAN reading strategy, a review of literature was conducted. Several authors listed the benefits of the PLAN reading strategy in their original research (Caverly et al., 1995; Radcliffe et al., 2004). While general benefits were provided, additional advantages were reported by the educators and students involved in the studies.
General Benefits

In the course of their original research, several authors explained that one of the general benefits of implementing the PLAN reading strategy was that it facilitated active reading (Caverly et al., 1995; Myers & Savage, 2005; Best, Rowe, Ozuru, & McNamera, 2005). For example, Caverly et al. (1995) explained that the PLAN reading strategy taught students to develop ownership for their own reading comprehension. Furthermore, the authors stated that the PLAN reading strategy generated student awareness of reading as an active exercise. Myers and Savage (2005) emphasized that improved academic achievement could be accomplished through reading strategies that allowed students to examine and create their own meaning for a given text. Wade and Reynolds (as cited in Caverly et al., 1995) concurred in stating that it was important to train students to monitor their own understanding of the content through reading strategies. Taylor and Beach (as cited in Caverly et al., 1995) discovered benefits to adding reading strategies that tactically led students to recognize text structure. Caverly et al. (1995) elaborated that the creation of the concept map in the PLAN reading strategy supported the need to identify text construction. In all, the creation of students who actively monitor the arrangement the text as well as the content of the text were shown to have higher levels comprehension (McNamara & Scott, as cited in Best et al., 2005).

An additional advantage of the PLAN reading strategy was recognized as the engagement of appropriate schema, or prior knowledge (Anderson & Pearson, as cited in Caverly et al., 1995). The authors explained that once prior knowledge was activated it could be modified and adjusted in order to increase the knowledge base. Best et al. (2005) expounded that the main advantage of activating of prior knowledge was that students gained access to related information and built upon it to make inferences and restructure misconceptions. The PLAN
Another benefit to implementing the PLAN reading strategy, as demonstrated in three separate studies, was increased reading comprehension (Caverly et al., 1995; Radcliffe et al., 2004; Caverly, Nicholson, & Radcliffe, 2004). As indicated by Caverly et al. (1995), when the PLAN reading strategy was instituted there were significant gains in reading comprehension test scores of struggling students at the college and middle school levels. It was expanded that, in most instances, these struggling readers rose to achieve reading comprehension that paralleled their grade-level counterparts. The Caverly et al. (1995) study further found that struggling readers who were not exposed to the PLAN reading strategy experienced a significant drop in their test scores. In a similar study, Radcliffe et al. (2004) demonstrated the benefits of the PLAN reading strategy to all students. Their study found that the use of the PLAN reading strategy increased the mean grades in a middle school science classroom for students at all reading levels. In a separate study conducted by Caverly et al. (2004) it was reported that higher education students who implemented the PLAN reading strategy showed improved scores on teacher-created reading comprehension tests and were gauged to have become “strategic readers” (p. 43) in four out of five separate evaluations.

**Educator Reported Benefits**

In the study by Radcliffe et al. (2004), the authors interviewed the educator involved in the research project to determine the benefits that he perceived in the implementation the PLAN reading strategy. The educator recognized that his students showed increased content comprehension, showed more willingness to complete textbook readings, and felt more positively toward their textbook. The educator also found that the majority of his students had
created accurate concept maps of major headings and subheadings of the textbook. In addition he found that 98% of the key words and phrases recorded under each topic in the concept map were correct. Moreover, the educator found that his students went from needing group support to being independent in their use of the strategy. Overall, this educator found that the PLAN reading strategy pushed his students to take on responsibility for their reading skills which, in turn, caused an increase in their reading comprehension.

**Student Reported Benefits**

As shown in the professional literature, students found considerable benefits from the use of the PLAN reading strategy. According to student interviews conducted in the Radcliffe et al. (2004) study, learners testified to an increase in their comprehension of the assigned textbook readings. The students further shared that this increased comprehension was due primarily to the creation of concept maps. Furthermore, students reported doing better in science and finding the assigned readings more enjoyable. In their study, Caverly et al. (1995) discovered that students who were introduced to the PLAN reading strategy showed continuous use of the approach after direct instruction has ceased. As reported by the students in this study, they had modified the PLAN for their individualized use once they were comfortable with the methods. Caverly et al. (2004) found that students reported continuous use of the PLAN reading strategy because they found it was the most effective way to organize their reading. Additionally, students in this study confirmed that had developed a better understanding of reading strategies and had determined effective methods to read a textbook.

To summarize, several benefits to implementing the PLAN reading strategy were indicated in the professional literature. These benefits included an increase in mean test scores, enhanced recognition of text structure, and the engagement of prior knowledge (Myers &
Savage, 2005; Caverly et al., 1995). Three studies (Caverly et al., 1995; Caverly et al., 2004; Radcliffe et al., 2004) defined the benefits as reported by the educator and students involved in the studies. Educator reported benefits included accurate concept mapping, increased content knowledge, and improved attitudes toward textbook reading (Radcliffe, et al.). Benefits experienced by students included an increased amount of completed reading assignments, greater pleasure when reading, and generally performing better in science (Caverly et al., 1995).

*Research Question #3: According to the Professional Literature,*

*How Has the PLAN Reading Strategy Been Implemented?*

In order to answer research question #3, and determine how the PLAN reading strategy was implemented, a review of literature was conducted. It was found that the implementation of the PLAN reading strategy was either done as a stand-alone course in a college setting or used in conjunction with an existing content course at the middle school level. In their study, Caverly et al. (1995) concluded that the PLAN reading strategy began as a rigid sequence of steps and then was gradually adapted for students' individual use.

*Middle School Implementation in Conjunction with a Content Course*

Radcliffe et al. (2004) conducted a study in which the PLAN reading strategy was implemented in an eighth grade science classroom over a nine-month period. During this study the authors identified three phases in the implementation of the PLAN reading strategy. These phases were reported as (1) preparation, (2) implementation, and (3) adaptation.

*Preparation.*

The preparation stage was explained as the period when the educator was involved in a professional development course that focused on the implementation of reading strategies in the classroom (Radcliffe et al., 2004). During this course, the educator learned how reading
strategies had improved reading comprehension, as well as how to model reading strategies for students. The course additionally provided the educator with an introduction to the PLAN reading strategy.

_Implementation._

As stated by Radcliffe et al. (2004), during the implementation phase the educator instructed students how to use the PLAN reading strategy. In implementing the PLAN, this educator used modeling, scaffolding, and the direct instruction techniques of guided and independent practice. Caverly et al. (2004) identified the importance of using direct instruction techniques as allowing students to develop proficiency at strategic reading as they progressed from guided to independent practice. In implementing the PLAN, the educator in the Radcliffe et al. study utilized four steps. First, he introduced the PLAN to his students as a new approach to reading difficult textbook material. Caverly et al. (1995) expanded that this stage was important because middle school students must know the differences between narrative and informational texts in order to understand why a new reading approach would be necessary. They further explained that middle school students should be made aware of reading strategies, metacognition and prior knowledge to realize why these reading strategies work. The second step, as identified in the Radcliffe et al. study, was when the educator modeled concept mapping on the blackboard. Third, the students created concept maps in groups and then individually. Fourth, the students individually completed all four steps of the PLAN strategy with their textbooks.

Specific teaching tactics utilized by the educator when the PLAN reading strategy was implemented were given in the professional literature. One specific approach was asking students to complete only the “P” and “L” portions of the PLAN, with the other sections to be
completed in future assignments (Radcliffe et al., 2004). Other teaching tactics noted by the authors were educator led class discussions on students’ prior knowledge, available class time for students to begin their concept maps, and collection of completed concept maps for assessment.

*Adaptation.*

The authors described the adaptation phase as the continual implementation of the PLAN reading strategy. It was described that during this phase the educator led students toward adapting the PLAN for their personal use. It was additionally stated that the educator created instructional adaptations for future lessons (Radcliffe et al., 2004). This phase, as indicated by the authors, was vitally important in that both the educator and the students restructured the PLAN for their individual uses, purposes, and goals. The authors recognized that the educator in the study tailored the PLAN to his class in these ways; allowing students to choose hand-written or technology-based concept maps, using end of chapter questions to modify the *Note* step, and depicting the textbook as a device to improve background knowledge (Radcliffe et al.).

*Collegiate Implementation as a Stand-Alone Course*

In a study by Caverly et al. (1995), the PLAN reading strategy was taught to college students who failed a reading skills test and were shown to lack the required reading ability to excel in a college setting. In this study, a stand-alone developmental reading course was taught over a 15-week session. The authors explained that the first three to four weeks of the course was spent in identifying the ineffective reading practices of the deficient students. As indicated in the study, the next step was eight to ten weeks when the PLAN reading strategy was taught. As a final step, the authors stated that the time remaining at the end of the semester was spent in adapting the reading strategy to narrative texts. The authors elaborated that students involved in this study were encouraged to enroll in a second course that included a substantial amount of
Implementing the PLAN reading strategy with college students was shown to include four stages (Caverly et al., 1995).

**Stage one.**

Caverly et al. (1995) stated that stage one included the first three to four weeks of instruction. It was stated that the first stage included a self-assessment of the students’ current approaches to reading where they were asked to determine the reading strategies they presently used and to rate the use of these approaches based on the grades that they had received. The authors communicated that they introduced the students to active reading, the nature of the reading process, and the importance of prior knowledge.

**Stage two.**

During the next eight to ten weeks of the course, the authors provided that the students practiced using the four steps of the PLAN reading strategy (Caverly et al., 1995). It was espoused that this step began with either journaling or class discussions on the PLAN step being implemented and how it was utilized. Additionally during stage two, the authors revealed that the students would review the breadth of their prior knowledge. Caverly et al. (1995) and Caverly et al. (2004) discerned that simpler texts were used during this second stage because they were typically well organized with explicitly stated main ideas. Caverly et al. (2004) further documented that the educator modeled the strategic reading approach by way of think-alouds.

**Stage three.**

At stage three the authors described how small, collaborative groups were formed to tackle more difficult text selections. These texts were identified as being poorly organized with implicit or misleading main ideas (Caverly et al., 1995). Caverly et al. (2004) emphasized that
when reading these texts students were asked to stop often to discuss how to correctly use the 
PLAN, the difficulties incurred in using the PLAN, and how they could adapt the PLAN for their 
specific purposes. Caverly et al. (1995) expressed that the small groups reported back to the 
class in order to achieve a collective awareness of how the PLAN reading strategy was being 
employed.

*Stage four.*

Stage four was summarized as students’ becoming more independent in their use of the 
strategy (Caverly et al., 1995). It was recognized that journal entries and class discussions 
continued and that students were asked to complete the PLAN reading strategy with an authentic 
text from another course. Caverly et al. (2004) reflected this same idea, that reading assignments 
in separate college courses were integrated into the PLAN strategy. Once the students had 
worked through stage four, Caverly et al. (1995) noted that student’s molded the strategy for 
their personal and ongoing use.

To summarize this section, the professional literature has shown that the PLAN reading 
strategy has been implemented in conjunction with a middle school content course and as a 
stand-alone colligate course. In both instances, the professional literature explained how readers 
implemented the PLAN reading strategy first with easy, explicit texts and then with gradually 
more complicated, implicit texts (Radcliffe et al., 2004; Caverly et al., 1995). In these studies it 
was revealed that students, whether college or middle school aged, became aware of their 
previously ineffective approaches to reading and were instructed on the more effective methods 
that existed. According to the literature, students began to use the PLAN reading strategy as a 
fixed sequence of steps and then began to modify the strategy to fit their individual uses (Caverly 
et al., 1995).
Research Question #4: How Did the Professional Literature Define Reading Comprehension?

In order to answer research question #4, and obtain a clear definition of reading comprehension, a review of literature was conducted. Multiple definitions were found that explained the basic meaning of reading comprehension. The literature also established reading comprehension as a multi-step process and as an active process. Additionally, the characteristics of deep-level comprehension were addressed in the literature. The literature also described reader deficiencies that affect comprehension. Finally, several professional articles explored the impact of reading motivation on reading comprehension.

Definitions of Reading Comprehension

Several precise definitions of reading comprehension were offered by the professional literature. Vellutino (as cited in Best et al., 2005) defined reading comprehension as “the ability to obtain meaning from written text for some purpose” (p. 66). Aarnoutse and Schellings (2003) concurred that reading comprehension required the creation of meaning from a printed text. Kintsch (as cited in Caccamise & Snyder, 2005) stated that reading comprehension was the formation of mental representations of a written text. Daniels and Zemelman (2004) felt that reading comprehension was defined as the deliberate process of extracting meaning from text.

Reading Comprehension as a Multi-Step Process

The professional literature defined reading comprehension as a process that required the mastery of several sub-processes. For example, Joyce and Weil (2004) described reading comprehension as a multifaceted method of thinking. Snyder, Caccamise, and Wise (2005) agreed that reading comprehension was defined as a compound process and further recognized that it consisted of a combination of linguistic and semantic skills. In their definition, Snyder et
al. (2005) expounded that the prime focus of reading comprehension was two-fold and included the construction and interpretation of meaning from a text.

In keeping with the idea of reading comprehension as a multi-step process, Caccamise and Snyder (2005) identified two phases of reading comprehension. Phase one was termed the construction phase and was explained as the period when the reader has activated prior knowledge and created a rough version of text meaning. The author’s specified phase two as the integration phase. They described that this phase was achieved when the reader assigned an inclusive meaning to the text as a whole. It was added that readers in this phase have recognized misconceptions in their prior knowledge and have adapted their thinking to form a coherent view of the text.

Two other articles referred to reading comprehension as a step-wise process. For instance, Graesser, McNamara, and Louwerse (as cited in Snyder et al., 2005) stated that when a text was encountered, a reader must first decode the text at a basic level. Following this, they recognized that the reader developed an understanding of the explicit features of the text, including word meaning and text structure. Next, it was communicated that a reader discovered the implicit nature of the text. In all this, Graesser et al. (as cited in Snyder et al., 2005) indicated that a reader had interacted continuously with the text and that full comprehension was reached only with the completion of all steps. Myers and Savage (2005) produced a similar conclusion and pointed out the act of decoding a text did not denote comprehension. Equally important, they stated that a student who has effectively decoded a text may not have made accurate inferences. They explained that this shortcoming prevented the reader from identifying a text’s overarching theme and therefore, the reader would lack the necessary comprehension to complete an assignment.
Aarnoutse and Schellings (2003) explained that all the stages, steps and processes involved in reading comprehension have a significant impact each other. The authors expounded that these influencing processes included letter and word recognition, detection of word function and meaning, and integration of sentence parts and sets of sentences into a meaningful whole. They further stated that deficiencies in any one area could cause complete breakdown of reading comprehension. They held that the core of reading comprehension was rapid word recognition integrated with the formation of meaning into a global context (Aarnoutse & Schellings, 2003).

Reading Comprehension as an Active Process

The review of professional literature produced several references to reading comprehension as an active process. Caverly et al. (1995) defined reading comprehension as a process that required the reader to interact with the text at all stages of reading. According to the National Institute of Child Health and Human Development (as cited in Klingler, Vaughn, Arguelles, Hughes, & Leftwich, 2004), the active engagement of students led to improved reading comprehension. Aarnoutse and Schellings (2003) acquiesced that reading comprehension was the result of an active interface between the reader and the written text. Roe, Stoodt-Hill, and Burns (2004) explained that active engagement of the reader’s prior knowledge was directly correlated to reading comprehension. Daniels and Zemelman (2004) concurred that reading comprehension was improved when it was made an active and engaging process.

Deep-Level Comprehension

A definition of deep-level comprehension was included in several articles during the course of the literature review. Kintsch (as cited in Best et al., 2005) concluded that deep-level comprehension required the ability to deduce connections across sentences and paragraphs to construct a global picture (Best et al.). Fordham et al. (2002) felt that combining reading and
writing led to deep-level comprehension because it required more extensive cognitive processing than reading alone. Brill, Falk, & Yarden (2004) explained that educators can promote deeper level comprehension of texts by raising probing questions and requiring meaningful tasks to be completed after reading.

**Reader Deficiencies that Affect Reading Comprehension**

As stated in the professional literature, reading comprehension can be affected by deficiencies of the reader. Casteel and Isom (1994) explained that students who have difficulty reading and comprehending a text may also have problems integrating the skills of listening, speaking, reading, thinking, and writing. They further explained that all these literacy issues have a profound effect on the attainable level of reading comprehension. Simplicio (2003) stated that a student’s reading ability has a direct affect on the educational success of that student. He further explained that a student must read effectively to expect high academic performance.

According to Aarnoutse and Schellings (2003), to achieve full comprehension readers possessed sufficient knowledge of the language of the text but also of the topic of the text. Furthermore, they stated that for readers to comprehend a text, they had mastered reading strategies and were sufficiently motivated to understand the text.

**Reading Motivation and Level of Comprehension**

Renninger (as cited in Aarnoutse & Schellings, 2003) described that a strong connection existed between the level of the reader’s interest and motivation to study the content and their degree of comprehension. In fact, Van Elsäcker (as cited in Aarnoutse & Schellings, 2003) had shown that reading motivation has an indirect effect, via reading strategies, in increasing reading comprehension. In their study, Aarnoutse and Schellings (2003) demonstrated an increase in reading comprehension through the implementation of reading strategies that improved reading
motivation. Wigfield, Wilde, Baker, Fernandez-Fein, & Scher (as cited in Aarnoutse & Schellings, 2003) also explained that the readers perceived value of the text had influence on the quality of reading comprehension. Casteel and Isom (1994) reported that literacy-based instruction, such as reading strategies, increased motivation in students because it engages students and brings life to the content.

In summary, reading comprehension has been defined in the professional literature in many ways. It was illustrated as an active, multi-stage process that required the active engagement of a reader's prior knowledge (Aarnoutse & Schellings, 2003; Joyce & Weil, 2004; Snyder et al., 2005; Roe et al., 2004). It was pointed out that deficiencies possessed by the reader had a severe impact on their ability to comprehend a text (Casteel & Isom, 1994). Finally, it was discussed that the motivational level of the reader had a direct impact on reading comprehension (Aarnoutse & Schellings, 2003).

Conclusion

In order to answer the four research questions, a review of literature was conducted. To begin, the PLAN reading strategy was defined. Radcliffe et al. (2004) defined the PLAN reading strategy as an instructional approach used to aid students in understanding and analyzing a textbook. The PLAN reading strategy was further explained as being composed of the four sequential stages of Predict, Locate, Add, and Note (Caverly et al., 1995; Radcliffe et al.). Radcliffe et al. reported that when students worked through these stages, they completed a concept map consisting of textbook headings, identified topics that were known and unknown, recorded essential ideas and phrases as they related to the topics, and revised the concept map to verify their understanding of the text.
Following the definitions of the PLAN, the benefits of the PLAN reading strategy were offered. The benefits, as listed by Caverly et al. (1995), Caverly et al. (2004), and Radcliffe et al. (2004) included increased test scores, enhanced recognition of text structure, and increased reading comprehension. In the Radcliffe et al. study, the educator reported the following benefits of the PLAN reading strategy; students had created accurate concept maps, increased their knowledge of the content, and showed improved attitudes toward textbook reading. In a separate study, students indicated that they experienced the benefits of the PLAN reading strategy in that they had completed more of their reading assignments, took greater pleasure in reading their textbook, and performed better in science (Caverly et al., 1995).

Once the benefits were elaborated, the methods by which the PLAN reading strategy was implemented were discussed. As stated by Radcliffe et al. (2004) and Caverly et al. (1995), introduction of the strategy was carried out as a stand-alone collegiate course or was incorporated into an existing middle school content area course. Regardless of the mode of implementation, it was pointed out by Radcliffe et al. (2004) and Caverly et al. (1995) that the PLAN reading strategy was introduced in a step-wise fashion. First, the authors explained that the students were made aware of their current, ineffective approaches to reading and why a new strategy was necessary. Secondly, the authors espoused that students were instructed how to use the PLAN reading strategy via modeling with a considerate text. Thirdly, it was stated that small groups were utilized to tackle less-considerate and inconsiderate texts. Finally, the authors expressed that the students performed the four steps of the PLAN reading strategy individually with their textbook. From here the authors noted that the PLAN reading strategy was modified for each student’s individual use.
To end this chapter, an in-depth explanation of reading comprehension was presented. Multiple sources indicated that reading comprehension was defined as an active, multi-stage process that required the active engagement of a reader’s prior knowledge (Aarnoutse & Schellings, 2003; Joyce & Weil, 2004; Snyder, Caccamise, & Wise, 2005; Roe et al., 2004). In addition, many authors agreed that reader deficiencies, such as issues with decoding or inferring, could have a substantial impact on the reader’s realistic level of reading comprehension (Casteel & Isom, 1994; Simplicio, 2003; Aarnoutse & Schellings, 2003). As espoused by Casteel and Isom (1994) and Aarnoutse and Schellings (2003), equally important to defining reading comprehension was the level of students reading motivation.

In summation, several studies (Caverly et al., 1995; Caverly et al., 2004; Radcliffe et al., 2004) confirmed that the PLAN reading strategy had positive effects on students’ level of reading comprehension. Furthermore, these studies provided evidence that the PLAN reading strategy was a viable method for increasing academic performance through improved reading comprehension. Having completed the literature review, the researcher has developed instruments to collect and analyze data in order to answer research question five. These methods are explained in detail in Chapter III.
Chapter III: Methods and Procedures

Introduction

The purpose of this project was to determine if textbook reading comprehension increased when the PLAN (Predict, Locate, Add, and Note) reading strategy was implemented in a tenth grade biology classroom. The research questions were: (1) How did the professional literature define the PLAN reading strategy? (2) According to the professional literature, what were the benefits of the PLAN reading strategy? (3) According to the professional literature, how has the PLAN reading strategy been implemented? (4) How did the professional literature define reading comprehension? (5) Did textbook reading comprehension increase in a tenth grade biology classroom when the PLAN reading strategy was implemented? In order to answer research question five, data was collected.

For this project, the PLAN reading strategy was implemented in a tenth grade biology classroom and the students were assessed for improved textbook reading comprehension. Specifically, the project was conducted over a ten-week period with twenty-six tenth grade students who were enrolled in the school’s required biology course. The students were introduced to the PLAN reading strategy through the direct instruction techniques of guided, structured, and independent practice. Assessment of students’ reading comprehension was based on the current course grade, past course grades, student surveys, and field notes. Data was analyzed by comparing past and current course grades, through examining responses to student surveys, and by evaluating field notes.
Participants

The participants for this study were twenty-six tenth grade students. These students were enrolled in the school’s required biology course in a small, Midwestern school district. The group consisted of fifteen females and eleven males who were specifically selected for the following reasons. First, this collection of students encompassed a wide range of academic performance. Students in this group consisted of grade-level and above grade-level achievers as well as learning disabled students who typically achieved below grade level. By using a varied group of students, the researcher was able to determine the impact of the intervention on a variety of academic levels. Second, this group of students had previously shown that they worked well in cooperative groups. Due to the fact that part of the intervention was carried out in small, cooperative groups, the ability of the students to work together to achieve specific learning goals was extremely important. Finally, this group of tenth grade students would be able to benefit from this reading strategy through the remainder of their schooling and into college. It was the hope of the researcher that the reading strategy could assist these students throughout the duration of their educational careers.

Treatment/Intervention

The intervention during this project was the implementation of the PLAN reading strategy. The intervention consisted of guiding students through the PLAN reading strategy in order to increase textbook reading comprehension. The PLAN reading strategy consisted of four stages. Stage one was Predict. This stage required the students to construct a concept map of major headings from a textbook section and then link each topic to the others. This stage allowed the students to explore the material that would be learned and discover initial connections between the topics. During stage two, Locate, students placed check marks next to
known items and question marks next to unknown items. This step allowed students to plan the speed of their reading and learning by recognizing which concepts would require more time and which concepts could be covered more quickly. During the Add step, students read the textbook passage and wrote key facts and comments about each topic next to the corresponding bubble in their concept map. This phase functioned as a during-reading exercise which kept students focused on the task of reading to learn. During the final stage, Note, students reassessed their understanding of the material by reconstructing their concept map, writing a short summary of the section, or engaging in another academically significant task. The function of this step was to solidify their understanding of the content and to demonstrate that understanding through authentic means. These four steps were implemented through the course of this study.

This intervention was implemented in a tenth grade, school required biology course with twenty-six students, over a ten-week period. The researcher described the PLAN reading strategy to the students through oral and written instructions. Additionally, the researcher demonstrated the PLAN reading strategy to the students through whole-class, guided practice using the course textbook. Once this step was completed, structured practice was conducted in small, cooperative groups. During structured practice, the researcher was available to facilitate problem solving within the groups and assist with difficulties that were encountered. The final step in implementing the PLAN reading strategy was done through independent practice where students individually tackled reading selections in the course textbook. This step offered the delayed feedback that is typical of independent practice. Implementing the PLAN reading strategy in a step-by-step manner, through direct instruction, was consistent with the research done by Radcliffe et al. (2004) and Caverly et al. (1995).
Assessment of students’ reading comprehension during the implementation of the PLAN reading strategy was based on several instruments including current course grades, student surveys, and field notes. In addition, past course grades were examined to determine if the PLAN reading strategy resulted in improved student achievement. These assessment methods were employed because they offered a wide range of evaluation techniques that enabled the researcher to cross check and triangulate results for accuracy and significance.

Two instruments were used in conjunction with each other. These instruments included past and current course grades. Past course grades were used to indicate each student’s previous academic performance in the content area. The previous course grades were used to provide each student with a “base score”. The current course grade for the time when the PLAN reading strategy was utilized was used to determine a “PLAN score”. The base score and the PLAN score were compared to give a percent difference. The percent difference allowed the researcher to determine changes in academic performance in relation to the intervention. The use of these two instruments resulted in numerical data, which could be easily analyzed. Numerical data was also generated from student surveys.

A student survey was administered at the conclusion of the ten-week study period, which assessed the students’ attitudes and views toward the PLAN reading strategy. The survey also evaluated the perceived benefits and shortcomings of the PLAN reading strategy. This survey consisted of twenty-five Likert Scale questions, focused on seven key components. These components were: (1) learning the PLAN, (2) methods of the PLAN, (3) reading comprehension before the PLAN, (4) reading comprehension after the PLAN, (5) current use of the PLAN, (6) continued use of the PLAN, and (7) overall attitude toward the PLAN. Examples of these
questions follow. “The steps of the PLAN confused me.” “The PLAN makes me feel like I can understand complicated reading assignments.” “I feel that the Add step helped me to keep my thoughts organized while reading.” “I do not think I will ever use the PLAN reading strategy again.” Responses for each question followed the typical Likert Scale and were: strongly agree, agree, undecided, disagree, and strongly disagree. The survey was scored using standard Likert scale values of 1 to 5. Positive and negative statements were included to increase the validity of the survey. See Appendix I for a copy of this instrument.

Field notes, based on observations, were also used to answer the fifth research question. Throughout the stages of teaching and facilitating the use of the PLAN reading strategy, the researcher noted positive and negative behaviors during student work. Behaviors were noted informally and were based on participant observations, as well as verbal and non-verbal cues from students. Additionally, the researcher noted the positive and negative implications to the classroom as a result of the PLAN reading strategy. By using observations in this way the researcher was able to gauge how the PLAN implementation was proceeding and make modifications if needed.

These four data collection methods were used to offer a broad range of data to analyze, reflect on and cross check. All of the data was used in conjunction with each other and no one method was considered dominant.

Procedures

The procedures involved in implementing the PLAN reading strategy began with the pre-assessment of prior student achievement, and then proceeded through the stages of direct instruction. The stages of direct instruction were guided practice, structured practice, and
independent practice. Implementing the PLAN reading strategy with direct instruction was consistent with the research done by Radcliffe et al. (2004) and Caverly et al. (1995).

Before the PLAN reading strategy was implemented, the researcher performed a pre-assessment of student achievement by examining past course grades to establish the base score. This step allowed the researcher to identify the relative achievement level of each student as well as to determine which students may benefit the most from this reading strategy.

To begin the implementation of the PLAN reading strategy the researcher introduced reading strategies to the students by explaining the purposes of reading strategies and how they support improved reading comprehension. In doing this, the researcher gave an introduction to the PLAN reading strategy and explained how it would be used in conjunction with this course. After this introduction, the researcher led the class through the first guided practice session with the PLAN reading strategy. The guided practice was initiated with the first section of the course textbook. The textbook was considered to be a considerate text because it included well-labeled and easily recognizable section headings and subheadings. These obvious labels aided students in working through the beginning implementation steps.

After a week of guided instruction with the PLAN reading strategy, the researcher began to reduce the amount of direct teaching and increase the amount of facilitative teaching. Though still conducting guided practice, the researcher provided students with incomplete concept maps of section headings, which were used during instruction and completed as a class. This step also aided in a smooth transition from guided practice to structured practice.

The next step in implementing the PLAN reading strategy was structured practice. During this phase of implementation, cooperative groups were utilized to complete the PLAN reading strategy through peer collaboration. This step offered developmentally appropriate peer
interaction and social learning, and fit the need of structured practice. While students worked in groups, the researcher circulated the classroom to assist and facilitate student learning. The researcher was able to check for student understanding regarding use of the PLAN strategy and offer timely feedback to students on their progress. After the groups had been given sufficient time to complete their concept maps, the researcher would conduct a whole class discussion of the how the PLAN was used and the methods that students employed. After this stage was complete, the groups were told to carry out the PLAN reading strategy from start to finish using no additional aids. This served to lead students into the next stage of implementation, which was independent practice.

During the independent practice stage of implementation, each student was required to use the PLAN reading strategy on an assigned textbook reading. Students were able to work in groups or as an individual during this stage. The direct instruction technique of independent practice was met through this step in that assessment was delayed and students received more time to think through the process on their own. For the start of independent practice, the PLAN concept map was collected for assessment. Discussions were held where the researcher and students compared problems and successes when using the PLAN reading strategy. During this phase of implementation students began to modify the PLAN reading strategy to best fit their unique needs and learning styles. Some students used the concept map and then created an outline of the important topics. Other students used various colors to denote different topics. After this model of independent practice was completed, true independent practice was started.

While participating in true independent practice with the PLAN reading strategy students were assigned a section of the textbook to read independently, as homework, while conducting the PLAN reading strategy. The individually completed PLAN concept maps were visually
inspected during the following days lecture to verify completion of the assignment. During the lecture on the selected assignment, a warm-up activity was conducted where the students were asked to share topics from the text that they are still unsure about after having completed the PLAN reading strategy. The main activity of the lecture was to cover the text section as an interactive, discussion-based lecture where students were encouraged to offer ideas and thoughts on the material. During the lecture, students were quizzed on aspects of the content to determine their level of understanding. This model of true independent practice continued through the tenth week of the study.

At the conclusion of the ten weeks of study, a summation survey was given to the students. This final assessment was used to determine the benefits and shortcomings of the PLAN reading strategy. For this survey, students reported their attitudes and views regarding the PLAN reading strategy and evaluated the perceived benefits of having used the PLAN reading strategy. This survey intended to offer the researcher with the students' honest views in regards to the PLAN reading strategy.

**Timeline**

The PLAN reading strategy was introduced to the students during the first week of January. This was done through guided practice with the school issued textbook. At the end of the first week of January, students began to tackle textbook sections through guided practice. Students started with blank paper and were guided through the PLAN reading strategy from start to finish. During the second week of January the students were still being guided through the PLAN, however they were beginning to work more independently.

During the first week of structured practice students worked in groups to finish incomplete concept maps, supplied by the researcher, to carry out the rest of the PLAN steps.
The researcher circulated the room to facilitate learning and offer immediate feedback to students. The last week of January found students working in groups to use the PLAN reading strategy from start to finish using no additional instructional aids. During this week the researcher again circulated the room to facilitate learning and offer immediate feedback to students. The first week of February was the start of independent practice.

During independent practice, the students were assigned a section of the textbook to read and were told to use the PLAN reading strategy before, during, and after reading the selection. During the first week of independent practice the concept maps were collected to verify correctness and assess student progress. From the second week of February until the third week of March the students continued independent practice in the method previously described. During these last weeks of instruction, the PLAN concept maps were visually inspected during the following day to verify completion of the assignment. The third week of March was the conclusion of the research and was when the student surveys were completed. Students received and completed the surveys during one class period.

Data Analysis

In order to generate each student’s base score, archival documents were analyzed. The base score (BS) for each student was the average course grade received during the first two nine weeks of the current course. Base scores were used to categorize students as above average, average or below average. Students who received an A base score were identified as above average. Those students who received a B or C were identified as average, and students with a D or F were categorized as below average. This same system was used to categorize each student’s PLAN score (PS). The PLAN score was the course grade after the first nine weeks of the school
required biology course. The number of students in each achievement category was then compared to determine significance.

To generate additional numerical data from the past and current course grades, the actual percentages were evaluated. Final data was generated by subtracting the PS from the BS. This sum was multiplied by 100% to generate a percent difference. A negative number indicated falling scores during the PLAN, while a positive number indicated improved scores during the PLAN.

The post PLAN student surveys were scored using the Likert Scale. For positive questions the following number assignment was used: Strongly Agree = 5, Agree = 4, Undecided = 3, Disagree = 2, Strongly Disagree = 1. Negative questions were scored in reverse, with Strongly Disagree being a five and Strongly Agree being a one. Each question was assigned an average score based on student responses. The scores were analyzed to determine commonalities among students and to understand the opinions of the students in regards to the PLAN reading strategy.

Field notes were the final portion of data that was analyzed. Throughout the stages of teaching and facilitating the use the PLAN reading strategy, the researcher noted positive and negative behaviors during student work. Behaviors were noted informally and were based on participant observations, as well as verbal and non-verbal cues from students. Additionally, the researcher noted the positive and negative implications to the classroom as a result of the PLAN reading strategy. To analyze the observations, the researcher looked for commonalities between groups of students as well as the differences between students in their use of the PLAN reading strategy. By searching for commonalities and differences, a clear picture of student use, acceptance, and enjoyment of the PLAN reading strategy was developed.
Conclusion

Several methods of data collection and analysis were used for this study. Past and current course grades were used to gain an understanding of the previous and current academic achievement levels of each student. The use of student surveys allowed for students to honestly and anonymously report their thoughts and feelings about the PLAN reading strategy. The surveys allowed for students to have voice and report their opinions. Finally, the use of field notes based on observations were used to discover commonalities and differences in student use of the PLAN reading strategy. Each portion of data was analyzed separately and then compared to the whole to determine the ultimate effects of the PLAN reading strategy on textbook reading comprehension. Multiple data collection and analysis methods were used to adequately provide for triangulation of data and assurance of accurate results. The results of the data are explained in detail in Chapter IV.
Chapter IV: Results

Introduction

The purpose of this project was to determine if textbook reading comprehension increased when the PLAN (Predict, Locate, Add, and Note) reading strategy was implemented in a tenth grade biology classroom. The research questions were: (1) How did the professional literature define the PLAN reading strategy? (2) According to the professional literature, what were the benefits of the PLAN reading strategy? (3) According to the professional literature, how has the PLAN reading strategy been implemented? (4) How did the professional literature define reading comprehension? (5) Did textbook reading comprehension increase in a tenth grade biology classroom when the PLAN reading strategy was implemented? In order to answer research question five, data was complied and results were generated.

Results

After compilation of the data, results were generated for each of the data collection instruments. The data collection methods that were used included the comparison of past and current course grades, student surveys, and field notes. The results from each were then used to determine commonalities and differences between students, their success with the PLAN, and their attitudes toward the PLAN.

Comparison of Base and PLAN Scores

Past and current course grades were compared by using a base score (BS) and a PLAN score (PS). The BS was the average grade from the first two nine week periods of the course, while the PS was the grade at the conclusion on the third nine weeks after the PLAN reading strategy had been implemented. When the BS and PS numbers were compared, it was found that in general students who had a high BS comparatively had a high PS. Overall results of the
percentage comparison indicate that most students showed an increase in their grade during the time when the PLAN reading strategy was implemented. Figure 1 shows a comparison between the BS and PS percentages.

![Figure 1: Percentage Base Scores vs. PLAN Scores](image)

The BS and PS were then analyzed for percent difference by subtracting the PS from the BS. A negative percent difference shows a decline in student achievement, while a positive percent difference shows an increase in student achievement. The results show that five students showed a decline in their achievement, one student showed no change and the remaining seventeen students experienced an increase in their achievement. The percent differences from each student were averaged to show the overall benefit of the PLAN reading strategy on student achievement, and hence reading comprehension. The average percent difference was found to be +2.5%. This percentage indicates a marginal improvement in reading comprehension after the implementation of the PLAN reading strategy. Figure 2 illustrates the findings of the percent difference between the base and PLAN scores.
Before the PLAN there were nine students in each the above average and average categories, and five students in the below average category. After the PLAN there were still nine above average students, while the average students increased to eleven and the below average students decreased to three. From this data, it can be determined that there was a slight increase in student achievement among the below average students after the PLAN was implemented. Additionally, the data shows that the number of above average students remained relatively stable. Figure 1 shows a comparison between the BS and PS percentages. Figure 3 summarizes the number of students in each achievement category before and after the PLAN reading strategy was implemented.
Post-PLAN Student Surveys

The next source of data that was complied was the student surveys. The surveys were administered at the conclusion of the ten-week study period and assessed the students' attitudes and views toward the PLAN reading strategy. The survey also evaluated the perceived benefits and shortcomings of the PLAN reading strategy. This survey consisted of twenty-five Likert Scale questions, which focused on seven key components. These components were arranged in the following question blocks: (1) learning the PLAN, (2) methods of the PLAN, (3) reading comprehension before the PLAN, (4) reading comprehension after the PLAN, (5) current use of the PLAN, (6) continued use of the PLAN, and (7) overall attitude toward the PLAN. Responses for each question followed the typical Likert Scale and were: strongly agree, agree, undecided, disagree, and strongly disagree. For positive questions the following number assignment was used: Strongly Agree = 5, Agree = 4, Undecided = 3, Disagree = 2, Strongly Disagree = 1. Negative questions were scored in reverse, with Strongly Disagree being a five and Strongly
Agree being a one. Each individual question and question block were assigned an average score (1-5) based on student responses. The scores were analyzed to determine commonalities among students and to understand the opinions of the students in regards to the PLAN reading strategy. See Appendix I for a copy of this instrument.

The first block of questions that students were asked to answer dealt with learning the PLAN. This question block consisted of two questions, specifically questions 1 and 2. Refer to Appendix I for these questions. It was found that a majority of students agreed that they were taught the PLAN in an effective way and were given plenty of time to practice before individual use had begun. For both questions, 19 out of 24 students responded favorably to these statements. An average score of 4 was found for this set of questions, which indicates that the majority of students felt that learning the PLAN was conducted in an effective and efficient way.

The second block of questions dealt with the methods of the PLAN in regards to how students felt about the steps of the PLAN and their ease while completing each step. Four questions comprised this particular block, specifically questions 3-6. Refer to Appendix I for these questions. Through this question block, it was determined that a majority of students felt that the PLAN was easy to understand and use. Furthermore, students responded that the concept mapping portion of the PLAN was well liked. An average score of 4 was received for this question block, which indicates that the majority of students responded favorably to the statements regarding the steps of the PLAN.

The third set of questions asked students to gauge their reading comprehension before the PLAN reading strategy was implemented. This block consisted of four questions, specifically questions 7-10. Refer to Appendix I for these questions. Overall, student responses regarding their reading comprehension before the PLAN were mixed. While a majority of students
responded that they felt their science textbook was difficult to read, in contrast, a majority of students reported that they have been able to garner the key concepts from the text and understand the content. When asked to respond about the trouble they have had in the past when reading their science textbook, 50% responded that they have had trouble in the past while the other 50% reported that they were doing fine. An average score of 3 was established for this block of questions indicating that a majority of students were unsure of their current level of reading comprehension.

The fourth set of questions in the student survey dealt with students reading comprehension after the PLAN reading strategy was implemented. There were five questions in this block, specifically questions 11-15. Refer to Appendix I for these questions. Student responses to this block of questions showed that a majority of students felt that the PLAN assisted them in better understanding their science textbook and that the concept mapping portion was of particular value in this endeavor. Conversely, students were split on their opinions of the overall value and enjoyment of the PLAN reading strategy. In each case, students responded that they were largely undecided as to the value of the PLAN reading strategy and their enjoyment while using it. Finally, when asked whether the PLAN reading strategy caused an increased likelihood of completing a reading assignment, 50% responded that they were more likely and 50% responded that there was no change in the likelihood of them completing a reading assignment when using the PLAN. Overall, an average score of 3 was determined for this block of questions indicating that a majority of students were undecided regarding their reading comprehension after the PLAN reading strategy was implemented.

The fifth question block of the survey was focused on determining the current use of the PLAN reading strategy. This block consisted of five questions, specifically questions 16-20.
Refer to Appendix I for these questions. Similar to the fourth block of questions, this block showed that students were again largely undecided in their responses. When questioned about the use of the Predict and Add step, students responded at about 50% that they felt these steps of the PLAN were useful. However, when asked about the use of the Note step, students responded favorably that they found the Note step helpful to increasing their understanding of the textbook. Additionally, when asked about their comfort level when using the PLAN reading strategy on their own, the majority of students responded that they were comfortable enough to use the PLAN reading strategy on their own. Overall, an average score of 3 was received for this block of questions, indicating that a majority of students were undecided regarding their reading comprehension after the PLAN reading strategy was implemented. However the students clearly indicated that the Note step was found to be the most helpful.

The sixth set of questions on the student survey centered on students’ continued use of the PLAN reading strategy after the conclusion of the study period. This block was made up of three questions, specifically questions 21-23. Refer to Appendix I for these questions. For this block of questions, an overall score of 3 (undecided) was received. This indicates that students may have failed to understand the overall use of the strategy. However, students did respond that they had made changes to the PLAN, which they felt assisted them in better understanding the textbook and its content. These responses indicate that students were able to mold the PLAN for their individual use. Additionally, student responses show that, marginally, students foresee that they will use the PLAN reading strategy again.

The final block of questions on the student survey dealt with the students’ overall attitudes toward the PLAN reading strategy. This block consisted of two questions, specifically questions 24-25. Refer to Appendix I for these questions. When asked to respond to the
following statement, “Overall, I feel that by using the PLAN reading strategy I am able to better understand reading assignments in my science book”, seven students responded that they agreed with the statement, five responded that they disagreed, and ten were undecided. These results indicate that while more students agreed than disagreed, the majority was undecided. When asked to respond to the following statement, “I feel that the PLAN reading strategy has helped me to become a better reader”, seven each responded that they agreed or disagreed with the statement, while eight answered that they were undecided. This indicates that the ability of the PLAN reading strategy to improve reading comprehension was unclear to the students. This question block received an average score of 3, showing that in general, students were undecided regarding the benefits of the PLAN reading strategy. Figure 4 shows a breakdown of each question from the student survey and the average Likert score for each question. Figure 5 illustrates a breakdown of each block of questions and the average Likert score for each block.
Field Notes

The final portion of data that was analyzed were the field notes. Throughout the stages of teaching and facilitating the use of the PLAN reading strategy, the researcher noted positive and negative behaviors during student work. Behaviors were noted informally and were based on participant observations, as well as verbal and non-verbal cues from students. Additionally, the researcher noted the positive and negative implications to the classroom that resulted from the PLAN reading strategy. To analyze the observations, the researcher looked for commonalities between groups of students as well as the differences between students in their use of the PLAN reading strategy. By searching for commonalities and differences, a clear picture of student use, acceptance, and enjoyment of the PLAN reading strategy was developed.

Positive Student Behaviors.

Upon review of the field notes, several positive student behaviors were noted. These included cooperative behaviors during group work, verbal comments, and positive peer
interactions. Specifically, students showed an increase in peer interaction and social learning during the time when the PLAN was in use. Students were observed asking peers for advice and guidance while working through the steps of the PLAN. Student’s verbal comments showing positive outlooks on the PLAN included, “I feel like I am not doing schoolwork”, “Looking over the PLAN’s from the chapter make it easier to study for a test”, “Doing the PLAN first and then listening to a lecture helps me understand a lot better.” Furthermore, it was observed that students quickly began to make changes to the PLAN for their own individual use. These changes included preparing more structured outlines, using highlighters to color code section headings, and the use of pictures for note taking during the Note step. These positive behaviors indicate that students felt comfortable using the PLAN and saw the value of the PLAN in the classroom. Additionally, these results show that the students were using the PLAN correctly and were benefitting from its use.

Negative Student Behaviors.

Upon review of the field notes, a few negative student behaviors were noted. These included an increased amount of time in which some students were off task, as well as negative verbal comments. During the PLAN, students were permitted to work with groups to collaborate on their use of the PLAN. While most students used this time wisely, some students were off-task a majority of the time. This time off-task resulted in these students not being able to complete the PLAN in allotted time. Additionally, one student in particular felt that the PLAN was of little use. This student verbally commented to the researcher, “I am not going to learn anything from this [doing the PLAN].” These negative behaviors indicate that the PLAN was not well received by all students and that some struggled to understand the benefits of the reading strategy.
Positive Classroom Observations.

Several positive implications to the classroom were noted during the time when the PLAN reading strategy was in use. These included an increased rate of homework completion, increased time spent on-task, more student centered learning, and insightful observations that could be used by the educator to further enrich the class. While the participants in this study had shown high rates of homework completion in the past, rates were shown to increase slightly when the PLAN was used as a homework assignment. Figure 6 illustrates the increase in homework completion.

![Figure 6](image)

Additionally, using the PLAN reading strategy allowed for more student centered learning. By allowing the students to use the PLAN, the researcher was able to circulate the classroom to check in on students regularly. It was found that students were more likely to ask questions about the topics with which they were confused during the one-on-one time than during a lecture. The students responded favorably to the one-on-one time and were found to make their own connections with the content and show that a majority of time was spent engaged
in instructional activities. Furthermore, while conducting the one-on-one time, the researcher found that students would typically ask the same questions. This observation was used to the advantage of the class by devoting extra lecture time to the specific concepts that students asked about. The researcher found that this insight was of great value in gauging the students’ understanding of the content and aiding in student learning. Through these observations, the PLAN was shown to have many positive results on the classroom as a whole.

**Negative Classroom Observations.**

A minute amount of negative classroom observations were noted during the time when the PLAN reading strategy was in use. The largest problem during this time was students being off-task. While only small portions of students were problematic, it was noticed that students who were off-task took generally longer to complete the PLAN than the rest of the class. In many cases this caused the time devoted to the PLAN to be extended. It became clear that time management was an important concept to have mastered when working with the PLAN reading strategy. This extended time spent on the PLAN resulted in less than 100% of instructional time being used effectively.

**Conclusion**

In compiling the results from this study, three data collection instruments were analyzed. These included comparison of base and PLAN scores (BS and PS), analysis of post-PLAN student surveys, and examination of field notes. When comparing the BS and PS, the results indicated a marginal increase in student achievement and reading comprehension after the PLAN reading strategy was implemented. Through analysis of the post-PLAN surveys, students appear to be largely undecided about the benefits and shortcomings of the PLAN reading strategy. Finally, the field notes seemed to show that the overall student behaviors and classroom
implications were positive in nature. The meaning of this data, along with recommendations for future research is offered in Chapter V.
Chapter V: Discussion

Introduction

The purpose of this project was to determine if textbook reading comprehension increased when the PLAN (Predict, Locate, Add, and Note) reading strategy was implemented in a tenth grade biology classroom. The research questions were: (1) How did the professional literature define the PLAN reading strategy? (2) According to the professional literature, what were the benefits of the PLAN reading strategy? (3) According to the professional literature, how has the PLAN reading strategy been implemented? (4) How did the professional literature define reading comprehension? (5) Did textbook reading comprehension increase in a tenth grade biology classroom when the PLAN reading strategy was implemented? In order to answer research question five, the meaning of the data was determined and summarized. From the analysis of the data, recommendations for future research were offered.

Meaning of Findings

After compilation of the data, results were generated for each of the data collection instruments. The data collection methods that were used included the comparison of base and PLAN scores (BS and PS), student surveys, and field notes. From the collected results, meaning was gathered from the raw data.

Comparison of Base and PLAN Scores

When comparing past and current student achievement levels it was found that those students who were above average before the PLAN was implemented remained above average after the PLAN was implemented. This may suggest that high achieving students will do well in spite of changes to instructional methods. Additionally, these findings may indicate that these students understand the content at a higher level than their classmates and, due to their higher
intellect, show little academic change after the implementation of a new instructional method. Also in regards to prior student achievement, the number of students who were in the below average category before the PLAN was applied, decreased after the PLAN was introduced. Consistent with the research done by Caverly et al. (1995), this slight decrease in the number of below average students may signify that the PLAN reading strategy helped lower achieving students more often than their more intellectual counterparts. This finding might suggest that reading strategies, such as the PLAN, are more tailored to lower students. However, from this research, it was found that all students could benefit from the PLAN reading strategy.

When analyzing the percent difference between the BS and the PS, a +2.5% increase in student achievement was noted. This result was generally consistent with the increases in student achievement noted in the research by Radcliffe et al. (2004) and Myers and Savage (2005). For the purposes of this study, this result could be considered to be marginally significant in showing an increase in reading comprehension and student achievement regardless of prior achievement level. This may have the larger implication of showing that the PLAN reading strategy has the potential to improve the educational success of all students. This potential progress of all students could be the result of increased completion of homework.

The data showed that a small increase in homework completed on time resulted during the implementation of the PLAN reading strategy. The reason for increased completion of homework could be due to the students’ attitudes toward the PLAN. For example, the student surveys showed that a majority of students felt that the PLAN reading strategy was easy to complete. Taking this into consideration, the increases in completed homework could have resulted from students feeling that they could complete the assignment quickly and easily. Additionally, it could be proposed that the reading strategy gave students a purpose for reading
and that this caused an increase in completed homework. The PLAN gives students a purpose and goal while reading and this could have caused the favorable results for on-time homework.

*Post-PLAN Student Surveys*

Through the analysis of the post-PLAN surveys, students responded that the PLAN was taught in an effective manner, and was easy to use and understand. Students may have responded in such as way because they received detailed handouts regarding the steps of the PLAN or because the researcher demonstrated the PLAN several times before asking students to conduct the PLAN on their own. Despite the reason for their response, it could be expected that when students feel confident about their ability to accomplish an academic task such as the PLAN reading strategy, that they will be more likely to complete the task. By being more likely to complete the PLAN, this could cause more favorable data and study results. Additionally, students reported high levels of comfort when using the PLAN on their own. This high comfort level could be signified in the higher rates of completed homework.

When asked about their reading comprehension before and after the PLAN was employed, students were largely undecided about their abilities. This may show that students simply are not used to gauging their level of academic success and therefore are unsure of their current reading level. To go along with this, a majority of students reported that they felt science textbooks were difficult to read. As stated in the study by Mandeville and van Allen (as cited in Caverly et al., 1995), this difficulty may be due to the switch from narrative forms of writing, such as novels, to the more informational writing that exists in science class. The participants of this study were high school sophomores and may still be struggling with this new form of textbook writing. However, students report that the difficulty they experience when reading a science text had no impact on their ability to comprehend the text. Through the survey, students
reported that they are able to understand the big concepts from a science textbook. Perhaps the responses about the science text being difficult to read have nothing to do with the content itself and more to do with the informational writing style. Presumably, the results that dealt with student determination of their reading ability were mixed due to the diversity of students’ abilities to accurately gauge their own learning.

When asked to rate the helpfulness of the individual steps of the PLAN reading strategy, the concept-mapping portion (Predict) was identified as being well liked and useful. This result is consistent with the study by Radcliffe et al. (2004). It could be assumed that the concept-mapping step was enjoyable because it allowed students to make visual connections from a difficult text. Through making these visual connections, it could be seen that students would understand the content at higher levels than without the concept map. Furthermore, the concept map is less like typical note taking, and could be seen as favorable due to this. While students saw the Predict step as favorable, the Note step was recognized as the most valuable step in PLAN. During the Note step of the PLAN, students revised their concept maps or engaged in another academically significant task to solidify their knowledge of the reading assignment. It could be supposed that students viewed this culminating activity as the "bulk" of the work and the time when they actually came to an understanding about the content. If this were the case, students would have seen this as the most helpful step because this was where they were learning the new concepts.

One downfall noted from the student surveys was that students failed to understand the overall value of the PLAN reading strategy. However in contrast, students reported having modified the PLAN to their individual learning style. These results seem to be contradictory in that by molding the PLAN for their own use, students indicated that that they may have
understood the benefits better than they reported. It could be argued that by adjusting the PLAN, students were using the reading strategy to the fullest potential for their individual learning style. Arguably if the students were using the PLAN to its fullest extent, they may have understood what the intended goals of the PLAN were and determined how to best meet those goals. This ambiguous response could be a result of the students not being fully aware of their own reading and learning styles, and what works best for them.

Overall, the analysis of the student surveys resulted in a general “undecided” vote on the PLAN reading strategy. This resultant value of undecided could mean that not enough time was spent on the PLAN to show significant differences. With such a short study period, students may not have had enough time to experiment with, adapt, and understand the PLAN. Additionally, given more time, students may have been able to better determine their own reading and learning styles.

Field Notes

When the field notes were analyzed, generally more positive than negative behaviors were noted. Among the positive behaviors, the PLAN reading strategy caused an increase in social learning and peer interaction during group work. This type of learning is developmentally appropriate for high school sophomores, and could have added to the successes that resulted from the PLAN reading strategy. It could be assumed that when students of this age were permitted to interact with their peers that learning was enhanced.

Similar to the findings from the student survey, the field notes included observations of students making modifications to the PLAN. This could indicate that students had an interest in the reading strategy as well as an understanding of the use and goals of the strategy. If students understood the strategy in this way, favorable outcomes could have resulted. Also congruent
with the student survey, field notes showed that, in general, students were completing the PLAN quickly and easily. This could imply that students had a high level of comfort with using the PLAN reading strategy and a firm understanding of the steps involved with the PLAN. With high levels of comfort and understanding of the PLAN, again, favorable outcomes could have resulted.

One particularly interesting observation from the field notes was that most students did not use the *Add* step (indicating which topics were known and unknown with check marks and question marks). Based on student comments, the reason for this was that most, if not all, of the textbook headings and subheading were unknown concepts. This could have led the students to not utilizing this step of the PLAN because it was not seen as useful. If the student knew that all of the topics would need to be approached with the same speed, it could be inferred that students felt safe in skipping this step.

There were two observations from the field notes that were especially useful. The first was a notable increase in student learning. This improvement in student learning was evident through observations as the researcher was acting as a facilitator and not a direct teacher. It was clear that students were able to make their own connections and become more aware of their own learning process through using the PLAN reading strategy. This could have caused an increase in student learning, as was reported in the research conducted by Caverly et al. (1995). Additionally, the PLAN reading strategy was perceived to have created a more positive classroom environment. It was thought that the more positive environment was due to the course being more student centered. In all probability, students who felt that they were the focus of the course, rather than the teacher, were more likely to have felt better about the class as a whole.
The second observation that was especially useful was the way in which students were able to ask content specific questions while they worked through the PLAN reading strategy. During facilitation the researcher was available to the students for questions. Many students asked specific questions regarding the content during this time. Student questions regarding the content were invaluable as a teaching tool and lesson planner. Through these questions, the researcher was able to use the common questions that came up during facilitation, or the comments the students would make, to enhance the quality of the lecture. Presumably, students were more likely to listen intently to a lecture when the researcher added in classmates’ thoughts and ideas. By listening more avidly, students would most likely glean more from the lecture, resulting in higher academic achievement.

Negative behaviors recorded in the field notes were minimal and were believed to be caused by some students not perceiving the value in the reading strategy. In particular the student who verbally stated, “I am not going to learn anything from this [doing the PLAN]” was the only junior in a class of sophomores. Additionally, this was a new student to the school and he had already taken a similar a course at his home school. It was thought that this student was overtly aware of his learning style and understood how he learned best. Apparently, he felt that the reading strategy was not aligned with his modality and so was of no use to him. It is important to point out that this was an atypical case among the class. However, from this observation an educator could help students like this to find an alternate reading strategy that would be better suited to their learning style. In the case of this study, the majority of students were welcoming of a new tool to help them to learn better.
Summary of Study

The purpose of this project was to determine if textbook reading comprehension increased when the PLAN reading strategy was implemented in a tenth grade biology classroom. Twenty-six tenth grade biology students enrolled in a small, Midwestern school district participated in this study. The study covered a ten-week period in which the students completed successive phases of implementation of the PLAN reading strategy. The PLAN reading strategy was defined as “a study-reading strategy...which helps students develop strategic approaches to reading” (Caverly, Mandeville, & Nicholson, 1995, p. 190). The PLAN acronym was represented by the steps of Predict, Locate, Add, and Note. This strategy involved before, during and after reading activities. Direct instruction was the main instructional method used to teach this reading strategy. Instruments used for data collection during this study included analysis of base and PLAN scores for each student, a post-PLAN student survey, and field notes. Results showed marginal increases in the achievement level of all students, but seemed to have a larger effect on the lower achieving students. Many positive behaviors and implications were noted during the course of this study and included, more student centered learning, a more positive classroom environment, and the availability of useful teaching and planning tools for the educator. Students indicated that they were largely undecided as to the benefits of the PLAN reading strategy. While overall results showed a slight increase in reading comprehension, a longer study time may result in more favorable and significant results.

Recommendations

The following are specific changes to the procedures, instruments, and techniques used in this project that are recommended for future research. First, a longer study period is advised for future studies. If possible at least a full school year should be used in order to gauge significant
changes in student achievement. With a short study period, as in this project, a clear picture of student improvement could not be accurately gleaned. Second, the use of a control class and a study class should be used to better compare the results and effects of the intervention. This study used only one class and results could have been assessed better if a control class was utilized. Third, students should be given a more lengthily and detailed explanation of the PLAN to assist them in understanding the research and the benefits that back it up. This extended explanation could allow students to better understand the reasons for the reading strategy and respond more favorably to it. Fourth, students should be given additional surveys to complete throughout the study period. Specifically, a before PLAN survey should be employed to assess students attitudes in advance of the study. Multiple surveys could then be used to compare student views at varied intervals. Finally, future researchers should administer specific reading comprehension tests to gauge actual reading comprehension instead of reading comprehension as related to course grades. The researcher would do well to give similar tests before, during, and after the implementation of the PLAN to measure changes at each level. By linking reading comprehension to course grades, this project may not have shown the most accurate picture of student reading comprehension.

By updating the study in these ways, future research may show that the PLAN reading strategy is able to significantly improve textbook reading comprehension for all students. Additionally, future research may show that low-level students acquire more confidence when reading higher-level texts. If this would be the case, higher confidence levels could lead to considerable academic advances in the lower echelon of high school students in America.
Conclusion

Reading comprehension was shown to be important to academic achievement through a review of the professional literature. Specific reading strategies have been shown to increase reading comprehension. Over the course of this study, reading comprehension of tenth grade biology students was marginally improved when the PLAN reading strategy was implemented.
References


Appendix I:

Post-PLAN Student Survey
**Student Survey on Use of the PLAN Reading Strategy**

Put in a mark in the box that you feel best fits YOUR OPINION of the statement.

<table>
<thead>
<tr>
<th>Q.</th>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>The PLAN was taught to me in a way that I found easy to understand.</td>
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<td>2</td>
<td>I feel I was given enough time in class to practice the PLAN before I had to do it on my own.</td>
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<td>3</td>
<td>I like the concept mapping involved with the PLAN.</td>
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<td>4</td>
<td>The steps of the PLAN confused me.</td>
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<td>5</td>
<td>The PLAN was hard to follow.</td>
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<td>6</td>
<td>Using the PLAN is easy.</td>
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<td>7</td>
<td>In the past, I have had trouble understanding reading assignments in my science textbook.</td>
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<td>8</td>
<td>I find my science textbook easy to read.</td>
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<td>9</td>
<td>In the past I have had problems getting the key concepts out of a reading assignment in my science book.</td>
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<td>10</td>
<td>I feel I have always understood most of what I read in my science book.</td>
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<td>11</td>
<td>I am more likely to complete a reading assignment in my science textbook if I use the PLAN.</td>
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<td>12</td>
<td>The PLAN makes me feel like I can understand complicated reading assignments.</td>
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<td>13</td>
<td>I feel that the concept mapping part of the PLAN has helped me to better understand reading assignments in my science book.</td>
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<td>14</td>
<td>I feel the PLAN reading strategy has been a waste of time.</td>
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<td>15</td>
<td>I have enjoyed using the PLAN read strategy.</td>
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<tr>
<td>16</td>
<td>The Predict step of the PLAN helped me to understand how concepts fit together. (This is the concept mapping part.)</td>
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<td>17</td>
<td>Figuring out what I know and don’t know about the concepts in a new reading assignment did not help me.</td>
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<td>18</td>
<td>I feel that the Add step helped me to keep my thoughts organized while reading. (This is when you make short notes under each box in the concept map.)</td>
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<td>19</td>
<td>The Note step helped me to connect individual concepts to each other. (This is when we would write a summary of the reading.)</td>
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<td>20</td>
<td>I feel comfortable in my ability to use the PLAN reading strategy on my own.</td>
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<td>21</td>
<td>I think that I might be able to use the PLAN reading strategy in other classes to help me better understand the textbook.</td>
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<td>22</td>
<td>After using the PLAN for a while, I made changes to the way I used it to help me be more successful with the PLAN.</td>
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<td>23</td>
<td>I do not think that I will ever use the PLAN reading strategy again.</td>
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<td>24</td>
<td>Overall, I feel that by using the PLAN reading strategy I am able to better understand reading assignments in my science book.</td>
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<td>25</td>
<td>I feel that the PLAN reading strategy has helped me to become a better reader.</td>
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