Motivating Young Students to be Successful in Science:

Keeping It Real, Relevant and Rigorous

by Dr. Malcolm B. Butler

SUCCESSFUL ELEMENTARY SCIENCE TEACHING must include strategies that encourage students to learn the science that will help them in class and in life. The National Research Council and the American Association for the Advancement of Science address this issue in their *National Science Education Standards* (NRC, 1996) and *Benchmarks for Scientific Literacy* (AAAS, 1993), respectively. Knowing how to teach young children science is quite different from teaching science at the middle and high school levels. Elementary-aged children's attitude towards science is as important as the science content and scientific skills they must learn. Research findings show that teachers who are effective at supporting learners via the affective domain are also able to show improvements in student learning and academic achievement in science. Making the science real, relevant and rigorous for young children can help them be more successful. The strategies to motivate all students to learn science highlighted in this paper are consistent with current trends and research-based, best practices in science education (Gallenstein, 2005; Mantzicopoulos, Patrick, & Samarapungavan, 2008).

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Motivating Young Children in Science

Research on motivation to learn shows children are attracted to ideas that address both their cognitive and affective needs. Young children are typically already interested in nature, the environment and how things work. It serves elementary science teachers well to take advantage of the students' interests as a source for engaging and motivating students to high levels of achievement. Motivation can be an antecedent to and an outcome of learning. Thus, students must be interested and motivated to learn before learning will take place (Turner & Patrick, 2008), and this success can lead to motivation to learn more (Turner & Patrick, 2008). Sorting through those students' interests can make teachers' jobs a bit easier in connecting the needed science concepts and skills to the students. Addressing the affective domain can lead quite well into success in the cognitive and psychomotor domains. Current research is replete with findings that show when learners are engaged in classroom activities on a cognitive level, they acquire the conceptual understandings expected of them (Gallenstein, 2005; Turner & Patrick, 2008).

What are the Key Aspects of Motivation to Learn Science?

Making the Science Real

Young children's daily realities are fertile ground for helping them observe and understand the world around them. Students' "funds of knowledge" (i.e., the information and experiences they bring with them to school) can be tapped to encourage and engage them in the science they need to know and be able to do. Science assessments that tap into the reality of the students can increase the possibility that students will be successful. For example, having a second-

grader in an urban community consider the many and diverse transportation options in her city can serve as the starting point for looking at pollution, forces and motion, and physical and chemical changes. Each of these topics is grade-level appropriate and can open the door for students to explore science in new ways.

Making the Science Relevant

A young student's lived experience is an important consideration for teachers as she/he seeks to explain those scientific ideas that are age appropriate. What is relevant to a six year old about forces and motion can be different for a ten year old.

Relevance also extends into the arena of questioning, where students have to be taught how to pose scientific and investigable questions. However, teachers can take advantage of the inherent inquisitiveness of children to incorporate into the classroom those questions students will see as natural extensions of the mental gymnastics in which they have already been engaging about their world.

Making the Science Rigorous

In addition to being real and relevant, the science young children must learn has to be rigorous enough to afford the students the opportunity to move forward in their understanding of key scientific concepts (Butler & Nesbit, 2008). These are the same concepts assessed on multiple levels, including classroom tests and quizzes, and district, state, national and international standardized assessments.

> "Connecting the science to be learned to the reality of their lives, the relevance of their age-appropriate experiences, and the rigor of the science concepts can make science come alive in unique and meaningful ways for these children."

Consider the following fourth grade student's comment to his teacher at the end of the school year about science:

> *"Mrs. Johnson, I had a lot of fun in science. The activities we did were cool. I can't wait to get to fifth grade to do more of those cool things. I didn't learn a lot of science, but I sure had lots of fun. Thanks for a great year."*

Mrs. Johnson did an excellent job of engaging this student in science. However, the missing link to this young learner's success may have been the lack of attention to the importance of rigor in scientists' attempt to understand and explain our world.

Teachers can use writing in science as a source for increasing student learning. Thus, writing expectations must be clear. For example, students should be given detailed instructions about what their writing and/or sketches and drawings must include to demonstrate their understanding of concepts. In addition, students' writings must also communicate a depth of comprehension is acceptable to the teacher. Students who are focused on the task at hand tend to lose themselves in the task and are not necessarily focused on the intensity of the activity. This highly focused, mentally intense kind of inquiry can greatly assist students with grasping scientific concepts.

Applying the Research

Inside National Geographic Science

Several components of *National Geographic Science* support motivating young children in science. The Science in a Snap gives the teacher the opportunity to make some quick and real connections to what is forthcoming in the Student Inquiry Book. Those simple activities serve as attention getters and thought stimulators to help students experience real science activities that tie to the content that will be explored.

The Student Inquiry Books build on making science relevant to students. They are tied to the unique experiences of children. When looking through the books, students connect to both the text and pictures. The book is seen as relevant to the students' lives and thus becomes a source of motivation for wanting to know more about particular science concepts.

The Open Inquiry activities in the Science Inquiry Books lend themselves to both the relevance and rigor students need to increase their scientific knowledge and skills. These activities give students the opportunity to develop their own questions to investigate. Also included are questions for students who

might not be ready to come up with their own questions, but are ready to go deeper in their work.

The Become an Expert and Explore on Your Own books contain a plethora of the kinds of relevant science ideas for children to use to make sense of the science in their world. This source of relevance is focused on two levels of inquiry, where students are able to work as a group to engage in reading and experimenting, then work individually to further their understanding beyond the whole class discussions. The group work can give students the confidence they need to move on to exploring science on their own.

Finally, the rigor in science is also a critical aspect of the Science Notebooks, where students can document their scientific experiences in ways they think are important to them. In addition, the consistency in recording information in the science notebooks adds more rigor for students, as they consider how the recorded information accents their thoughts (Butler & Nesbit, 2008).

Conclusion

Young children typically have an affinity for nature and science. Connecting the science to be learned to the reality of their lives, the relevance of their age-appropriate experiences, and the rigor of the science concepts can make science come alive in unique and meaningful ways for these children. *National Geographic Science* contains the necessary components for motivating and engaging all elementary students so their proficiency in science improves and success becomes their norm.

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