An Investigation into the Effective use of Poleidoblocs in the Nurse and Infant classroom
Research for the Dr Margaret Lowenfeld Trust

Section A: The Case for Research

For generations the use of tactile structured materials has been advocated by eminent psychologists and educators as essential for children's learning and practice confirms the wisdom of this advice. Dr Margaret Lowenfeld wrote of 'non-verbal thinking' and Piaget of 'learning by doing' and such theories need to be reflected in the opportunities that are provided for children in their early years of schooling. Current developments in school mathematics, however, place an emphasis on number learning and on mental thinking and there is a need to ensure that the curriculum is not distorted so that practical experiences and geometric thinking become neglected. The new technology of video recorders and computer games means that many children have fewer opportunities outside school for practical experimentation with quality materials.

Mathematical and scientific understanding relies on awareness of patterns and relationships that exist among objects, and young children need to gain first hand experiences in the nursery and infant classroom using such materials as Poleidoblocs. Not only mathematical and scientific principles but also fundamental ideas of design and technology are embedded in the way's materials interact and Poleidoblocs provide opportunities for young children to experiment and learn from their own constructions. While the children are well motivated, effective interactions will promote questioning that focuses children's observations and responses to the stimuli provided, and language will be developed in a meaningful way to promote mathematical and scientific understanding. Teacher awareness of the potential for such learning is heightened through initial and in-service training and through publications (including the increasingly popular training video) that identifies more precisely effective interactions to promote learning while encouraging initiative and embracing the children's own creativity.

Although the popularity of Poleidoblocs is consistently stable and most teachers associate their use with the development of mathematical ideas, their *efffective* use as a teaching aid needs to be developed with respect to the changing needs of schools and of society and to the content of the new National Curriculum. These materials provide the opportunity for young children today to develop their thinking and communication skills through interactions with teachers in practical situations while exploiting the pleasures that motivate learning.

Section B Design and Conduct of Research

Building on the recent study by Dr Julia Anghileri and Sarah Baron which identifies aspects of mathematics learning with Poleidoblocs through free play and some structure tasks, this study will extend work to include science and design and

technology and focus on the role of teachers in supporting children's learning. It will also consider pupils with Special Educational Needs (SEN) as Poleidoblocs activities appeared in the first study, to have particular relevance for these children.
The main strand of the study will identify the purposes of Poleidoblocs activities for developing thinking and communicating skills in young children in nursery and infant classes and appropriate teacher interactions to promote learning. The National Curriculum and Desirable Outcomes identify specific attainment targets (see Appendix 1) in relation to Mathematics, Science and Design and Technology, that are particularly well suited to practical experiences with Poleidoblocs.

Having identified activities and appropriate teacher support, a second strand of enquiry will consider how such work may be adapted to support learning for children with Special Educational Needs (SEN).

The outcome will involve dissemination to teachers and other adults involved with the learning of young children through publications, inservice courses and the production of a video which will be available for staff development in colleges and in schools and nurseries.

Research Programme

The work will be undertaken in three phases, each focused on a distinct aspect of the research and each contributing to final publications and production of a video for supporting teachers.

Phase 1

Design and testing of activities to promote effective learning. Recent requirements for detailed planning by teachers for learning outcomes in nursery and infant classes has led to the need for a careful analysis of the potential learning in activities that engage children. When young children work with materials such as Poleidoblocs they are not aware of distinction between the mathematical, scientific and design aspects of their constructions but learning objectives must now be documented in these terms. It is important that teachers are aware of the full potential of each situation, not for separation of these inter related disciplines, but so that they may be involved in appropriate interactions to promote effective learning. It is also important to identify leaming related to individual or collaborative activities where ideas and achievements will support peer group learning and teachers will have opportunities for assessment through structured observations and conversational insights. This phase of work with teachers and pupils in school will involve an analysis of appropriate activities to promote learning while encouraging children's autonomy and creativity.

Phase 2

Social Educational Needs

Having worked with teachers and children to identify good learning opportunities in the use of Poleidoblocs in the classroom, the second phase of this research will look at the particular needs of special children in both mainstream classrooms and special schools. Although not a focus of the first study, feedback from teachers has already

identified effective use of Poleidoblocs to motivate and involve children with special needs in focused activities for extended periods of time. Through these activities the children were motivated to set and meet their own challenges while providing opportunities for learning through interaction with the teacher or leaming support assistant.

Phase 3

Video tape for dissemination and teacher support

Video tape recordings of effective use of Poleidoblocs in the nursery and infant classroom will be collected and edited 'in-house' to produce a resource for teachers and teacher trainers. The tape will be accompanied by a booklet identifying classroom uses for Poleidoblocs and relevant learning outcomes related to the national Curriculum in Mathematics and Science and Desirable Outcomes for Nursery Education. 'Advertised' through published articles and available from Homerton College on request - proceeds to Lowenfeld Trust]

Section C Proposed Outcomes

Articles in journals for teachers (e. g. Early Years, Mathematics in School, Primary Science)

Research publication in international journals (e.g. Educational Studies in Mathematics, Education 3-13)

Videotape recordings of activities using Poleidoblocs and accompanying booklet for teacher training and for use in school.

Dissemination through college pre-service and in service courses.

Section D Summary Information

Applicants: Julia Anghileri and Penny Coltman (Project Directors),
Therese Woodcock (consultant)
Research Assistant (to be appointed)
Duration: 12 months from September 1998 to August 1999
Phase 1: Sept 98 - May 99
Phase 2: Jan 99 - August 99
Phase 3: April 99 - August 99

Total Amount Requested:

Phases 1 and 2	
Full time Researcher Grade B	
plus 20% on costs £3392 (12months)	(£19,674)
Supply cover for teachers 20 @ £55 per half day	(£1,100)
*Dissemination/travel/conference attendance	(£1,000)
Materials	(£1,000)
Total	**£22,674**

***Video production £5,000-£10,000 + vat (£11,750)
[*Association of Mathematics Teachers and the Mathematical Association have a joint conference at Easter 1999.

**Video production £5000 - £10,000 +vat £11,7 50 [cost advised by the University of Cambridge video studio]

[*Association of Mathematics Teachers and The Mathematical Association have a joint conference at Easter 1999.
**The cost would cover all aspects of production including filming. Peter Cook of the University video unit suggests that it may well be covered by £5000 + vat but the maximum figure will allow for contingency events]

Homerton College will fund Project Directors and will also provide access to computer facilities, video camera and associated equipment for the research and secretarial support.

About the Project Directors
Dr Anghileri, Head of Mathematics at Homerton College, Cambridge is actively involved in research into children‘s learning of mathematics and has ' numerous published works. She has extensive experience with children and with both pre-service and ln-service teachers. Her recent publications include

-(1994) Daniels H. and Anghileri J. Secondary Mathematics and Special Educational Needs Cassell (review attached)
-(1995) Children's Mathematical Thinking in the Primary Years Cassell

Penny Coltman is senior lecturer in Early Years mathematics, science and design technology at Homerton College, Cambridge.

Until l997 Penny taught at in primary schools and had responsibilities for mathematics and science curriculum. She was a writer with responsibility for Key Stage One materials in the new Longman primary science scheme, Science Connections. Penny also writes regularly for the Child Education magazine.