

## COOPERATIVE PROFESSIONAL DEVELOPMENT FOR MATHEMATICS TEACHERS: A CASE STUDY

Steven Nisbet, Griffith University  
Shelley Dole, Queensland University of Technology  
Elizabeth Warren, Australian Catholic University

A project of professional development for mathematics teachers was organised in which teachers were employed as facilitators to lead groups of their peers for professional growth in the area of performance-based assessment and reporting. Although a large number of teachers were recruited for the role of facilitator, a small proportion only actually conducted sessions and stayed on in the role. Insufficient training on the topic itself and the skills for the leadership role beforehand and negligible support during the project were the main reasons for the high drop-out rate. Instances of successful professional development occurred where the teachers already had these skills or received adequate training.

### Introduction

The literature on professional development of teachers includes many studies of programs in which classroom teachers have taken on roles of responsibility such as facilitator and adviser. These programs fall under Glatthorn's (1987) umbrella term of cooperative professional development, which includes the concepts of cooperative development, colleague consultation and peer coaching. Cooperative professional development is a process by which small teams of teachers work together, using a variety of methods and structures for their own professional growth. The objective of cooperative professional development is to facilitate reflection about practice, helping teachers "become more thoughtful decision makers" (p. 143).

One successful program in which teachers assisted other teachers in their professional development was reported by Kent (1985). In that program, teachers were trained to act as advisers and facilitators to their colleagues, in changing classroom practice and improving the quality of learning in their classrooms. There were three major findings reported: (i) facilitators sometimes encountered jealousies of teachers who were not moving into new roles, because of the additional training and teamwork provided for these new roles, (ii) some schools and districts feared losing control of teachers, because the teachers were empowered to become active problem solvers participating in organisational decisions, and (iii) when teachers took on roles other than classroom teaching, they needed additional skills and knowledge to work effectively with adults, implement change and serve as curriculum consultants.

In another cooperative professional development program, it was found (Goodwin & Lieberman, 1985) that although the teachers taking on professional development roles had extensive skill and experience for their normal class teaching roles, much learning was acquired on the job from their new roles in implementing school improvement programs. In a study of *change agents* in urban school improvement programs, Saxl and Miles (1985) documented the general and specific skills identified in change agents (i.e. facilitators). Among the general skills were interpersonal, group-related, content-related and communication skills. More specific skills gained were initiation, rapport-building, task-oriented, educationally-focussed and autonomy-increasing skills.

Another aspect of facilitator-led professional development was highlighted by Guskey and Sparkes (1991) who showed that the effectiveness of professional development is enhanced if teachers had opportunities to share their best practices, trial new ideas in their own classrooms, assess student understanding and bring feedback to the next in-service session to share with colleagues. A study by McLaughlin (1990) indicated that seven particular strategies were effective when applied in a professional development project. Included in the seven strategies were the notions of professional development occurring over an extended period of time, and regular teacher meetings focussing on practical issues related to the topic.

## The case study

*The professional development project*

In 1994, the Queensland Association of Mathematics Teachers (QAMT) received a grant for professional development of mathematics teachers in the area of assessment and reporting. The purpose of the project was to assist mathematics teachers at primary and lower secondary level to implement Student Performance Standards (SPS), the local version of the National Mathematics Profiles (Australian Education Council, 1994), to broaden their assessment and reporting practices, and subsequently to enrich their teaching methodology. Full details of the project can be found in Cooper, Bleicher, Dole, Nisbet and Warren (in preparation).

It was assumed in the organisation of the project (i) that for teachers to change their teaching practice, there was a need to change their knowledge, beliefs and attitudes to new techniques (Clarke & Hollingsworth, 1994), (ii) that beliefs and attitudes change when student outcomes are seen to improve (Berliner, 1986), and (iii) that opportunity should be provided for teachers to reflect on the techniques. Also, it was assumed that successful professional development occurred in peer cooperation situations (Glatthorn, 1987), in which discussion of best practice and sharing of ideas would take place. Hence, the project was built around employing teachers as facilitators.

A complication for the project came as a result of a major review of the Year 1 to 12 school curriculum in Queensland, commissioned by the state government. Among the many recommendations of the report by the review team (Department of Education, Queensland, 1995) was a proposal to appoint 94 educational advisers (EAs) in each of the areas of literacy and numeracy, to assist classroom teachers with the identification of students having difficulties and the correction of these difficulties. The applicants for these positions included many of the teachers targeted as facilitators for the project. The result was a major depletion of the pool of facilitators available to the project.

The project described in this paper can be classified, in Glatthorn's (1987) terminology, as a cooperative professional development program. Classroom teachers and advisory teachers were recruited to take on the role of facilitator for professional development of teachers of Year 1 to 10 classes, in the area of performance-based assessment and reporting, and SPS in particular.

The role of facilitator was seen as crucial in the network of people involved in this professional development project. Key people were nominated in each region of the state to assist in identifying and recruiting classroom teachers and advisory teachers who could act as facilitators for the project. The role of facilitator was to conduct workshops for participating classroom teachers on various aspects of performance-based assessment and reporting, and SPS specifically. Facilitators were expected to offer to conduct workshops in their areas for teachers of all school systems on relevant topics, and after approval by the project officer, prepare and conduct the workshops. A fee of \$50 per hour was paid to facilitators for their seminars and workshops, which took a variety of formats. Some were held during the week, and these usually lasted between 2 and 3 hours. Others were held at weekends, and lasted one or two days. All workshops were conducted out of school hours, due to restrictions imposed by the funding body.

It was envisaged in the initial conceptualisation of the project, that facilitators would not be mere instructors but sharers of their wisdom of practice (Shulman, 1986) in implementing SPS in their own classroom. Ideally, a facilitator would conduct a series of workshops with a group of participating teachers, and over time, the facilitator and the participating teachers would meet to discuss their experiences with the implementation of performance-based assessment and SPS in their own classes and schools.

*Recruitment, training and support for facilitators*

The recruitment of facilitators began during the official project launch, which took the form of a video conference conducted by satellite across 38 centres in Queensland. Also, invitations were issued to all members of QAMT (the professional association in the state) to volunteer as facilitators; key people in each region of the state were invited to nominate classroom and advisory teachers who were seen as potential facilitators.

Just weeks after the project launch, facilitator training events were organised and conducted in Brisbane (the capital and largest centre of the state) and four other regional centres throughout the state. The program for these weekend training events included (i) Background to SPS; (ii) Materials available; (iii) Planning a professional development activity; and (iv) Teaching approaches for mathematics learning. It was planned also that a package of purpose-designed materials to assist facilitators run seminars and workshops be developed and available at the training weekend. However, this did not eventuate.

Just under 300 potential facilitators attended the training weekend in Brisbane, 40 in Townsville, 35 in Cairns, 20 in Rockhampton and 20 in Mt Isa, which made a total of over 400 potential facilitators expressing an active interest in the project at that stage. However within six months of the training seminars, only 48 of the initial volunteers had conducted a course or remained actively interested in being a facilitator.

A suite of in-service training packages were planned for the project, covering topics such as SPS, assessment and reporting techniques, and the implementation of SPS in all the major strands of the mathematics curriculum (Number, Space, Measurement, Chance & Data, and Working Mathematically) at the three school levels of lower primary, upper primary, and lower secondary. However the suite of in-service packages did not eventuate, due to various factors, such as lack of support in the management committee, changes within the Education Department, and later the resignations of the project officer and liaison officer. Only four of the 18 packages were written, and only three published. A Newsletter was started in 1994, but was not kept up during the course of the project. The planned computer-based communication network was not started until late 1995 and was not developed to any extent to be useful to facilitators or teachers.

#### *Courses (workshops/seminars) conducted by facilitators*

A total of 107 professional development events (seminars and workshops) were conducted by facilitators in the first half of 1995. The content of these courses centred mainly on Student Performance Standards (SPS) and its implementation.

A high proportion of the courses conducted contained material of a general and introductory character either about assessment planning and techniques in general or explicitly in terms of the elements of SPS. The remaining courses covered topics that involved problems of making judgments about levels of performance demonstrated in work samples in various strands and SPS implementation issues. The numbers of courses conducted by individual facilitators ranged from 1 to 12. Most facilitators conducted one, two or three courses, and only five facilitators conducted more than four courses.

By the end of Semester 1, 1995 (June 1995), only 10% of the potential facilitators had actually conducted at least one course, and only a handful of others were still interested in the role. The fact that only a small number of facilitators conducted a series of workshops over a period of time with the same participating teachers indicates that this aspect of the project (sharing classroom experiences relating to SPS with a facilitator on a regular basis) was lost in many cases. Approximately half of the events conducted during the project were one-off workshops or seminars, the other half were components of series of two, or more events.

The best examples of series of professional development events occurred in regions outside the metropolitan area. For instance, one key person in a rural area gathered a group of local facilitators (EAs), sought extra training for them and then supervised a program of significant professional development for classroom teachers. In the words of the key person

"We were able to provide extra training for the EAs here because we saw that as part of an on-going commitment. I encouraged them to go to conferences and I lobbied with their co-ordinators that they would be released to go to conferences wherever possible. ... Each of them were then able to pick up the professional development that suited where they were at. I think that's a very important part. ... You have to have on-going support."

Another example of significant professional development occurred in a collaborative writing group which was set up to produce assessment tasks (Dole, Cooper, Nisbet & Warren, 1996). A group of 12 primary teachers were brought together to produce a package of exemplary assessment tasks, rich in their potential to provide data on students'

mathematical understanding and knowledge, and thus link with the national profile as a reporting framework. The group had two facilitators, one of which was a university mathematics education lecturer and the other was a member of the project team. The first facilitator acted in the role of participant observer, and the project's research officer attended the meetings as an observer. Data on the project were collected through fieldnotes based on researchers observations combined with ad hoc group interviews, plus an end of in-service survey to ascertain effect of the program on participants.

The writing team met together four times over a four month period during the school year. Meetings were for the whole day and were organised in a three session format: (1) an opening session where participants discussed assessment issues in the first meeting and shared their experiences in trialing the assessment tasks with other teachers in the second, third and fourth meetings; (2) a second session where the teachers brainstormed new assessment ideas and techniques in small groups in the first, second and third meetings and refined tasks in the last meeting; and (3) a final session in which individuals or dyads planned the trials of the assessment ideas from the second session in the first, second and third meetings and organised final writing and publishing in the final session. This format afforded the opportunity for teachers to share their classroom experiences of trialing new ideas and techniques of assessment with critical friends/colleagues. At the end of the final session, participants completed a feedback survey which covered positive and negative aspects of the program, changes in teaching and assessment practices, attitudes to SPS, support networks, suggestions for improvement, and confidence in running similar programs.

Through involvement in the writing team, it was found that teachers actually guided their own professional development. The writing team situation provided teachers with (i) support, (ii) feedback, (iii) opportunities for reflection; as well as assisting them gain (iv) confidence in using, and (v) knowledge and understanding of, the national profile. The results support the following three conclusions: (1) the collegial support of the collaborative writing process resulted in increased confidence for the participants with respect to teaching and assessment; (2) the collegial feedback from the classroom trials and discussion with other teachers improved the teaching and assessment ideas of the participants; and (3) the reflection encouraged by the process on classroom practice improved the teaching and assessment practices of the participants and improved students' learning outcomes.

#### *Feedback about facilitators' training and support*

Written feedback from the first facilitator training weekend (held in Brisbane) indicated that the majority of the facilitators believed that they did not receive adequate training. Only 19% reported that the training seminars were good overall, while 59% indicated that they believed that they needed further training if they were to become trainers in SPS and related topics. A large proportion (41%) wanted to learn more about performance-based assessment and SPS and the curriculum strands in particular. It was clear from the feedback that the participants believed that they should have been given greater information, training and guidance in the area of conducting workshops and seminars for teachers on these topics. Many would have appreciated receiving support materials such as a facilitator handbook, presentation packages on recommended workshops topics, handouts and overhead transparencies, in order to conduct seminars and workshops. Some predicted that they would probably need to keep contact with other facilitators and receive support from the project team from time to time, in the form of a newsletter, for example. Feedback indicated that the majority of participants left the training weekend with a lack of confidence in being a facilitator, and a need to know more about SPS and workshop presentation method. They were not sure about how the project was going to be organised in their local areas. There was, nonetheless, a positive attitude in most participants that these things could be remedied before they began any seminar or workshop presentations. There was a general feeling of enthusiasm and a positive attitude that this professional development project had the potential to really make a difference in the classroom if facilitators received more training and support during the project.

Following analysis of the feedback from the Brisbane training weekend, it was recommended that the program for the subsequent training events be modified. It was suggested that (i) opportunity be given for participant discussion of their expectations of the

weekend, the project and their involvement, (ii) greater emphasis be given early in the weekend to the essentials of SPS and student-based assessment and reporting, and (iii) other priority sessions be planned on guidelines for workshop presentation, and setting up support networks between facilitators and key people in regions. Because of the short time between the Brisbane training weekend and three of the other four, these changes were not able to be implemented, except for the weekend at Mt. Isa, which occurred much later. Not surprisingly, feedback from the training seminars in Rockhampton, Townsville and Cairns was very similar to that from the initial Brisbane weekend. In particular, the potential facilitators needed greater knowledge of the essentials of SPS, more suggestions on how to implement SPS in mathematics topics in the school syllabus, more training in how to present in-service sessions, and more resources to use in planning and conducting in-service in SPS.

It is significant to note that of the 400 (approximately) teachers who initially had expressed interest in being a facilitator, only 10% went on to conduct a course in first semester 1995 (February to June). A key question was - What happened to the potential facilitators? It was known that some had become numeracy advisers but there was no information about the others. A telephone survey, therefore, was conducted with a large sample of potential facilitators to determine what had happened to them. It revealed that 40% of those interviewed were unsure about being a facilitator, 30% were not interested any more (other commitments or lack of interest in SPS), 20% had taken a new position or had left teaching, and only 10% were willing to continue as facilitators. Of the 40% who were unsure about being a facilitator, many indicated that they might become interested if they received adequate training in SPS and the role of facilitator. Fortunately, a number of teachers who had been appointed as numeracy advisers retained their interest in being a facilitator and conducted courses for the project. In fact, the greater proportion (almost all) of the facilitators who actually conducted courses were Educational Advisers (EAs) or people in positions of responsibility such as heads of department, regional in-service coordinators or university lecturers, or members of the project team. Those who conducted more than three workshops or seminars were all in this category.

By the time a training weekend was held in Mt Isa, the structure of the sessions had been modified taking on board the comments and criticism of the previous events. Hence, the sessions were perceived by the facilitators attending as being more relevant and useful than those conducted at prior events. The majority thought that they received the information than they expected and needed to conduct professional development.

The importance of appropriate training and the positive effect it had on facilitators was noted by the key person from the rural area example quoted above.

"I think the EA positions demonstrate that classroom teachers do make excellent mentors to their colleagues. But, you've got to take them out of the classroom and give them some kind of training and on going support.

### Reflections and implications

The findings of this study confirm a number of the conclusions from published studies of cooperative professional development. These findings relate essentially to drop-off rate and the need for training and support, and are considered firstly in relation to the project overall and then in relation to two successful cases.

#### *Project overall*

The large drop-out rate of facilitators was a significant feature of this professional development project, and should not come as a surprise considering the results of previous studies documented in the literature and the limited extent of preparation of the facilitators in this project. The literature has shown that when teachers take on a role such as facilitator, they need additional skills and knowledge (Kent, 1985), including general skills such as interpersonal, group-related, content-related and communication skills, and more specific skills such as initiation, rapport-building, task-oriented, educationally-focussed and autonomy-increasing skills (Saxl & Miles, 1985). Analysis of the feedback and inspection of the training program agenda, reveals that there was insufficient emphasis on these topics, as well as the target topic, itself, namely SPS. Moreover, it is clear that the training program for

facilitators was too limited in time: clearly, one weekend is too short to prepare teachers for the facilitator role in terms of the recommended skills. Pressure of time on the project team forced a compromise in this regard.

The limited training of facilitators led to very few of them being able to conduct a sustained program of workshops over a period of time. Consequently, the impact of the project on the implementation of SPS and performance-based assessment in Queensland was quite limited. Very few participants took part in a *series* of seminars and workshops, and hence most participants had no opportunity to share their best practices, trial new ideas in their own classrooms, assess student understanding and bring feedback to the next in-service session to share with colleagues, as recommended by Guskey and Sparkes (1991), and to do this at regular meetings over an extended period of time, as recommended by McLaughlin (1990).

#### *Successful cases*

On the positive side, the impact of the project was quite significant in some particular cases. In some areas of the state a number of facilitators, who were also educational advisers (EAs) conducted programs of seminars and workshops, and many teachers participated in a series of events. Feedback from participants showed that these events were worthwhile in assisting teachers learn about SPS and implement performance based assessment and reporting procedures.

In the case from a rural area quoted above, the key person personally recognised the need for facilitator training in SPS itself and in seminar presentation skills, as advocated by Kent (1985). As a result, the facilitators gained much knowledge about performance-based assessment and were in a position to conduct professional development for local teachers. Regular seminars and workshops over an extended period meant that participating teachers benefited from these in-service activities.

In the case of the collaborative writing group, the facilitators were experienced in the role and had appropriate background in assessment in mathematics. The collaborative writing process proved to be successful in providing participants with significant professional development. Factors that were strongly affected throughout the program were the attitude and beliefs of the participants, particularly confidence and self-esteem. Therefore, the program supported the findings of Clarke and Hollingsworth (1994) that changes in teaching practice is preceded by changes in attitudes and beliefs. As well, the program supported the findings of Berliner (1986) that beliefs and attitudes change when student outcomes are seen to improve, and the findings of Guskey and Sparks (1991) that trialing and sharing are crucial for effective in-service.

#### *Find comment*

Overall from this project, it can be said that the potential for significant effect did exist initially with the model of cooperative professional development as it was envisaged with this project, and that it did occur for a limited number of facilitators. These facilitators had, or gained, knowledge about performance-based assessment plus skills in the role of facilitator beyond that of regular classroom teachers. However, the potential was not realised with the majority of volunteers due to the lack of knowledge about performance-based assessment, and lack of confidence, skills and experience in the facilitator role. The project did not adequately deliver the required training program or support material. Hence, the major proportion of potential facilitators did not elect to participate in the project. It can be said that the project did not fulfil the purpose of helping the majority of teachers in the state reflect on their assessment and reporting practices and, in Glathorn's (1987) terms, "become more thoughtful decision makers" in this area of classroom practice. The implications for future programs of professional development are significant in terms of selection, training and support of facilitators.

#### References

- Australian Education Council (1994). *Mathematics - A curriculum profile for Australian Schools*. Carlton, Victoria: Curriculum Corporation.
- Berliner, D. (1986). In pursuit of the expert pedagogue. *Educational Researcher*, 15, 5-13.

- Clarke, D. & Hollingsworth, H. (1994). Reconceptualising teacher change. In G. Bell, B. Wright, N. Leeson & J. Geeke (Eds.), *Challenges in Mathematics Education: Constraints on Construction. Proceedings of the seventeenth Annual Conference of the Mathematics Education Research Group in Australasia (MERGA)* (pp. 153-163). Lismore, NSW: MERGA.
- Cooper, T., Bleicher, R., Dole, S., Nisbet, S., & Warren, E. (in preparation). *Developing assessment and reporting skills: A research report of the QAMT-NPDP Project 1994-96*.
- Dole, S., Cooper, T., Nisbet, S., & Warren, E. (1996). Collaborative team writing of assessment tasks as professional development. *Proceedings of the 19th Annual Conference of the Mathematics Education Research Group in Australasia (MERGA)*. Melbourne: MERGA.
- Glatthorn, A. (1987). Cooperative professional development. Peer-centred options for teacher growth. *Educational Leadership*, 45, 31-35.
- Goodwin, A. & Lieberman, A. (1985). *Effective assister behaviour: What they brought and what they learned*. Paper presented at the annual conference of the American Educational research Association, Chicago, IL (ERIC Document Reproduction Service No. ED 264 354)
- Guskey, T. & Sparks, D. (1991). What to consider when evaluating staff development. *Educational Leadership*, 49(3), 73-76.
- Kent, K. (1985). A successful program of teachers assisting teachers. *Educational Leadership*, 43, 30-33.
- McLaughlin, M. (1990). The Rand change agent study revisited: Teachers' perceptions of and attitudes to change. In F. Furinghetti (Ed.), *Proceedings of the 15th Conference of the International Group for the Psychology of Mathematics Education (Vol 3)*. Assisi, Italy: PME.
- Saxl, E. & Miles, M. (1985). *The real thing: What skills do effective change agents need? Some preliminary findings from the field*. Paper presented at the annual conference of the American Educational Research Association, Chicago, IL (ERIC Document Reproduction Service No. ED 268 630)
- Shulman, L. (1986). Paradigms and research programs in the study of teaching: A contemporary perspective. In M.C. Wittrock (Ed.), *Handbook on research on teaching*. New York: MacMillan.

\* \* \* \* \*

(The authors acknowledge the assistance given by Tom Cooper at QUT in the preparation of this paper.)