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EDST 403
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Final Assignment: Representing what I know to increase students' understanding

PART I. Previous lesson and the struggles

Topic of the lesson

My lesson was taught to a Science 10 class, on the physics unit. We discussed different languages used in describing motion and movement, such as scalar, vector, distance, and displacement. It is particularly important for the students to know the exact definition of the different words, as failure to understand the subtle differences may eventually result in the students failing to grasp the more complex concepts that require higher order thinking. Understanding the basic terminology used in describing motion serves as a foundation for the students that are planning on taking Physics 11 and perhaps also a career in science in the future.

Struggles as a teacher

Initially, as I was preparing for the lesson, I had to do extensive review and research as well since my background is in biology and not particularly in physics. Also, since I had not learned about the topic of physics since my first year in university, it had been several years since I had studied physics and anything relating to any field outside of biology. Therefore, multiple days were spent merely relearning the topic and preparing for the entire unit, so that I could be an "expert" of the content. Despite putting in effort to understand the topic as well as ways to scaffold it to the students, I wasn't as comfortable about teaching the topic as I would have been with biology or a topic that I had been familiar with. Due to this feeling of incompetency, I sometimes even found myself slightly confused from time to time and often had to refer to additional resources to fill in my knowledge gap as well as to impart comprehensive and accurate knowledge to the students.

Struggles of the students

The students struggled to differentiate which quantities were scalar and which quantities were vectors. Scalars are quantities that can only show what the magnitude (number) is, such as time. However, vectors are quantities, which have both a magnitude (number) and a direction (north, west, south, east, etc.). When they were asked to provide definitions of scalars and vectors, they were able to memorize and regurgitate the definition that was read out to them. However, when they were required to apply the knowledge into categorizing different quantities as vector or scalar, they weren't able to apply the knowledge for this sort of activity, which required a higher level of thinking. In particular, they struggled to distinguish between distance and displacement. This is due in part to the fact that many individuals, even teachers, fail to understand the difference between the terms and use them interchangeably. The students were unable to understand how the two terms were differentiated from similar words that they used outside of a classroom context.

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PART II. Revised lesson plan to enhance students' learning

Preparation for the lesson

Prior to teaching of the unit, I will consult colleagues that have a better understanding of the material. This is so that, as Shulman says, I will have both the pedagogical and content knowledge. According to Shulman (1986), there are three different knowledges that need to be equally considered in order for an individual to be an effective teacher. In the past, there was an emphasis on "content knowledge" where teachers were viewed upon as individuals that were experts on the subject matter, and their sole responsibilities were to become knowledgeable in the content material and impart the knowledge to the students. However, recently there has been a swing to the other side of the spectrum where too much emphasis has been placed on pedagogical knowledge, which is "the knowledge about the processes of methods of teaching and learning." As a beginning teacher, I feel like the focus has been placed on understanding the process of learning and using appropriate pedagogical tools within a classroom setting to enhance the understanding of the students. However, teachers must focus on pedagogical content knowledge, where equal emphasis is placed in content knowledge as well as pedagogical knowledge. After all, I am a teacher that teaches high school students science, and not just a teacher that teaches youth. Therefore, if I were to teach the lesson and the topic again in the future, I would first place my emphasis in truly understanding the content and becoming an expert. This process does not have to be done on my own, but could be facilitated by consulting fellow colleagues that may possibly have a better understanding of the topic than I do. I would allocate much of the initial preparing time to consult with other science, physics, and math teachers and also to collect additional resources. In order for me to understand what makes the learning this topic difficult and how I can facilitate the students to enhance their understand, I first must become an expert of the topic and go through an extensive and personal learning process as a life-long learner (slide 10, may 19th class). It is important for a teacher that "we pay as much attention to the content aspects of teaching as we have recently devoted to the elements of teaching process" (Shulman, 1986, p.8).

1

Lesson Activity1: Think-pair-share

In order to allow the students to re-examine their prevailing beliefs and understanding of the topic of motion, distance and displacement, the first part of the lesson will present the students with multiple open ended and complex questions to get them thinking about the topic. The students will be asked the question, "what is the difference between distance and displacement?" and they will be asked to conduct a think-pair-share activity. The purpose for this activity is for the students to re-examine their previous knowledge and beliefs, and also for the teacher to determine the pre-conceptions and beliefs the students might have with regards to the topic. The students will be provided with an opportunity to really think about what they know, or perhaps what they think they know, and also become cognizant of their misconceptions or false beliefs through conversing with a partner that might have a contrasting response to the question. Students do not enter a classroom or a subject as blank slates, but they already have information and beliefs that have been acquired and constructed over time. This previous knowledge and belief may either assist or even hinder students from accepting

the knowledge presented in class. Thus, it is essential for the teacher to be aware of the fact that students have foundational knowledge, conceptions and pre-conceptions that need to be examined for new knowledge to be built upon (Shulman, 1986, p.9).

2

Lesson Activity 2: Jigsaw learning

The students will be instructed to conduct a "jigsaw learning" activity, where they are provided with information on one particular terminology used in the study of motion. The students that are given the same word will gather together to form "expert groups" to discuss and learn through collaboration. Then the students will be divided into "mixed groups" where individuals with different expert areas come together. Here, they will be required to teach their word and what the word means to the rest of the members in the mixed group. Previously, I held onto a notion that teachers were fundamentally the conveyers of the "scientific truth," and students were mere consumers of facts. I had presumed that knowledge was transferred unmodified from the teacher to the students, in a direct, vertical fashion. Rather, students are constructors of their own knowledge, based on their previous experiences and deeply rooted prevailing beliefs. Thus, teaching requires far more than simply stating a concept and expecting the students to receive it as being the truth. With the "constructivist" approach in mind, my primary role as a teacher during the jigsaw was not to simply "show and tell," but to be a facilitator through an engaging learning opportunity, where the students are actively involved in exploring a particular topic as constructors of their own knowledge. Instead of the teacher merely providing them with information and notes and having them learn it individually, they will take ownership of their own learning process and become active learners.

3

Lesson Activity 3: "Four-corners" review activity

Finally, after the students have grasped a basic idea of the different terms used in describing motion, they will be asked to demonstrate their understanding through a kinesthetic activity. The activity will be a variation of the four corners instructional strategy, with multiple corners instead of just four. Different parts of the classroom will be labeled with the terms that have just been covered in the lesson. I will be reading out the definitions or words related to the particular term, and the students will be asked to move across the classroom to stand by the word that they think the definition is describing. The purpose for the activity is to increase the spatial awareness of the students. Physics, and particularly the unit on motion, requires students to be able to understand directionality and have a sense of spatial awareness. Thus, the four corners activity will not only serve as a review activity of the terms that are important, but will also provide the students a chance to review directions for future lessons subsequent to this one. This kinesthetic activity will reinforce multiple ideas and information, and also enhance understanding for the students. This activity will also serve as a formative assessment for me to determine whether the students have achieved a level of understanding that was aimed at. As this would be the first lesson taught for the entire physics unit consisting of around 10 lessons, I believe that it would be too early for a summative assessment. Therefore, a formative assessment will be conducted for me to ensure that the students have really grasped the foundational ideas, prior to moving on to more complex and difficult concepts.

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References:

Shulman, L. (1986). Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4-14.