

The Effect of the Use of Interactive Notebooks on 9th Grade Student Achievement

by

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Abstract

There is an increasing push for improvement in the academic performance of students across the nation. Researchers have shown that one way to achieve this is to help students become more organized in their gathering and reviewing of information. This study was done to determine whether using interactive notebooks would impact organization enough to increase the academic achievement of 9th grade students studying Biology. The null hypothesis was that there would be no difference in achievement between the students using interactive notebooks and those who did not. A pretest-posttest comparison was used to test the effectiveness of the interactive notebooks. Although both groups of students showed improvement after the quarterly exam was issued, the students who used the interactive notebooks throughout the quarter received higher scores and showed more improvement between their pretest and posttest data causing the null hypothesis to be rejected. This study therefore supported the use of interactive notebooks as a tool to help improve organization thus student achievement.

CHAPTER I

INTRODUCTION

Overview

For many years there has been a push for higher academic achievement from students throughout the country. Different states have begun to implement various strategies in order to see this goal realized. A large suburban school system in Maryland has allowed various schools in the system to implement their own school-wide initiatives, within their School Improvement Plan (SIP). These initiatives, when implemented, will assist in student academic improvement within each department.

Beginning in the early 1920s, there has been evidence to support the idea that if students take active notes during a lecture, they generally do better at recalling the information presented and their test scores and overall grades seem to improve (Cornelius & Owen-DeSchryver, 2008). Rozalski (2008) believed that the ability to take good notes was so important that he stated “the development of these skills is crucial if students are to succeed academically” (p.17). But not only should students actively write down information presented, they would need to have the right interaction with this information in order to make it part of their knowledge and be successful in their classes (Rheingold, LeClair, & Seaman, 2013).

Interactive notebooks are one tool for students to use keep their information and produced work organized (Walden & Crippen, 2009). It would also allow them to refer back to the contents and engage with new information and process it more thoroughly (Rheingold et al., 2013). A research plan was created to test one high school within the school system, where some students used the interactive notebooks and others did not to see if there would be a difference in the grades they received.

Statement of Problem

The purpose of this study is to investigate the impact of interactive notebooks on the academic achievement of 9th grade students studying Biology.

Hypothesis

The null hypothesis is that there would be no difference in achievement between the students using interactive notebooks and those who do not use interactive notebooks.

Operational Definitions

The independent variable in this research is the use of interactive notebooks for students to organize the information given to them on a daily basis.

The dependent variable is the student achievement, which will be measured by the scores they receive on a quarterly exam created by teachers during a summer assessment writing workshop.

Interactive notebooks are instruments used where students are able to record the information given to them by their instructors on one side of the notebook, then apply their own understanding of the material on the other adjoining side of the notebook.

Student achievement is noted as the measurement of a student's learning and understanding of content in a determined amount of time.

CHAPTER II

REVIEW OF THE LITERATURE

This literature review discusses the use of interactive notebooks for note-taking and its impact on student achievement. The first section focuses on some key factors that result in higher achievement for students. The second section discusses the dynamics of interactive notebooks, how they are used and how they may be beneficial to academic success. The third section explores strategies other than using interactive notebooks that can be effective in promoting academic success in students.

Factors that Determine High Achieving Students

It is the goal of school systems across the country to increase the level of student achievement within their schools and thus the school's academic success. In order to accomplish this goal, certain factors that increase student success rate and achievement must be considered. One such factor is effective note-taking skills. Research done as early as 1920s showed that students who take notes during a lecture tend to do better at recalling information as well as with test scores and their overall grades (Cornelius & Owen-DeSchryver, 2008). It was also noted by Cornelius and Owen-DeSchryver (2008) that through the process of taking notes, students are able to personalize and reorganize information thus making it their own. In order for this personalization and reorganization to occur, notes should be taken by the students and not completely provided by the teacher (Pakdaman, Niusha & Boreiri, 2013). Studies have shown that students who take, then review their own notes, perform better than students who either do not take notes at all or do not review the notes they took (Rozalski, 2008). Pakdaman, et al. (2013) suggest that students receiving fully completed notes from their teacher in class often fail

to write further information that may be of importance and they tend to procrastinate in using them again for review purposes.

The correlation between student success and good note-taking strategies is also seen in reverse when observing students with emotional and behavioral problems. These students typically struggle academically because they do not have basic study skills needed to succeed which includes note-taking (Rozalski, 2008). In fact, good note-taking strategies were seen as being of such high importance for student achievement that Rozalski (2008) went on to say “The development of these skills is crucial if students are to succeed academically” (p.17). Many times the reason such students struggle with taking notes is that they attempt to write too much as they are unable to figure out the important details of the information being presented (Rozalski, 2008). To help students with taking relevant notes, teachers can provide a summary of the information to be taught in advance for students to review so they know what to focus on, or the teacher could provide guided-notes (Rozalski, 2008). These students may also be able to find relevance in the information if the teacher activates prior knowledge. This was determined by Trevors, Duffy, and Azevedo (2014) who stated that students who show more prior knowledge tend to take more quality notes than if there was no prior knowledge on a particular concept or topic.

Another factor indicative of a high achieving student is that of organizational skills possessed by the student. Soric and Palekcic (2009) state that successful students use learning strategies that organize learning material which in turn helps them to make better connections between the material they already learned and the material they are learning. Such organization includes strategies such as “KWL” where students record information they already know, information that they gathered during the learning process, and new information that they learned

at the end (Rozalski, 2008). Students who utilize such strategies are able to make stronger connections with the new knowledge and are able to formulate more pertinent questions that may lead them to an even deeper understanding of the material (Soric & Palekcic, 2009). Students who organize information they learn are also able to locate their notes and the information that they are in need of studying at a faster rate, thus having more time to review material before an exam or any assessment instead of sorting through information and starting off feeling overwhelmed (Soric & Palekcic, 2009).

Another factor that determines success in students is their ability to interact and engage with course concepts. There have been studies done that support the theory that even after taking notes, students do not do as well on assessments if they do not interact or engage with the concepts that they have recorded (Rozalski, 2008). Rheingold, LeClair and Seaman (2013) stated that interaction with content should be done in such a meaningful way that even the classroom and the environment created within the classroom should be set up to allow for such interaction. As students interact with course concepts, discussions can occur among peers and the teacher that can help to broaden their concepts of the topic at hand. This occurs because often times, students tend to have varying opinions and draw different conclusions about the same topic matter, giving others a different perspective in which they can view various concepts (Walden & Crippen, 2009). When students have such discussions and are presented with varying opinions and views of a subject matter, it helps them develop a better understanding of the concept and are able to respond more effectively and in depth when responding to questions on any given assessment (Walden & Crippen, 2009).

Finally, research shows that successful students are those who are able to self-regulate and reflect on their learning process and as a result, they are able to attain a higher level of

achievement (DiFrancesca, Nietfeld & Cao, 2016). Today's educational success and learning is no longer based on memorization and recital of facts as it was in times past, thus, in order to be a successful, lifelong learner in today's society, students must become self-regulated (DiFrancesca et al., 2016). Self-regulation is described as an active process in which students must develop the skills that are needed to monitor their learning and take control of it as well as their cognition, motivation and behavior (Pakdaman et al., 2013). They must also be able to make the necessary adjustments to the techniques they use to learn as their learning environment changes (DiFrancesca et al., 2016). Self-regulation however, is a quality that varies greatly among students (DiFrancesca et al., 2016). One explanation provided for differences in self-regulation among students is their epistemological beliefs, which refers to what they believe in regard to the way knowledge is formed (Pakdaman et al., 2013). Some students believe they are born with a certain level of intelligence and so they will either do well or not (Pakdaman et al., 2013), while other students believe that their ability to learn and succeed can improve if they actively try and they are therefore motivated to try to succeed (Soric & Palekcic, 2009). These students also tend to practice self-reflection which means the students look back and analyze themselves, in an attempt to figure out the areas in which they may be weak and make attempts to improve (Waldman & Crippen, 2009).

How Interactive Notebooks Work

As indicated in the previous section, high achieving students take notes, organize their notes, and actively interact with the notes taken. Interactive notebooks were designed with the intention of meeting all the previously mentioned characteristics. The first concept that must be understood with interactive notebooks and the way it is structured is that it is based on three types of activities: "In" activities, "Through" activities and "Out" activities (Walden & Crippen,

2009). These are strategically setup in the notebook in which the pages should be numbered before use so that a table of contents can be created and information can be easily found. In addition, spiral notebooks should be used in the construction of these notebooks so it easy to fold the book over for ease of use without damage (Walden & Crippen, 2009). The “In” activities should last about five minutes and is designed to activate prior knowledge and as act as an interest stimulator for the students, motivating them to want to learn more (Walden & Crippen, 2009). These activities can be done in small groups, pairs or individually. More can be gained by the students if they collaborate with their peers during this process however. While the students are completing the “In” activity, the teacher can walk around the room and quickly check the students’ responses for understanding of the material and thereby use those responses to determine what should be focused on during the lessons (Walden & Crippen, 2009). During the “Through” activities it is the teachers’ turn to provide information to the students. The information given can be in the form of but not limited to a lecture, a class discussion where the teacher facilitates, or a lab or some sort (Rheingold et al., 2013). This is the time where students are actively gathering new information and gaining knowledge as lead by the teacher, and the only part of the process where students are not driving what is taking place (Walden & Crippen, 2009). Finally, the “Out” activities are the reflection component where students are able to engage with the key concepts they just covered in class. This section is teacher initiated but strictly student-driven. In this way students may reflect on their own learning (Walden & Crippen, 2009). When structuring the interactive notebook, both the “In” activities and the “Out” activities that are directed by the students are entered on the left side of the notebook (Walden & Crippen, 2009). The “Through” activities which are teacher lead are the only items that are entered on the right side of the notebooks (Walden & Crippen, 2009).

With this very structured and organized setup of interactive notebooks, there is no wonder why many teachers across the country are beginning to embrace them. Rheingold et al. (2013) said “A primary reason teachers ask students to use academic notebooks is to capture and organize information” (p. 28). They provide a variety of learning strategies and they help students keep their information and produced work organized (Walden & Crippen, 2009). As mentioned before, the pages are numbered and the sequence in order to make finding specific material for studying purposes easy for students and it makes grading of assignments and assessments easier for teachers as all the work is in the same place (Walden & Crippen, 2009). In addition to the organization and ease of subject location, the information added to the notebook can take on many forms that can be adapted to suit needs of the student (Rozalski, 2008). Students can input information in a way that best suits themselves making the notebook a personal device that reflects their style and learning (Walden & Crippen, 2009). Rheingold et al. (2013) describes these notebooks as starting off as a blank notebook that is only filled with lines and empty spaces, but as time progresses, it becomes a goldmine of information.

Walden and Crippen (2009), states that the power of interactive notebooks is in the “In” and “Out” activities. These activities force students to engage with the new information they just learned and process it more thoroughly (Rheingold et al., 2013). It has been stated earlier by Rozalski (2008), that students who take and review their notes do much better remembering information than students who do not. Boyle and Rivera (2012) state that taking notes will not only serve as a means to remember the information presented during class but it also seemed to improve students’ understanding of the material in grades K-12 in one particular study done. So after the interactive notebooks are created and organized, it is important for students to utilize and interact with the information in it thus taking control of their learning (Walden & Crippen,

2009). Interactive notebooks are designed to allow for such reflection and engagement with information recorded as students must use the information on the right side of their books to complete and submit work on the left side (Walden & Crippen, 2009). Students are therefore reviewing and engaging with their notebooks daily. The information given on the right may also be the most likely place where the teacher will take information to create a test or quiz (Walden & Crippen, 2009), so once again, it would be in the student's best interest to review the work given and produced in their notebooks. Students are also able to keep assessments and other work in their notebooks so they can reflect on what they did well and what they need improvement in (Walden & Crippen, 2009).

Alternative Strategies to Interactive Notebooks to Promote Academic Success

Research suggests that taking notes and reviewing them are an essential part of success in students (Rozalski, 2008). However, there are many ways for students to record and structure notes and still achieve success than simply using interactive notebooks (Boyle & Rivera, 2012). One example is seen in a study performed that showed when students used various strategies of taking notes, what mattered most was not the type of organization but the style of the notes taken (Boyle & Rivera, 2012). In one case, females who created a matrix style of notes performed better than those who simply studied them but did not create them, and they also did better than those who used a different technique such as traditional notes or linear style of notes (Boyle & Rivera, 2012). This is because that style of note-taking was probably more conducive to their style of learning (Rozalski, 2008).

Another strategy that may be beneficial to student learning and success would be hands-on activities. In the case of science for example, hands-on science has been defined as any science laboratory activity which allows the students to handle, observe and manipulate a

scientific process (Sadi & Cakiroglu, 2011). This type of approach to science in particular is valuable and necessary as it results in increased learning and student success because students become more actively involved in the learning process while they are manipulating materials, helping them gain a better understanding of certain concepts (Sadi & Cakiroglu, 2011). By working with materials or objects, students become more motivated and excited to join in the lesson. It enables them to become critical thinkers and active learners (Sadi & Cakiroglu, 2011) and it helps students make connections between the activities they are doing and the relevance to the concepts that they are required to learn (Walden & Crippen, 2009). Teachers should therefore fully embrace just how impactful hands-on instruction in science, really is in regard to learning (Sadi & Cakiroglu, 2011).

Among the other factors that were mentioned previously that can help students become successful and high achieving, the type of study skills a student develops is also very important in achieving success. Rozalski (2008) stated that “for students to succeed in school, they must be taught thinking and analysis skills” (p. 19). This is because no matter how well a student may take notes, if they are unable to study those notes effectively, they may still not succeed. One technique that can be used to do this is in using the SQ3R method which involves: Surveying or understanding the question before starting; Questioning what should be learned, or possible questions that could arise from the content; Reading effectively and actively; Reciting information through repetition; Reviewing information by going over summaries etc. (Rozalski, 2008). In addition to developing good study habits, good test-taking strategies are also needed if a student is to be successful in taking exams and being a high achiever. Rozalski (2008) states that students should be taught basic test analysis skills before they take their first test. There are only two general categories of tests which are recognition based questions or integration

questions (Rozalski, 2008). However, despite the type of test a student may be taking, they must be taught thorough test-taking skills that they can utilize in order to perform better on the assessment given (Rozalski, 2008). This may simply involve techniques such as reiterating to students the importance of reading instructions and questions carefully before beginning and helping them understand the tasks that are required by certain keywords they see in a question (Rozalski, 2008).

Summary

In order for students to become high achievers, there is a combination of skills and techniques that they must develop in order for that to be accomplished. One key technique that must be mastered is the art of taking notes so they have a rich and organized source of information from which they can study. The use of interactive notebooks is one tool that can be used to provide such structure. It is becoming more widely used in some classrooms as it provides a well-structured and organized layout of the notes that students have recorded as well as the means by which to engage with and reflect on the information gathered by the submittal of work and activities within the notebook as well. However, this is not the only means or method to students becoming successful. Other strategies such as developing good study habits and test-taking strategies must also be incorporated for a student to truly be successful today in the area of academics.

CHAPTER III

METHODS

This study was performed in order to investigate the impact of interactive notebooks on the academic achievement of 9th grade students studying Biology.

Design

This study was based on a quasi-experimental design. This design was chosen as intact classrooms were used to apply the treatment rather than individual students. The independent variable was the use of interactive notebooks (INB) by one group of students. This was done for the timeframe of one semester for students to take, organize and study their notes. The dependent variable was the students' performance and achievement on the Anne Arundel County-based quarterly assessment. A pretest-posttest comparison was used to test the effectiveness of the INBs on student performance on the assessments.

Participants

The participants in this group were 44 students in the 9th grade ranging from ages 14 to 16 years old. Of these students 24 were male and 20 were female. None of the students were ELL (English Language learners) however one student had an IEP (Individualized Educational Plan) and 5 had 504 plans (students identified with disabilities). Nineteen of the students were Caucasian, 17 were African American, and 5 were of Hispanic descent. The remaining 3 students were classified as "other". The students were all enrolled in two general education science classes. The groups were identified as they were the only two ninth grade classes being taught at the time in a course that was not being tested by the State of Maryland.

Instrument

The instrument used in this experiment was a quarterly assessment - an assessment given at the end of the quarter. This summative assessment consisted of 20 to 25 multiple-choice questions that were developed by a team of science teachers from various high schools throughout the county. The purpose of the exam was to assess the mastery of the content presented throughout the quarter by the students enrolled in the course.

Procedure

There were two classes involved in this study. The class that received the treatment were provided with spiral notebooks that they were required to set up at the beginning of the quarter. The students were required to number their notebooks using numbers 1 to 50, ensuring that the right side of the book contained odd-numbered pages and the left side of the book contained even-numbered pages. The first two pages (pages 1 and 2) were reserved for the table of contents that they used to keep track of the information recorded each class period. Class periods ran for 90 minutes every other day. Students were then instructed that notes provided by the teacher or information collected from a video or article read, had to be recorded on the right side of the notebook (odd-numbered pages). Whereas any work that they produced themselves such as questions answered, completed labs, drawings or graphic organizers had to be placed on the left side of the book (even-numbered pages). The date was to be recorded on the top of each page they were working on for that day as well as in the table of contents so students could easily look back to see what was done on any given day. The interactive notebooks (INBs) were kept in the classroom on an assigned bookshelf and each day the students came into class, they retrieved them and began their work for the day. All assignments including drills and some exit tickets were recorded in the INBs on pages assigned by the teacher. Students were not allowed to

take the INBs out of the classroom. As a result, students reviewed for assessments in small groups or with a partner before assessments were given.

Simultaneously, the other group of students who did not use INBs within the classroom were provided with the same instruction and activities each day and were given the same assessments that the other group of students were given during the same period of time. These students were allowed to use any form of note-taking that they desired.

Both groups of students came into the ninth grade with similar scores on their Middle School Assessment required by the state. They were also issued a pretest that covered the material that they were going to be taught during the course of the first quarter to see what prior knowledge they had on the topics to be covered. At the end of the quarter, both groups of students were issued the county-based quarterly assessment and scores between both groups were recorded and compared.

CHAPTER IV
RESULTS

The purpose of this study is to investigate the impact of interactive notebooks on the academic achievement of 9th grade students studying Biology. Pre and Post test data Pre and post data were gathered on the intervention group using interactive notebooks and the control group not using interactive notebooks. The pre and post tests were not the same measure, did not have the same number of total points and therefore were on different scales. Thus, the analysis was done using multiple linear regression where the dependent variable was the post-test and the independent variables were the intervention or lack of intervention and the pre-test score. Table 1 displays the results of the multiple regression which indicated that the intervention group outperformed the control group.

Table 1

Multiple Regression Results

Model		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	16.139	2.002		8.061	.000
	Pretest data (scores out of 10 points)	2.654	.235	.814	11.308	.000
	Group 1 = Intervention 2 = Control	-2.158	.901	-.173	-2.397	.020

a. Dependent Variable: Score on Exam out of 35 points
P<.05 statistically significant

In the above table “B” is the unstandardized coefficient and Beta is the standardized coefficient.

Using first B; the regression equation would be:

$$2.654(\text{Pretest score}) + 16.139 - 2.158(\text{Intervention}) = \text{Posttest score.}$$

Or if one used standardized coefficients then the equation would be:

$$.814 (\text{Pretest score}) - .173(\text{Intervention}) = \text{Posttest score}$$

The table indicates that statistical significance was reached and in favor of the intervention over the nonintervention (the negative sign on the coefficient for the intervention versus nonintervention). Thus the null hypothesis is rejected. There was a difference in achievement between the students who used the interactive notebooks and those who did not use interactive notebooks.

CHAPTER V

DISCUSSION

The purpose of this study is to investigate the impact of interactive notebooks on the academic achievement of 9th grade students studying Biology. After both groups of students took the end of semester exam – those receiving the intervention of Interactive notebooks and those who did not – analysis of the data in Chapter IV rejected the null hypothesis in favor of the intervention.

Implications of Results

The results of this study indicated that the usage of Interactive Notebooks was helpful in students being more successful on their end of quarter exam. This is beneficial in that it may provide teachers with a useful tool to help their students not only do better on an exam but to organize their work better so that they are able to return to the information provided to them and study so that the material is better understood. The ability to organize information is also a good skill to develop for students who plan on pursuing a higher level of education or even for those who plan to pursue careers where organizing data is important. It also helps students take ownership of their learning in that they have to provide feedback and create some form of product from their interaction with the material being taught to them. This also helps students become more responsible for their learning instead of just being passive recipients of knowledge.

Threats to Validity

In this study, one threat to external validity was selection bias where the groups of students being compared were not randomly chosen. They were selected conveniently based on the classes available that studied the same material. As a result, the subjects were similar in age and experiences and did not cover a broad range of individuals. Another threat was to construct

validity. Because the students were not randomly chosen and the sample size was relatively small it may be difficult to apply the results obtained from this study to other groups of individuals making the data only non-applicable across the board.

There were also threats to internal validity. Both groups of students being tested were in classes that met at different times of the day. The group receiving the treatment met early in the morning whereas the class that did not receive the treatment met right after lunch. Once again, this was based on the availability of classes which presents a threat to History. Another threat to internal validity was the composition of the class. In the control group, there were students who were more social and found it difficult to refocus at times which may have also affected the overall results of the class as a whole.

Connections to Previous Studies

The topic of interactive notebooks is gaining interest as educators discover the benefits of its use within the classroom. A previous study presented by Cornelius and Owen-DeSchryver (2008) showed that students who take notes during a lecture tend to do better at recalling information as well as with test scores and their overall grades. In this study it was also observed that as students within the group where interactive notebooks were being utilized were presented with information, they were responsible for recording key parts of that information. This was to be used later for review purposes and to be used in activities where students needed to create questions based on the information recorded. This use of information was also seen in other studies done. One such study as published by Yager and Akcay (2010), showed that when students used information they learned to create questions and allow these questions to drive further learning. As a result, their understanding of skills and concepts also improved.

In 2008, Rozalski indicated in other studies students who take, then review their own notes perform better than students who either do not take notes at all or do not review the notes they took. In this study a similar result was seen. The group who did not use interactive notebooks may have used other methods of taking notes and reviewing them but the structured, mandatory notebook usage seen in the experimental group proved to work better in ensuring that the information gathered had to be reviewed and utilized in preparation for upcoming assessments. Another connection that is seen in the study done by Rozalski (2008) and this study is the correlation between the success a student has on an assessment and the ability to not just take notes but to focus on the information that is relevant. Using the interactive notebooks forced the students to limit the information they wrote to what was necessary and relevant to the topic they were studying. This helped students to focus their reviews on information that mattered so they did not become overwhelmed with studying a broad spectrum of details.

A final study that connected well to this study was where the students had to practice self-regulation and reflection on their own learning process and as a result, they were able to attain a higher level of achievement (DiFrancesca et al., 2016). The students who participated in this study also had to practice self-regulating as they used their notes and then the questions constructed from their notes to monitor their learning and assess their progress in mastering the information they had been receiving. This was seen in a similar study done by Soric and Palekcic, 2009. Those students also practiced self-reflection, looking back and analyzing themselves in order to figure out the areas where they needed improvement.

Implications for Future Research

There is more that can be done to make this study even more beneficial and reliable. Researchers should use a wider variety of classes to get more reliable results. Students from

different grades and subject-areas should be included in the study to see if the same results may be obtained. The research should also be done for a longer time period with multiple assessments being used for data. The research in this study was carried out for the time frame of one quarter which is the equivalent of 3 months. In the future more time should be designated to see how much more of an impact is made by the treatments being applied to both groups.

Another way to ensure that more valid results are obtained would be to have random selection of the students that would be assigned to each of the groups for the study. These groups should then be tested around the same time of day so that there are no other factors affecting their ability to succeed on each exam.

Conclusion

The purpose of this study was to investigate the impact of interactive notebooks on the academic achievement of 9th grade students studying Biology. The data obtained supported the concept that interactive notebooks are beneficial to students and did result in a more successful outcome on their quarterly exam. During the study, some of the participants who were part of the treatment group resisted the idea of being told how they should record and organize their notes but at the end of the study the students generally enjoyed the structure that the interactive notebooks provided and the predictability of what to expect with information in and information out. In an age where there is a high demand for students to be more successful in school and where standardized and classroom testing seem to be on the rise, interactive notebooks can be a very useful tool. It can help students record and organize all the information they are being presented with and productively interact with it for better understanding.

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