Concepts or context? Hands on Science in early learning, its crucial role
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Abstract

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Experience using cognitive and kinaesthetic skills is essential in learning
Experience using cognitive and kinaesthetic skills is essential into learning and understanding science in the observable everyday context. From their earliest years children are hand-son intuitive scientists observing thinking and trying out things and observing the results, hence collecting and evaluation data. Such observations and investigations occur in everyday contexts, often unasked and is verbalise through hidden questions resented an s statements. They are often observed during play, which is divisible into experimental investigative play and narratives, when they are working through a past experience imaginatively or interpreting a story they have heard.

Hands on activities are essential in the learning of science in the early years the science explanation does not need to be given but the practical experience of the phenomenon inessential to further learning. At this age the foundations for observational and planning skills are laid as well as the process skills of manipulating items, collecting and evaluating such. Later in a child's formal science education such fundamental experiences provide them with an experiential foundation on which to construct the curriculum science required for examinations.

Introduction

Learning is socially constructed. Today, in the 21st century, there is an emphasis on interactive learning as well as the socio cultural aspects of learning. Dialogic talk (Alexander, 2008) is encouraged rather than what we, in England would term a didactic or declarative approach, talking facts at learners. Fleer (1992) reminds us that constructivism places importance on determining the learners existing ideas.

Such pre knowledge, which is personal to each and every learner, is significant in influencing how children respond are able to make sense of what is given, transmitted to them, by teachers of any kind, indeed of non formal teaching out of school, home, other venues and own observations are even more important.. Driver et al. (1985) wrote a seminal book used in many courses on the teaching and learning of science in. This book concerns secondary school children's ideas about a range of natural phenomena and how these ideas change and develop with teaching". Moreover, Driver (1983), and Fleer (1992) observed that teaching engages in a 'handover' process and their support of the teacher or facilitator is gradually withdrawn as the learner gains confidence and skill at interpreting their own observations and ideas. Such development of confidence and understanding can be partially achieved by the effective use of questioning, particularly the 'throw back' technique, not telling the learner but asking challenging their statements to encourage them to rethink, a type of cuing process (Chin, 2007).

Emergent scientists

More recently other researchers have pointed out that children start experiencing science from their earliest years, e.g. Gopnik, (2008). These researchers have highlighted that the observations such learners make and how they made sense of them for themselves, through what they noticed, are influenced by their ideas and expectations, based on prior knowledge.

One of the issues amongst those working with learners in science is the difference between inference and observation. We need to teach both teachers and learners the critical difference between these two practices. An observation is information that someone gathers about an object or event using one or more of the senses, it can be quantitative or qualitative. Whereas an inference is a conclusion or explanation one makes about an object or event from what you already know and your own prejudices about the topic or situation. It is not evidentially based.

What is Scientific Inquiry?

What is Scientific Inquiry? It was defined by the USA National Research Council in 1996 as "the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work. Inquiry also refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world ".

This document summarized scientific inquiry for essentially elementary or primary learners as

- Ask a question about objects, organisms, and events in the environment
- Plan and conduct a simple investigation
- Employ simple equipment and tools to gather data and extend senses
- Use data to construct a reasonable explanation
- Communicate investigations and explorations

Rather similar to the understanding which many of us in Europe share. Remembering that inquiry is not just a 'Fair test' (Turner, 2010). Unfortunately many primary teachers in England have regarded it as such. Where we regard scientific inquiry or Enquiry, as is the correct English when using the word in everyday contexts. However, many of us have adopted the use of the word, " Inquiry " as it is increasingly used by organizations and funding bodies to indicate this approach to science whereby leaners raise, from observation, often combined with prior relevant knowledge, questions for which they then plan a strategy to answer their question. There are various levels of Inquiry from directed through guided to totally child lead.

A Framework for K-12 Science Education.

I find it of interest that in the USA the National Academy has produced a new initiative, Next Generation Science Standards' in which they purposely do not employ the term "inquiry' .
.http://www7.nationalacademies.org/bose/Standards_Framework_Homepage.html

Indeed ,in their documents they refer to 3 dimensions , one of which, 'Practices' which merges the of skills and processes.

They use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice.
Secondly, Crosscutting concepts which reiterate many of the unifying concepts and processes that previous documents had emphases. lastly. The third dimension proposed is that of disciplinary core ideas which effectively strive to create through their school education, really scientific literate citizens and practitioners who leave formal school education… *" as science learners, users of scientific knowledge, and perhaps also as producers of such knowledge. '*

Hands on- interactive real experiences

Interactive experiences have a value in the consolidation of an individual's learning . Indeed, Inhelder et al .(1974) observed that the more activities in which a leaner is involved the more they learn. These researchers , psychologists, identified the transition from one level of cognition to the next. Before learners can involve themselves however in interactive science they need to have mastered practical skills such as manipulation and holding items and the skill of observation. Before phenomena can be investigated through the formulation of a question they need to know how to go about devising such an investigation using items and skill with which they are comfortable and experiences.

Children, from their earliest consciousness , observe and investigate. They play. In fact they need to play (Moyles ,1989). Play can be referred to as "messing about, in our case , in science learn to do science" (Their and Linn, 1976).

If you observe young children, before they externalise out loud their thoughts, which you can hear as a narrative, which contains, hidden questions. These emergent, intuitive scientists hidden questions, they are asking them self's questions which guide their subsequent activities when further investigating. The baby in a high chair or push chair drops something out over then side, and observes what happens,. They are collecting data including observing and hence learning that most often someone returns the object to them whereupon they can repeat the investigation.

Crucial Role of Hands-on

Hands-on is vital to the development of a learner's real understanding of science and engineering The United States is emphasising, particularly in its Next Generation Science Standards, museums and science centres, engineering and the hands on approach in such museums as the Thinkery in Austin Texas where children and their accompanying adult, a home, according too their publicity, of the "how" and "why". Other centres emphasise the disassembly of objects so the learner can see how the item works. Other museums stress innovation and the development of workable solutions to issues, and their progress from idea to working realisation, with the drawbacks as well as successes. An example of such is the Museum of History and Industry recently reopened in the Old Armoury building in Seattle.

The Experiential learning

Hands-on is a critically important component of learning of science and engineering. It is salutary to recall and to pass the message to our learners ,and other teachers with whom we work, in the words of Bill Gates. Forgive the Americanism, but the idea is crucial to our learners and us.

"Success is a lousy teacher. It seduces smart people into thinking they can't lose."

He is also quoted as saying "It's fine to celebrate success but it is more important to heed the lessons of failure."

But, he recognised us too and said:
"Technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is the most important".

Remember that! Good luck

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Gates, B. Quotes

http://www.brainyquote.com/quotes/authors/b/bill_gates.htm

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