

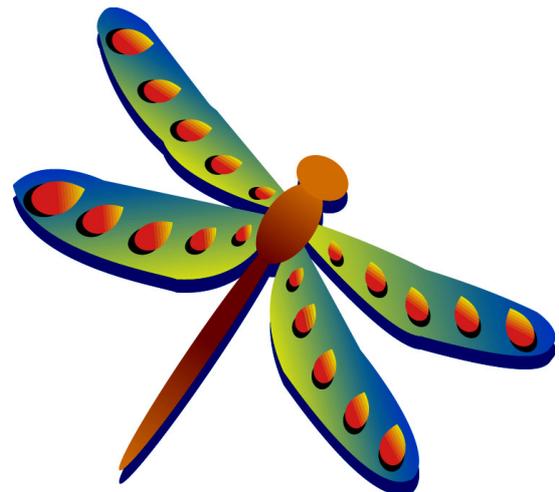
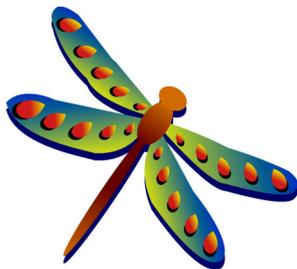


## Lesson study project

An educational research project conducted by the  
NSW Department of Education and Training  
Professional Support and Curriculum Directorate

# Evaluation report

2003



Evaluation conducted by  
University of Western Sydney  
Mathematics Education Research Team  
Dr A L White & Assoc Prof B Southwell



Professional Support and Curriculum Directorate

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## Executive summary

The *Lesson study* project is a statewide government secondary schools initiative conducted by the Professional Support and Curriculum Directorate of the NSW Department of Education and Training. *Lesson study* is a Commonwealth funded project that began in July 2001.

The key personnel involved are Mr Peter Gould, the Chief Education Officer of Mathematics, Ms Diane McPhail, Principal Education Officer Numeracy and the Project Officer, Mr Ray MacArthur.

*Lesson study* is a model of professional development designed to assist teachers produce quality lesson plans and gain a better understanding of student learning in mathematics Years 7 to 12. The process involves a small group of volunteer teachers as a *Lesson study* team (3 or 4 secondary mathematics teachers), who meet regularly to plan, design, implement, evaluate and refine lessons for a unit of work. The lessons may be sequential within a chosen topic, or target specific focus areas within the topic.

In Semester 2, 2001 a Trial Phase was conducted using a sample of three secondary schools, involving a total of twelve teachers (four per school). Phase One began in March 2002 and ended in June 2002. It involved 36 schools and over 100 teachers. Phase Two began in August 2002 and ended in November 2002. It involved 45 government secondary schools. The Mathematics Education Research Team from the University of Western Sydney began the evaluation of the project in March 2002.

The data collected have been organised according to the five critical levels of professional development evaluation (Guskey, 2000, p. 82). They are:

1. participants' reaction
2. participants' learning
3. organisational support and change
4. participants' use of new knowledge and skills
5. student learning outcomes.

The conclusion arising from the evaluation data was that the *Lesson study* program was a success on all five levels. From the very beginning, early expectations of the *Lesson study* process were positive and there was a confidence expressed in the program's ability to enhance student learning outcomes. As a result of experiencing the program, teachers continued to express high levels of satisfaction of *Lesson study* as a program for teacher professional development and as a process for improving the teaching and learning of mathematics within secondary schools. As a result of the program, teachers reported developing a *Lesson study mentality* that allowed them to apply the skills and knowledge they had acquired to their daily teaching. The process provided a meaningful context for non-threatening lesson observation and the development of greater collaboration and sharing among the



team and with the wider mathematics staff. The team members formed a professional relationship that remained after the completion of the program. Many teams expressed confidence and the motivation to continue the program without the provision of support. The lessons developed were enthusiastically received by the students and resulted in higher learning outcomes and the improvement of student motivation, engagement and attitude towards mathematics.

There were anticipated difficulties that were realised during the process. These difficulties involved: time constraints; finding suitable meeting times; getting other staff to be involved and enthusiastic about the project; fears of staff being reluctant to try new strategies and being reluctant to share; finding suitable mathematics casual replacements, and teachers seeing the project as another imposition on their already crowded day. This report has made recommendations that addressed these and other reported issues.

In summary the *Lesson study* program was recognised by teachers as a powerful process for guiding them towards new practices and dispositions. The program united an examination of practice with commonly accepted features of quality teaching and learning to create a well-defined and structured process. The core of the *Lesson study* program involved working on focus lessons, a process which was natural, useful and easily sustainable by teachers. The program provided a comfortable forum for teachers to challenge ideas about their practice and the content that they taught. The program provided opportunities for the system to learn from its own experience and fitted comfortably into the secondary school structure. The program was efficiently and effectively supported by the project officer.

There are a number of recommendations that arose as a result of the evaluation process and they overwhelmingly focus on ways of supporting and improving the continuation of the current process. Thus the primary recommendation was that the *Lesson study* program be continued as a voluntary program to meet the professional development needs of government secondary mathematics teachers and as a process to improve the teaching and learning of mathematics in secondary schools.



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## Program description

### Background

The *Lesson study* project is a statewide public secondary schools initiative conducted by the Professional Support and Curriculum Directorate of the NSW Department of Education and Training. *Lesson study* is a Commonwealth funded project beginning in July 2001.

The key personnel involved are Mr Peter Gould, the CEO of Mathematics, Ms Diane McPhail, PEO Numeracy and the Project Officer, Mr Ray MacArthur. Mr MacArthur was appointed at the end of July 2001, and began a trial using a sample of three secondary schools. A total of twelve teachers (four per school) were involved in the Trial Phase.

In March 2002, the project launch was conducted in Sydney with representatives from 36 NSW government secondary schools. During the Launchday these team leaders received a package containing organisational and support material prepared by the project officer. These schools completed their project at the end of June and over one hundred teachers were involved in the program. This group comprised Phase One of the evaluation.

Also in March 2002 the Mathematics Education Research Team from the University of Western Sydney were appointed to evaluate the project.

A second group began in August 2002, involving another 45 schools scattered across the state. Because of the increased size of the group, the project managers and the project officer planned and produced a video presentation for distribution to the *Lesson study* team leaders. Each team leader and school received a package and the video although some initial production difficulties caused a minor delay in the distribution. Another video containing six lessons from the Third International Mathematics and Science Study (TIMSS) was available through each district mathematics consultant. This group consisted of over two hundred teachers and comprised Phase Two of the project and the evaluation.

### Brief theoretical position

One of the issues raised by the TIMSS and the repeat study (TIMSS-R) was that student learning was not likely to improve markedly until teachers were given the opportunity and the support to further develop and increase the effectiveness of their skills (Lokan, Ford & Greenwood, 1996; Martin & Mullis, 2000; U.S. Department of Education, 2001). About 46 nations participated in TIMSS and about 38 nations participated in TIMSS-R. In response to this and other concerns, the NSW Department of Education and Training initiated a trial project called *Lesson study* as part of the Quality Teaching Program (QTP). The QTP is a three-year Commonwealth funded initiative designed to enhance the quality and status of teaching throughout Australian schools.



The *Lesson study* program is a model of professional development designed to assist teachers produce quality lesson plans and gain a better understanding of student learning in mathematics Years 7 to 12. The *Lesson study* program belongs to a tradition of teacher professional development that concentrates upon an examination of practice either through direct observation or through classroom artefacts and case studies (Hollingsworth, 2002; Lampert & Ball, 1998; Rowley & Hart, 2000; Seidel, 1998; Stigler, Gallimore, & Hiebert, 2000). It assumes that teacher learning and development will be more meaningful and effective if it is embedded in their everyday work, or that of their colleagues (Lieberman, 1996).

The process involves a small group of teachers as a *Lesson study* team (3 or 4 secondary mathematics teachers), who meet regularly to plan, design, implement, evaluate and refine lessons for a unit of work. The lessons may be sequential with a chosen topic, or target specific focus areas within the topic.

The *Lesson study* team uses the following process to develop their study lessons:

1. Define the learning goals for the lesson study and plan each lesson.
2. Teach the lesson.
3. Reflect, evaluate and refine the lesson.
4. Teach the refined lesson.
5. Repeat steps 1 to 4 as required to improve the lesson.

The aims of the project are to promote a process whereby teachers experience gradual and incremental professional growth through the collaborative development of lessons. Teachers and schools are able to build a bank of valuable resources that can enrich teaching and learning programs and be shared with other teachers undertaking a *Lesson study* project. It is possible that reports could be published on the Internet in order to provide models and ideas for other teams. However, *Lesson study* is not aimed at producing a library of tried and tested lessons but is more concerned with engaging teachers in the process of planning, teaching, observing, discussing, and reflecting upon the lessons.

The *Lesson study* program closely satisfies the key principles for effective professional development of mathematics teachers arising from the research literature (Clarke, 1994, p. 38), because it:

1. Addresses issues of concern and interest, largely (but not exclusively) identified by the teachers themselves, and involves a degree of choice for participants.
2. Involves groups of teachers rather than individuals from a number of schools, and enlists the support of the school and district administration, students, parents, and the broader school community.
3. Recognises and addresses the many impediments to teachers' growth at the individual, school and district level.



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4. Uses teachers as participants in classroom activities or students in real situations, modelling desired classroom approaches during in-service sessions to project a clearer vision of the proposed changes.
  5. Solicits teachers' conscious commitment to participate actively in the professional development sessions and to undertake required readings and classroom tasks, appropriately adapted for their own classroom.
  6. Recognises that changes in teachers' beliefs about teaching and learning are derived largely from classroom practice; as a result, such changes will follow the opportunity to validate, through observing positive student learning, information supplied by professional development programs.
  7. Allows time and opportunities for planning, reflection and feedback in order to report successes and failures to the group, to share "the wisdom of practice", and to discuss problems and solutions regarding individual students and new teaching approaches.
  8. Enables participating teachers to gain a substantial degree of ownership by their involvement in decision-making and by being regarded as true partners in the change process.
  9. Recognises that change is a gradual, difficult, and often painful process, and affords opportunities for ongoing support from peers and critical friends.
  10. Encourages participants to set further goals for their professional growth.

There are other such collections of good principles for teacher professional development and three such examples have been included in the appendixes. For information regarding the appendixes, contact Dr A.L. White at [al.white@uws.edu.au](mailto:al.white@uws.edu.au)

They all resonate strongly with Clarke's (1994) list and the principles of *Lesson study* (Stigler, & Hiebert, 1999) which can be summarised as:

1. Based on a long-term continuous improvement model where change is incremental.
2. Maintains constant focus on student learning.
3. Focuses on direct improvement of teaching (not on the teacher).
4. Makes improvement in context.
5. Is collaborative where improvement is the work of the teacher. Teacher develops perception of contributing to the development of knowledge as well as their own professional development.
6. Builds a system that can learn from its own experience. It develops the teacher, develops knowledge, and is able to be shared.



## Evaluation design and procedures

This research study was undertaken to evaluate the effectiveness of the teacher professional development program *Lesson Study*. It sought to gather and analyse data that would inform and be beneficial to the education authorities and other stakeholders. The study used a framework proposed by Guskey (2000) to guide the compilation of data via a variety of means. The data collection techniques of case studies, interviews and surveys were included to enhance the internal validity of the study by providing a triangulation of sources. These techniques were selected in order to gather data from a wide range of teachers as well as examining some teachers' experiences in greater depth. The details of how this research process was conducted are as follows.

### Evaluation timeline

The interviews were conducted later in the year in order to make best use of the data from the end of project questionnaire.

YEAR AND PHASE	PERIOD	EVENT
2001: Trial Phase	Semester 2	Three schools trial the project.
2002: Phase 1		Research involving 36 schools.
	7 March	Project Launchday. Questionnaire of Launchday perceptions and expectations. QTP <sup>1</sup> survey.
	June	QTP survey. Questionnaire of all participants at end of project.
	July	Interim report.
	August	Interviews of 2002 and 2001 participants and Head Teachers.
	November	Follow-up questionnaire of all participants at end of semester

<sup>1</sup> Quality Teacher Program



2002: Phase 2		Research involving 45 schools.
	November	Questionnaire of all participants at end of Semester 2.
	December	Further interviews.
2003	January	Head Teacher interviews.
	February	Final Report.

## Instruments

It was decided to use a range of strategies to collect data for the evaluation, such as questionnaires, case studies and structured open-ended interviews.

EVALUATION FOCUS	DATA SOURCE
Participants' reactions	QTP surveys Questionnaires
Participants' learning	QTP surveys Questionnaires Interviews
Organisation support and change	Questionnaires Interviews
Participants' use of new knowledge	QTP surveys Questionnaires Interviews
Student learning outcomes	Questionnaires Interviews



The QTP Surveys are the standard evaluation form completed at the end of the project by participants. As these data were available, it was decided to include this data and to adapt the other instruments around these surveys. This was done to avoid the duplication of questions that annoy and frustrate participants, resulting in a higher degree of non-compliance. Unfortunately, the follow-up survey for Phase One coincided with another QTP survey. This duplication of surveys may have caused the reduced return rate.

The questionnaires were designed with a range of closed questions scored on a four or five point Likert scale and open-ended questions which invited a sentence response to cover each of the five critical levels of professional development proposed by Guskey (2000). The questions involved with teacher learning tended to be closely linked with the principles of the *Lesson Study* project (Guskey, 2000, p. 83). However, efforts were made to gather material outside the range defined by these principles. Questions were framed around the responses from open-ended questions and were included in later instruments to determine the degree of consensus among the participants. All questions were discussed with teachers before and after survey completion to address concerns of descriptive and interpretative validity "if we start from the same perspective, sharing a language and so on, we will tend to describe/interpret things in basically the same ways" (Denzin & Lincoln, 2000, p. 883). The teachers were encouraged to leave blank responses to questions that were not applicable. The follow-up questionnaire was distributed in order to capture those insights that clarified as a result of the delayed reflection of the teacher.

Telephone interviews were conducted with teachers, team leaders and Head Teachers of mathematics because of convenience given the geographic spread of teachers and schools and because of the demonstrated advantages of this approach in facilitating thought and reflection (see Dinham, 1994).

The instruments with a summary of the data collected can be found in appendixes.

## Analysis

The method used in the analysis of data used elements from grounded theory (Strauss & Corbin, 1990) and that of content analysis, although a full application of the technique did not occur due to the exploratory nature of the evaluation. Both quantitative and qualitative analysis were used and are desirable because neither on its own yields as much information as they do together (Cant, 1997).



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## Evaluation results

The data collected has been organised and reported according to the five critical levels of professional development evaluation proposed by Guskey (2000, p. 82). They are:

1. participants' reaction
2. participants' learning
3. organisational support and change
4. participants' use of new knowledge and skills
5. student learning outcomes.

The higher the level in this scale the more difficult it is to measure. It is often the reason that many evaluation reports only gather data at level one. Within each level the data will be organised into the three sample groups involved in the study: Trial Phase; Phase One; and Phase Two.

It is necessary to sound a note of caution concerning some of the data used in this study. Firstly the size of the trial group was very small. Secondly the response rate was low for the follow-up survey for the Phase One teachers. It was expected that the rate would be lower than the earlier response rate for the completion of project survey due to the six month interval between completion of project and the survey.

However the arrival of a follow-up QTP survey at the same time as the follow-up survey could have contributed to a further lowering of the response rate. The follow-up response sample was dominated by team leaders (72%) who perhaps felt more obligated to respond and were more committed to the success of the project.

Three brief snapshots of schools involved in the *Lesson study* program have been interspersed within the report and are presented as a summary of some of the interview data. These brief descriptions will provide a setting and a framework to be enhanced and enlarged by the following results section. The descriptive information was gathered during a series of interviews with participants in the *Lesson study* program who volunteered and the first is presented below. The descriptions are general in order to protect the identity of both the school and the participants.

Another feature of reporting these data is the inclusion of teachers' comments, anecdotes and testimonials.

From a methodological perspective, they are a poor source of data. They are typically biased and highly subjective. They may be inconsistent and unreliable. Nevertheless, they are a personalised form of information that can be powerful and convincing. And as any trial attorney will tell you, they offer the kind of evidence that most people believe. (Guskey & Sparks, 1996, pp. 87–88).



## Snapshot One

### Country central school

This small country central school is situated in a town of approximately four thousand people. The school population consists of students drawn in approximately equal amounts from the town and the surrounding farming community. It is a K–12 school with all students housed on the one site. There is considerable interaction between primary and secondary teachers and there is a modified middle-school plan operating for some subjects in Years 5–8.

The secondary mathematics staff consists of five teachers and one Head Teacher. Four of the five teachers are due for retirement in two to three years. The other teacher has had four years teaching experience and all of it at this school. The Head Teacher is newly appointed to the school and this is his first appointment as a Head Teacher. In Year 8, grading of classes begins in mathematics which means that all Year 8 classes are on the timetable at the same time. The members of the mathematics staff are able to cover all the mathematics taught in the secondary school.

During the interviews with the Head Teacher, he stressed that the staff were hard working and concerned about the welfare of their students. He discussed his frustration in wanting to further motivate his staff and reorganise the department, which in his opinion was a little run down and with the tendency of some staff to coast to retirement rather than consider alternative programs. The previous Head Teacher had retired and had let the department drift along. However if he was to initiate change, there was the prospect of any major efforts being lost in a couple of years when staff retired. The Head Teacher volunteered his school to participate in the *Lesson study* program because he was attracted by the offer of funding. He saw this as a way of purchasing some desperately needed resources and intended to cover the relief internally. He admitted that he was not confident at the beginning that the program would make a difference.

The *Lesson study* team consisted of two older teachers and the younger teacher with the Head teacher acting as an adviser. They decided to concentrate on one Year group incorporating the use of technology. One mathematics class for each Year was scheduled in the computer room every week. An internal swap was arranged between the mathematics teachers if another parallel mathematics class wished to use the room. The Head Teacher said that this was the only way that he could ensure that mathematics got a chance to use the computer room because of the demand from other subjects.

The Head Teacher said that the *Lesson study* program was a success and that he would use it again. He said that he was applying for funding in all sorts of ways. He felt that the program provided a context through which he could generate enthusiasm and initiate change. He listed as the main strengths of the program: firstly, the classroom observation; secondly, the forming of a special relationship among the team members that flows beyond the actual focus lessons; and thirdly, the change in the discussion in the staffroom.



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He said that before the program, if he had asked to observe a class, the immediate reaction would have been the reply, ‘What for?’ If he then replied with something about improving the teaching or the lesson then there is a judgement implied in this and the reaction would probably be defensive and hostile. Yet it wasn’t an issue with the *Lesson study* program. In fact the older teachers seemed to take greater pleasure from the visits than was expected, seeming to enjoy the chance to demonstrate their craft.

The special relationship formed between the older teachers and the younger teacher has been very beneficial. There was more of a common purpose and a greater sharing of ideas and material, and this flowed over into the conversations in the staffroom. Thus the other staff were drawn in. There was much more discussion of teaching and ideas for the classroom. The Head Teacher was keen to repeat the program next year involving the other two teachers. They were happy to participate. He agreed that it was possible to run the project without funding, but this placed an extra strain upon the goodwill of the staff. However, the chance of it continuing without funding was greater after the school had first experienced the *Lesson study* program.

## Participants’ reactions

A common feature of most evaluation studies is that information on participants’ reactions is generally gathered through questionnaires handed out at the end of a session or activity. While these:

*measures of participants’ reactions are sometimes referred to as “happiness quotients” by those who insist that they measure only the entertainment value of an activity, not its quality or worth.*

There are others who would argue that:

*measuring participants’ initial satisfaction with the experience provides information that can help improve the design and delivery of programs or activities in valid ways. In addition, positive reactions from participants are usually a necessary prerequisite to higher level evaluation results (Guskey, 2000, p. 82).*

While participants’ reactions will be reported for all groups, the Phase One group is in a unique position. The members of this group were surveyed at the completion of the project and six months later, while the team leaders were also surveyed earlier at the Launchday.

### *Trial Phase*

Upon completion of the trial phase program, the 12 teachers were asked to indicate their *satisfaction* with the project on a five-point Likert scale with endpoints of low to high. A total of 11 teachers registered positive satisfaction, with 7 (58%) of the teachers recording high satisfaction. There was one teacher who remained undecided.



## Phase One

In the survey conducted at the Launchday in March 2002, all the team leaders reported they were satisfied with the day, with 16 teachers (47%) indicating a high level of satisfaction.

When asked at the Launchday about their confidence in implementing the process in their school, 7 team leaders reported a high level of confidence while there were two who reported a low confidence level. The reasons for these concerns were found in their comments concerning perceived difficulties. The greatest perceived difficulty involved time constraints. Of the 34 team leaders who responded 27 anticipated difficulty with time and finding suitable meeting times. A total of 20 reported anticipated difficulties in getting other staff to be involved and enthusiastic with the project. There were also fears of staff being reluctant to try new strategies, resistance to sharing, and generally regarding the project as another imposition upon their already crowded day. One leader didn't think the project would enhance teacher skills in planning, implementing and evaluating lessons because of a very experienced school staff. The anticipated difficulty in finding casual replacement teachers was also a strong concern. Yet in spite of these concerns 27 (79%) of the leaders were confident that *Lesson study* would enhance student learning outcomes in their school.

At the completion of the *Lesson study* cycle in July 2002 a total of 53 participants responded to the questionnaire. Approximately 47 (89%) of these teachers and team leaders reported a high degree of satisfaction with *Lesson study* as a staff development program and as a process for improving the teaching and learning of mathematics in their school. "Teachers getting together and working on a common goal is very satisfying especially when their efforts can later be shared". Only 3 (6%) respondents reported a low level of satisfaction with *Lesson study* as a professional development program and 1 teacher (2%) was dissatisfied with the improvement in the teaching and learning of mathematics in the school. The reasons given for this dissatisfaction had been anticipated by the team leaders at the Launchday and included the organisational problems of getting casuals, staff transfers, setting meeting times and lack of co-operation and sharing among staff. "I believe the program is worthwhile but significant staffing problems within the staff (i.e. lack of stable staff) in conjunction with difficulties getting casual teachers made it very difficult".

In response to direct questions, 38 (72%) agreed they were more confident in having their class observed by their colleagues, and 45 (85%) agreed that they felt more confident in teaching the topic of the focus lessons.

A QTP activity report (N=82) for Phase One schools collected at the end of program indicated a high level of satisfaction 69 (84%) with the program. Other teacher reactions to the program reported a high degree of learning 55 (67%) as a result of the program, and a moderate 44 (54%) anticipated behaviour change.

A follow-up survey was conducted in November/December, six months after the completion of the project. The teachers and team leaders (N=32) were asked to respond to a statement regarding their satisfaction made by other *Lesson study*



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colleagues. All respondents disagreed with the stimulus statement that while the program was interesting, they had been teaching for some time and did not need further professional development.

Further signs of their satisfaction with the program were evident in the 18 (56%) of teachers who responded “yes” in contrast to the 11 (34%) who responded ‘no’ to a very provocative question. The question was: would you approve of the *Lesson study* program being made compulsory in 2003 for all mathematics teachers in NSW government secondary schools and linked to the implementation of the new mathematics syllabii?

While this is a high “yes” result, caution must be exercised due to the comments made earlier about the nature and size of the sample. The comments from those responding “yes” emphasised the benefits of the program “it will help the teachers in presenting quality lessons to their students”. Although many linked their yes to the provision of time, resources or relief, “a great idea but guidelines would need to be set, e.g. funding, time allocation, relief from classes, resource funding”. Those who responded “no” argued that force would lose any goodwill, at best achieve minimum results, and at worst elicit negative reaction that would not gain commitment. While others wrote “not compulsory but funded fully and supported with technology and time. So that its not an add on but an integrated program”.

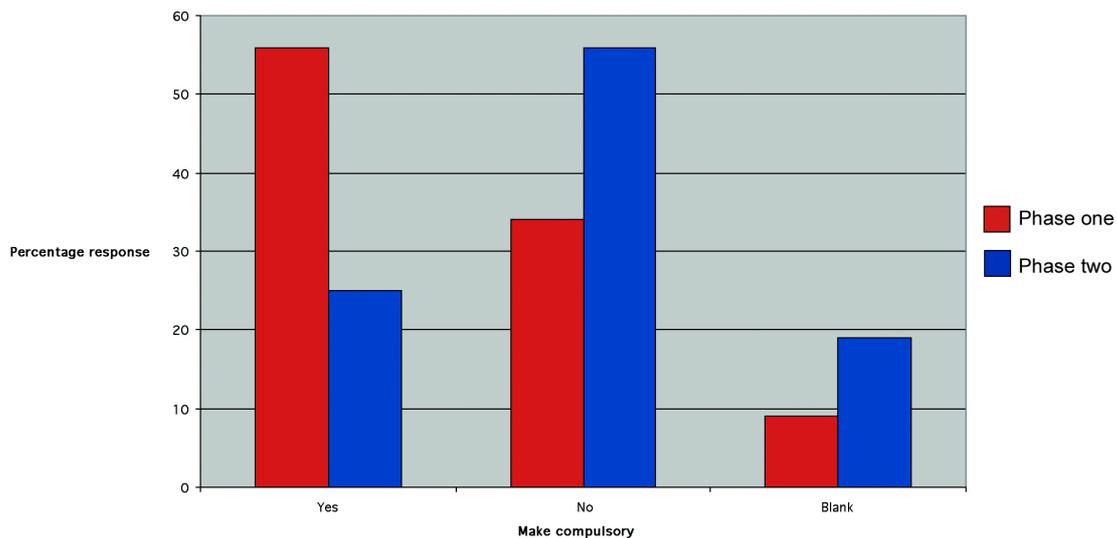
### *Phase Two*

At the completion of the *Lesson study* cycle in November 2002, a total of 64 teachers and team leaders completed a questionnaire. This group’s pattern of response was very positive and approximately 63 (98%) of teachers and team leaders indicated a high degree of satisfaction with *Lesson study* as a staff development program. Approximately 62 (97%) indicated a high degree of satisfaction with *Lesson study* as a process for improving the teaching and learning of mathematics in their school.

However only 16 (25%) of respondents said “yes” and 36 (56%) said “no” to the *Lesson study* program being made compulsory in 2003 for all mathematics teachers in NSW government secondary schools. There were 12 (19%) who didn’t respond to this question.



Comparison of Phase One & Two responses



This result is in contrast to the Phase One item completed in the same time period and adds further weight to the remarks made earlier concerning the sample in the follow-up survey of Phase One (see chart above). In this case approximately 47% of the sample were team leaders compared to the higher concentration (72%) in the follow-up sample.

Asked to comment 15 (23%) respondents recorded that to gain commitment, teachers should retain responsibility for programming, teaching styles, and be encouraged instead of being compelled to be involved in the program. There were 22 respondents (34%) who felt that time, support and resources were needed for the continuation of the program. A further 16 (25%) commented on the benefits of the program, listing: inexpensive; non-threatening; appeals to different styles; allows mentoring; encourages setting goals and team teaching. There were a small number 5 (8%) who commented on the program disrupting the school routine and adding to the workload of the staff.

The teachers were asked to respond to a stimulus statement (a comment from an earlier *Lesson study* questionnaire) regarding their satisfaction. Five respondents (8%) agreed and 55 (86%) disagreed with the statement that “the program was interesting, but they had been teaching for some time and did not need further professional development”. The same item on the Phase One follow-up survey conducted at the same time recorded 100% disagreement.



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## Participants' learning

This section is closely linked with the principles of *Lesson study* because:

*Measures must be based on the learning goals prescribed for that particular program or activity (Guskey, 2000, p. 83).*

There are six principles underlying the program. The *Lesson study* program:

- (i) is based on a long-term continuous improvement model where change is incremental
- (ii) maintains a constant focus upon student learning
- (iii) focuses upon the direct improvement of teaching (not on the teacher)
- (iv) makes improvement in context of classroom
- (v) is collaborative where the improvement is the work of the teacher. The teacher contributes to the development of knowledge as well as their own professional development
- (vi) builds a system that can learn from its own experience.

As well, attempts were made to gather material outside of the range defined by the principles because:

*Openness to possible "unintended learning", either positive or negative, also should be considered (Guskey, 2000, p. 83).*

### *Trial Phase*

In the trial phase the 12 teachers were asked to indicate their *degree of learning* as a result of the project on a five-point scale with endpoints of low to high. All the teachers indicated that the project had contributed to their learning, with 4 of the teachers recording a high degree of learning.

### *Phase One*

The Launchday survey indicated 27 team leaders (79%) who were confident that *Lesson study* would enhance their skills in planning, implementing and evaluating lessons. However, 1 team leader indicated low confidence giving the reason that: "have an experienced staff. Time is the most significant factor". A total of 25 leaders indicated a high degree of confidence in the *Lesson study* program enhancing the professional collegiality within their mathematics staff.

An examination of the team leader's responses of the degree of importance they assigned to the individual *Lesson study* principles from the Launchday survey revealed that teachers regarded the most important principle to be a constant focus upon student learning. The next grouping of importance contained the principles of collaborative nature; contribution to development of knowledge of teaching and



learning; and the direct focus upon improvement of teaching were given similar high importance. Then followed a grouping, which contained the principles of being based on a long-term continuous incremental improvement model and contributing to staff professional development. The least important group contained the principles that the focus was on the local school context and the building of a system that can learn from its own experience.

An examination of responses of leaders to the degree of importance they assigned to the individual *Lesson study* principles from the Launchday survey revealed that the constant focus upon student learning was regarded as the most important principle by all the leaders. The others given similar high importance evaluations (approx 90%) included the principles of collaborative nature, contribution to development of knowledge of teaching and learning, the direct focus upon improvement of teaching, and contributes to staff professional development. Of high but lesser importance (approx 78%) was the grouping containing the principles of the program being based on a long-term continuous incremental improvement model and builds a system that can learn from itself. The least supported principle was that the focus was on the local school context (47% with 35% undecided).

At the completion of the program in July 2002 the teachers and team leaders (N=53) were asked to respond to statements about their learning, and 42 (79%) agreed that the program had increased their understanding of student learning. When asked directly about the most important ideas gained from the *Lesson study* project, working collaboratively and sharing ideas was again very popular. “The realisation that collaborative team work is an outstanding professional development exercise. It certainly enhanced the teaching of the topic we focused on and made for greater student engagement by engaging them more actively in their own learning”. Others commented that they discovered, “well planned lessons lead to greater levels of student learning. Lessons which engage the students are more effective and lead to enjoyment and understanding”. The breadth of comments indicated the program was a rich experience for most of the participants.

The group were also asked what new skills they had acquired that would improve their ability to help students learn. Again the breadth of comments indicated the program was a rich experience for most of the participants. One respondent commented, “I have a greater understanding of how the steps involved in learning a new concept can be simplified, and scaffolding can be provided for the students”. And another wrote “reversal of the traditional maths lesson. Instead of learning skills and using them to answer questions I’ll consider presenting ‘the problem’ and then develop the necessary skills”.

A follow-up survey was conducted in November/December, six months after the completion of the project. The teachers and team leaders (N=32) were asked to respond to statements about their learning made by other *Lesson study* colleagues. All (100%) agreed that it was valuable to co-teach, because it showed them how other teachers dealt with the topic as well as disruptions to tasks; 27 (84%) agreed that they learnt a better way to teach the topic; 27 (84%) agreed they had a deeper understanding of the content now; and 26 (81%) agreed that they had a deeper understanding of how students learn the mathematics in the lessons.



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## Phase Two

The teachers (N=64) were asked to respond to statements about their learning from other *Lesson study* colleagues. A total of 56 (87%) agreed that it was valuable to co-teach, because it showed them how other teachers dealt with the topic as well as disruptions to tasks; 55 (86%) agreed that they learnt a better way to teach the topic; only 22 (34%) agreed they had a deeper understanding of the content now; and 37 (58%) agreed that they had a deeper understanding of how students learn the mathematics in the lessons. These results were generally lower than the responses to the same set of questions in the follow-up survey of Phase One.

An interesting issue arose from the interviewing process about the availability of good mathematics programs for teachers. Teachers reported that the *Lesson study* program provided the motivation to engage with programs that have been available but not used. “We have had the MCTP (Lovitt, & Clarke, 1988; 1989) in our storeroom for years. We knew it had some good ideas but we didn’t get the time to use it. With *Lesson study* we were searching for good ideas and were amazed at how good the MCTP was. So it has been dusted off and we are now using other lessons from it. I guess it is just having the time and motivation”. It appears that the problem lies not with a low supply of good mathematics teaching resources and programs but with a low demand.

## Snapshot Two

### *Large regional secondary school*

This regional secondary school is situated in a large country town. The school population consists of approximately 1100 students drawn mainly from within the town but with approximately 20% of students travelling from the surrounding farming district. It is a Year 7–12 school with all students housed on the one site.

The mathematics secondary staff is made up of eleven teachers and one Head Teacher. The Head Teacher was on leave and the *Lesson study* team leader was the acting Head Teacher. The youngest member of staff is in their 30s and the ages range through to the late 50s. There is streaming of Year 7 classes with two classes in a top stream and the remaining five classes divided into a further two streams. The mathematics staff were able to cover all the mathematics taught in the secondary school, although sometimes other Key Learning Area (KLA) staff take periods in Year 7. Years 8 to 12 are graded and time tabled in parallel.

During the initial interview with the team leader, she discussed the staff who she regarded as hard working and concerned about their students’ welfare. However there were particular difficulties in having a fairly aged and conservative staff and getting them involved in the program. The school attracts very few young teachers. She was also concerned with one member of the team who was having difficulties with classroom management. She also thought that members of the team would become upset and defensive about critical feedback.



The leader said that the *Lesson study* program was a success. She listed the strengths as:

- (i) observing others teach was interesting and informative. This process assisted the member who was having management problems as the solution was linked to preparation and lesson structure
- (ii) having the opportunity to plan lessons that were “hands-on” and practical, which the students loved and demanded more
- (iii) dropping of the defensive walls by the teachers. The initial uncomfortable feelings had passed. The staff could see the program was non-threatening and different. Even the children asked, “Are you checking up on us?” and were quite impressed when told that the purpose was to improve the lesson to help them learn. The rest of the staff were interested but remained aloof and only responded to direct requests.

There are plans to run another program in first Term 2003 and she is hopeful that the momentum and motivation will increase and the others will also become actively involved.

## Organisational support and change

The heart of the issue here is determining to what degree a change at an individual level was encouraged and supported at all levels within the school. Associated with this issue is what recommendations arise as a result of this determination.

### *Phase One*

At the completion of the Launchday in March 2002, the 34 team leaders recorded their perceptions of anticipated difficulties in the implementation of the *Lesson study* program. By far the greatest worry involved time constraints. Of the 34 teachers, 27 (79%) mentioned anticipated difficulty with time and finding suitable meeting times: “Time constraints. Getting three maths teachers off at the same time (We only have three. I don’t think we are ever off together), or some staff find it difficult to remain after school”. Other worries concerned the shortage of casuals and the educational implications of appointing casuals to supervise senior mathematics classes.

At the completion of the program in July 2002 the teachers and team leaders (N=53) were asked to respond to statements about organisational support and change. A total of 24 (45%) were confident in continuing *Lesson study* in their school after the time release support has been withdrawn, “we will present this again through a maths staff meeting”. A further 15 (28%) were undecided, “I would like to continue the process but understand that finding the time needed to meet with other teachers to plan these lessons is not easy to find”, and 27% against the program continuing giving reasons of “I would like to think it will continue but without funding to relieve us from ‘normal’ teaching duties there will simply not be enough time to work collaboratively.”

The group was also asked if the talk in the staffroom changed as a consequence of the *Lesson study* project. The respondents reported that the change was in the



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nature of the discourse with focus upon the focus lessons, alternative teaching strategies, with a lot more sharing of ideas. Typical comments were “an enhanced willingness to engage in professional conversations ... interest in what’s going on in this *Lesson study* thing”, or “yes, more professional observations and judgements were made to help improve teaching and learning”, or “more sharing of ideas taking place”.

As a result of this change in staffroom discourse, did they feel supported by their colleagues? A follow-up question asked if they felt any positive or negative reaction from their other colleagues who were not part of the *Lesson study* project. There were mixed results of positive “not at all, they tried to help as much as possible, they also took one of the participants classes”, negative “glad they weren’t involved”, or both “some were keen to assist and judge objectively with a lot of encouragement. Some thought it was a waste of time”. Overall, respondents reported feeling encouraged and supported in the staffroom.

When asked directly if the school executive at their school was supportive, sympathetic to any difficulties and helpful in overcoming problems, the overwhelming response was positive. Typically they commented “Executive are very supportive in helping to overcome problems” and “very supportive but DP agonised over how to provide relief at times. Severe shortage of casuals. Principal attended the teaching of some focus lessons”. There were a few respondents who reported “they were sympathetic and did offer support. But when the support was needed they were often not able to”.

When asked directly to suggest some organisational changes at their school that would assist and enhance the continuation of the *Lesson study* project, the strongest suggestion was summed up in the comment that the “major requirement is funding. Without it I believe *Lesson study* will tend to disappear into oblivion like previous concepts or ideas. DET must see this as a priority for professional development and provide the funding”. There were other suggestions for “more time is needed and perhaps designated meeting times on the timetable” and “reduce load so that period time could be used to plan, observe etc. This requires teachers being off lessons together. Being relieved from classes is not ideal as the teacher still has to prepare the lesson and follow up”.

A follow-up survey was conducted in November/December, six months after the completion of the project. The teachers and team leaders (N=32) were asked to respond to statements about organisational support and change made by other *Lesson study* colleagues. A total of:

- (i) 31 (97%) agreed that more time was needed and perhaps designated meeting times on the timetable
- (ii) 29 (91%) agreed (44% strongly) that unless “forced” to commit to this program other “more immediate” concerns seem to come to the fore. The best way to ensure the continuation of the process would probably be to incorporate it as a regular component of Faculty meetings
- (iii) 20 (62%) agreed that it will continue but without funding to relieve them from “normal” teaching duties there will simply not be enough time to work



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collaboratively. “the difficulty will always be time, When relieved from classes, lessons still have to be prepared and followed up”

- (iv) 14 (43%) agreed 18 (57%) disagreed that it would not work for senior mathematics classes because you cannot afford to lose the teaching time when you are supposed to be observing others
- (v) 31 (97%) agreed that the program generates professional discussion amongst peers, which is something that does not happen often enough
- (vi) 26 (82%) agreed that it was too difficult to get casuals in mathematics. “Casuals are difficult to obtain, Casual trained maths teachers—an impossibility”
- (vii) 17 (53%) disagreed that the other mathematics staff were largely indifferent (and) glad they weren’t involved
- (viii) 26 (82%) said the *Lesson study* program had improved sharing and discussion among their colleagues.

The follow-up group were also asked questions concerning the fate of the focus lessons. Only 3 (9%) thought that the lessons should just remain the property of the team with 29 (91%) disagreeing indicating that the lessons should be shared with all the members of the mathematics faculty. A total of 29 (91%) agreed that the lessons should be shared among neighbouring schools or should be published on the web for other teachers to view, copy and use.

The survey also contained a team leaders (N=23) only section for comment about the organisation and support given to lead and conduct the program. A total of 22 (96%) were satisfied (61% very satisfied) with the project officer. All respondents were satisfied with the *Lesson study* planning documents and folder and only one person was dissatisfied with the electronic version having had difficulty opening the files. Only three respondents were dissatisfied with the list of web sites and 21 (91%) were satisfied with the financial provision for relief staff. There were 14 (61%) satisfied with the TIMSS video with others finding it difficult to access.

## *Phase 2*

The teachers (N=64) were asked to respond to statements regarding organisational support and change made by other *Lesson study* colleagues. A total of:

- (i) 46 (72%) agreed that more time was needed and perhaps designated meeting times on the timetable
- (ii) 54 (84%) agreed and 20 (31%) strongly agreed that unless “forced” to commit to this program other ‘more immediate’ concerns seem to come to the fore. The best way to ensure the continuation of the process would probably be to incorporate it as a regular component of Faculty meetings
- (iii) 58 (90%) agreed that it will continue but without funding to relieve them from “normal” teaching duties there will simply not be enough time to work collaboratively;



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- (iv) 35 (55%) agreed that it would not work for senior mathematics classes because you cannot afford to lose the teaching time when you are supposed to be observing others
  - (v) 51 (80%) agreed that the program generates professional discussion amongst peers, which is something that does not happen often enough
  - (vi) 41 (64%) agreed that it was too difficult to get casuals in mathematics
  - (vii) 33 (51%) disagreed that the other mathematics staff were largely indifferent (and) glad they weren't involved.

In comparison to the follow-up survey for Phase One conducted at the same time, all the responses in this group are lower except for a higher score on the possibility of it continuing without funding and the use of casuals with senior classes. The follow-up group were more pessimistic about the project continuing and more optimistic about casuals taking senior classes.

The survey also contained a team leaders only section for comments about the organisation and support given to lead and conduct the program. A total of 29 (96%) were satisfied, 13 (43%) highly satisfied with the project officer, the one dissatisfied felt the officer should have paid the school a visit. All respondents were satisfied with the *Lesson study* planning documents and folder. There were only 4 (13%) dissatisfied with the *Lesson study* video due to the late arrival of the video. Only one respondent was dissatisfied with the list of web sites and the financial provision for relief staff and two were unhappy with the TIMSS video. There were five who commented that the TIMSS video should be provided to schools, as it was too difficult to obtain from the district mathematics consultant.

## Participants' use of new knowledge

This is a difficult area to measure and a variety of means have been employed and administered at different times as:

*Information ... cannot be gathered at the completion of a professional development session. Measures of use must be made after sufficient time has passed to allow participants to adapt the new ideas and practices to their setting (Guskey, 2000, p. 84.)*

### *Trial Phase*

In the trial phase the 12 teachers were asked to indicate their *extent of (anticipated) behaviour change* as a result of the project on a five-point scale with endpoints of low to high. A total of 12 (100%) teachers indicated that their behaviour would change, with one of the teachers recording a high anticipated behaviour change.

### *Phase One*

At the completion of the program in July 2002 the teachers and team leaders (N=53) were asked to respond to statements about their use of their new knowledge. A total of 94% agreed that the program had improved their use of collaborative work



practices to design lessons that engage students with their learning. One respondent who disagreed stated, “I’ve always believed that collaborative work practices are important. Therefore there has been little change in this area”.

The respondents were asked direct questions and 69% agreed that they would use the focus lessons to trial additional teaching strategies, and 77% agreed they would use the *Lesson study* model of planning, evaluating and refining to develop further focus lessons.

A follow-up survey was conducted in November/December, six months after the completion of the project. The teachers and team leaders (N=32) were asked to respond to a statement regarding their use of new knowledge and skills made by other *Lesson study* colleagues. A total of 72% agreed that they use the *Lesson study* model of planning, evaluating and refining to develop further lessons, with 38% disagreeing.

Asked to respond to the influence of the *Lesson study* program, 72% said it had improved their collaboration and sharing with other staff members; and 75% said it had improved their lesson planning and preparation.

### *Phase Two*

The respondents (N=64) were asked to compare their usual lessons with the focus lessons produced. They reported an 87% increased use of practical activities, a 77% increased use of concrete materials and technology, a 78% use of new teaching procedures, and 49% increased use of intellectually challenging mathematics.

The teachers (N=64) were asked to respond to a statement regarding their use of new knowledge and skills made by other *Lesson study* colleagues. A total of 63% agreed that they use the *Lesson study* model of planning, evaluating and refining to develop further lessons, with 30% disagreeing. The Phase One follow-up group’s responses to the same question were slightly higher.



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## Snapshot Three

### *Sydney suburban secondary school*

This city suburban secondary school is situated in a lower-middle class suburb of Sydney. It has a multicultural school population with 27 countries of origin. The school population consists of approximately 950 students drawn mainly from the local feeder primary schools. It is a Year 7–12 school with all students housed on the one site.

The mathematics secondary staff is made up of seven teachers and one Head Teacher. The Head Teacher nominated the school and then appointed the *Lesson study* team leader. Three of the youngest members of staff are in their 20s and the others range through to the late 50s. Year 7 is totally ungraded. Year 8 is streamed and loosely graded in Term 3, while Years 9 to 12 are graded. The mathematics staff was able to cover all the mathematics taught in Year 8–12 in the secondary school. Year 7 classes are taken by mathematics staff in combination with others from other KLAs. The team leader said that this arrangement was not good as these teachers tend to “turn the students off maths”.

During the initial interview with the team leader, she discussed the difficulties of having a split staff with half the staff full of enthusiasm and low on experience and the other half with lots of experience but conservative and not wanting to try new ideas. She was unable to get any older member of staff involved and so the team consists of two young enthusiastic female teachers and herself. She has been teaching for nine years with five years at an all boys secondary school. She attributes this later experience with teaching her about classroom management and the need to make the lessons interesting and relevant to the students, “otherwise all hell broke loose”. The Head Teacher was interested, offered support by organising relief when needed, but otherwise remained apart.

The leader said that the *Lesson study* program was a great success. She listed the strengths as observing others teach and team teaching. The three would contribute to the running of the lesson irrespective of who was supposed to be in charge. This allowed the freedom to try lots of ideas. Secondly, having the opportunity and time to plan lessons and brainstorm and share ideas was liberating. And thirdly, the reaction of the students to the lessons was very enthusiastic, “they just loved them”. Her regret was being unable to get the other members of staff involved in the program.

There are plans to run another program in first Term, 2003 and she was hopeful that the others would also become involved. She insisted that “new teachers are supported by this program, experienced teachers are valued and everyone learns and is refreshed by a new synthesis of ideas”.



## Student learning outcomes

It is beyond the scope of this study to conduct pre-tests and post-test and conduct a quantitative study of student learning outcomes as a result of the *Lesson study* project. In any case:

*The relationship between professional development and improvements in student learning in these real-world settings is far too complex, and there are too many intervening variables to allow for simple causal inferences. (Guskey & Sparks, 1996, p.87)*

Instead, this study will rely upon teachers' perceptions and reports volunteered via the questionnaires and interviews.

### *Phase One*

In the survey conducted at the Launch Day, 27 (79%) of the 34 team leaders indicated a strong belief that *Lesson study* would enhance student learning outcomes in their school.

At the completion of the program in July 2002 the teachers and team leaders (N=53) were asked to respond to statements about the impact of the *Lesson study* project upon their students. A total of 44 (83%) agreed (8% no response) that their students had a better understanding of the topic as a result of the focus lessons. And 74% (8% no response) agreed that their students demonstrated higher achievement with the topic as a result of the focus lessons. Asked to comment they focused on increased student engagement, motivation, co-operation, and better behaviour. A typical response was, "students are more engaged in the learning. Students appreciate the learning of mathematics and the links with practical problems. Students requested more of these types of lessons", or, "less discipline problems, greater learning, higher work rate during class".

When asked how they knew the level of student learning had increased they volunteered as evidence, increased student concentration, understanding, enjoyment, appreciation, and enthusiasm. Typical comments were "they concentrate more and ask more questions", and "students seem to be enjoying maths more". Some included formal assessment, "(a) student evaluation (b) student performance in topic test was vastly superior to classes that hadn't been taught the unit".

A follow-up survey was conducted in November/December, six months after the completion of the project. The teachers and team leaders (N=32) were asked to respond to a statement regarding their students made by other *Lesson study* colleagues. A total of 30 (94%) agreed that there were fewer discipline problems and a greater learning, higher work rate by the students.

Asked to respond to the influence of the *Lesson study* program, 22 (69%) said it had improved their students learning, and 22 (69%) said it had improved their students attitude towards mathematics.



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## *Phase Two*

The respondents (N=64) were asked to compare their usual lessons with the focus lessons in terms of the student outcomes. A total of 58 (91%) of respondents agreed (27% strongly agreed) that their students have a better understanding of the topic(s) in the focus lessons. And 52 (82%) reported their students demonstrated improved achievement in mathematics. A total of 50 (78%) reported their students had a better attitude towards the topic and mathematics and, 50 (78%) reported their students were more motivated to learn mathematics. However, there were 12 (19%) who disagreed that their students had a better attitude towards the topic and mathematics or were more motivated. Some of these teachers indicated in their comments that they felt their students were already motivated and had a good attitude towards mathematics.

The teachers (N=64) were asked to respond to a statement regarding their students made by other *Lesson study* colleagues. A total of 48 (75%) agreed that there were fewer discipline problems and a greater learning and higher work rate by the students. This result is lower than the same item on the follow-up Phase One survey.



## Summary and recommendations

### *Preamble*

If we use the data reported in recent literature then the stereotypical NSW government secondary mathematics teacher is a male in his 40s who spends most of his staffroom time involved in completing an increasing paperwork load and various administration tasks. He works solidly while at school and is concerned with the welfare of his students. Add this to his teaching load and other duties and the total contribution results in a defensiveness and resistance to change, seeing proposed change as just more work for little gain.

*It has now been well documented in several studies that teachers asked to change features of their teaching often modify the features to fit within their pre-existing systems instead of changing the system itself. The system assimilates individual changes and swallows them up. Thus, although surface features appear to change, the fundamental nature of the instruction does not. When this happens, anticipated improvements in student learning fail to materialize and everyone wonders why. (Stigler, & Hiebert, 1999, p. 98)*

He doesn't belong to a mathematics teacher professional association and rarely reads a professional mathematics teaching journal. His existence as an expert with many years of teaching experience is a lonely and largely unreflected one. This is a well known phenomena and:

*the expert might be characterised as often arational. Experts have an intuitive grasp of the situation and seem to sense in nonanalytic and nondeliberative ways the appropriate response to be made. They show fluid performance, as most people do when they no longer have to choose their words when speaking, or think about whereto place their feet when walking ... When things are going smoothly, however, experts rarely appear to be reflective about their performance. (Berliner, 1994, p. 6022)*

Thus staffroom discourse concerning teaching consists predominantly of organisational details and problem students. Once the door of the classroom is closed he is on his own. No one has visited his classroom to observe his teaching unless he was caught up in the old inspection system. He has not observed the teaching of his colleagues except for brief passing glimpses. He is neither confident nor comfortable discussing his own teaching with his colleagues and the thought of classroom observation fills him with dread. He is counting down until his retirement.

The trouble with stereotypes is that the description may fail to fit any teacher exactly and they tend to be too judgmental. However this stereotype is useful in raising some of the issues that the *Lesson study* program has to confront when introduced into a school.



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## *Structure of the summary and recommendations section*

The data collected have been organised according to the five critical levels of professional development evaluation (Guskey, 2000, p. 82). They are:

1. participants' reaction
2. participants' learning
3. organisational support and change
4. participants' use of new knowledge and skills
5. student learning outcomes.

Emerging themes have been reported as they became evident.

### *Participants' reactions*

Participant reactions were divided into two separate categories. The first category contained reactions to the launching of the *Lesson study* program. The Phase One participants at the Launchday were team leaders and they expressed satisfaction with the structure and resources received that day and the subsequent support from the project officer.

The Phase Two teachers and team leaders did not have a Launchday and received the information via contact with project officer, a support package and a specially prepared video. This change in launching the program did not detract from the reported satisfaction of the participants. The specifics of the launch process will be examined in more detail in the "organisation and support" section.

The teachers and team leaders appreciated having a project officer. Teachers expressed in varying ways the need for "someone I know we can contact if (and when) problems arise. The Project Officer has indicated his availability should such situations arise which puts me in a greater comfort zone". There was an expressed need to continue this position either in its current form or by having it become a responsibility of the mathematics consultants.

- An emerging issue concerned the continuation of the role of the project officer.

The second category of responses in this section contained the reactions of teachers and team leaders to the actual *Lesson study* process. The reactions recorded across all groups were extremely positive. Before beginning the process, the group of team leaders for Phase One expressed confidence in being able to implement the process, although they were concerned with certain issues. These issues involved: time constraints and finding suitable meeting times; getting other staff to be involved and enthusiastic about the project; fears of staff being reluctant to try new strategies; staff being worried over sharing; and staff generally seeing the project as another imposition on their already crowded day. A resource issue involved the difficulty in finding casual replacement teachers of mathematics. As it turned out, these concerns were very accurate. However in spite of these concerns most of the team leaders were confident that *Lesson study* would enhance:



- (i) student learning outcomes in their school
- (ii) their own skills in planning, implementing and evaluating lessons
- (iii) the professional collegiality within their mathematics staff.

This confidence was maintained upon completion of the program with teachers and team leaders reporting high levels of satisfaction with *Lesson study* as both a professional development program and a process for improving the teaching and learning within the school. Phase Two teachers recorded higher levels of satisfaction for both. Nearly 100% of both groups surveyed in November rejected the assertion that they were experienced teachers and were not in need of professional development.

- Thus an emerging issue was teachers' need for on-going professional development aimed at improving the teaching and learning of classroom mathematics.

The issue of compulsory implementation of the *Lesson study* program was raised and comments were canvassed. Surprisingly, over half of the Phase One follow-up sample and a quarter of the Phase Two sample said "yes". This is a strong affirmation of the value of the program. The teachers and team leaders stressed the need for the program to be voluntary and highlighted the empowering nature of the program where the teaching team made the decisions concerning the goals and procedure to achieve them. The lack of compulsion contributed to a greater commitment and motivation

In discussing the reasons for their decision, a number of recurring themes emerged. These themes lead on to the following section of participants' learning. Teachers also discussed what was needed to keep the program running and this will be discussed under the organisation and resources section.

### *Participants' learning*

All groups indicated that the program contributed substantially to their learning and in particular to their understanding of student learning. When asked to give specific examples, the breadth of comments indicated the program had been a rich experience for most participants. However, just because the *Lesson study* program was a systematic process, this doesn't guarantee that teachers would develop a disposition towards learning. The role of the team leader was to stress the grounded vision of teaching as a site for learning where the teacher was in charge of their ongoing learning.

- An emerging issue was that *Lesson study* provided a context for exploring and developing a richer understanding of student learning.

Before undergoing the program, the team leader's classified the degree of importance of the individual *Lesson study* principles. There were four groups of



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decreasing importance. The most important group contained the single principle of a constant focus upon student learning. The next grouping of importance contained the principles of collaborative process; contribution to development of knowledge of teaching and learning; and the direct focus upon improvement of teaching. The next group contained the principles of being based on a long-term continuous incremental improvement model and contributing to staff professional development. The last group contained the principles of the focus upon the local school context and the building of a system that can learn from its own experience.

After completing the project, the grouping of the principles in terms of importance had changed. For all groups and across all the surveys, teachers continually highlighted and commented upon the use of collaborative work, working on common goals, sharing of ideas, team teaching and co-operation among staff as major benefits of the program. For some teachers, they reported that the program was their first real experience of collaborative planning and teaching. The discourse in the staffrooms changed with the focus being directed to a greater extent on issues of teaching and learning with an increase in the willingness of colleagues to share ideas. Disagreements could be explored and settled experimentally via the focus lessons in the classroom.

Associated with the collaboration was the appreciation of the opportunity for classroom observation. All groups emphasised that *Lesson study* provided a non-threatening context for lesson visits. These observations were rich experiences for teachers. Of course, this was an opportunity for a good deal of incidental learning. However, the data showed that in some classrooms the observer acted as another set of hands in the classroom and turned the lesson into a team teaching situation. While this was a rich learning experience for the teacher it obviously made it difficult to examine the true effects of the lesson. It would have been harder to pinpoint the effects of poor instructions or confusing explanations when the other teacher is providing compensatory explanations.

- An emerging issue was that *Lesson study* provided a context for collaborative planning and sharing. Teachers expressed in varying ways the fact that: “teachers getting together and working on a common goal is very satisfying especially when their efforts can later be shared”.

Nearly as strong, and linked to the comments above, were those attesting to improved learning and different ways to teach a topic and an increased depth of understanding of the content and structure of the lesson. Comments of the following type were common, “the process certainly makes you evaluate your teaching and content both prior to delivery and after”.

- An emerging issue was that *Lesson study* provided a professional development program for improving mathematics teaching.

### *Organisational support and changes*

Consideration of the organisational support firstly focused upon the extent to which change at an individual level was encouraged and supported at all levels within the



school. The teachers and team leaders of all groups reported feeling supported by their colleagues and their school executive.

In regards to the team leaders, they reported a very high level of satisfaction with the project officer. There was no weakening of this satisfaction when the program changed from using a Launchday to using the video and support material.

- An emerging issue was the satisfaction with the organisation and support extended to team leaders of the *Lesson study* program by the project officer.

Consideration of the organisational support also involved canvassing alternatives to the current organisational and delivery systems. Initially this involved the identification of difficulties and then the canvassing of solutions. Thus before starting the program, the Phase One team leaders reported anticipated difficulties involving: time constraints due to busy teaching loads; arranging meetings where all members could attend because of timetable constraints; and, obtaining suitable mathematics casuals. Upon completion of the project, these difficulties were also listed as creating difficulties for the running of the program on all surveys for all groups.

The teachers and team leaders were asked for solutions and suggestions for improvement both in the surveys and through the interviews. They were asked to state what was needed for the program to continue operating at their school.

While many teachers indicated that they would attempt to keep the process going at their school without support, many others indicated that the program would not continue without the provision of some support. Many teachers and team leaders saw the continuation of the program being linked to the continuation of funding, yet the surveys indicated that providing funding to hire casuals was ineffective for many schools because of the difficulty in getting mathematics casual teachers. Even those who obtained relief reported that “being relieved from classes is not ideal as the teacher still has to prepare the lesson and follow up”. Some schools used the funding to buy resources and arranged relief from classes among the staff.

The difficulty of time reflects the daily routine of a secondary teacher, which is busy and can become dominated by “the now”. A teacher’s role can become reactive rather than proactive. Thus without a structured approach to the *Lesson study* program some teachers reported that it would be buried under other daily events.

*Unless “forced” to commit to this program other “more immediate” concerns seem to come to the fore. The best way to ensure the continuation of the process would probably be to incorporate it as a regular component of Faculty meetings.*

However, many teachers wanted their colleagues to have the option of volunteering rather than being forced to commit to the program. Once teachers indicate their commitment to the program then they should be supported at the school level. Thus the timetable should be planned to allow the teachers to meet at a particular time. No other duties should impinge upon that time. Professional development



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should not be seen as something that was done after everything else was completed but should receive equal status on the timetable.

- An emerging issue involved the level of support needed for the continuation of the *Lesson study* program after the initial phase had been completed.

A number of Head Teachers involved in the study were interviewed concerning the level of support needed to continue the *Lesson study* program in their school. They stated that the funding for casuals could be wasteful. They proposed a voluntary system whereby a school mathematics staff would be offered two periods per week for the year to conduct the *Lesson study* program. This would allow the Head Teacher to assign one period each to two of the staff, and this group of three would work for six months (or the year), sharing their developments with the rest of the staff. Thus the teacher's load would have one period designated as a professional development period. After six months there could be a swap and two other staff members would work with the Head Teacher. These periods would be placed on the timetable with the expectation that the team worked on the *Lesson study* program.

The organisational implications depended upon the school, however the Head Teachers indicated that it would cause minimal complications. Most Head Teachers reported that generally Year 7 classes were split in order to satisfy staff loads and the two periods and the mid-year swap would be easily absorbed into the current timetable structure. Thus, when a teacher lost their professional development period they picked up an extra Year 7 period.

The Head Teachers were questioned as to the benefits of the *Lesson study* program from their perspective of department organiser. They reported on the difficulties of getting staff, particularly more experienced staff, to be involved in professional and curriculum development. Teachers were comfortable with current practice and were suspicious of classroom observation and further impositions upon their time. The Head Teachers reported that the *Lesson study* program provided a non-threatening context for professional and curriculum development and classroom observation. They also reported that the nature of teacher staffroom discourse changed in nature with less devoted to individual problem students and more devoted to issues of teaching and learning of mathematics.

When the focus lessons were discussed, team leaders and teachers wanted to see greater use made of the finished product. They wanted some system whereby teachers could get access to the actual lessons. The Head Teachers suggested that as a commitment for receiving support, schools would submit their lessons in electronic form to be loaded on to a web site available only to government school teachers. Schools would have the option as to whether they include the names of the team members. The web site would include a disclaimer indicating that the material displayed on the site was not subject to quality control and was merely a collection of lessons that teachers could adapt to their own classrooms. *Lesson study* was not aimed at producing a library of tried and tested lessons but was more about engaging in the process of planning, teaching, observing, discussing, and reflecting on the lessons. Teachers regarded their improved understanding as more important than the resulting focus lessons. For this reason it was even more important to promote the site as devoid of quality judgements. The Head Teachers



suggested that perhaps the project officer could oversee the construction of the site.

- An emerging issue concerned the dissemination of the actual focus lesson plans from the *Lesson study* project to all secondary teachers.

In the discussion of the focus lessons with the Head Teachers they expressed the view that occasionally the teachers would benefit from the input from an outside expert such as the district mathematics consultant. They felt sometimes there was a need to challenge teachers to look beyond their limitations and current situation and to be introduced to fresh ideas and new knowledge. The way teachers viewed their practice would be influenced by providing different perspectives. The *Lesson study* program provided an excellent context for the inclusion of an expert. The pool of experts could include not only the local talent but also draw upon professional associations and universities.

- An emerging issue concerned the inclusion of knowledgeable experts in order to stimulate the thinking of the group to rise beyond their current situation.

### *Participants' use of new knowledge and skills*

To measure in fine detail the participants' use of new knowledge and skills would require a different type of evaluation study. The *Lesson study* program provided a rich experience whereby the teachers developed new knowledge and skills in a non-threatening and collaborative environment. The interviews uncovered a wide range of knowledge and skills that depended upon the needs of the individual teacher. However there were common themes shared by most of those involved in the program.

The teachers and team leaders reported that they continued to use the *Lesson study* model of planning, evaluating and refining to develop further lessons. They reported developing a *Lesson study mindset*, which now influenced every aspect of their teaching. One critical skill that teachers were making greater use of was that of reflection, which was seen as an integral component of the process. Respondents in all groups reported that their planning and teaching had improved as a result of the program. They reported a constant concern with how to sequence and connect the students' learning experiences. They also highlighted an improvement in the use of collaborative work practices to design lessons that engage students with their learning. The program had helped the team members form a closer collegial relationship that continued after the completion of the program.

The focus lessons would be used again by the teachers and shared with other staff members. These lessons were more practical, made greater use of technology and concrete materials, used new and alternative teaching strategies, and many made greater use of intellectually challenging mathematics. Teachers discussed the importance of examining the lesson from the point of view of the student in order to anticipate difficulties before they arose.



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- An emerging issue was the model of planning, evaluating and refining used to develop lessons in the *Lesson study* project was still being used by participants after completion of the program.

### *Student learning outcomes*

The data available involving student learning outcomes are also limited in most cases, to teacher perceptions. At the very beginning, the Launchday participants believed that *Lesson study* would enhance student learning outcomes in their school. Later, at the completion of the program, the teachers and team leaders stated that the program had improved their students' learning, and had improved their students' motivation and attitude towards mathematics.

All groups of teachers reported that their students had a better understanding of the topic, and that these students demonstrated a higher achievement with the topic as a result of the focus lessons. When asked to justify their claims, those who hadn't collected test results focused upon increases in student engagement, concentration, motivation, co-operation, appreciation, enthusiasm, and better behaviour as evidence.

- An emerging issue was the focus lessons developed in the *Lesson study* project contributed to increased student learning outcomes.

### *Recommendations*

The evaluation panel recommends that:

- 1.1 *Lesson study* should continue to be offered as a program to fulfil the need for on-going professional development of mathematics teachers and as a process to improve the teaching and learning of classroom mathematics. This offer should be voluntary.
- 1.2 Alternatives should be explored regarding the funding of casual relief for the initial phase. Some options are discussed in this report such as a school mathematics staff being offered two periods per week for the year to conduct the *Lesson study* program.
- 1.3 Possibilities should be explored regarding the level of ongoing support provided at the completion of the initial phase for the continuation of the *Lesson study* program. Where funding is provided, the school would submit data for continuous evaluation of the mode of professional development with a view to determining the sustainability of the value of the process.
- 1.4 The role of the project officer should be continued either in its current form or it should be subsumed within the responsibilities of the mathematics consultants.
- 1.5 The organisational and support material developed by the current project officer should be made available to schools wishing to undertake the *Lesson study* program and to all mathematics consultants.



- 1.6 Each district, under the administration of the mathematics consultant, should create their own pool of *Lesson study* experts by drawing upon the talent existing within their district.
- 1.7 Each district, under the administration of the mathematics consultant, should create opportunities for their pool of experts to promote the *Lesson study* program and share their lessons and experiences.
- 1.8 The project officer should create and monitor a web site for the dissemination of the actual focus lesson plans from the *Lesson study* project to all secondary teachers. This site should include a disclaimer stating the site was not subject to quality control and contained a collection of lessons to stimulate ideas and further development. The inclusion of author names should be voluntary.
- 1.9 A requirement of teams receiving funding would be that they provide to the project officer, a copy in the form of a *MS-Word* document of the actual focus lessons and comments on the process for inclusion on the web site.
- 2.0 Possibilities should be explored within the *Lesson study* program to include knowledgeable experts to stimulate the thinking of the group to rise beyond their current horizons.
- 2.1 Consideration be given to relevant aspects of this report be disseminated to all NSW secondary schools as a means of encouraging schools to participate.



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