The Impact of an Early Number Project on the Professional Development of Teachers

Janette Bobis
University of Western Sydney, Macarthur
and
Peter Gould
NSW Department of Education and Training

This paper reports the findings of an investigation that evaluated the impact of the Early Number Project conducted by the NSW Department of School Education in 1996. It includes information obtained from a questionnaire distributed to all participating classroom teachers. Generally teachers benefited from their involvement in the project both professionally and personally. The classroom-based model of professional development was determined to be a major factor in the success of the project.

An ultimate objective of any professional development program is the enhancement of student learning (Schools Council, 1990). However, a re-occurring criticism of projects intent on change and the professional development of teachers is the lack of concern for such outcomes (Hopkins, 1994). Recent reports concerning the professional development of teachers in Australia, have emphasised the fact that teachers consider the most effective and useful learning occurs within their schools—from their students and other teachers. Until recently, the notion of the school as an educative workplace has been largely ignored by those responsible for the professional development of teachers. This paper reports the findings of an investigation that evaluated the impact on the professional development of teachers during their involvement in an early number project that was based largely in the classroom (Bobis, 1996).

Background to the Study

In 1996 the NSW Department of School Education trialed an early number project (Count Me In) in 13 schools throughout NSW. The aim of the project was to develop the knowledge of K-2 teachers in early number with the ultimate aim of improving young children's mathematical abilities.

The project employed a work-based model of professional development, with mathematics consultants working in classrooms alongside teachers. Exactly how consultants became involved varied from school to school, but basically their role was to assist teachers with the implementation of the learning framework espoused by the Count Me In (CMI) project. Generally, this was achieved by consultants helping teachers assess the mathematical development of children in their class, and by helping them plan and implement developmentally appropriate learning and teaching experiences.

Design and Methodology

Materials and Procedure

Questionnaires: Questionnaires were sent to all teachers participating in the project at the end of term 3. It consisted of two parts. The first part was designed to collect relevant demographic and biographical details about each teacher and their school. It

contained questions pertaining to school district, student population, teacher age range, teacher qualifications, years of experience and the like. The second part contained open-ended questions intended to elicit teachers' perceptions about the program's effectiveness in relation to their professional development and its impact on the learning outcomes of the students in their class.

The questionnaires were distributed by the mathematics consultants, completed anonymously and returned to the researcher by mail to maintain confidentiality of the people involved. Quantitative data was collated and presented in tabular form. Qualitative responses were analysed for emerging themes or categories. Once an initial identification of themes was made, data was further analysed with the help of the qualitative analysis program NUDIST (1994).

Results

Reporting of all responses to open-ended items on the questionnaires will give prominence to the individual voices of the people in question. First, a summary of the demographic and biographical data of participating teachers who responded to the questionnaire will be reported. This will be followed by an analysis of their responses to the open-ended items.

The Questionnaire

Twenty-six questionnaires were returned, representing approximately 70 percent of the total number of teachers involved in the Count Me In Project. A summary of the demographic and biographical data of participating teachers is presented in Table 1.

Findings reported from Part B of the questionnaire were obtained by analysing open-ended responses for patterns and key themes. Four major categories of responses emerged: participation, outcomes, responses and needs. Each of these categories will be discussed briefly.

Participation: Fifteen percent of teachers who responded to the questionnaire indicated that the final decision to participate in CMI was not made entirely by themselves. For these teachers, the final decision was made by the "principal", "other teachers" or by the "entire school" at a staff meeting. Another 11% indicated that their final decision was influenced by the "respect" and admiration they held for the district consultant that introduced the school to the project. The desire for professional development was the most often cited reason for participating in CMI with 65% of teachers indicating that their involvement was an opportunity for "professional development and to strengthen maths teaching skills" in the early childhood years. Generally, teachers thought the project would benefit them professionally by helping their "understanding of maths concepts to increase", by providing them with "ways of extending children" in their classes and by informing them of "how children learn and acquire number skills".

Thirty percent of teachers referred to personal reasons for deciding to participate in CMI. For instance, a number of teachers commented that they found the whole CMI concept "exciting" and were personally "interested in learning about any new programs or teaching strategies". Another teacher considered herself to be "bored" with teaching maths and was hoping to "get my teeth into something" to relieve the boredom.

Table 1 Demographic and biographical details of respondents to teacher questionnaire (n=26)

Category	Details	Percentage
Gender	Female	85.0%
	Male	15.0%
School Size *	100-200 students	11.5%
	201-300 students	23.0%
	301 + students	62.0%
Nature of Population **	High % NESB	19.0%
	High % Aboriginal	12.0%
	Predominantly Anglo Saxon	54.0%
	Low socio-economic	35.0%
	Middle Socio-economic	58.0%
	High Socio-economic	3.8%
Age range (years)	20-30	23.0%
	31-40	38.0%
	41-50	31.0%
	50+	8.0%
Teaching Experience (years)	1-5	8.0%
	6-10	19.0%
	11-15	23.0%
	16-20	38.0%
	21+	12.0%
Current Year Level	Kinder	34.5%
	Year 1	31.0%
	K/1	19.0%
	Yr1/2	11.5%
	K/1/2	4.0%
Years Teaching Current Level	1-3	38.0%
	4-7	31.0%
	7+	31.0%
Highest Level of Teacher Ed *	Diploma of Teaching	38.0%
	Bachelor Degree	38.0%
	Teacher's Certificate	15.0%
	Masters Degree	4.0%
Undertaking Further Teacher Ed	Yes	12.0%
	No	88.0%

* Not all respondents completed this question. ** Some responded to more than one category.

Responses: Teachers recorded their affective responses to most aspects of the project. In particular they considered events, key people and documents. For instance, a number of events that occurred throughout the project triggered mixed reactions amongst the respondents. The initial inservice day was generally viewed negatively, including 20% of respondents who considered "the aim of the project was not clearly outlined nor what was expected of us" and the fact that many found the "new terminology confusing" and too much to absorb in one day. Three teachers indicated that they would "like to re-visit the theory side of the project" now that they more fully

understand its aims and how it was to operate. The second session, however, was viewed much more positively:

> The second session with n...(lecturer's name) was *excellent* - where we viewed videos of children being taught and discussed what they were 'learning' and how they were being 'taught' - but it would have been more useful earlier-on in the program.

The initial and final video taping sessions of the children for assessment was considered "time consuming" and "difficult" by 19% of respondents. Despite this, many of the same respondents also considered the assessment process to be "extremely useful" and "helpful" as it gave teachers "a chance to focus on individuals and assess their growth" and taught them "to focus on the strategies not the answers".

Due to the perceived benefits teachers gained from "professional dialogue" with colleagues, consultants and teachers from other schools, a plea for "more opportunities for schools in the district to get together" with their consultants was a recurring request. Similarly, time spent "sharing knowledge, problems and anecdotes" with their colleagues and teachers from other schools was viewed positively by 35% of respondents, with many expressing the need to extend this contact by arranging for teachers to observe the "successful practices and activities" of others. One teacher suggested that:

> Now that it has been run, I feel the next group would benefit from a teacher explaining the project initially, ...to give a better overall view of how it is run in the classroom.

Other events that teachers found valuable were the opportunities to not only observe math consultants teach, but to observe their own students engaged in learning, thinking and reflection:

> I found it fascinating watching children engaged in lengthy times of thinking and reflection. We gave them the opportunity and time to do this and watched amazed at their concentration.

As an 'event', the Count Me In Project in its entirety, received overwhelming and unconditional support from 81% of respondents:

> It's a great way to inservice teachers. Inservicing is always more powerful when a number of teachers from the same school can benefit from it. Thanks - I've thoroughly enjoyed it and I'm no longer bored.

> An enormous beneficial experience for all involved, especially as an STLD as it was used well with primary children who need a strategy and to be directly taught.

Positive comments about aspects of the project were made by all teachers despite their reasons for participating in the project initially. However, teachers who participated "at the request of the principal" were more likely to have reservations about some elements than those who felt that they needed the "professional development".

The role of key people in the numeracy project was perceived by teachers to be a crucial element. In particular, the "supportive consultant" was viewed by at least 3 teachers as a major determining factor in deciding whether to participate in the project or not. Furthermore, reference to "helpful discussions", "helpful advice from our consultant", the expert knowledge of consultants, and respect for a consultant's

"professional judgement" pervaded responses to almost every question for 31% of respondents. The overarching perception of teachers was that the success of the project depended to a great extent on the consultant - both the relationship they had with them and their expertise was considered important:

> I have a lot of respect for n....'s (consultant's name) professional judgement and I valued n....'s interest in the project. ...It has been a lot of work and involvement, but very worthwhile. I do not believe it could have been successful without the tremendous input we had from n.....

The only negative comment that was made about a consultant indicated that "too many ideas from a very helpful consultant" resulted in 'overload' given the short time frame of the project and that "more time to develop a program of lessons with other participants would have been helpful".

Other people that figured greatly for 35% of teachers responding to the questionnaire were "colleagues" and "teachers from other schools". To a lesser extent, contact with "university lecturers" was also considered invaluable:

> I've learned new strategies from working with n....(consultant's name), and discussing ideas/activities with the other project teachers at other schools and how these activities fit into the learning framework.

> The half day sessions with colleagues and consultants was invaluable when we shared knowledge, problems, interesting happenings in our classrooms and spent some time watching children being assessed on the video.

Thirty-one percent of responses from teachers referred to documents such as the *Mathematics Syllabus K-6* (1989) or to documentation supplied as part of CMI that outlined the project's theoretical perspective and classroom activities supporting the Learning Framework. For example, a number of teachers considered that they had benefited from the "additional reference to the current syllabus" with 23% of the opinion that the Learning Framework gave them "more detail ...than I've learnt from the curriculum":

> Learning about the 'Learning Framework' - I can see/understand where individuals fit in, and therefore what I need to teach them in more detail and more specifically than I've learnt from using the curriculum.

At least two respondents indicated a need for more documentation from the project coordinators in the form of "lessons ...providing a step by step approach from using concrete materials ...to the abstract" or "activities which could be used to support the SENA test".

Outcomes: The final category in which responses fell referred to *outcomes* of the project. This category was by far the largest of those emerging from the data. Teachers referred to outcomes in a number of different areas. For the purposes of analysis of this report it is helpful to subdivide this category into outcomes pertaining to: teacher professional knowledge; attitudinal changes; classroom practice; children's knowledge and skills; and children's affective responses.

Teacher professional knowledge related to comments about content knowledge, knowledge of strategies and of how children learn. Almost all teachers expressed the

notion that they now felt they had a "greater understanding of content and strategies children need and use". The project allowed some teachers to go "beyond what has been seen as 'kindergarten maths'". For those teachers already familiar with the content and strategies presented "..it has refocussed my attention on how to most effectively teach these strategies."

Many teachers felt that their attitude to teaching mathematics had already been quite positive and therefore did not change significantly as a result of their involvement in the project. However, 42% of teachers commented that they were now more "enthusiastic", "confident about teaching mathematics" or no longer "bored" by their teaching of the subject.

All teachers acknowledged that they had made changes to their classroom practice. While some commented on the increased "use of games" or the adoption of a more "hands-on" approach, others considered that they now encouraged "higher levels of thinking" from their children, taught "specific strategies", teach more to the "individual levels" of their children and encourage more discussion in the classroom by allowing "the children to discuss their methods a lot more and to learn from each other".

It was the view of every respondent that the children in their class had benefited by their involvement in the project. Sixty-two percent of teachers felt that the final assessment of the children confirmed their observations that there was increased "understanding of math across all ability groups". With the lower ability children developing "strategies previously undeveloped and higher ability students extended". However, a small number indicated that the less able children did not progress as much as the higher ability children. Thirty percent of respondents commented on the children's increased confidence, enjoyment and enthusiasm to solve problems and use large numbers. Many teachers noted that their students were able to "think", "reflect" and "to talk about maths" as a result of their involvement in the project.

Needs: Almost three-quarters of the teachers responding to the questionnaire considered there were shortcomings of the project. These were often expressed in the form of perceived *needs*. Comments that fell into this category were further divided into the four sub-categories resources, guidance, knowledge and contact. For instance, under the sub-category of resources, the need for more *"time* " to be allocated to almost every aspect of the project was made by 46% of respondents. Some thought that the "program needed to be extended beyond two terms so that the work begun can be continued". In particular, the request was made for additional time to train themselves to conduct the assessment sessions more effectively and that professional assistance be given to help with video-taping the children.

Another perceived need emerged in the form of guidance. Thirty-one percent of respondents expressed the desire for more clearly defined "aims of the project" so that they might know exactly "what was expected" of them. To a lesser extent, teachers indicated a need for more guidance in the form of "specific activities for children at each stage in the Framework", especially at the start of the project. Guidance or clarification was sought on almost every aspect of the project by at least one respondent.

In relation to the need for knowledge, two respondents indicated that they would have liked the opportunity to "re-visit the theory" once the project was established. Others wanted more "expert knowledge sooner" from their consultant .

Finally, the overwhelming positive reaction to contact with colleagues, teachers from other schools, consultants and university lecturers saw respondents wanting more opportunities for "professional dialogue". One teacher suggested that "the half days for planning could be planned with other participating schools to discuss what they are doing and get new ideas".

Summary of Questionnaire Data Findings

In short, a number of findings have emerged from an analysis of the questionnaire data:

1. Generally teachers were positive about the overall outcomes of the project regardless of initial reasons for participating.
2. All teachers acknowledged that they had changed their classroom practice as a result of their participation in the project.
3. All teachers considered that they had gained knowledge relating to content, strategies, how children learn mathematics or that their prior beliefs about these things had been reaffirmed by their involvement in the project.
4. The project was also seen to have a positive impact on other staff members not involved in the project.
5. Teachers found contact with consultants, colleagues and teachers from other schools invaluable for their professional development and requested that more opportunities for this type of professional dialogue be provided.
6. The role of the consultants and the relationships they established with individual teachers was considered crucial to the success of the project.
7. All teachers considered that the project had positive cognitive and/or attitudinal outcomes for the children in their classrooms.
8. Approximately one-third of teachers thought that the aims of the project were not clearly articulated during the initial inservice day and that there was some degree of information 'overload'. However, subsequent meetings were considered more helpful once the project was in progress and teachers were more aware of their roles.
9. Teachers shared similar concerns about time required for certain aspects of the project, namely the video-taping of assessment segments.
10. Teachers requested more guidance or clarification, particularly in the form of documentation, for almost every aspect of the project.

Final Summary and Conclusions

An initial aim of this investigation was to determine the impact of the Early Numeracy Project on teachers. It was evident from questionnaire findings that generally teachers benefited from their involvement in Count Me In, both professionally and personally. Teachers increased their knowledge and understanding of mathematical content, of strategies and of how children learn mathematics. They changed their classroom practices by allowing their students to take more responsibility for their own learning, by providing more discussion time in math lessons and by encouraging their children to be more reflective.

Findings indicate that the classroom-based model of professional development was a major factor in the success of the project. Similarly, the role of the consultants was vital—as mediators between schools, providers of expert knowledge and mentors with whom teachers might engage in professional dialogue. Finally, contact with colleagues, teachers from other schools, consultants and lecturers was seen to be invaluable for all those involved in the project. Hence, providing more collegial group gatherings could be beneficial for the ongoing success of the Count Me In Project.

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