

An Exploration of Instructional Support Use in a Secondary Science Classroom

Doris Kennedy Tyler, Ed.D.

**North Carolina Central University
Department of Special Education**

Abstract

Our classrooms are becoming more diverse; with this diversity educators need to find multiple strategies to address the varied learning preferences in their classrooms. By the time students enter secondary education, the expectation is that they are capable of reading and organizing information from a text. However, all of our students do not come to a high school course prepared with the essential skills to benefit from instruction. This can be especially true with content such as science. This study explores the use of varied instructional supports to facilitate better access to the curriculum for diverse learners, especially those with special needs. Students were provided text materials, podcasts, and digital books. Surveys indicated that students used the text based materials most frequently.

Effective Classroom Strategies

Effective teachers know that it is essential to differentiate instruction. This can prove especially challenging when a teacher instructs more than 100 students per day. Universal design for learning (UDL) guidelines provide principles that, when utilized, can help all teachers meet the varied needs of their learners (Rose & Meyer, 2002). The three basic elements of UDL are multiple means of representation, multiple means of expression and action, and multiple means of engagement. We all learn differently; providing multiple means of representation involves different ways of accessing the curriculum. To meet the varied abilities and differentiate instruction, we can provide multiple means of expression and action; this allows varied ways of letting students demonstrate what they know. And finally, to engage our students, we must provide varied choices to peak their interests and keep them engaged.

No matter how many instructional strategies are used, it is essential that students read effectively to access all of the available materials. Yet, many of our students are either unmotivated or lack the essential skills to read effectively. To add to this problem, explicit reading instruction tends to decline as students move toward the secondary level (Ness, 2007). As materials become more complex, supports are diminished.

Students will likely need a variety of strategies to be successful in their coursework; this includes being able to develop mental models as they engage with the content. There is some evidence that drawing can help learners to construct mental models. In fact, students who draw mental models tend to be more engaged in their learning; they appear

to provide more self-monitoring (Wooley, 2010). Strategies that incorporate the development of mental models could improve a student's comprehension. Additionally, as students begin learning new content, it is important that they learn vocabulary and engage in multiple strategies to enhance comprehension (Carnine & Carnine, 2004).

Effective readers use a variety of learning strategies to access text and organize information. These skills include previewing the text and developing a method for paraphrasing. The use of paraphrasing assists students in monitoring their understanding of text and can be helpful in improving comprehension (Kletzien, 2009). In a way, paraphrasing can serve as a metacognitive strategy. It is a way to think about and reflect on what we are reading; we can monitor our understanding as we engage with the reading content.

Another way to improve comprehension is to preview and interact with text as we read the content; effective readers use these strategies. The PART strategy has been found to be an effective reading strategy (Friend, 2009). Using this strategy, the student (1) previews the text (2) asks questions to discern what the text is about (3) reads the text then (4) takes notes. While this method seems rather simple, it can help students to develop their mental models as they engage with text. Rather than viewing this strategy as linear, students can use it for each section of text. This strategy allows them to chunk information as they read text chapters or supplemental material; chunking can aid in comprehension.

Method

The researcher and classroom teacher collaborated in developing selected instructional supports that were made available to all students in three sections of biology. Biology I was chosen because this is a course required for high school graduation. Students taking the course were provided access to podcasts, digital books, and handouts to support instruction in the biology classroom. It should also be noted that there were selected podcasts that accompanied the biology text as well as teacher-made podcasts.

The classroom podcasts referred as ("special podcasts") were developed by the researcher or the classroom teacher. The initial intent was to provide a pre-reading tool that could be used to assist in comprehending and learning the content in the textbook. The podcasts were enhanced; that is, they were audio synced with slides. The format was designed so that they could be used while students were reading their texts and taking notes. The idea was to help students in creating mental models of the content and using strategies such as PART to enhance comprehension.

The classroom teacher developed all of the digital books. These electronic books highlighted selected concepts that the teacher wanted to emphasize. It was hoped that these additional supports would be helpful to a variety of diverse students, especially those with disabilities. The materials were posted on the classroom teacher's website for easy access, outside of the classroom.

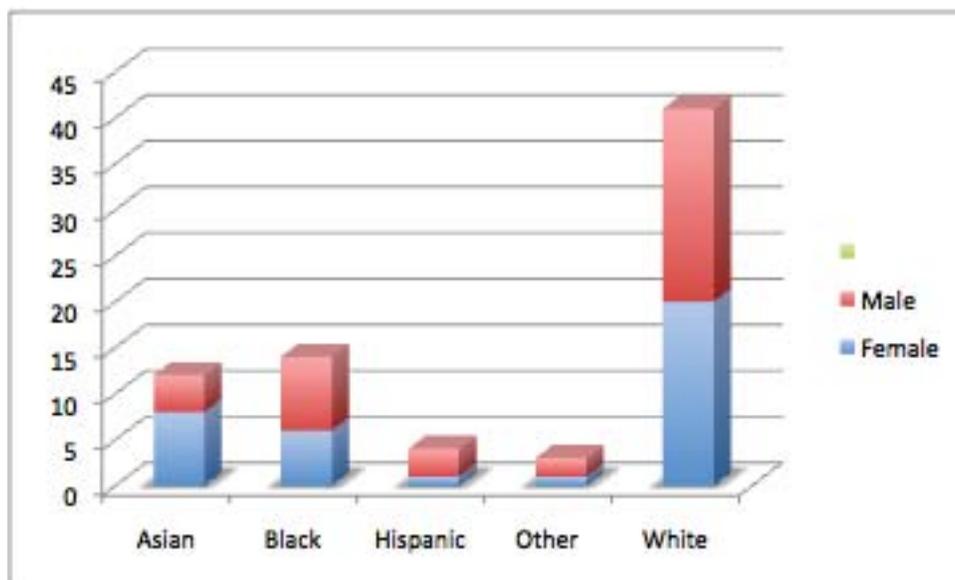
To ensure that all students understood how to access the materials, the classroom teacher demonstrated and used one of the digital books during a class session. The teacher was available for students to use computers before and after school and during lunch. Although a podcast was not shown during the class sessions, students were told how to access them. Students also had access to the materials before and after school, and in some cases, during lunch. The teacher was readily available, if students didn't have access outside of school.

Although materials were developed for the key concepts throughout the year, a survey was administered at the end of the first semester. While additional data was not collected, the instructional supports were made available throughout the year; hoping that these materials would help diverse learners have better access to the general curriculum in biology.

Results

The survey was conducted during regular class sessions for the three sections of Biology I. There were a total of 74 respondents; there were 36 females and 38 males. Figure 1 provides the racial/ethnic background of the respondents.

Figure 1. Demographics



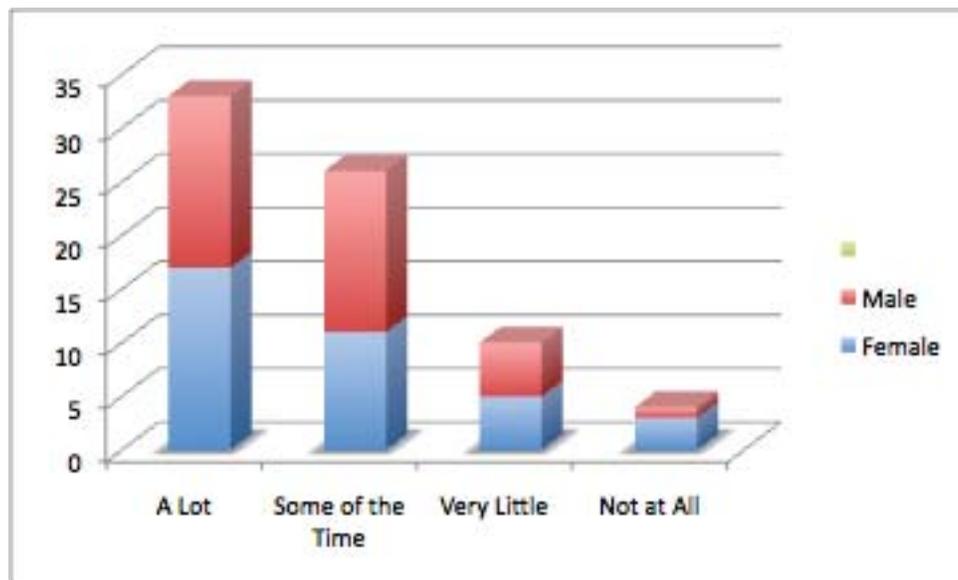
Of the respondents, six of the students were identified as students with disabilities and had individualized education programs (IEP). Two were female and four were males. Students with 504 plans were not included. Because of the small numbers, the data was not disaggregated.

Students were asked to respond to the use of selected materials. The categories of response were: used the materials a lot; used some of the time; used very little; did not use at all. Students were asked about their use of: (1) assigned readings (2) podcasts that accompanied the textbook (3) teacher-created podcasts and (4) teacher-created digital books.

Whole Class Responses by Gender

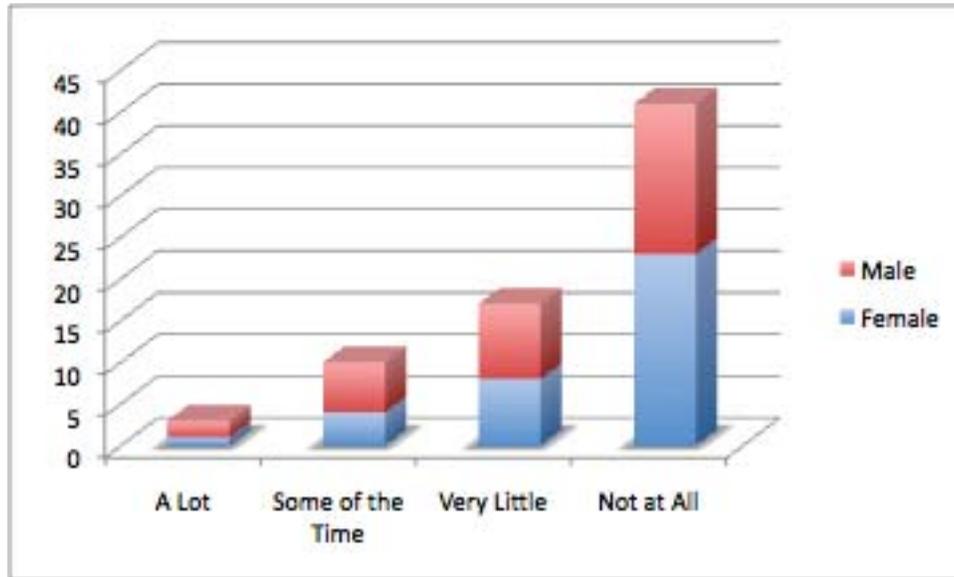
Students were asked to what extent did they read the assigned text or readings. The figure below represents the responses of the total class. Most students responded that they read the text and the assigned readings a lot or some of the time.

Figure 2. Use of Assigned Readings



There were a series of podcasts that accompanied the textbook. Students were asked about their use of these podcasts. Most students did not use these podcasts at all.

Figure 3. Use of Textbook Podcasts



Students were provided teacher-created podcasts. They were asked if they used these podcasts as a pre-reading activity or to study for tests. Most students did not use these podcasts for either activity.

Figure 4: Use of Podcasts as a Pre-Reading Tool

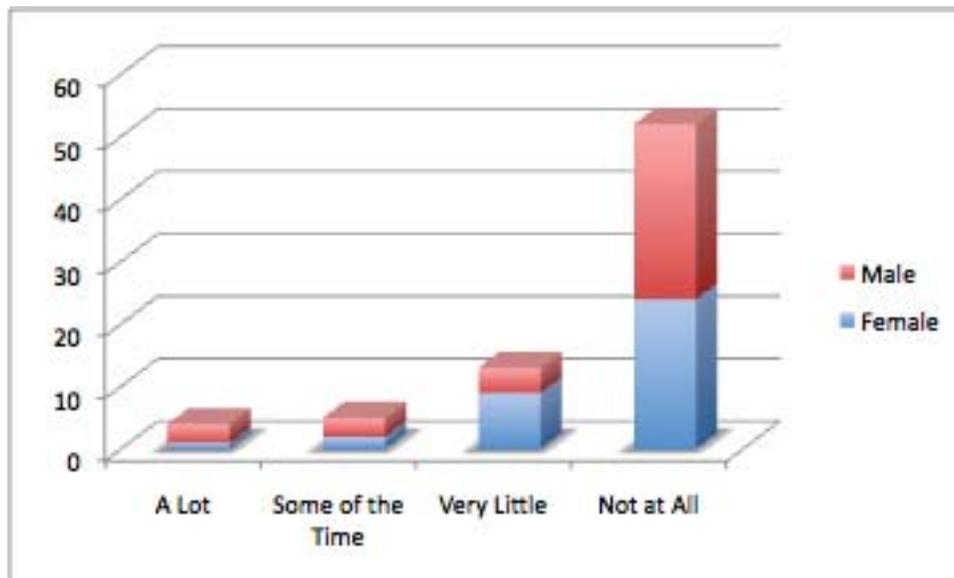
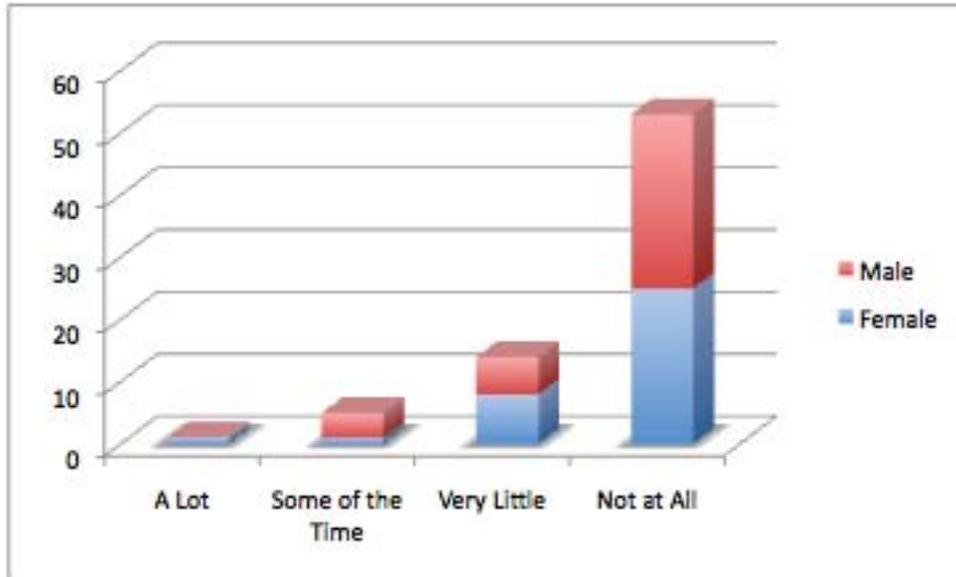
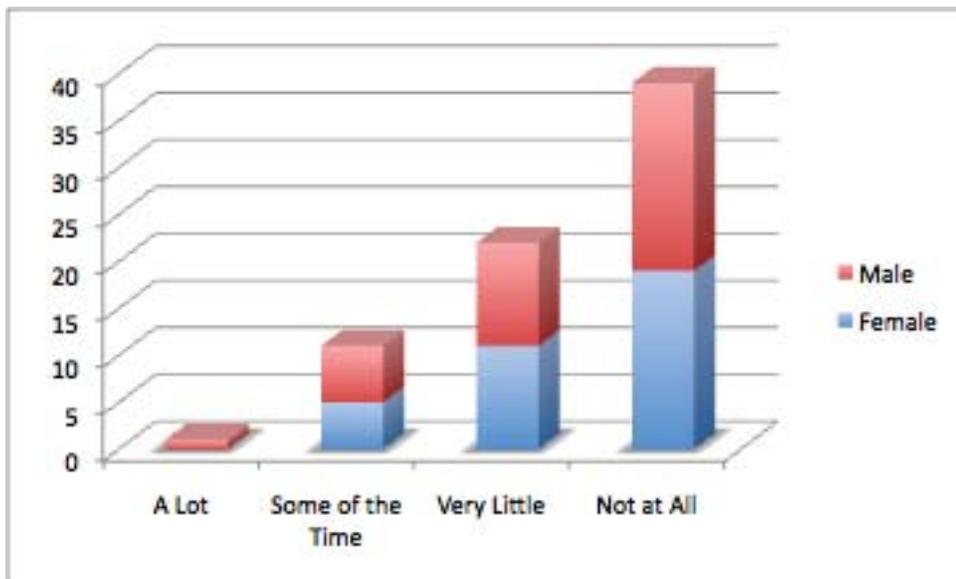


Figure 5. Use of Podcasts as a Study Tool



The final instructional support was the digital books. As with the podcasts, limited use was reported.

Figure 6. Use of Digital Books



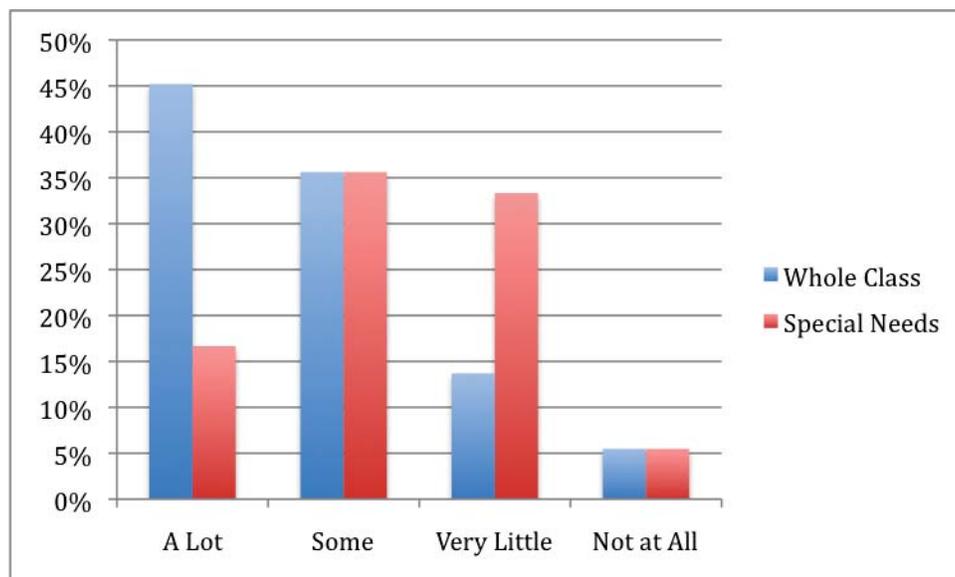
Students with Disabilities and Whole Class Responses

The main goal of this study was to provide better, independent access to the curriculum for students with special needs and other diverse learners. Because the numbers were so

small, the data could not be disaggregated by gender or race. The following figures provide a comparison by percents of student use.

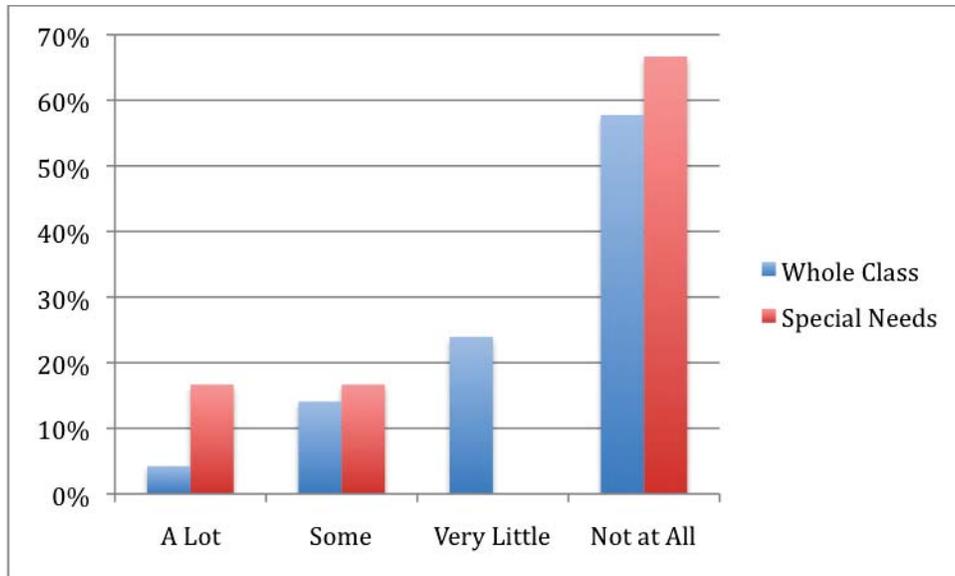
For use of assigned readings, 45 percent of whole classes reported ‘a lot’ while only 17 percent of students with special needs reported in this category. Use was the same for ‘some’ use of textbooks at 36 percent for both groups. In looking at textbook and other text materials, it appears that a higher percentage of students with special needs reported using text materials “very little”; 33 percent reported very little use while 14 percent were reported for whole classes. Only five percent of both groups reported not using the text and related materials at all.

Figure 7. Use of Assigned Readings



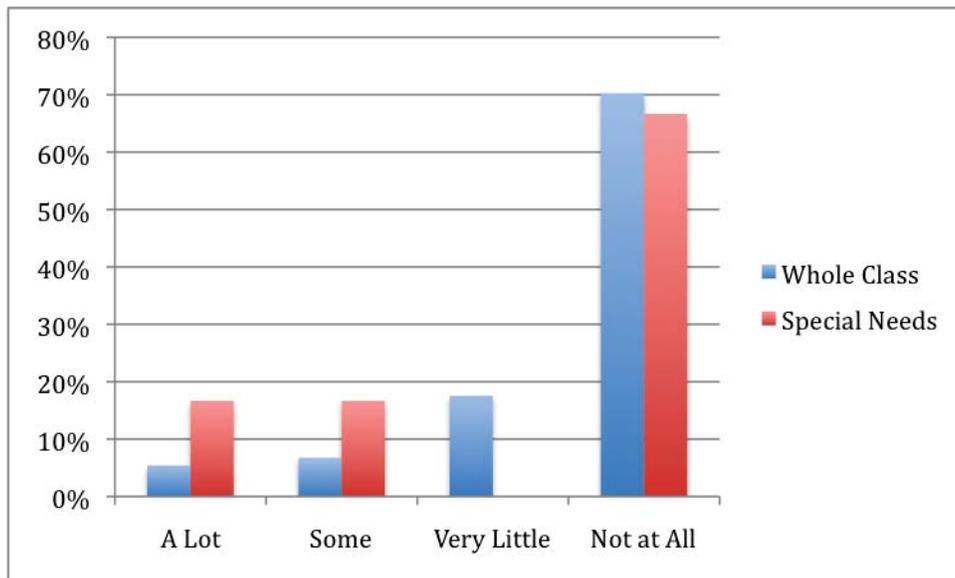
In terms of the textbook podcasts, more students with special needs reported using the podcasts than classes as a whole in the ‘a lot’ or ‘some’ category; 34 percent of students with special needs compared to 18 percent reported use as a lot/some. 24 percent of whole class reported very little use with zero percent for special needs. 58 percent of the class reported no use with 67 percent of students with special needs reporting no use.

Figure 8. Use of Textbook Podcasts



Five percent of whole class and 17 percent of students with special needs reported using podcasts as a pre-reading tool; 7 percent of whole class and 17 percent of students with special needs reported using them some; 18 percent of whole class and zero percent of students with special needs reported very little use. Like classes as a whole, most students did not use podcasts as a pre-reading strategy; 70 percent of whole class and 67 percent of student with special needs did not use them.

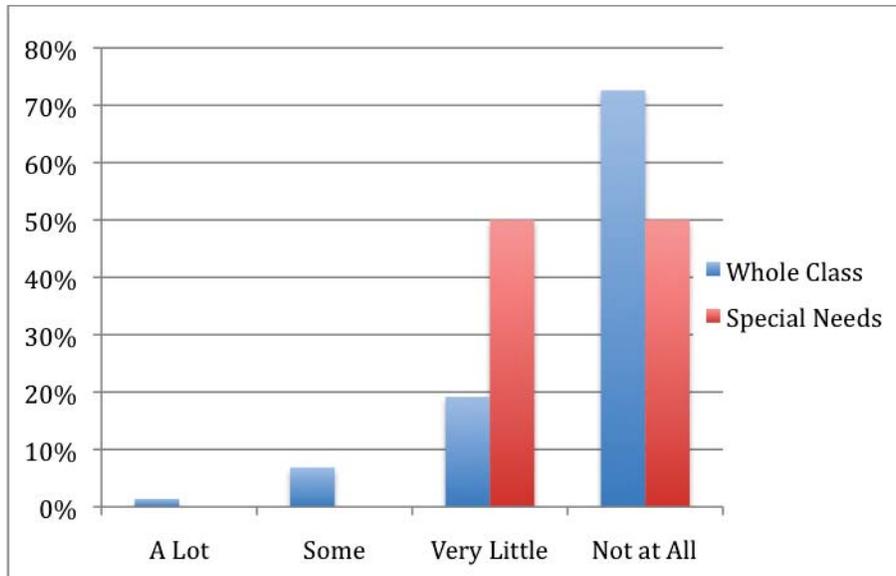
Figure 9. Use of Podcasts as a Pre-Reading Tool



Only one percent of whole classes reported using podcasts as a study tool with zero percent of students with special needs reporting in this category. For whole class, seven percent reported some use, 19 percent very little, and 73 percent reported no use. For

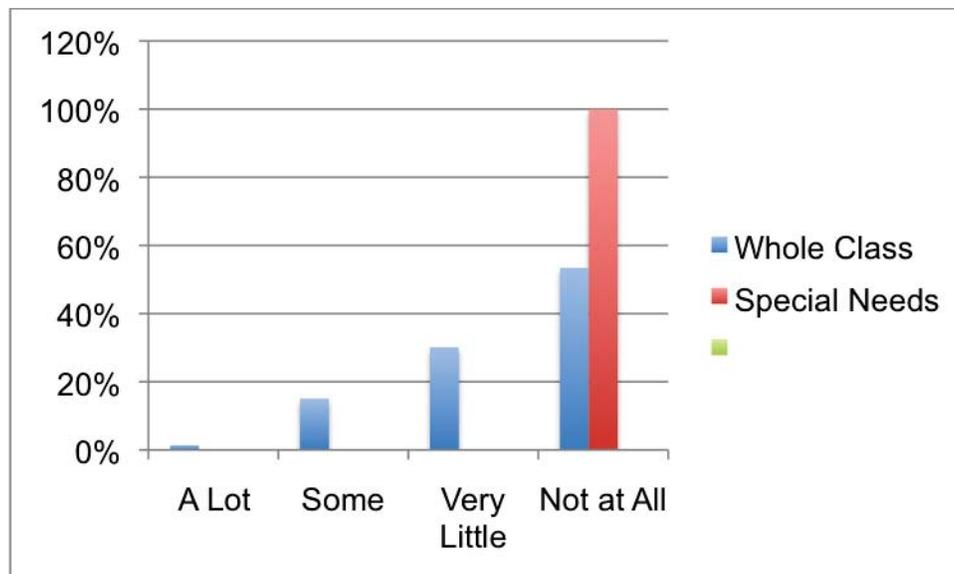
students with special needs, zero percent reported some use, 50 percent reported very little use, and 50 percent report no use.

Figure 10. Use of Podcasts as a Study Tool



In looking at digital book use, overall classroom use was low. 17 percent reported using the books a lot, 15 percent reported some use, 30 percent reported very little use, and 53 percent reported not using them at all. However, for students with special needs, they reported that they did not use the digital books at all.

Figure 11. Use of Digital Books



Discussion and Recommendations for Future Research

To learn science or any other content, we know that students need to be engaged and to interact with the materials. Because we are educating twenty-first century students who are actively using technology, we chose to develop more materials that were technologically based. We expected that these materials would prove interesting and motivate the students to use them.

From reported use, it seems evident that students relied more on traditional materials; that is, they used the textbook and handouts created by the teacher. One major print support provided by the teacher was study guides for major tests. Students may have been more comfortable in using traditional materials to enhance their learning. Because the materials were not used extensively, we cannot determine any effect on learning.

This exploratory study raises some critical questions in how to assist students with special needs in accessing the general curriculum. The study was conducted in an inclusive manner. Discussions with the teacher indicated that students do not want to be identified; they want to be part of the regular classroom with their peers. One strategy that could have proved helpful would be to provide one-to-one instruction for students with special needs in a private setting. This extra support would ensure that the students knew how to access and use the support materials. In hindsight, this resource could have been provided to any student, after school.

From anecdotal comments of the teacher, students were very interested in how the materials were constructed. In keeping with a constructivist approach, the next step would be to have the students create all of the materials. Many of the students were technologically savvy, so instruction could focus on strategies that can be helpful in learning science content. Teachers could assess levels of understanding by reviewing and grading activities that the students created.

In fact, the classroom teacher is now beginning this effort. A number of students are unsuccessful with the formal test environment. The teacher has developed a system of test recovery. She is introducing various study strategies for student use. Students have the opportunity to create an assignment that will allow them to improve their test grade. Initial observations indicate that this is a success. A future research project could focus on which strategies seem to be the most effective. It is likely that different strategies will be more effective with certain types of learners. In differentiating instruction, it is evident that a single solution is not effective with all learners.

References

Carmine, L. & Carnine, D. (2004). The interaction of reading skills and science content knowledge when teaching struggling secondary students. *Reading and Writing Quarterly, 20*, 203-218.

- Friend, M. & Bursuck, W. (2009). *Including students with special needs: A practical guide for classroom teachers*. Pearson Publishing Company: Upper Saddle River, NJ.
- Kletzien, S. (2009). Paraphrasing: An effective comprehension strategy. *The Reading Teacher*, 63(1), 73-77.
- Ness, M. (November, 2007). Reading comprehension strategies in secondary content-area classrooms. *Phi Delta Kapan*, 89(3), 229-231.
- Rose, D. & Meyer, A. (2002). *Teaching every student in the digital age: Universal design for learning*. Association for Supervision and Curriculum Development: Alexandria, VA.
- Wooley, , G. (2010). Developing reading comprehension: combining visual and verbal cognitive processes. *Australian Journal of Language and Literacy*, 33(2), 108-125.