Professional development: Whose problem is it anyway?

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Abstract:

This paper describes the processes, outcomes and issues that arose out of activities in three school-based settings that focused on teachers determining their own needs in relation to professional development. Teachers identified areas of need or change on the basis of a needs analysis questionnaire. The questionnaire asked teachers to identify their strengths, weaknesses, opportunities for change and threats against change occurring. Teachers then worked with the three researchers in various ways to promote change in the school setting. The teachers involved were asked to keep a diary, recording observations on the activities that were tried and answering such questions as: Was the activity successful? How could the activity be improved?

The professional development of teachers of mathematics

The professional development of teachers of mathematics is currently becoming an important issue to consider in the discipline of mathematics education (Aichele & Coxford, 1994). Professional development of teachers can be considered in two ways: approaches that derive from teachers' needs and ones that are the result of the agenda of others. In Australia, a common form of inservice for practicing teachers is the one-shot approach. This usually takes the form of one or two-day professional development presentations by experts in mathematics education. Successful outcomes from this type of professional development have been widely questioned (Mousley, 1992). Yet even the most recent Australian developments in inservice activities, for example, MathsWorks (AAMT, 1994) supports unquestionably this problematic approach. Nevertheless, there appears to be some argument for matching various models of inservice to the outcomes of teacher change, for example, training, personal development and systemic restructuring (Clarke & Hollingsworth, 1994).

For teachers wishing to make changes in their local school environments, a process which enables them to take the responsibility for identifying their own inservice needs is a desirable alternative. It would seem logical that the teachers in a school would be the best placed to judge the type of inservice required and the problems or changes that need addressing in their school and with their students. Yet there appears to be few attempts in mathematics education where this process is documented. Where similar projects have been implemented, the process of change has been conceptualised in terms of a *technical* action research paradigm (Grundy, 1982). In this form of research, teachers and researchers act collaboratively to plan an approach to address perceived needs (e.g., Ellerton, Clements, & Skehan, 1989; Miller & Hunt, 1994). The resulting changes are reflected upon by the participants and further action plans are formulated (Kemmis & McTaggart, 1988; Elliot, 1991).

This paper describes the processes, outcomes and issues related to a professional development program for teachers of mathematics working within a practical action research paradigm, that enabled teachers to identify their

own agenda for change. The types of problems, the action taken and observations made at each setting will be described separately. However, issues and commonalities were identified and will be addressed in the concluding discussion.

Research settings

The research was carried out in three different settings involving state and private primary schools in urban and country areas. Each author was involved in one of the settings.

Setting 1: One metropolitan primary school

This setting consisted of a small group of volunteer teachers at a Perth metropolitan primary school. Mathematical activities were carried out with two Year 5 classes at the school. The motivation for change appeared to arise from the concerns of teachers about the poor performance of students on tests given across the school. These pencil-and-paper tests were developed by the teachers to measure children's ability to calculate change in money transactions. Because of the poor results teachers saw a need to make changes to their mathematics program.

Setting 2: Three metropolitan schools

Three metropolitan schools, two in the State system and one in the Catholic education system, ranging in size from eight to twenty five classes were involved in this setting. Each school focused their concerns on the Western Australian Student Outcome Statements. Within each school were two coordinator teachers who liaised between the school and the researcher.

Setting 3: Two rural primary schools

These two primary schools were quite diverse. One had a staff of 25 teachers, the other had only 5 including part-time teachers. The smaller school wished to examine the *working mathematically* section of the student outcome statements while the larger school concentrated on the *mental computation* aspects of the number strand. The push for *working mathematically* came from the principal of the smaller school who was interested in improving problem solving with his upper primary class. Similarly the deputy principal at the larger primary school was very keen to work on *mental computation*.

Steps in the research

In general, the research at each setting followed these steps:

- An initial request was made by the school to be involved in professional development
- An initial meeting between staff and researchers was held to set the parameters for the project
- School staff identified their problems and priorities
- A mutually agreeable approach was planned
- The plan was carried out
- The participants reflected on the success of the approach
- A decision was made on how next to proceed.

An approach for identifying teachers needs was common to the three settings and involved teachers completing a needs analysis (SWOT analysis) (see below). Teachers were asked to identify, in relation to their mathematics program, the strengths, weaknesses, opportunities for change and threats against change occurring. For schools in Settings 2 and 3, this initial analysis had to be considered in the context of the Student Outcome Statements for Western Australian schools.

SWOT Analysis

	My Mathematics Program
Strengths	
Weaknesses	
Opportunities	
Threats	

Results of SWOT analysis

Setting 1: One metropolitan primary school

On the initiation of the school mathematics committee, an after-school meeting was held for staff interested in making changes and improvements in their mathematics program. Attendance was voluntary and 7 teachers attended including the principal. After an informal discussion, staff were asked to identify changes to their mathematics programs by completing the SWOT analysis. The concerns that were raised were summarised by one of the teachers who took notes of the meeting. One Year 2 teacher was concerned about enabling students to achieve mastery of tables facts. A pre-primary teacher was interested in developing peer group interactions. A Year 6 teacher was interested in investigating approaches to assist students make links between concrete experiences and abstract mathematics. Two Year 5 teachers were deeply concerned about their abilities to teach meaningfully the concepts of volume and capacity. Teachers identified threats such as the lack of appropriate working areas for hands-on activity, the need for support staff, timetable constraints and syllabus pressures.

Setting 2: Three metropolitan schools

In these schools most teachers identified a lack of knowledge of student outcome statement and this provided the first area for focus. Threats were seen to be a lack of time to understand the new material, overload of new ideas following the *First Steps* initiatives in language teaching, a reluctance and negativity due to not being consulted about the application to join the project. In consultation with the school coordinators it was decided to seek staff approval to focus on a small part of the outcome statements. School one adopted the mental computation substrand, school two problem solving and school three estimation in measurement. These were either the main thrust of the school management plan or an area of perceived weakness.

Setting 3: Two rural primary schools

Teachers' interpretation of what constituted weaknesses, opportunities and threats varied considerably. For strengths, teachers noted topics that they felt they had taught well or approaches they had used, for example, language-based approaches. Weaknesses tended to focus on a lack of resources, time and specific topics such as fractions or calculators. One respondent mentioned recording as a weakness. When it came to opportunities a large number of respondents left this section blank. Others referred to the need for inservicing on specific topics referred to in the weakness section. One respondent recognised the value of having some time to reflect on teaching. Most threats referred to an increase in work load. A number of teachers also mentioned a lack of resources and time.

Taking action

Setting 1: One metropolitan primary school

It was agreed at the initial meeting that a plan of action would take place with two Year 5 teachers who felt that they would like to incorporate different approaches in their teaching of volume and capacity. Initially the researcher involved spent time in the two classes observing the current approaches used by the teachers and getting a feel for the abilities of the students and the general

classroom and school culture. Both were experienced teachers and had their students working with materials and in groups. The teachers both felt that they would benefit most by asking the researcher to model teaching approaches with their class. Consequently, the researcher prepared and gave two lessons on volume and capacity to the combined classes. The first lesson consisted of making different shapes with 4 cubes and drawing these on grid paper. The second lesson involved students using balloons and the displacement of water to determine the volume of air each child breathed during the day. Teachers agreed to use similar activities and problems in between these lessons and with follow-up lessons and to record their reflections on the activities.

Setting 2: Three metropolitan schools

School coordinators in consultation with the researcher devised and conducted activities to familiarise teachers with the outcome statements. For example, this involved analysing students' work samples and matching these to outcome levels. Meetings were held to evaluate the process. Follow-up activities were designed and implemented. In addition, teachers identified other areas for professional development in particular, mental mathematics, problem solving strategies and estimation. Teachers then undertook work in their classrooms analysing children's responses in relation to the student outcome statements.

Setting 3: Two rural primary schools

Teachers in the larger country school collected a number of mental computation activities currently in use by staff across the school. Additional activities were provided by the researcher. Activities were classified according to student outcomes and then trialed across the school. Adaptations were made as a result of trialing - especially for children in the junior primary area. Modifications to activities were made by the two key teachers and researcher based on the feedback made by participating teachers. A booklet was produced and given to all teachers on the staff regardless of their support for the project. The smaller school adopted a different approach. Sample tasks were taken from the working mathematically section of the student outcome statements and were given to students in the school. Work samples were brought to fortnightly meetings and the group discussed the results. As teachers grew in confidence the work samples were included as part of the assessment portfolios of children in the school.

Reflections on action

During the time that the action plans were being carried out coordinating teachers kept minutes of meetings and classroom teachers were asked to record their observations of the results in a diary which contained the following directions:

During the time you are making changes in your mathematics classroom we would like to keep a record of the successes and failures that occur. This diary will help us to reflect on those changes and may help to assist others who attempt similar approaches. It would help if you record the following information:

1. Date
2. Classroom activity
3. Result of the activity
   - was the activity successful. Why?
   - was the activity unsuccessful. Why?
   - how could the activity be improved?
4. Any other comments

Meetings and other situations: Your reflections and thoughts on other situations to do with the project will also provide useful data. You might, for example, record:

- your feelings
- your role and contributions
- the interactions of others
- how you feel the project is progressing
- how things are impacting on your classroom

Please note that all information contained in the diary will be treated confidentially being available only to yourself and the project facilitator. Any use of the material contained in your diary will be anonymous and subject to your comment.

Thank you for your contributions.

Setting 1: One metropolitan primary school

Since the lessons were taught at the end of the day the teachers involved were happy to remain after school and discuss the activity. One teacher expressed the view that she did similar activities with her students but she was not sure what the students were learning. She also admitted that she felt pressured from the school administration and upper school teachers to make sure the students were learning content. She was concerned that the tests used throughout the school did not measure the outcomes from these type of activities and that more credibility should be given to alternative assessment procedures such as work samples. The other teacher agreed that the lessons had been worthwhile but were a 'bit messy'. Both teachers agreed to write about the lessons in their diary and to reflect on follow-up lessons. Only one of the teachers was able to carry out this task.

Setting 2: Three metropolitan schools

In all schools, common elements included a gain from the professional development input as more teachers were actually using similar style activities in their classrooms. Insights were gained in the process of allocating students to outcome statement levels. Work samples often provided surprise in relation to perceived abilities of children. Difficulties were experienced by the coordinator teachers in adopting the role of professional developer, as they had no training or experience in this situation. The informal use of the reflective diary was not successful, however, the use of minutes kept the project moving and clearly identified the roles and activities to be undertaken.

Setting 3: Two rural primary schools

The two approaches of keeping a diary and holding fortnightly meetings, each have their own problems but it was quite clear that more useful data was collected from the fortnightly meeting format. Teachers often blamed their busy schedule for not completing diary entries. Many of the comments made were of an anecdotal nature about student behaviour rather than about the activity or their own teaching performance. The fortnightly meetings were more effective because the comments of one teacher would trigger comments from others.

These sessions also gave teachers the time to reflect and problem solve. Modifications to teaching practice were often suggested. All the comments were of a supportive nature and the staff began to develop a general feeling camaraderie.

Common issues

A number of common issues that arose across the three settings are discussed below. They appear important to consider in the implementation and continuation of action research projects along the lines of the ones described in this paper.

Roles of participants

The researchers: For the majority of the participants this was a new format in which to work. All previous teacher experiences had seen the researcher in the role of the expert, the giver-out of knowledge and the leader of the interactions. Initially participants found this new role somewhat uncomfortable and there was an initial reluctance to decide upon areas for investigation. Other participants saw the researcher as a resource as someone to use and to seek advice. Some teachers across the three settings saw the researcher as a critical friend willing to discuss and reflect on shared experiences. For many teachers the researcher was also seen as the driving force for the continuation of the project.

Coordinator teachers : As a key person in the school, the role in each setting was a vital one. This involved liaison between teachers, principal and researcher and in some cases providing another resource of professional development which involved helping other members of staff come to terms with new information and ways of working. This is a similar role to the one outlined by Ellerton, Clements and Skehan (1989) where such a role provides a sense of ownership by the school.

Classroom teachers : From the point of view of the researchers, the classroom teachers who volunteered to be involved in the project were enthusiastic and willing to make changes to their normal routine. It was felt that working with teachers who had chosen to be involved was far more productive that simply providing professional development for a school staff where many might not have sufficient interest or motivation for involvement

Principal: This was a pivotal role in each setting and the one which held the balance between success and failure of each project. A major part of the principal's role was to provide support for resolving problems over issues such as teacher release time and time for meetings. Projects where the principal took an active interest in the projects rather than one of delegation were more stable in their progression.

Time commitment

The importance of time is critical in planning any inservice activity (Sturgess, 1988). Clearly, for many teachers, the commitment to begin thinking about their own teaching and trying out new approaches demanded time that for many was on top of their already heavy work commitments. For many teachers there was a strongly-felt pressure that they already had so much to cover in the overcrowded syllabus that they could not find time to think about or fit in any more.

Meetings to discuss progress often met with varying success. Those held early in the morning, before the school day were beset with interruptions, and participants were concerned with what would be happening at their first class rather than giving their concentration to the project. Those held after school with a definite close were more successful. Innovative ways of working and finding time were found and put into operation. In some settings, teachers were released by the use of casual staff, non-teaching time was reorganised where necessary, and substantial blocks of time for discussion and teaching established.

Communication

For action research to take place in a school, many forms of communication need to be fostered and developed, for example,

communication between researchers, teachers, administrators, and in some cases between parents and students. The use of a needs analysis questionnaire and diaries for reflection not only require a time commitment but also a willingness to commit one's ideas for public scrutiny. In particular, teachers found the process of communicating strengths, weaknesses, opportunities and threats using the SWOT questionnaire extremely difficult. Perhaps this was because they had been given very little opportunity to express an opinion in the past. It would possibly be a good idea to model the process with teachers prior to asking them to complete a SWOT analysis because unfortunately the process of completing a SWOT may restrict the amount of valuable information received.

While these procedures are clearly beneficial, many of the true feelings of participants in the research were revealed often through formal and informal discussion. The recording of these interactions by the researcher provided valuable insights on the success of the project. Communication of the outcomes of the project is also a valuable exercise for participants to enable other teachers with similar concerns to become aware that they are not alone.

Conclusion

The success of the action programs described in this paper can be judged in many ways. The responses from teachers suggest that there are immediate benefits to be made. For longer-term change to occur commitment needs to be continued - both by teachers and researchers. In the present climate in Western Australia the factors that militate against such commitment are strong. Not least of which is the industrial action that appears long term and endemic but also the continuing beliefs by many in educational bureaucracies that teachers are not the best people to judge what are the important changes to be made in teaching school mathematics.

It might be salutary to reflect on David Sturgess' (1988, p.45) belief in relation to teachers' professional growth: 'You can not change anyone else, you can only change yourself.' However, the processes to enable this to happen are open to many influences. For these influences to be positive, greater support structures need to be considered within schools and within school systems.

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