THE DEVELOPMENT OF SCIENCE CONCEPTS IN PRIMARY CHILDREN
BY DISCOVERY STRATEGIES

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Abstract

A year three/four class of thirty primary school children was selected and then exposed to a series of twenty discovery lessons on electricity, discovery learning being:

The learning of scientific principles or concepts which occurs as a generalisation of experiences by the learner in the absence of direct telling by the teacher. (Carin and Sund, 1975)

The performance of these children was evaluated, both before and after the discovery lessons, on the basis of their ability to solve problems requiring the application of one or more of the thirteen concepts covered.

On comparing the performance of the “discovery” class on pre-test items with the performance of children from years three and four, as well as five to seven in other Perth suburban schools on subsets of these items, it was found that the “discovery” group was no better and no worse than other primary classes. A team of ten graders (examiners) was used for rating purposes.

The Rasch Model was the statistical model used and enabled comparison to be made between the “discovery” group and all other class groups.

Purpose

As a starting point, the following hypothesis was chosen:

Children can develop science concepts through involvement in discovery activities and apply these concepts to solve problems they have not met before. It is not necessary for children to verbalise a discovered concept for the child to be able to use it. This has been called unverbalised awareness.

In detail the project should show that:

(a) children can state the discovered concepts in their own words if asked;
(b) given a problem requiring the application of a given concept in order to reach a solution, the children will apply the concept;
(c) given a situation contradictory to the concept, the children will be able to explain that it is wrong.

Discovery

Carin and Sund (1975), in Teaching Science Through Discovery, define discovery learning as:
The learning of scientific principles or concepts which occurs as a generalisation of experiences by the learner in the absence of direct telling by the teacher.

Bruner (1961), in The Act of Discovery, says:

I do not restrict discovery to the act of finding out something that before was unknown to mankind, but rather include all forms of obtaining knowledge for oneself by the use of one's own mind . . . .

**Concepts**

As the strategy used was guided discovery (Carin and Sund, 1975), thirteen concepts in electricity were chosen. Concepts covered were:

1. metals are conductors;
2. non-metals (except carbon) are non conductors;
3. an electric current requires a complete circuit for a current to flow;
4. when a conductor is moved in a magnetic field, a current is produced;
5. two unlike metals, immersed in a solution that acts chemically on one more rapidly than on the other, will produce an electric current;
6. an electric current passing through a conductor produces a magnetic field around the conductor;
7. the strength of the magnetic field around a conductor is proportional to the current;
8. in an electromagnet, the strength can be increased by—
   (a) increasing the number of turns around the core;
   (b) increasing the amount of current;
9. in a series circuit, all the current travels through all parts of the circuit in turn;
10. in a parallel circuit, the current travels through alternate pathways;
11. the components of a circuit can be represented by symbols;
12. when a conductor resists the flow of electricity, heat is generated;
13. an electric motor can be made using a magnet and a coil.

**Testing programme**

It was proposed to pretest the concepts to be discovered at the beginning of each week by "journal" assignment and then post-test by classroom assignment at the end of the week, after two discovery lessons had occurred. The "journal" assignment would be done at home and children would receive a token reward for just returning this type of assignment, complete or incomplete.

The schedule of assignments was as set out below.