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A NEW VISION: SMART EDUCATION AND E-LEARNING

(A Peer-reviewed Research Papers of
the Second International Conference of Teacher Educators)

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STRATEGIES FOR FOSTERING CHILDREN'S SCIENTIFIC ABILITIES

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ABSTRACT

Scientific Ability is currently considered the central goal for development of the 21st century learners. "Scientific Ability" can be defined as scientific thinking potential or as a special talent for excellence in sciences.Scientific ability is determined as an important factor for fostering student performance in science learning. Fostering students' scientific ability in school has always been an important aim of education. The transition from a content-oriented instruction to a process-oriented instruction depends critically on teachers' pedagogical knowledge and beliefs about science teaching and learning. To foster students' higher-level thinking, teachers must possess not only in-depth subject matter knowledge in the field they are specializing in science, but also good pedagogical knowledge on how to develop students' scientific ability.This paper highlights the scientific abilities that can be developed through teaching science and the ways to foster scientific abilities among students.

Introduction

Science has helped the man to acquire supremacy over nature. It has greatly affected the way the people view themselves and the world around them. The wonderful achievements of science glorified the modern world and illuminated the human creative potential. Science is the knowledge acquired by study, acquaintance with or mastery of any department of learning. Science in literal sense, means 'the pursuit of knowledge'. The science comes from the Latin word 'scientia'

which means 'knowledge'. Science is usually defined as systematized knowledge. It is not a casual heap of disconnected scraps, but the bonds of union and the principles of arrangement of knowledge and it is mainly practical and social. Science is considered as a cumulative and endless series of empirical observations which result in the formulation of concepts and the formulation of concepts and theories, with both concepts and theories are being subject to modification in the light of further empirical observations. Science is both a body of knowledge and the process of acquiring and refining knowledge.

Some people think of science as learning facts about the world around us. Others think of science and other ways of knowing as "the having of wonderful ideas". This latter view of science and ways of knowing match the characteristics of children as learners. Students are naturally curious and passionate about learning. In their pursuit of knowledge, they're prone to poking, pulling, tasting, pounding, shaking and experimenting. "From birth, children want to learn and they naturally seek out problems to solve".

Such attitudes and actions on the part of the students indicate that they engage in scientific thinking, long before they enter a classroom. Unfortunately, when science education is introduced in a formal setting, it often reflects the understanding of science as the learning of facts. This approach has led some educators to suggest that "most science learning that takes place in formal settings is not true science".

Defining scientific abilities

We use the term "scientific abilities" to describe some of the most important procedures, processes and methods that scientists use when constructing knowledge and when solving experimental problems. The term "scientific abilities" instead of "science process skills" to underscore that these are not automatic skills, but are instead processes that students need to use reflectively and critically. The teaching of science aim at developing certain abilities in the students such as:

- ability to represent information in multiple ways;
- ability to use scientific equipment to conduct experimental investigations and to gather pertinent data to investigate phenomena, to test hypotheses, or to solve practical problems;
- ability to collect and represent data in order to find patterns, and to ask questions;
- ability to devise multiple explanations for the patterns and to modify them in light of new data;
- ability to evaluate the design and the results of an experiment or a solution to a problem;
- ability to communicate.

To help students develop these abilities, one needs to engage students in appropriate activities. The students should learn science through active involvement – that is, through first-hand, investigative experiences. Students should be involved in "sciencing" versus the learning of scientific facts presented by others. Sciencing is a verb and suggests active involvement. Such involvement should be both hands-on and minds-on in nature. Thus, students should be engaged both physically and mentally in investigating and manipulating elements in their environment. To be developmentally appropriate and to be in compliance with national guidelines for the teaching of science, science education at the high school level must be "an active enterprise". Both the National Science Education Standards and Benchmarks for Science Literacy call for an action-oriented and inquiry-based approach to science with students. As articulated by Lind (1999), "the best way to learn science is to do science".

Therefore, science for students should involve asking questions, probing for answers, conducting investigations, and collecting data. Science, rather than being viewed as the memorization of facts, becomes a way of thinking and trying to understand the world. This approach allows children to become engaged in the investigative nature of science and to experience the joy of having wonderful ideas.

Ways to Foster Scientific Ability

One of the primary goals of science curriculum is the development of scientific ability in students. Scientific ability differs from the learning of scientific facts in that scientific ability involves students in the process of finding out. Instead of learning what other people have discovered, scientific ability leads students to make their own discoveries. Scientific ability is manifest as students ask questions, conduct investigations, collect data, and search for answers.

Students as Scientist, present a constructivist curriculum model for science and emphasize the importance of scientific ability. They clearly debunk the notion that the constructivist approach is incompatible with science education. They describe students as "actively inquiring natural scientists" and learning as "the process of theory building". This view of students and how they learn is supported elsewhere in the literature where students are described as being naturally curious to learn about the world around them.

To foster scientific ability, teachers should view students as active learners and give them varied opportunities to explore and experiment. Such opportunities will allow students to construct meaning and develop understandings that are not only valid but also valuable to their on-going intellectual development.

An environment that fosters scientific abilityis one that gives students the time, space, and materials to exercise their curiosity. It also gives them the freedom to engage in student-centered explorations, experimentations, and explanations.

To become engaged in scientific ability, children need access to materials that they can take apart and the tools to assist them in doing so. They need places where they can dig in the dirt and dip water from a pond. They also need magnifying glasses, measuring tools, buckets, and frequent access to the natural world.

Teachers should take advantage of the different ways science can be naturally integrated into a play-centered curriculum. Scien

should not be viewed as an "add on" or a separate part of the school students program. Sciencing occurs, in many cases, in what children already do and how they think about what they do. As a student experiments with a mixture of oil and water, for example, she is making observations and predictions.

Student's construction of knowledge can be enhanced through social interactions—that is, by sharing their observations and ideas with each other. Students should be encouraged to work together "in building theories, testing those theories, and then evaluating what worked, what didn't, and why". Shared inquiry where students work together can be especially beneficial in fostering curiosity and stimulating new ideas.

Conclusion

Students are naturally curious about the world and want to find out as much as they can. They want to be the discoverers, the experimenters, and the theory builders. They don't want science to be something that is imparted to them; they want it to be something that they do. They want to be scientists; not just consumers of science. They want to ask their own questions, collect their own data, and arrive at new and wonderful ideas. These "wants" should shape the foundation of school science curriculum.

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