Can The Use Of Interactive Science Notebooks Increase The Understanding Of Science Terminology And Concepts For English Language Learners?

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Introduction

Four years ago, I started working in a large high school with a predominately Hispanic enrollment. Even though the students were already in high school, many of them could not speak English. Although I was not an ESL teacher, I was assigned to work with 9th and 10th grade science students with little or no English language skills. These students were in the same class as the English speaking students. All of them had failing grades due to the language barrier. I was sent in to work with these students in understanding of science terms and concepts and to help them raise their grades in the process. On first observation I could see that the students really had no understanding, but were too afraid or embarrassed to ask for help. In fact, they would not attempt to ask for help because they had to ask in English and were not secure with their English speaking skills (much less science terminology). I was looking for strategies and curriculum for Science ESL students. I had no clue as to how to help them. In my school, across the curriculum, we had begun using a type of interactive notebook. It was more of a clear way to take notes than it was an interactive tool. I was not completely sure how to use this "notebook" and had a hard time explaining the use to the students. However, it was a requirement at the school and I did my best to incorporate the notebook. At first, I thought it would be a great tool for differentiation instruction. The students wrote in the notebooks, had vocabulary studies in them and also foldable inserts. It worked for about four weeks and then the students quit writing in the notebook and stopped using it as a reference tool. They found it difficult to use because they could not spell, did not completely understand the use of the notebook (neither did I), and would be constantly losing the notebooks or stealing them from other students if they could not find their own. I became frustrated and the students became frustrated. I found the use of this "notebook" to be inconvenient and not at all an advantage for the students. We began to use the "notebook" less and less until finally I stopped using it at all. However, in the last year or so, I have done more study on interactive notebooks. I found

that because I did not completely understand the use of the notebook, I certainly could not explain it to the students. As I began to learn and understand the proper use of an interactive science notebook, I came to the realization that it could be a very useful tool for English Language Learners. Therefore, I would like to revisit the use of interactive science notebooks. With a better understanding of the interactive notebook and a better understanding of my students, I hope to increase their overall science understanding in English. My students take notes on a daily basis. I would like their note taking to be a tool they can use for reference at other times to aid in understanding of science terms and concepts. My study is to determine if the use of interactive science notebooks can increase the understanding of science terminology and concepts for English Language Learners. This particular study is related specifically to secondary English Language Learners.

Review of Literature

Interactive notebooks are widely used throughout classrooms. Over time, teachers have interpreted their purpose and use different ways. They have tailored the interactive notebooks to meet the needs of the students and the subject. The purpose of this literature review is to investigate if the use of interactive science notebooks can increase the science terminology and concept understanding of English Language Learners. Reasons and advantages for the use of an interactive notebook will be explored.

What is an interactive notebook?

Lee Swenson, a high school history teacher, created the interactive notebook in the 1970's. Interactive notebooks are typically spiral bound notebooks with plastic covers. Three ring binders are not recommended because loose pages have the potential to get lost. Students do not remove or add pages, but glue pages periodically into the notebook. Students glue an assessment rubric into the front of the notebook to inform them and parents how it will be scored. Students organize the notebook as

the year progresses. At the beginning of each unit, students create a table of contents. They date and add page numbers to each entry (Young, 2003).

The interactive notebook page has two sides. The right side is for the teacher to provide the content knowledge (for my students, I will also include web links for further study on the topic at home); the left side is for students to demonstrate learning. The right side of the interactive notebook is for input of information. Students record notes on the lesson, lecture, reading, video, class discussion, etc. The left side of the interactive notebook is the area where students process ideas by interacting with the information on the right side or page. The student has the opportunity to express their interpretation and reactions to the content through original and creative ideas (Waldman & Crippen, 2009).

Why are interactive notebooks used?

Most of the professional literature supports that the purpose of an interactive notebook is to help students organize and synthesize information given to them in class. I think that this could be an excellent tool for English Language Learners. (Waldman & Crippen, 2009) state, “At its best, an interactive notebook provides a varied set of strategies to create a personal, organized, documented learning record” (p. 51).

Interactive notebooks can also serve as a formative assessment. Students’ writings and drawings provide documentation of their thinking, which can be used to guide instruction. By having access to students’ thinking, teachers can use the interactive notebook to assess and guide their next steps in instruction (Gilbert & Dotelman, 2005). This is especially useful for English Language Learners and their instructors because the opportunity to express their understanding in ways other than writing can help to show what they actually are processing and understanding. The teacher, student, and parent will all be able to clearly see where there is a breakdown in the learning of some science terms or even concepts. The formative assessment of the interactive science notebook will give the teacher the

opportunity to see the student's interpretation of the material presented as well as the thinking process of that student. The teacher can then take this information and speak with the student and the parents of that student about steps that may be needed in aiding the student with comprehension of certain ideas or vocabulary. The teacher will be able in this way to get the "real" feelings of the student and the parents. Knowing how the student feels in this situation is important because it can help with motivation. As English Language Learners are working on science concepts and vocabulary, they tend to lose motivation because of repeated lack of success. It is often because the teacher is not aware of the problems the student is having with the subject. In the proper use of an interactive science notebook, there is a lot less room for ambiguity of the understanding that the student may have. The notebook is continually assessed by teacher and parent, therefore, lack of understanding or misinterpretation of information will be seen immediately.

Advantages of Interactive Science Notebook Use

Studies on brain research, active learning, and drawing to learn support the classroom use of interactive notebook as an effective learning tool. The interactive notebook enables students to use both right and left brain hemispheres to help them sort, categorize, remember, and creatively interact with the new knowledge they are learning (Wist, n.d.). The brain is divided into two parts. The left side of the brain is the logical hemisphere. It processes speech, rational, convergent, objective, and sequential tasks. The right side of the brain is the intuitive hemisphere. It processes nonverbal, spatial, musical, and analogical information (Saleh & Iran-Nejad, 1995). According to Young (2003), interactive notebooks are successful because they encourage the use of both right and left brain hemispheres. When students are given information to put on the notebook's right side, and use the left side to interpret the information, it activates both sides of the brain. This helps the "brain by making connections between what is experienced (learned) and what that experience (information) means to

the learner" (Wist, n.d., p. 7). I think this is useful for English Language Learners as they are not using their native language to process scientific information. The interactive science notebook will force both sides of their brain to have an active process in learning the given information. If they are only using the speech side, they will have difficulty making a connection or correlation with the given material. When they have the opportunity to use both sides of their brain, it is much more likely for them to connect the information using a second language. It will also be useful for making "transfers" when necessary. As it is an ongoing tool, the student, teacher, and parent can refer back in the notebook if needed. It becomes a tool of reference as well as a strong learning and organizational tool. I can also see how differentiated instruction can be integrated into use with the interactive science notebook.

Active Learning for English Language Learners

Interactive notebooks promote students engagement by providing active learning opportunities. Active learning takes place on the left side of the notebook, where students are required to actively engage with the information. The left side focuses attention and guides students' learning of the content (Young, 2003). Research has shown that active learning positively impacts student achievement. MDRC (Manpower Demonstration Research Corporation), a nonprofit, nonpartisan educational and social policy research organization, examined the relationships among school context, student attitudes, and achievement—using data from a large-scale high school reform effort. Researchers collected and analyzed data from student surveys and administrative records. They concluded that students learn more and retain more information when they actively participate in the learning process and when they can relate to what is being taught (Akey, 2006).

Interactive notebooks engage students in meaningful learning tasks, not just traditional notetaking. Glasersfeld (1998) explained, "When students participate in meaningful learning tasks, they will actively engage in those tasks and use active learning strategies to integrate their existing

knowledge with a new experience (p. 3). The left side of the notebook stresses that writing down lecture notes does not mean students have learned the information. The output activities of the interactive notebook cause students to interact with the curriculum and promote higher order thinking. They must actively do something with the information before they internalize it (Waldman & Crippen, 2009).

Interactive notebooks can increase student motivation by providing students with meaningful learning activities and giving them choice. A study (Tuan, Chin, & Shyang-Horng, 2005) correlated student motivation with science achievement. Researchers developed a motivation questionnaire and distributed it to 1407 junior high school students in Taiwan. They concluded that giving students ownership, choice, and meaningful learning activities results in increased motivation. Increased motivation strongly correlates to student achievement. Interactive science notebooks provide student ownership and choice. Activities are teacher-initiated but student directed. Teachers provide the prompts but students choose from a menu of activities. They can create illustrations, diagrams, flow charts, concept maps, songs, poetry, cartoons, concept maps, etc. With all of the choices the student can make, there is a higher retention and understanding level. The students can choose the way that they feel they can best express the learning. Although students also have the opportunity to respond by writing, an English Language Learner can first assimilate the information in a way they can understand and then apply it to writing as their language skills become stronger. Because the notebook is continually assessed, the teacher will be able to see through the illustration chosen by the student whether or not they are having an accurate understanding of the vocabulary and science concepts being taught. They can self-reflect, explore their opinions, clarify their values on controversial issues, or ask questions about new ideas (Chesbro, 2006).

Interactive notebooks give students the option to interact with the information by generating illustrations. Drawing to learn is an active learning strategy and can help students understand concepts and demonstrate their learning. A study (Edens & Potter, 2003) investigated the effects of student-generated descriptive drawings on students' conceptual understanding of science principals. One hundred and eighty four fourth and fifth grade students were randomly assigned to groups in which they copied an illustration, generated a drawing, or wrote a description about the principals taught. A post-test used to measure conceptual understanding of the science concept, revealed that students who generated or copied descriptive drawings scored higher that those who wrote. The research suggests that student-generated descriptive drawings are an effective way for students to learn scientific concepts (Edens & Potter, 2003). These findings support interactive science notebooks because students have the option of drawing to demonstrate their understanding of the written notes on the right side of the notebook. For an English Language Learner in secondary science classes, I think that this becomes a very useful tool in their understanding of science concepts and vocabulary in a language that is not native to them. It also becomes a motivational tool because the student knows that they can express their understanding in alternate ways and writing in English may be very difficult for the student. Even though the student has the choice of illustration of understanding, they will also slowly build their English vocabulary due to the interactive nature of the notebook. Science scores and understanding in a second or third language should also increase due to the set-up of the interactive science notebook.

Summary

A review of the literature supports classroom use of interactive notebooks. Interactive notebooks positively impact students by activating both brain hemispheres, incorporating motivating and active learning strategies, and by eliciting higher order thinking through illustrating. Teachers should be informed of the advantages of interactive notebooks so they can incorporate this powerful learning

tool effectively in their classrooms. Although it appears that using the interactive science notebooks is a "win, win" situation, I definitely feel that more research should be conducted to directly correlate interactive science notebook use to student success and achievement. I have chosen to research the use of interactive science notebooks for English Language Learners in secondary grades. My research question is whether or not the use of the interactive science notebook can increase the understanding of science vocabulary and concepts for ELL students on the secondary level. As a side curiosity, I would like to see if it can also increase English language writing skill level for these students across the curriculum. My students do not have learning disabilities, only a language barrier. I feel (actually from experience) that there are many students in the United States in an ESL program that feel completely lost in their core subjects. They have a language barrier and not a learning problem. Although these students are being helped with their English language skills, it is usually in speaking the language. Speaking a language and learning core subjects in that language are two different animals. I would have difficulty understanding secondary science in Spanish because it is not my native language. Obviously, it works the other way around as well. These students are having difficulty with the subject because it is conducted in a different language. Using an interactive science notebook will give the students an opportunity to express their understanding in an alternative way while they are still in the process of understanding another language. If the interactive science notebook is a successful tool for my students, I think that it is worthwhile for the information to be shared with ESL teachers around the United States. My research is specifically for science, but if it works, it can be used across the curriculum. I also think that it could be adapted as a useful learning tool for students that have a learning disability or disabilities.

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