

**CURRICULUM PROJECT:
THE EFFECT OF NOTE-TAKING AND STUDY SKILLS ON FRESHMEN
MATHEMATICAL ACHIEVEMENT**

by

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CERTIFICATION OF THESIS/PROJECT CAPSTONE WORK

We, the undersigned, certify that this project entitled CURRICULUM PROJECT:
THE EFFECT OF NOTE-TAKING AND STUDY SKILLS ON FRESHMEN
MATHEMATICAL ACHIEVEMENT by STEPHANIE WISNIEWSKI, Candidate for the
Degree of Master of Science in Education, Curriculum and Instruction in Inclusive Education, is
acceptable in form and content and demonstrates a satisfactory knowledge of the field covered
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ABSTRACT

With the decrease of mathematical achievement amongst high school freshmen, and the lack of passion for mathematics; it has become crucial to determine the skills teachers can implement into their classroom in order to better serve the needs of their students and their academic achievement. Research has shown a positive trend for teaching students foundational skills, such as strategic note-taking, implementation of their notes, collaborative work and practiced study habits. This curriculum project was intended to develop a growth mindset in the high school mathematics classroom, while preparing students for their most successful education through the evolution of foundational skills, specifically note-taking. Future investigations can be processed to determine the effectiveness of these foundational interventions.

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Introduction

Notes are such a vital part of the classroom and of a students' education. The National Council of Teachers of Mathematics (NCTM) (2000) specifically stressed writing as "essential part of mathematics and mathematics education" in the landmark document "Principles and Standards for School Mathematics" (p. 22). As a teacher, we carefully and thoughtfully prepare our lessons, which includes notes, with a sense of purpose. We have the intention of our students receiving a deeper understanding and development of an idea, and then for them to practice that idea on their homework in reference to their notes. Robinson (2018) reflects on note-taking as "a way of concisely recording information to help with later recall" (p. 8). Unfortunately, most students see notes as a form of torture brought on by the teacher and the educational system.

Often, students mindlessly take the notes presented in class and then they have a few options: they could leave the notes behind in the classroom, throw out or recycle their notes on their way out the door, place the notes in a folder or binder only to be forgotten, or they could take the notes home and put them to use while practicing the idea on their homework. As educators, and creators of the notes, we hope the students will utilize them as a tool to assist in their completion of the homework assignment; however, the reality is that situation very rarely occurs with our students. There is little to no understanding of the relationship between the material presented in class and the material they are supposed to practice on their own. So, students take an "out of sight, out of mind" approach; they have done what was expected of them – they have copied their notes, and now they are free to stop thinking about math. Brown (2005) stated that, "note-taking helps students to sort unimportant from important information and

attend to the relationship between main ideas and supporting details;” this is the thought process we, as educators, want to develop and instill in our students (p. 23). Dundar (2016) noted that, “the relationship between the success of the students and their note-taking status is positive” (p. 9). That is, when a student actually does what is expected of them with their notes, such as take them home with them and use them when completing their homework assignment, they seem to be more successfully completing the homework assignments and have a higher achievement on assessments in the classroom.

Problem Statement

Students are not taking notes, or using the notes, in their mathematics classes. Boyle (2011) studied the case that “most students are poor notetakers,” and assessed the “effects of strategic note-taking on notes recorded, a delayed recall measure, and a test” (p. 58). The results of Boyle's study indicated that, “students who used strategic note-taking recorded significantly more notes and performed better on achievement measures than students in the control group” (p. 64). His work supports my project to first prepare our students to do their best active and engaged learning before actually learning the curriculum. This idea is also part of what Eades and Moore (2002) argue in their study, which states that notes “are a tool that can benefit students,” but “some burden of responsibility rests upon the instructor to lead students to understand how this system may aid in homework assignments, quizzes, and tests” (p. 21). Therefore, as an educator, I have to take the step back from focusing on the curriculum that I “need to get through” and recognize the importance in teaching my students how to be the best and most successful learner they can be. Robinson (2018) suggests that, “by focusing on tools and strategies that not only organize information but also increase student interaction with the

information, teachers can help transform students from transcribers to active learners in their note-taking process;" which is my goal with this curriculum project (p. 4).

Personal Interest Statement

I am currently employed with the Dunkirk City School District and am nearing the end of my third year of employment at the high school. My first two years of teaching consisted of teaching strictly freshmen. I was entrusted with the Common Core Algebra 1 course, and a supplemental course called Math Enrichment which reiterates and further practices the strategies and topics developed within the Algebra curriculum. This year, my third year of employment, I have continued my duties of working with the freshmen, but have expanded to Particular Topics of Geometry (essentially non-Regents Geometry) which includes sophomores, juniors and seniors.

My work at Dunkirk High School has been encouraged and supported by the mathematical department, as well as the administration, supporting faculty and outside personnel. I have collaborated in ways I never even imagined to occur in the educational system. Specifically, this year, for the first time ever, the other three Algebra teachers and I have been able to establish a common planning period. We are able to discuss and develop our curriculum to best fit, to our ability, all of the students taking Common Core Algebra 1 instead of only focusing on our personal students within our classroom. We share the responsibility of creating lessons that model the New York State Common Core Modules and encourage the development of the students' understanding through the implementation of Kagan structures during group work and informal assessments such as warm-up activities and exit tickets. As a subgroup of our math department we are also able to compare and contrast our students learning, understanding, and comprehension of the material we present in our classes; therefore, encouraging the

transmission of new skills and techniques one may use in their own classroom when presenting a topic.

Even in these few years as an educator, I can see now in my classroom that I have three students specifically that are performing exceptionally better than the rest of the class, and those three students are much more engaged in lessons. The three students are not only copying down what is presented, but they are also listening to my explanations and reasoning and asking questions, they are responding to prompts, and they are thinking more deeply about the content, which results in the development of their interpretation and questions regarding the material presented. These students, almost every day, are taking their notes home with them in an organized binder or folder, and they are using their notes while completing their homework assignments. I have personally witnessed first-hand in our after school program where the students come to work on and receive help on their homework assignments. Needless to say, this practice has led to their increased comprehension of the material and hence their high scoring achievement on assessments (typically within the top five scores, if not being the top three scores in the class).

Purpose Statement

The reason I have decided to study this topic is because it honestly baffles me that, as an educator, I am providing students with a “cheat sheet” or guided examples in order to assist the students in their completion of their homework, and still they do not use them! It is very different from when I was in school and, as students, we always worked feverishly to complete any homework before we left school, referencing back to the examples from class (our notes), and talking to each other to check our answers for correctness. From my standpoint, I need to help the students to realize the importance and of these notes to their success in algebra. Eades and

Moore (2007) “convey the importance of note taking,” and present “a strategic note taking methodology that is designed to help students increase self-regulation and facilitate learning” (p. 19). We have to establish a “set of behavioral norms that heighten the study of mathematics, such as doing homework regularly, taking careful notes in class, being attentive when the teaching is explaining, asking the right questions, among others” such as studied and presented in the Australian Mathematics Teacher journal (p. 20).

One way in which we, as an Algebra department, have started to encourage the study of mathematics and doing homework regularly is by allowing students to make a second attempt on homework assignments once the assignment has been graded (on a 1-4 scale) and feedback is provided. The intent of this homework strategy is to allow the students to practice more and become more successful in the implementation of the topics presented in class. The strategy is just one step in a long process that needs to be further developed; we still need to take a step back and educate our students on how to effectively take useful and meaningful notes. Hence, the purpose is to develop a rigorous and engaging 9th grade curriculum surrounding a theme based on note-taking and study skills. It is my hope that this curriculum will give my students a deeper appreciation of the many advantages created by using the well-thought and structured guided notes as a valuable resource to completing homework assignments, online and in-class practice, and as a tool for studying for assessments.

I recognize the importance of the notes and I need to assist the students in understanding the essential nature of the notes to their success in mathematics; that is why I plan to develop a curriculum project that will teach my students “the vital role of purposeful reading and writing in the mathematics classroom,” and outline some techniques and strategies that will promote their active learning and understanding (Bosse and Johna, 2008, p. 9).

Literature Review

In the previous chapter, I introduced the problem of students not having the foundational skills of note-taking, or the ways in which to effectively utilize their notes in order to be successful. This chapter is intended to review the literature on this topic and to explore the kind of research has already been done in this area of inquiry.

Many researchers have investigated the effect of purposeful note-taking and practiced study skills, as well as the importance of homework practice and completion (Boyle, Dunder, Wilkinson, and Eades & Moore). In a study conducted by Hoong, Guan, Seng, Fwe, Luen, Toh, and Teck (2014), 25% of the students who were identified as Normal Academic after their Year 6 examination, provided information about the academic areas that needed to be targeted when designing interventions to improve their learning in mathematics. They “identified “study habits” as one domain of careful consideration,” which involved “doing homework regularly, taking careful notes in class, being attentive when teacher is explaining, asking the right questions, among others” (Hoong, et al., p. 22). It is evident that there is a necessity that educators go beyond teaching the content material; that is, they must also make the point to put emphasis on these crucial note-taking and study skills. In a study conducted by Bosse and Faulconer (2008), the vital role of purposeful reading and writing in mathematics classrooms is explored. The authors argue that, “mathematics educators must not falter from promoting that the goal for increasing reading and writing in mathematics classrooms must unequivocally be increasing mathematical learning” (Bosse & Faulconer, p. 9). Hence, the authors provide an outline of “techniques to promote successful integration of reading and writing in mathematics” by uniting a number of models to create a more usable model for mathematics educators (Bosse & Faulconer, p. 10). The study goes into further detail discussing the variety of aspects that must be

developed in order to encourage a positive outcome from the students, which includes improving the classroom climate for reading and writing in mathematics, setting a standard of expectation, avoiding negative consequences and, most crucially, teacher modeling (Bosse & Faulconer). Incorporating each of these pieces in conjunction with the mathematical techniques outlined would increase student learning, understanding, and experience.

There are investigations that consider the effects of teaching note-taking to learners (Brown, 2005; Dundar, 2015; Robinson, 2018). Brown (2005) studied seventh-graders' self-regulatory note-taking from text and provided that, "learning to take notes from text performs a vital leaning function" (p. 24). The author acknowledged that teaching learners note-taking skills is teaching them the way to identify the content that is truly important (the main ideas) and the content that constitutes supporting details. Dundar (2015) used a mixed methods approach with a sample of 228 students from three different cities. In this study, the author examined the contents of the students' notes that they took during math classes and determined the relationship to their mathematical success. The author deduced that, "organizing seminars for students on better note-taking methods at the beginning of the semester will increase mathematical success" (p. 9). Robinson (2018) supported the concept of note-taking playing a vital role in a learner's mathematical success. The study explored the importance of teaching note-taking, as well as the students' interaction with the information. "Effective note-taking" Robinson noted, is a lifelong skill "that can be applied academically, socially and professionally" (p. 5). The author acknowledged the difficulty that teachers face when trying to implement these skills, but notes the key difference of teaching a learner to progress from "transcribers to active learners in the note-taking process" (p. 8). Each of these studies has identified note-taking as a crucial step to

becoming a successful mathematics student, as well as, developing skills that are transferable beyond the mathematics classroom, and beyond the learners' education.

Further investigations were conducted by Wilkinson (2012) in order to determine if teaching students structured note-taking strategies would improve mathematical achievement for seventh and eighth grade students at a suburban, public middle school. The researcher addressed two questions: whether there was a difference in mathematics achievement between students taught note-taking strategies and those who were not, and whether students who reviewed their notes would have more improved mathematics performance than those who did not. The quasi-experimental, quantitative study used a pretest/posttest control group design in order to compare the achievement of 131 middle school students' performance on curricular exams, with the treatment group receiving training in Cornell note-taking. Prior research suggests that, "note-taking can improve academic achievement" (Wilkinson, p. 3). The pretest data of Wilkinson's research indicated there were no achievement differences between the groups; two additional tests reported no significant difference in posttest scores. Hence, the results of this study may help schools create initiatives to support, promote, and encourage the math success of low achievers. Eades and Moore (2007) conveyed the importance of note-taking with the process of a "strategic note-taking methodology that is designed to help students increase self-regulation and increase learning" (p. 23). The authors delved into the help that note-taking strategies can and cannot offer for learners and teachers. According to Boyle (2011), "strategic note-taking was developed in order to assist students during lecture learning and note-taking" (p. 57). Boyle recognized the issue of learners being poor note-takers; therefore, he conducted a study of 76 middle school students who were assigned to an experimental or control group to assess the effects of strategic note-taking. The results of multivariate analysis indicated that students who

used strategic note-taking recorded significantly more notes and performed better on achievement measures than did students in the control group.

Landers and Reinhold (2015) considered the ways in which the students utilize feedback through a mixed methods, quasi-experimental study that compared students who participated in a feedback reflection activity to those who did not engage in the activity. The study considered the learners' participation level, their understanding of the feedback, and if the learners took ownership of their work and the feedback they received. The "survey responses indicated that all students understood the purpose" of the activity, and participated at varying levels while completing the reflection pieces" (p. 27). The authors of this study concluded that, "these students did not outperform peers on summative course assessments; however, there were differences in their growth as effective learners" (p. 22). Although this study may not support a positive effect of the role of strategic note-taking; it does encourage the improvement of the learners' educational skills, and classroom development of the content material. Hence, the research saw some sort of positive impact on the students' growth within the mathematics classroom which, ideally, could be applied throughout their entire educational career.

Conclusions

In conclusion, this literature suggests that there are favorable results coming from studies pertaining to the significance of strategic note-taking and study skills on student success in mathematics. Research indicates that establishing these skills will have a positive impact on the learners' success in the mathematical classroom, and can be carried over into other subject areas. Research also shows that improving these skills will foster students' growth as effective learners; which is a lifelong skill that can be applied educationally, socially, and professionally. Through the work of my curriculum project, I plan to include the effects of teaching note-taking skills on

learners' performance to that which has been previously reviewed. I believe my project will assist in strengthening the importance for teaching the learners the foundational skills on note-taking and becoming effective learners.

Therefore, the purpose of this curriculum project is to develop the learners' note-taking strategies and study skills. This curriculum project is going to develop the foundational skills necessary for a students' educational success and cultivate career or real-world readiness. The curriculum project unit is based on a theme of note-taking and study skills that will be taught over the course of the first quarter at the very start of the new school year during my supplemental freshman course, Math Enrichment. The next chapter will outline the conceptual framework, audience, procedure, and scope and sequence.

Method

My curriculum project is a unit based on a theme of note-taking and study skills that was taught during my supplemental freshman course, Math Enrichment. The unit aimed to advocate for higher student success in mathematics with the implementation of lessons on better note-taking strategies, amongst other ideas (Dundar, 2016). Research suggested that note-taking could improve academic achievement, but it does not stop at just note taking; it is my job as the educator to demonstrate the benefits of using the notes as a resource to the students' success within mathematics (Wilkinson, 2012). Just in my first few years of teaching, I have recognized a lack of understanding from the students for the purpose of taking notes in class every day. More often than not, my students are either leaving their papers behind in the classroom, in the recycling bin, or placing the notes in their folders, never to be looked at again. Therefore, it is not only my goal to improve on their note taking skills, but also to instill a practiced procedure of utilizing the notes as a tool to complete their homework assignments and study for assessments. This curriculum project is about the follow through from start to finish, a practice that, I trust, can be used within any classroom setting.

Conceptual Framework

Constructivism

For the purposes of this curriculum project, the conceptual framework that possessed the most potential was the philosophy of constructivism, with its main focus on learning being an active process in which the teacher encourages students to use active techniques to create more knowledge (WNET, n.d.). This philosophy embodies the notion that the students' learning can develop over time, but must be facilitated by an expert of the subject matter and its materials. An article on the WNET website described the philosophy:

Constructivist teachers encourage students to constantly assess how the activity is helping them gain understanding. By questioning themselves and their strategies, students in the constructivist classroom ideally become “expert learners.” This gives them ever broadening tools to keep learning, with a well-planned classroom environment, the students learn HOW TO LEARN. (Emphasis in original, p. 1.)

Lending to the main purpose of the entire curriculum project is the notion that teaching students how to learn, and to learn at their best.

Implementing a philosophy of constructivism means creating more engaging learning, rather than passive listeners, which concentrates on learning how to think and understand (WNET, n.d.) Strengthening our students’ learning skills will also promote organizing principles that they can take with them to other learning settings, and hopefully beyond to their lives outside the classroom and beyond their graduation (WNET, n.d.). The philosophy of constructivism lends itself to the theory of self-regulation which is essential in processing knowledge and creating meaning (Wilkinson, 2012).

Audience

The curriculum created for this project was intended for the freshmen sub-group of students placed in a math enrichment (supplemental) course at Chadwick Bay High School in Western New York. Chadwick Bay is a city located in Chautauqua County that is surrounded by Lake Erie to the North, Fredonia to the South, and the Town of Dunkirk on the East and West. As of the 2010 census, the approximated 12,563 people consisted of 65.7% White, 5.1% Black or African American, 0.52% Native American, 0.5% Asian, 0.02% Pacific Islander, 9.14% from Other Races, and 1.8% from two or more races. Hispanic or Latino or any race were 26.4% of the population.

Specifically, Chadwick Bay High School is comprised of approximately 600 students in grades 9 through 12, and is the only public high school in the city. The ethnic breakdown is as follows: White 51%, Hispanic (mostly Puerto Rican) 39%, Black 9% and Asian 1%. There are approximately 60 or more faculty members within the Chadwick Bay High School Building.

Procedure

During the course of developing this curriculum, the author took the following steps:

Step One: Author's Background

The researcher was born and raised in Dunkirk, New York. She attended a local parochial school for kindergarten through eighth grade, and completed her studies within the Dunkirk Public School System in 2006. Her positive experiences from multiple educators throughout the years, as well as her enjoyment for the math curriculum, inspired her to become an educator and to excite others to have the same passion.

Following her graduation from high school, she attended a few colleges which began with a few semesters at the State University of New York at Fredonia, followed by a few years at the State University of New York at Geneseo, and ultimately finishing her undergraduate degree back at SUNY Fredonia. Throughout this process of returning to SUNY Fredonia, the author also worked full-time with a company that supports individuals with disabilities, and then gave birth to her first child during her last semester of undergraduate studies.

Step Two: Choosing a Topic

Initially the author had intended to conduct research. Her first idea was to investigate the students' perspectives on note-taking and the ways that they should utilize their notes upon completion. She felt there was a significant misunderstanding behind the purpose of notes and the reasons that the educator presents the notes on a daily basis. She also noticed a complete lack

of motivation to do anything worthwhile with the notes once class was dismissed. She had hoped that, with her students, she could develop a sense of understanding and meaningful purpose to their learning process in the math classroom. Although this is still the main goal, she felt as though a more direct approach needed to take precedence.

Step Three: Conducting a Needs Assessment

The researcher was interested in working with students being purposefully placed in a supplemental math course during their freshman year at Dunkirk High School. In order to establish the instruction and to help generate her curriculum topic, she conducted a needs assessment in order to determine the types of programs that were already being implemented. She searched via the Internet, and conversed with colleagues, former educators, and her teaching peers. Through her investigation she discovered that there were studies that have taken place that discuss the findings behind implementing a curriculum that focuses on writing skills, and note-taking strategies.

Step Four: Identify the Audience

Throughout the author's years of education through the Dunkirk Public School system, she was well-informed about the instruction provided to its students. The author determined that there was a significant need to offer more educational learning support for all the students, but recognized the time restraints within the core curriculum courses. With the researcher's own history throughout college of struggling with note-taking and applying what she had learned in the classroom to her work outside, she determined that focusing on working with the students being placed in the supplemental math course would be the most beneficial without disrupting the common core framework.

Step Five: Conduct and Review Literature

The author began her research with the use of the SUNY Fredonia library's online database. The Educational Resources Information Center (ERIC) database was the primary source for obtaining information. The researcher began by researching terms such as *note-taking*, *mathematics*, *secondary* as well as others in a variety of combinations in order to find empirical articles about her topic. She made certain that a core number of articles and resources came from reputable sources and were peer-reviewed. After finding minimal articles that were relevant to her topic, the author chose to review her pertinent literature resources in order to generate ideas for her curriculum project. This led to many admissible and applicable resources that were easily adaptable to meet the planned project curriculum.

Step 6: Use the Note-Taking Strategies to Plan and Design a Course

The strategies chosen for this curriculum project were note-taking strategies that were intended to be utilized simultaneously with the implementation of Kagan Structures, which would then develop into how to use the notes from the classroom to promote the students understanding and application of the strategies learned (Kagan, n.d.). These strategies were chosen because of their recognition and proven success. These strategies were established in order to create a cohesive curriculum for all teachers to adhere to, therefore establishing a unified curriculum of strategies in which all students will be fluent.

Scope and Sequence

The scope and sequence of the curriculum project described here followed the needs of the students as perceived by the mathematical department at the high school:

Standard One - Kagan Cooperative Learning Structures: The first standard assists in establishing the structure, layout, and expectations of the classroom. It is through this step that

the instructor is able to set goals, standards and procedures for all of the students. Setting the tone and modeling these practices was an important part to the foundation of the students' participation and development throughout the remainder of the curriculum. The scope and sequence included a cooperative learning model outlined by Spencer Kagan, cooperative learning, homogeneous grouping, and Kagan Cooperative Learning Strategies such as Sage and Scribe, Round Robin, Stand Up - Hand Up - Pair Up, Rally Coach and Quiz-Quiz-Trade (Kagan, n.d.). It is through this step that the instructor modeled and applied methods that will maintain student engagement and facilitate learning, while creating a classroom environment conducive to student growth.

Standard Two - Note-taking Strategies: After the instructor has demonstrated and prepared the students with the cooperative learning structures, the teacher implemented the structures to promote learning about successful note-taking strategies to be applied in any classroom, but with a focus on mathematics classrooms. Throughout instruction of the note-taking strategies, the instructor was aware of all cultures in the room and use speech and activities that are supportive of cultural differences. She analyzed the classroom space, existing technology, as well as the budget for purchasing necessary supplies. The author implemented note-taking strategies that have shown benefit to the students' development and understanding of the mathematics material, and referenced the ways in which the strategies may be used in other subject areas by sharing personal success stories through the use of the note-taking strategies.

Standard Three - Homework Practice and Completion: Once the students learned the note-taking strategies, and experienced using the strategies during mathematics lessons; the instructor established the importance of the completed notes. The instructor reviewed the purpose of strategic note-taking and validate its benefits through training the students on the ways to apply

their notes to homework practice and completion. The homework should not be exact replicas of the presented and completed notes, although, the notes should be a 'jumping off point' and guide to the processes the students perform to complete their homework. Again, keeping the focus on the use of the notes as a reference sheet to how to complete their homework assignment. The instructor should keep the student engaged and ignited to pursue completing the homework, while challenging their ability to think on their own and develop self-regulation.

Standard Four - Study Skills and Strategies: Next, the instructor needs to go a step further in order to ensure the students success in the course by teaching study skills through the use of their completed notes, practice homework and supplemental strategies. The instructor should educate students on the ways to utilize their resources in order to identify important information, topics, and skills that were reviewed and practiced. Furthermore, the instructor needed to advise students on some well-practiced study strategies that were most applicable to a mathematics curriculum.

Standard Five - Test Taking Strategies: The final skills the instructor developed were the test taking strategies. The instructor reviewed strategies that were basic test taking skills to be used in any subject area, such as reading, re-reading, and annotating, or identifying the content that the reader knows and what they need to know. The instructor also developed the identification of important vocabulary and its meaning, as well as the students' recognition of filler answers that could easily and obviously be eliminated. Furthermore, specific to the mathematics tests, the instructor revisited and drilled calculator features that were taught and studied throughout the mathematics curriculum which were quickly applied throughout mathematics tests, and when correctly applied they guaranteed the student credit.

Standard Six - Regents Preparation: The last standard, which is New York State focused, was Regents examination preparation; by New York State guidelines students are required to pass the New York State Common Core (NYS CC) Algebra 1 Exam in order to graduate with a high school diploma. Therefore, the instructor empowered the students through their understanding of the Algebra 1 exam. The instructor reviewed the outline of the exam contents, the implemented point system and grading rubric, as well as discussed how to ensure the students answered all questions to the best of their ability. The instructor slowly promoted the students' confidence by breaking the examination into shorter portions to be practiced, then corrected their work as a class by checking the students' work with the expectations of New York State answer key. Upon repeated practice, the development of the students' confidence and test taking skills; the instructor then allocated one week in which the students spent the class time answering the entire NYS CC Algebra 1 exam so the students would experience the allocated amount of time they were able to completed the exam.

Validity

One of the limitations faced by this curriculum will be the regular attendance of the students. Many learners may find it difficult to commit to consistent participation because of the numerous other responsibilities required of them. Unfortunately, for the majority of the student body, there are many extenuating factors that keep them from attending school on a regular basis. Often times, the students do not have a choice in whether they attend classes or not because they are forced to prioritize their own education below the needs of the families. Even if these circumstances do not exist, there is generally a low rate of accountability placed on the student from the parent or guardian at home. Without continuous presence within the program, the students would not acquire the knowledge from the lessons or get to experience and

participate in the authentic activities presented in the curriculum. These activities allowed the students to practice the skills they will inevitably need to be successful in and beyond the classroom setting. The syllabus for the curriculum reiterates that attendance is a key factor to determining the student's success throughout their educational learning process. To combat that issue, the author stressed the importance of every day attendance, and generates a class contract that must be signed by the student and their parent or guardian to confirm their understanding of the importance of attending classes daily.

Conclusions

Although the writer of the curriculum intends to implement a class contract, and plans to continually emphasize the usefulness of attending class daily, the students may not sign the contract or may not abide by the contract. With the hesitation of whether or not the curriculum is beneficial to their future, the students and their families may feel as though sacrificing the students' education is less detrimental than meeting the needs of the family. In the following chapter, I will review the results from my curriculum project on note-taking and study skills.

Results

The following section contains the syllabi for the three units within the curriculum.

Following each syllabus are the lesson plans that correspond to the individual units.

Additionally, the lesson plans are followed by the supplementary material and worksheets that coincide with the topics of the lessons.

Math Enrichment Unit: Note-taking and Study Skills

Instructor Information

Instructor: (Name withheld)

Office: Chadwick Bay High School, Cherry Street, Dunkirk, NY 14048

Office Hours: By appointment

Office Telephone: (Phone number withheld)

E-mail: (Email address withheld)

Course Description

Location: Chadwick Bay High School

Time: Monday – Friday 8:00 a.m. - 3:00 p.m.

Office Telephone: (716) 410 - 5049

Learners will be able to effectively and successfully take meaningful notes during educational courses. The topics covered within the “Note-taking Strategies” unit are implementation of Kagan Structures while strategically taking notes, successfully completing homework assignments while developing study skills, and regents’ preparation. Learners will acquire this knowledge through replication and practice of each of the skills. The instructor will design lessons using a variety of mathematical representations at increasing levels of difficulty. This course is designed using strategic note-taking instruction (Cornell method) with an emphasis on interaction between students. The interactive activities include but are not limited to: partner work, group work, and whole class activities. Upon successful completion of each section within the unit, the participants will receive a certificate acknowledging their accomplishment.

Prerequisite

There is no required level of math skills, just those the learners have already experienced; nor is it necessary to bring any materials to class.

Online Resources

For questions about mathematical topics and terminology, students may access any of the following links: <https://www.mathsisfun.com/>, <http://mathbits.com/>, or <http://www.mathwords.com/>. For additional mathematics practice that increases in difficulty based on completion of assessments, students may visit this link or download it on internet-connected devices. <https://www.ixl.com/>. To learn more about Kagan structures and develop a deeper understanding to the benefits of using them in the classroom, students may access https://www.kaganonline.com/about_us.php.

Intended Learning Outcomes:

- Learners will be able to identify the most beneficial note-taking strategy for their learning and apply it with the class notes.
- Learners will be able to organize their notes and increase their understanding through practice.
- Learners will be able to increase their comprehension through the study and preparation of New York State regents' questions that require higher order thinking.

Learning Standards

The standards are designed to meet those established by the high school math department based on the students' needs for educational success. These standards are used for teachers of freshmen in a supplemental mathematics course, but can be carried over into other subject areas and grade levels. The standards consist of the following:

- Standard 1: Kagan Cooperative Learning Strategies
- Standard 2: Note-taking Strategies
- Standard 4: Homework Practice and Completion
- Standard 5: Study Skills and Strategies
- Standard 6: Test Taking Strategies

Topic Outline/Schedule**Month 1: Kagan Structures & Note-taking strategies**

o In this section, learners will be able to identify the most beneficial note-taking strategy for their learning and apply it with the class notes.

Month 2: Homework completion & Study skills

o In this section, learners will be able to organize their notes and increase their understanding through practice.

Month 3: New York State Regents Preparation

o In this section, learners will be able to increase their comprehension through the study and preparation of New York State regents' questions that require higher order thinking.

Kagan Structures & Note-taking Strategies

Week	Topic	Target Vocabulary	Activities
1	Structures	stand up - hand up - pair up, quiz-quiz-trade, timed-pair share, rally robin, thoughts	Team building and class building: students get to know, respect, value and like their peers
2	Structures	round robin, rally coach, sage & scribe, show down	Knowledge building: students interact with each other to review or memorize important information
3	Note-taking	strategic note-taking, Information, Questions, Steps, Solution (IQSS)	Application to New York State Common Core Algebra I topics and questions
4	Note-taking	Cornell notes	Application to New York State Common Core Algebra I topics

Grading Policy

Learners will be graded based on completion, effort, and accuracy for all assignments.

Students will be awarded a PASS or FAIL grade for each category within each unit. Upon successful completion of all categories within each unit, the student will receive a certificate to show successful completion of the course.

Course Policies

- **Attend Class**

Learners are expected to attend all class sessions. If unable to make a class, the learner should try to inform the instructor prior to the class; otherwise the learner should return to class the next day with a valid excuse. Attendance is the primary factor in determining a PASS or FAIL score for each unit. Each unit section will have at least 15 classes depending on school calendar. Learners must attend at least 10 sessions to be eligible for a passing score. Classes can be made up by scheduling an appointment with the instructor to meet before school, after school, or during a study hall.

- **Participation**

If you find that you have any trouble keeping up with assignments or other aspects of the course, make sure you let your instructor know as early as possible. It is understood that each learner has his/her own responsibilities outside of class, but participation in classroom discussions and activities is a vital part of success.

- **References**

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Note-taking and Study Skills: Structures – Week 1

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Identify and learn procedures of structures
2. Practice implementing structures using team building or class building activities

Learning Objective(s):

1. Learners can implement the steps to a structure
2. Learners will use a structure to get to know their peers
3. Learners will develop a safe learning environment

Kagan Structures

stand up - hand up - pair up, quiz-quiz-trade, timed-pair share, rally robin, thoughts

Extra Resources/Supplementary Materials:

Index cards, post-it notes, writing utensil

Higher Order Thinking Questions:

- How else could these structures be used?
- What are the advantages and/or disadvantages to using the structures?

Mathematical Connections: How can the lesson be linked to examples from ninth grade algebra?

This lesson is relevant to the learner's educational, specifically mathematical, success. This lesson provides an opportunity for the teacher to learn about the students' willingness and intrinsic motivation. It is a way for the teacher to connect with the learners on a personal level, while the learners do the same with their peers. Most importantly it is developing well-practiced structures for good communication, and building the learners trust with each other and the teacher which is a vital part to their educational success.

Note-taking and Study Skills: Structures – Week 2

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Identify and learn procedures of structures
2. Practice implementing structures using mathematical knowledge building activities

Learning Objective(s):

1. Learners can implement the steps to a structure
2. Learners will use a structure to develop their mathematical understanding of a topic

Kagan Structures

round robin, rally coach, sage & scribe, show down

Extra Resources/Supplementary Materials:

Writing utensil, individual whiteboards, dry erase markers, whiteboard erasers, calculator, communicators with math practice pages

Higher Order Thinking Questions:

- What were your responsibilities during each role within in the structure?
- How did the use of the structure help or hurt you as a learner?

Mathematical Connections: How can lesson be linked to the learner's educational success?

This lesson is relevant to the learner's mathematical understanding and comprehension. This lesson provides an opportunity for the students to collaborate and share their thoughts and ideas in a small setting without judgement from the entire class or even the teacher. It is a way for the teacher to quickly assess the individual student's understanding. Still, the knowledge building structures are developing the students' communication skills through the use of mathematical language.

Note-taking and Study Skills: Note-taking – Week 3

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Learn strategic note-taking strategies
2. Learn the information, question, steps and solution (IQSS) model

Learning Objective(s):

1. Learners will successfully implement different strategic note-taking strategies to increase their understanding of the content
2. Learners will implement the IQSS model while answering mathematical questions within their notes

Extra Resources/Supplementary Materials:

guided notes, calculator, loose leaf paper, writing utensil

Higher Order Thinking Questions:

-How can these strategies be used in other courses?

Mathematical Connections: How can lesson be linked to the learners' educational success?

This lesson is relevant to the learner's educational success. This lesson provides the learner with the skills necessary to get the most out of what the instructor is presenting. The note-taking strategies, as well as the IQSS model, learned will develop the students' organizational skills of key information. Learners will be able to easily reference and apply the examples demonstrated during the class instruction.

Note-taking and Study Skills: Note-taking – Week 4

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Learn and implement the Cornell note-taking strategy

Learning Objective(s):

1. Learners will develop an understanding of an organizational note-taking strategy called the “Cornell note-taking strategy”
2. Learners will review and implement the 5 steps to Cornell note-taking

Key Vocabulary &/ Academic Language

Record, question, recite, reflect, review

Extra Resources/Supplementary Materials:

writing utensil, loose leaf paper or notebook, prepared Cornell note pages

Higher Order Thinking Questions:

- How can the learner implement the Cornell note-taking strategy in other courses?
- Compare and contrast the Cornell note-taking strategy to previously learned strategies.

Mathematical Connections: How can lesson be linked to the learners’ educational success?

This lesson is relevant to the learner’s educational success. The learners need to be able to organize the material presented in the course, and make sense of what they are being taught. The steps remind the students that the learning does not stop when the class time ends, but goes beyond the four walls of that math classroom.

Note-taking and Study Skills: Homework Completion - Week 1

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Learn how the notes from class will help with completing homework assignments

Learning Objective(s):

1. Learners will discover the effectiveness of their notes while completing homework

2. Learners will develop an intrinsic motivation and self-regulation

Extra Resources/Supplementary Materials:

homework assignment, calculator

Higher Order Thinking Questions:

-How do these skills relate to what the learner may do in everyday life?

Mathematical Connections: How can lesson be linked to the learners' educational success?

This lesson is relevant to the learners' education success. Through this lesson the learners will be able to use their notes to practice their math skills and complete homework assignments.

Furthermore, the learners will develop problem solving skills that could be beneficial to life beyond their education.

Note-taking and Study Skills: Homework Correction - Week 2

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Read and understand feedback
2. Make use of the notes, and the new feedback to try again

Learning Objective(s):

1. Learners will try their homework again after receiving feedback from the teacher

Extra Resources/Supplementary Materials:

Calculator, one-on-one instruction time with teacher

Higher Order Thinking Questions:

- What did the learner do successfully?
- Does the feedback indicate the learner lacked understanding of the topic, or had difficulty implementing the necessary skills?

Mathematical Connections: How can lesson be linked to the learners' educational success?

This lesson is directly relevant to the learner's educational success. It is important that the learners are able to receive feedback and interpret its meaning. The learner should be able to identify what the correct course of action is in order to be more successful on their second attempt of the assignment. If the learner does not understand the feedback, the learner should schedule one-on-one time to deepen their understanding and develop on their skills. This lesson will also help them communicate with the teacher so they can set up a meeting time and have open and meaningful communication.

Note-taking and Study Skills: Study Strategies - Week 3 & 4

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Make use of flash cards or quiz-quiz-trade cards
2. Practice mathematical problems
3. Implement a self-assessment on understanding of different topics

Learning Objective(s):

1. Learner will recall and identify the main topics
2. Learners will practice relevant algorithms and formulas

Extra Resources/Supplementary Materials:

NYS CC Algebra 1 Reference Sheet, calculator

Higher Order Thinking Questions:

-What other study skills has the learner implemented in other areas of study; can they be used in mathematics?

Mathematical Connections: How can lesson be linked to the learners' educational success?

This lesson is relevant to the learner's educational success. The learners will get an authentic experience recognizing their accomplishments and understandings from the course. Often times, the learner can be intimidated to communicate their knowledge with others, but creating study materials can develop the learners' confidence in their comprehension. This lesson intends to give students' the resources to be successful on a cumulative basis and not just day-to-day materials.

Note-taking and Study Skills: Review Foldable - Week 1

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Create review foldable with main topics and their key concepts

Learning Objective(s):

1. Learners will decide what are the most important topics they learned about during the course
2. Learners will create a quick reference foldable that contains the vital information that relates to the more important topics
3. Learners will use the foldable to assist in their review (completion of math problems)

Extra Resources/Supplementary Materials:

computer, printer, colored paper, markers, highlighters, writing utensil

Higher Order Thinking Questions:

-Justify the choices for each main topic and the related material in each foldable.

Mathematical Connections: How can lesson be linked to the learners' educational success?

This lesson is relevant to the learner's educational success. After this lesson, the learners will be able to communicate the key concepts they have learned throughout the course. The learners will be able to identify which information is needed to answer a specific question. Additionally, the learners will be able to elaborate on what else they could 'know' based on given information.

Note-taking and Study Skills: Test Taking Strategies - Week 2

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Review and discuss test taking strategies to be implemented during the NYS Regents Exam

Learning Objective(s):

1. Learners will create a list of test taking strategies they have used while taking a test

2. Learners will discuss the benefits and disadvantages to each

3. Learners will implement each and determine which suits their test taking style best

Extra Resources/Supplementary Materials:

writing utensil, paper, calculator, practice problems, practice exam

Higher Order Thinking Questions:

-Why is it important to know how to take a test and answer questions?

-Why is it important to have a strategy or plan of attack when taking a test?

Mathematical Connections: How can lesson be linked to the learners' educational success?

This lesson is relevant to the learner's educational success. After this lesson, the learners will be able to more successfully take a test or quiz in any subject area. The learner will develop skills that allow them to quickly eliminate choices and increase their success rate.

Note-taking and Study Skills: NYS Regents Prep - Weeks 3 & 4

Grade Level: 9th

Student Backgrounds: Homogeneous

Mathematical Ability: Low, Mediocre, Strong

Content Objective(s):

1. Learners see and understand the composition of the New York State Regents Common Core Algebra 1 Exam

2. Learners practice all parts of the exam

Learning Objective(s):

1. Learners can complete the practice exam over the course of 5 sessions

2. Learners can implement their prior knowledge and test taking strategies

Higher Order Thinking Questions:

-What mathematical topics, vocabulary or key ideas does the learner need to review more?

-What strategies did the learner implement while taking the practice exam?

-What more does the learner need to be successful?

Mathematical Connections: How can lesson be linked to the learners' educational success?

This lesson is relevant to the learner's regents' requirement for graduation. After this lesson, the learners will be able to anticipate the expectations of them for a New York State Regents Exam.

Additionally, the students will be able to implement strategies that are key to their success on the mathematical exam, as well as, other subject areas.

Conclusions

The purpose of this curriculum project was to create a supplemental program that would teach incoming freshmen the skills necessary to be successful in their educational journey. The completed curriculum addresses the problem that young learners do not have the skills or know-how to make their education meaningful to them. This curriculum intends to encourage and develop the learners understanding and comprehension at Chadwick Bay High School because that is where the author is employed. She has taught the New York State math curriculum for over 3 years and has become quite passionate about the material, but more importantly the success of her learners. Although a math educator with a bachelor's degree in mathematics education, the author understands the difficulty and the time it takes to become proficient in the common core curriculum. She feels very connected to most mathematics learners because she has had many different experiences with her own success and struggles in mathematics courses. The author hopes that through the implementation of this curriculum, the incoming freshmen in her school district will feel more connected to the curriculum and become as passionate about it as she is.

This includes making the learners more comfortable communicating with their peers within their mathematics courses, as well as increasing the positive outlook for math while developing a growth mindset. Promoting the success of the freshmen learners targeted with this curriculum will in turn increase the positive outlook, the growth mindset, and the success of the entire Chadwick Bay student body. In the final chapter of my curriculum project, I will be discussing how my project supports and strengthens the importance of implementing strategic note-taking skills and the effects the skills have on student achievement in mathematics.

Discussion

This curriculum project was developed by the observations and discussions within the Chadwick Bay school district, specifically amongst our Common Core Algebra 1 teachers. Through the data (low achievement on assessments, specifically the New York State Regents Examination) and our weekly deliberations, we recognized the need to assist the students in realizing the vital relationship between their notes and their success in algebra. This project changed the course outline and intentions of our supplemental math course - Math Enrichment. The focus of our curriculum shifted from solely reiterating and practicing the algebra topics presented in the algebra classes, to developing foundational skills such as strategic note-taking, collaborative Kagan Structures, and purposeful study habits. This shift was a meaningful way to prepare our students better, not only to be successful in the mathematics classroom, but to be successful educationally, socially and professionally. Hence, the purpose was to develop a rigorous and engaging 9th grade curriculum surrounding a theme based on note-taking and study skills, which was cultivated through the use of Kagan Structures. It was my hope that this curriculum would give my students a deeper appreciation of the many advantages created by using the well-thought and structured guided notes as a valuable resource to completing homework assignments, online and in-class practice, and as a tool for studying for assessments.

Significance

This curriculum project is a unit based on a theme of note-taking and study skills that was taught with a focus on higher student success in mathematics, but a hope the skills would transfer to other subject areas to make the learners education the most successful it could be. Research suggested that note-taking could improve academic achievement, and I intended on testing the theory on my freshmen supplemental course – Math Enrichment. (Wilkinson, 2012).

It was not only my goal to improve on their note-taking skills, but also to instill a practiced procedure of utilizing the notes as a tool to complete their homework assignments and study for assessments.

The strategies chosen for the curriculum project were note-taking strategies, specifically Cornell Notes, which were intended to be utilized simultaneously with the implementation of Kagan Structures (Kagan, n.d.; Wilkinson, 2012). The curriculum would then develop into methods to use the notes from the classroom to promote the students' understanding and application of the strategies learned. These strategies were chosen because of their recognition and proven success. These strategies were established in order to create a cohesive curriculum for all teachers to adhere to, therefore establishing a unified curriculum of strategies that are transferable to all subject areas and which all students will be fluent.

With the outlined framework, this curriculum unit gave teachers strategic note-taking practices that they could implement, along with collaborative structures. This project is a guide for teachers to follow in preparing their students for the rest of their educational success, but specifically geared toward mathematics. To effectively use this curriculum unit, teachers can refer to the Chapter 3 scope and sequence section, and then, refer to the Chapter 2 descriptions for a closer look at the intent of each strategy. Secondly, inspired by the research of Wilkinson (2012), and the materials from The Learning Strategies Center, this curriculum project came up with a basic structure by referring to the Cornell Notes outline provided from this article on the impact of structured note taking strategies on math achievement. Therefore, through research based methods, the note-taking in mathematics should include all aspects mentioned in this curriculum project, such as, document, write notes, review and clarify, summarize and study your notes (Wilkinson). Thirdly, as note-taking and study skills can be interpreted in many

different formats, this curriculum project combined the most useful models for the instruction and comprehension of mathematics. It did this by providing an overview of the components and structure, teaching approaches, typical activities, and unique aspects that are valuable to note, to mention, and to be sure to include in each lesson plan when instructing mathematics learners.

Limitations

Constructively, upon developing this unit, there are limitations in this curriculum project, additionally, there are limitations within the field of research in relation to the strategic note-taking and the information in regards to the influence on mathematical achievement. Due to the variety of the note-taking and study skills models and the depth of the professional development that it takes to implement this curriculum effectively, this unit lacks the in-depth insight about the components, or the reasoning behind each element; instead, it rather gives a primary overview as a tool for teachers to guide, inform, or refer instruction to build those foundational skill sets. There are also limitations with a lack of research available in relation to overall academic achievement on standardized testing and strategic note-taking. This can be viewed through Chapter 2, which reviewed the literature relevant to the topic, in which there is no reference to specific test models, just overall achievement. Furthermore, during this research project, an awareness developed that the strategy of Cornell Notes had the most research and resources available to develop this curriculum project, while reading and writing, and other models had less research in the field to support the utilization of strategic note-taking and study skills.

Lastly, the largest limitation of this study is that the design of this unit assumes teachers have an understanding of the Cornell Note-taking strategy and of the Kagan Structures. Therefore, if read by someone who has no prior engagement with these procedures, much of

what is being suggested may not be necessarily useful for those without professional development with this procedure's Scope and Sequences. Not only this, but without including the element of professional development, it would be hard to understand the reasoning behind the idea that certain Scopes and Sequences are important, effective, and must be included in order to ensure success when teaching mathematical learners. Partially, the cause of this problem has to do with the ways that the strategies draw upon the assumption that these models are the typical way to present content material and run a classroom. In conclusion, this unit is limited to those with experience in the Cornell Note-taking strategy and Kagan Structures implementation, and terms in order to mostly benefit from the set-up, perspectives, and goals of this curriculum project.

Future Investigations

If given another attempt to approach this curriculum project, it would be best to include illustrations of note-taking and Kagan scaffolds, and in-class materials. This unit would further benefit from examples of actual pictures of the ways in which the teachers commonly make use of the strategies. Teachers would also benefit from detailed examples of the ways to implement both the note-taking and Kagan Structures at their specific grade level, in their content area. The reason for the need of varying scaffolded examples relates to the ways that each content area and grade level has a different function when mathematical learners must comprehend, interpret and apply the content. Secondly, this curriculum project would benefit from actual examples of all of the materials that accompany each strategy within the Scope and Sequence, especially concerning the implementation of the Kagan Structures, which encourage the collaboration of the students. For example, it would be helpful to see the ways that in-class materials such as group work problems, and whiteboards are used with the structures so that there is a lack of bias

or the lack of varying interpretations of the texts presented throughout the Kagan Structures. Therefore, if there was another guidebook extended or made, it would be effective to create a resource of scaffolds and in-class materials to clearly and quickly show how mathematics teachers are to implement this program.

The goal of this curriculum project was for learners to be able to effectively and successfully take meaningful notes during educational courses. This includes developing a growth mindset within the mathematical classroom, while constructively collaborating with peers. Promoting a growth mindset will encourage a more positive outlook toward mathematics from the learners and those supporting their education; this in turn would establish a deeper appreciation for the subject and its material.

The dissemination of this project will be shared with faculty of Dunkirk Senior High School. Also, this curriculum project will be added to the archives at this college so that students and researchers can have access to this unit. Of course, through the dissemination, and by being able to read this unit, teachers may benefit from it since this project gives a deeper understanding to the importance of developing students' foundational learning and study skills. It can give them a comprehension as to why we, as teachers, should not always be solely focused on the content, but also concerned with cultivating a well-rounded individual.

Conclusions

The purpose of this curriculum project was to teach incoming high school students the skills necessary to be successful educational learners, but also to prepare them to carry skills into their everyday lives – both socially and professionally. Although there were limitations in the constructive research, illustrative scaffolds, or pictorial in-class materials, this project was

successful in providing mathematics teachers of New York State a reference that will ease the transition from teaching content, to teaching lifelong learning skills.

Therefore, through the implementation of this unit, teachers can foster a meaningful understanding for the purpose of classroom instruction, and promote the deliberate use of the notes beyond the classroom. Indeed, there are many other aspects to consider in the further creation of helpful projects for teachers today; in the same way, this curriculum project was made as a guide to encouraging and developing mathematical learners note-taking and study skills to improve on their academic achievement.

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