

The Science Process and Concept Exploration Project (SPACE)

This project explored young children's (age 5-11) understanding of science and its development in twelve areas of science, working within a constructivist framework. Children's thinking in specific areas was investigated prior to a 6 week intervention and then explored again to see what changes had occurred. The results led to the publication of 8 major research reports (available from King's) and to the development of a set of curriculum materials - Nuffield Primary Science (1994) whose national and international reputation is rapidly growing.

A more detailed description

The Primary SPACE Project was a classroom-based research project which aimed to establish

- the ideas which primary school children have in particular science concept areas.
- the possibility of children modifying their ideas as the result of relevant experiences.

The research was funded by the [Nuffield Foundation](#) and the publishers, Collins Educational, and conducted at two centres, the [Centre for Research in Primary Science and Technology](#), Department of Education, University of Liverpool and the Centre for Educational Studies (now the School of Education), King's College, London. The joint directors were Doctor Wynne Harlen and [Professor Paul Black](#). The following local education authorities were also involved: Inner London Education Authority, Knowsley and Lancashire.

The Project was based on the view that children develop their ideas through the experiences they have. With this in mind, the Project had two main aims: firstly, to establish (through an elicitation phase) what specific ideas children

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developed and what experiences might have led children to hold these views; and secondly, to see whether, within a normal classroom environment, it was possible to encourage a change in the ideas in a direction which will help children develop a more 'scientific' understanding of the topic (the intervention phase).

In the first phase of the Project from 1987 to 1989 eight concept areas were studied:	In the second phase of the Project during 1989 and 1990, a further ten concept areas were studied:
Electricity*	Earth in space*
Evaporation and condensation*	Energy
Everyday changes in non-living materials	Genetics and evolution
Forces and their effect on movement	Human influences on the Earth
Growth*	Processes of life*
Light*	Materials*
Living things' sensitivity to their environment	Variety of Life*
Sound*	Rocks, Soils and Weather*

Full research reports on those topics asterisked in the table above are available from:

Liverpool University Press
 PO Box 147
 Liverpool
 L69 3BX

The Project was run collaboratively between the University research teams, local education authorities and schools, with the participating teachers playing an active role in the development of the Project work.

The findings of the project led to further funding being obtained for a curriculum development phase and the publication of a set of curriculum materials published by Harper Collins of London called Nuffield Primary Science. This is an extensive set of materials consisting of 12 Teacher's Guides for different domains of science and 36 pupils books. Two versions

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are published, one for working with lower and upper junior children of age 7-11 (KS1) and one for infant children (KS2), age 5-7.

King's College Staff involved in the project

[Professor Paul Black](#): Project Director

[Dr Jonathan Osborne](#): Assistant Director

Pam Wadsworth: Research Assistant

Dr Tony Russell: Research Assistant

Publications

Osborne, J. F., Black, P. J., Smith, M., & Meadows, J. (1990). *SPACE research report: Light*. Liverpool: Liverpool University Press.

Osborne, J. F., Black, P. J., Smith, M., & Meadows, J. (1991). *SPACE research report: Electricity*. Liverpool: Liverpool University Press.

Osborne, J. F., Wadsworth, P., & Black, P. J. (1992). *SPACE research report: Processes of Life*. Liverpool: Liverpool University Press.

Osborne, J. F., Wadsworth, P., Black, P. J., & Meadows, J. (1993). *SPACE research report: The Earth in Space*. Liverpool: Liverpool University Press.

Watt, D., & Russell, T. (1990). *SPACE research report: Sound*. Liverpool: Liverpool University Press.

Russell, T., Bell, D., Longden, K., & McGuigan, L. (1993). *SPACE research report: Rocks, Soil and Weather*. Liverpool: Liverpool University Press.

Russell, T., Longden, K., & McGuigan, L. (1991). *SPACE Research Report: Materials*. Liverpool: Liverpool University Press.

Russell, T., & Watt, D. (1990). *SPACE research report: Evaporation and*

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Condensation. Liverpool: Liverpool University Press.

Russell, T., & Watt, D. (1990). *SPACE research report: Growth*. Liverpool: Liverpool University Press.

Osborne, J. F. (1994). Coming to terms with the unnatural - children's understanding of astronomy. *Primary Science Review.*, 31, 19-21.

Osborne, J. F., Black, P. J., Smith, M., & Meadows, J. (1993). Young children's ideas about light and their development. *International Journal of Science Education*, 15(1), 83-93

Russell, T., & Osborne, J. F. (1993). Constructivist Research, Curriculum Development and Practice in Primary Classrooms: Reflections on five years of activity in the Science Processes and Concept Exploration (SPACE) project. In J. Novak (Ed.), *Third International seminar on Misconceptions in the Learning of Science and Mathematics*, Cornell University, Ithaca: Cornell University.

Nuffield Primary Science Teachers' Guides

Osborne, J.F. with Black, P.J, Harlen,W., Russell, T., Austin, R.L, Bell, D., Hughes, A., Longden, K.,Meadows, J., McGuigan L., Wadsworth, P. & Watt D. London. Collins. 1993.

Teachers' Handbook for Nuffield Primary Science. Nuffield Primary Science Series, 1993, Variety of Living Things. Teachers' Guide for Key Stage 2. 1993.

Using Energy. Teachers' Guide for Key Stage 2.

Forces and Movement. Teachers' Guide for Key Stage 2.

Light. Teachers' Guide for Key Stage 2.

Sound and Music. Teachers' Guide for Key Stage 2.

Earth in Space. Teachers' Guide for Key Stage 2.

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Materials. Teachers' Guide for Key Stage 2.

Living Processes. Teachers' Guide for Key Stage 2.

Living Things in their Environment. Teachers' Guide for Key Stage 2.

Electricity and Magnetism. Teachers' Guide for Key Stage 2.

Rocks ,Soil and Weather. Teachers' Guide for Key Stage 2.

The Variety of Life. Teachers' Guide for Key Stage 2.

Nuffield Primary Science. Teachers' Guide for Key Stage 1.

The Science Co-ordinators handbook

Nuffield Primary Science Pupils' Books: All written by Wadsworth, P., Austin, R., Blackburn, D. , Blackie, C. , Codrington, S., Longden, K., McGuigan. L., Macqueen, J., Osborne. J., Reseigh, B., Taylor, E., Sandiforth, A. 1993:
London: Collins

A First Look at Electricity and Magnets

A First Look at Time and Space

A First Look at Energy

A First at Different Plants and Animals

A First Look at Moving Things

A First Look at Rocks, Soils and Weather

A First Look at Where Things Live

A First Look at Living Things

A First Look at Life

A First Look at Sound and Music

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