

Scientific enquiry skills



**ASSIGN
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A Discussion of the Nature of Scientific Enquiry Skills and their Role in Children's Learning in Science

Children tend to have their own initial ideas of how the world works and it is important to take these seriously when teaching them at school as “ if you insist on children ‘ learning’ the correct idea when they still have their own ideas, they will possibly memorise the correct one, but without really believing in, and will hold onto their own ideas to make sense of real phenomena around them.” (Harlen & Qualter, 2009: 69)

Therefore it is important to take into account the children's ideas as they have reasons for what and why they think and it needs to be addressed correctly to help the children progress and make sense of their ideas. There are both practical and theoretical reasons to why doing this is important to a child's learning. Practically, this can be done through scientific investigation and by teaching them the enquiry skills needed to provide the children with scientific knowledge to explain their own ideas.

By carrying out scientific investigations the children will use different skills to find out the results, these skills include:

- * Observe

- * Predict

- * Plan/ collect evidence

- * Investigate

- * Interpret evidence/record

* Communicate and reflect

' Observation' within a scientific investigation is an important aspect to teach children to use as they can see what they might not have experienced before and it might be different to what they first thought so it gets them to think about other possibilities. " Providing time is significant in encouraging observations, perhaps more than for other inquiry skills. Children need time to go back to things they may have observed only superficially or when a question has occurred to them about something they want to check. A display enables children to use odd moments as well as science activity time for observing and so increases an important commodity in the development of this skill." (Harlen & Qualter, 2009: 125)

By getting them to ' predict' what might happen in their own investigation they build on their own experience as they will already have an initial idea of what the answer is. By getting them to predict what they think will happen will then get them to think about the reasons behind why they think this. If their predictions were wrong it gets them to again think about why they were wrong and reflect upon this. In the national curriculum under key stage one it states that children need to " think about what might happen before deciding what to do" (DfES, 2000)

Once a child has made their predictions to an activity it is then vital that they ' plan' their activity i. e. how they want it to be carried out and what equipment they want to use and then implement the activity i. e. ' investigate'. By getting them to investigate, it means they are experiencing it for themselves - first- hand experience - which is important as unless the

children have the opportunity to find out what really happens to the world they live in for themselves they will never really understand it and may still have misconceptions if it is just told to them by the teacher.

Once they have finished the activity they will then need to 'record and interpret' what they found out as they can then relate their findings to their original predictions therefore building on their prior experience. Children need to be able to "compare what happened with what they expected would happen, and try to explain it, drawing on their knowledge and understanding" (DfEE, 2000)

Finally it is important for the children to 'communicate and reflect' with their peers and teachers of what they have found out and explain why this has happened as it is then getting the children to consider the scientific reasons behind the activity and not just their own ideas.

All of these inquiry skills take place within a single activity and it is up to the teacher to provide the children with these within the classroom as these skills help children to develop their original ideas into scientific reasons and concepts therefore developing their knowledge and understanding for the world around them.

Constructivist theorists such as Bruner, Piaget, and Vygotsky all have their own ideas to how children learn and develop which are essential for teachers to successfully teach science for example to the children.

Piaget believed "when children encounter a new experience they both 'accommodate' their existing thinking to it and 'assimilate' aspects of the

experience. In so doing they move beyond one state of mental 'equilibration' and restructure their thoughts to create another." (Pollard, 2008: 175).

Assimilation and accommodation are intentionally going on at the same time however assimilation is a more frequent process as we simplify and gather familiar material around more often but we also have to adjust it with the knowledge we already know.

Piaget also believed that there are stages that children develop and pass through which were roughly related to the age of the child. The stages were:

ü " The Sensori-motor stage (birth-2 years) - this stage is using their senses to learn things about themselves and the environment.

ü The Pre-operational stage (2-7 years) - this stage is when the child's thinking is self-centred or egocentric which is where the child has difficulty understanding other people's feelings.

ü The Concrete Operations stage (7-12 years) - this stage is when the child begins to reason logically and organise thoughts coherently. At this stage children can master most types of conservation experiments and begins to understand reversibility.

ü The Formal Operations stage (12 years onwards) - this stage is characterised by the ability to formulate hypotheses and systematically test them to arrive at an answer to a problem. However Piaget believed that not everyone reaches this cognitive developmental stage."

(Pollard A, 2008: 175)

“ Constructivists believe learners build their understandings of the world from their experiences and observations. They suggest that children bring many misconceptions and misunderstandings to the classroom from their experience of the world.” (Arthur J et al, 2006: 140)

Bruner and Vygotsky had slightly different ideas to Piaget. Both Bruner and Vygotsky had Social-constructivist views however both thinking and believing slightly differently. Jerome Bruner believed that a child is predisposed towards learning and that there are structures in place so that the child can follow a sequence of stages in their intellectual development. Bruner believed that adults play an important role as they support children as they move through different stages of development.

Bruner’s stages of development are:

ü “ Enactive (0-1 years) – learning through doing – physical movements

ü Iconic (1-7 years) – developing mental images

ü Symbolic (7+) – using symbols such as language and other representational modes to transfer thoughts.” (Snaith, M. & Tassoni, P, 2007: 256)

Lev Vygotsky felt that children’s development is strongly supported by the adults. The level of development for an individual child became known as ‘ the zone of actual development’ but Vygotsky felt that children were capable of higher levels with support and assistance from adults. The difference between these two levels was known as the ‘ zone of proximal development’.

From the science sessions I have attended this term my understanding of how science is taught to young children has changed and developed my knowledge of how it is done successfully. The theorists' beliefs and the inquiry skills taught to children are linked in the way that knowing how children learn can affect how the teacher plans the lessons so it's important to take this into account. Each inquiry skill is essential in the learning of science as it helps to develop children's initial ideas into scientific ideas without just telling them the correct answer.

By taking part in the class activities I used a variety of inquiry skills which showed how important it is to teach these skills to children, for example taking part in the planning of the investigations gives children the opportunities to explore new experiences first hand, shows them the importance of fair testing and how to conduct one. "Recognise when a test or comparison is unfair and use first-hand experience and simple information sources to answer questions" (DfEE, 2000)

Interpreting the evidence to their investigation is also an important skill to have as "it means trying to find patterns and to relate various pieces of information to each other and to the ideas being tested. As with other inquiry skills, children need the opportunity and encouragement to do these things if they are to develop these abilities. Some of the ways teachers can help are: make sure that the thinking does not stop when data have been collected or observations made and recorded; ensure the results are used to decide whether a prediction was confirmed or whether a question was answered." (Harlen & Qualter, 2009: 129-30)

References and Bibliography

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