Science: The Key to Exploration

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Science is an ongoing field of study. It encompasses and accounts for everything in the natural and physical world from the smallest bacterium to the entire universe. No matter what you see, science has an explanation for it that is backed by many experiments and observations. Science is a wide topic that branches off into many forms such as biology, chemistry, earth science, physical science, anatomy, and so much more. Not only does science explain so much for us, but it also answers some of our biggest questions. Through the processes of observing, collecting, organizing, and analyzing data, many doors are opened for new discoveries. This is why it is important for science teachers to encourage students to do experiments that are engaging and also allow the students to make inferences about the data for themselves. Science teachers should also use other best practices such as constructivist teaching strategies, project-based learning, and active learning.

Since science uses strategies such as observation and experimentation as its basis for discovery, it is important to teach the students good critical thinking skills. These skills they can use to decipher results and make discoveries based their observations and experiments. Critical thinking skills should range from helping students solve minor questions to deep and abstract questions. Students should be able to find out for themselves, using critical thinking, the answer to a question that isn't always in black and white for them. Instructors should therefore use lab experiments that are simple enough for the students to perform, but also challenging enough so that the students have to think outside of the box for the answers. These lab experiments should allow the students to experiment and make observations with little teacher assistance. They should be straight forward in directions, but at the same time allow the students to manipulate the experiment in the way they believe will produce the best results. By allowing students freedom in experimenting, it gives them a sense of responsibility and makes the learning fun for them.

The development of these critical thinking skills can be accomplished by science teachers using constructivist teaching strategies to help teach these skills. According to Santrock (2011), constructivist teaching places a big emphasis on allowing children to build their own knowledge and understanding with only guidance from the teacher. Through the process of guided discovery, students construct valid interpretations of the world, become scientifically literate, and are able to interpret new knowledge based off of what they already know. Students are able to do all of this through a comfortable learning environment, and a guiding teacher that monitors their progress to ensure they are learning in the best way possible. Guided discovery allows the students to explore on their own and discover for themselves, therefore allowing them to create a deeper understanding of science and how it works; not just making the students memorize facts.

Another practice that science teachers should become familiar with is project-based learning. In project-based learning, students are able to work on real, meaningful problems beyond those of everyday life and create tangible products that are solutions to those problems. (Santrock, 2011) These projects not only allow the student to learn concepts that can be applied later in their lives, but it also allows them to answer questions through careful analysis of their project results. When students engage in this type of learning, they learn on a deeper level because they are doing hands-on experimentation that they control. For example, in earth science, students can do a project where they take different types of plants and place them in different environments to see how it affects their growth. A plant can be placed in sunlight, in a dark room, in a wetter environment, and in a dry environment. During the experiment, students will take observations of what is happening to each plant in its environment and analyze their results. At the end of this experiment, students should be able to determine what type of environment helps plants grow the best, and also be able to make decisions on what they could

do differently if they were to do the experiment again. Project-based learning like the example above helps students to think for themselves and be able to interpret data which, in return, helps them learn concepts much better than traditional practices.

Another best practice that science teachers can use in their classroom is active learning. Active learning is a process in which students are engaged through hands-on activities rather than passively receiving the knowledge. In active learning, students work collaboratively with others, construct hypotheses and make decisions, and engage in higher-order thinking tasks (Silberman, 1996). Active learning is closely related to constructivist and project-based learning in that each allows the students to discover and make decisions through hands-on learning. Active learning also keeps the students interested in science because it places them in the center of what they are learning. By allowing the students to experiment and manipulate the materials they are learning about, it creates a deeper understanding of the information; therefore, the students to remember the information better. This differs greatly from traditional lecture based classrooms for one big reason; it sparks an interest in the students. When the students are eager to learn, and interested in learning, they learn the information at a deeper level.

Through the practices of project-based learning, active learning, and the constructivist approach, students are able to better retain the information they are learning because it is being reinforced. Each of these strategies places students in the role of a scientist and allows them to experiment, create, and analyze what they are learning. Not only do students learn the material better, but they also acquire higher order skills such as critical thinking and collaboration skills. By allowing students to experiment with real world problems and manipulate the project through trial and error, they learn vital information they can use in the future as well as develop a sense of independence because they are doing the project on their own. Science is a fascinating subject

to teach and it opens students up to the world around them. It is for this reason that the best practices of project-based learning, active learning, and the constructivist approach are so important in teaching science.

References

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