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## **Leading Educators in Preschools and the First Year of School to Develop Powerful Mathematical Ideas in their Children: Impact on the Numeracy Leaders**

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### **Background**

During 2008 and 2009-2010, the South Australian Department of Education and Children's Services (DECS) commissioned the authors to develop professional education programs in mathematics learning and teaching for educators in preschools and the first year of school. The Early Years Numeracy Pilot Project (EYNPP) was based on earlier research concerning powerful mathematical ideas, an early childhood educator constructed numeracy matrix, pedagogical inquiry questions, and narrative assessment. Central to the inquiry model of professional education used in EYNPP are early childhood educators who are designated as numeracy leaders. These are educators who have been nominated to lead clusters of colleague educators, in many cases including some from their own educational setting, in their professional learning. This paper describes and analyses the impact of EYNPP on the knowledge, skills, confidence and pedagogical approaches of these numeracy leaders.

### **Research Questions**

EYNPP consisted of professional education inputs from the authors and other personnel from DECS for numeracy leaders - five in 2008 (two preschool educators and three teachers in the first years of school) and four in 2009-2010 (one preschool educator and three teachers in the first years of school). These inputs relied on an inquiry approach in which the numeracy leaders were required to work towards the solution of challenges and issues in their clusters in conjunction with the project participants in the clusters (n=60 in 2008 and n=50 in 2009-2010). The numeracy leaders then utilised their learning to work with their colleagues on the development of strategies to provide answers to their pedagogical inquiry questions. The two research questions addressed in this paper are:

- In what ways did involvement in EYNPP change the numeracy leaders' beliefs and practices about how they could develop their children's numeracy? and
- To what extent did the work of the numeracy leaders in their clusters help change the beliefs and practice of their colleague educators?

### **Methods**

EYNPP utilised the notions of powerful mathematical ideas, developmental learning outcomes, numeracy matrix and pedagogical inquiry questions. All of these have been well-documented in earlier work of the authors and others. The numeracy leaders were critical in EYNPP because they were charged with leading the professional development of their colleague educators in the clusters and with distributing efficiently and effectively the key messages from the project. They also provided feedback to the project leaders about how these messages were being received and enacted in the clusters.

Data on the impact of this professional development and participation in EYNPP on the numeracy leaders' mathematics education beliefs and practices were gathered in a variety of ways:

- The pre- and post-project implementation of a schedule on mathematics pedagogy in the early years which had previously been used in Ireland.
- Reports from each of the numeracy leaders about their experiences and those of their cluster colleagues in the project.

- Interviews with the numeracy leaders and with leaders in the schools and preschools involved in the project.

Data on how the numeracy leaders helped change the mathematics education beliefs and practices of the cluster participants were drawn from the same sources along with the material contained in the cluster presentations at the two celebration days in 2008 and 2010.

### **Frame**

Each of the nine numeracy leaders in EYNPP provides the focus for substantive case studies of the impact of the EYNPP professional development on the mathematics beliefs and practices of themselves and their colleague educators. Analysis of the pre- and post implementations of the schedule on mathematics pedagogy for all participants provides evidence of statistically significant change on many items as a result of EYNPP. The responses to this schedule from the numeracy leaders can also be studied and compared with the entire group.

The interviews with the numeracy leaders provided a great deal of insight into the ways in which they coped with the pressure of learning new mathematical and pedagogical approaches; being a leader in numeracy among their peers; and providing leadership in the professional development of these colleagues in inquiry and mathematics education. Interviews with site leaders involved in EYNPP provide another view of the impact of the project and its numeracy leaders on mathematics education in their sites.

### **Research findings**

EYNPP has shown not only how the mathematical beliefs and practices of the numeracy leaders can be enhanced but also how the interaction between the leaders and other cluster participants can lead to significant pedagogical change for all participants. Data from the schedule on mathematics pedagogy showed a strong trend - often statistically significant for individual items - towards a more child-centred, socioconstructivist approach to mathematics learning and teaching. These findings are reinforced by the qualitative data from the interviews, especially those from site leaders who reported on the impact of the numeracy leaders on their staffs and, through them, their children. The key points made by the leaders included:

- the positive impact of the project;
- the high level of professional engagement in the project by participants;
- the outstanding levels of children's mathematical thinking observed and communicated during the project;
- the importance of the numeracy leaders to the success of the project;
- the huge impact of the project in such a short time span; and
- the opportunities provided by the cluster concept, where educators from prior-to-school and school settings could interact at a professional level and build solid positive relationships.

The Early Years Numeracy Pilot Project was an ambitious attempt to develop appreciation of the mathematics potential of young children and the power of their own pedagogical inquiry among preschool and first years of school educators in South Australia. Key players in EYNPP were the numeracy leaders. Data suggest that EYNPP has had a significant impact on the numeracy leaders' beliefs and practices around pedagogical approaches in mathematics learning and that these, in turn have impacted on those of EYNPP participants in each of the project clusters.