Teachers' Motivation to Attend Voluntary Professional Development in K-10 Mathematics

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Teachers choose to attend professional development courses and workshops for a range of reasons. New mathematics syllabuses in NSW with increased expectations for student learning outcomes created opportunities for providers to support the implementation of the new syllabuses. The participants at four six-week professional development courses completed surveys indicating motivation for attendance. This paper considers the reasons 109 teachers chose to attend these events and the type of knowledge they value as reported in evaluations of the courses. Responses were categorised using Shulman's knowledge categories with pedagogical content knowledge, curriculum knowledge and knowledge of learners as most valued.

According to Grundy and Robison (2004), professional development serves three functions (extension, renewal and growth) and is usually initiated through two drivers (systemic and personal). Systemic professional development is typically associated with renewal whereas personal professional development may serve all three functions. Exploring the reasons for a "personal desire and motivation by teachers to sustain and enhance their professional lives" (Grundy & Robison, 2004, p. 147), particularly in mathematics education where there is a shortage of qualified teachers, may help providers to plan appropriate content and knowledge building experiences to enrich and retain more teachers in the profession (Martinez, 2004).

The content of professional development courses varies from addressing mathematical content knowledge, pedagogical content knowledge, knowledge about how children learn mathematics, or a combination of these (White, Mitchelmore, Branca, & Maxon, 2004). If teachers do not receive the support they require at school, they seek support and collegiality through other means such as professional associations, local networks and professional development courses offered by providers or "knowledge vendors" (Kennedy, 2005, p. 212). To explore teachers' motivation to attend professional development, the introduction of new mathematics syllabuses for primary schools (Kindergarten to Year 6) and secondary schools (Years 7 to 10) in New South Wales (NSW) (Board of Studies NSW, 2002a, 2002b) provided a context for the investigation.

At the University of Sydney, three courses were developed to support teachers' knowledge and understanding of the new syllabuses – the *Certificate of Primary Mathematics Education* (the Primary Course), the *Certificate of Middle Years Mathematics Education* (the Middle Course), and the *Certificate of Secondary Mathematics Education* (the Secondary Course). The courses discussed in this paper were offered during the period from 2005 to 2008. For each course, participants from a range of schools attended a one-day conference followed by six consecutive Wednesday evening workshops. Evaluations through reflective surveys were used to gather data about teachers' motivation to attend and knowledge preferences.

While the investigation focused on teachers' knowledge preferences in professional development, it is acknowledged that knowledge is filtered through beliefs, experiences and the social context of teaching (Anderson, White, & Sullivan, 2005). These aspects were recognised in the design of the courses, as were the types of knowledge required of quality teachers. This paper addresses the questions:

1. What motivates teacher attendance at voluntary professional development courses?
2. What type of knowledge are teachers seeking and what knowledge do they value?
3. Is there a difference in the knowledge sought by primary and secondary school teachers of mathematics?

The Knowledge of Mathematics Teaching

Shulman (1987) sought to identify the particular knowledge required of teachers, which distinguished it as a profession and hence enabled the articulation of a set of standards for quality teaching. In the late Eighties, Shulman worked with a group of colleagues to design an assessment for the certification of teachers against "well-grounded judgements and standards" (p. 6). The identification of standards has relevance today given the development of the *AAMT Standards* in 2002 and in NSW, the *Professional Teaching Standards* (NSW Institute of Teachers, 2005). Shulman's work led to the identification of seven categories of knowledge (Table 1).

Table 1

Categories of the Knowledge Base of Teachers (Shulman, 1987, p. 7)

Content knowledge;
General pedagogical knowledge, with special reference to those broad principles and strategies of classroom management and organization that appear to transcend subject matter;
Curriculum knowledge, with particular grasp of the materials and programs that serve as "tools of the trade" for teachers;
Pedagogical content knowledge, that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding;
Knowledge of learners and their characteristics;
Knowledge of educational contexts, ranging from the workings of the group or classroom, the governance and financing of school districts, to the character of communities and cultures; and
Knowledge of educational ends, purposes, and values, and their philosophical and historical grounds.

Some professional development courses focus on content while others focus on pedagogy. White et al. (2004) compared several courses from each category to identify the advantages and disadvantages of each. The authors noted perceived relevance and teacher enthusiasm as criteria for success although these factors are clearly influenced by contextual and cultural factors such as working conditions, funding support, and accreditation. They conclude that a blended model, which incorporates both content and pedagogy is most desirable although it may not be what teachers are seeking. Their recommendation supports the advice of Loucks-Horsley, Love, Stiles, Mundry, and Hewson (2003) who advocate professional development should focus on knowledge of content, knowledge of students, and knowledge of instruction and assessment. However, is this the knowledge teachers are seeking when they choose to attend particular professional development courses, particularly when offered outside of school time?

If professional development is aimed at extension, renewal and growth, what sources provide the best opportunities for this to occur? Kennedy's (2005) detailed observations and interviews with 45 upper primary school teachers revealed improvements to practice are usually developed privately by teachers at the teacher's own initiative. She reported that almost all teachers' references to improvements were motivated by new ideas from three main sources – informal (including experience, colleagues, own materials), institutional (including curriculum, textbooks), or "knowledge-vending" (p. 212) (including professional development and university courses). To ascertain the importance of each source, she "cross-tabulated the sources of teachers' new ideas with the areas of concern that they addressed" (p. 214) (Table 2). Kennedy (2005) noted teachers typically did not seek out professional development to solve specific problems with several enrolling in professional development for "casual" reasons (p. 218) including recommendation of a colleague, proximity to the school, convenient timing of the program, or for accreditation.

Table 2

Percent of References to Sources of Ideas by Area of Concern (Kennedy, 2005, p. 214)

Area of concern	Source of Ideas		
	Informal	Institutional	Knowledge vendors
Defining learning outcomes	3	38	10
Fostering student learning	22	32	63
Maintaining lesson momentum	25	15	3
Fostering student willingness to participate	28	9	7
Establishing the classroom as a community	16	3	10
Attending to personal needs	6	3	7
Total	100	100	100

Contrary to Kennedy's findings, an earlier investigation into secondary mathematics teachers attending a professional development course by Anderson and Moore (2006) revealed more than half of the participants reported a desire to gain new teaching ideas, improve skills, and learn more about the curriculum. To further explore these aspects, this investigation seeks to identify the types of knowledge both primary and secondary teachers seek when they choose to participate in professional development activities.

Designing and Evaluating Professional Development

To address the introduction of new syllabuses in NSW from Kindergarten to Year 10, the three certificate courses were designed for different audiences – primary school teachers (K to 6), middle school teachers (5 to 8) and secondary school teachers (7 to 10). The design of courses was informed by Clarke's (1997) ten principles to guide planning of professional development as well as a large-scale national survey into the effects of different characteristics of professional development on teachers' learning (Garet, Porter, Desimone, Birman, & Yoon, 2001). In particular, each course aimed to develop teachers' knowledge and understanding of mathematics content as well as curriculum requirements, incorporated ongoing discussions with colleagues and opportunities to try teaching ideas between meetings. Each course included a conference and weekly workshops over a six-week period and encouraged more than one teacher from each school to attend.

Presenters embedded a combination of curriculum knowledge, pedagogical content knowledge, knowledge of learners, as well as content knowledge into workshops. The remaining categories of knowledge identified by Shulman (1987) – general pedagogical knowledge, knowledge of educational contexts, and knowledge of educational ends, purposes and values – were not considered explicitly in planning. However, aspects of these did arise in discussions between teacher participants and between teachers and presenters.

While it is a challenge to meet all teachers' needs given the diversity in experience and leadership responsibilities, providers need to determine whether their planning and organization are aligned with current issues for teachers in schools as well as their personal goals and expectations. As the courses aimed to develop teachers' knowledge and skills, it was appropriate to seek participants' views about their level of satisfaction in relation to identified learning needs. Guskey's (1999, p. 78) "five critical levels of professional development evaluation" were considered in the design of reflective surveys. These include:

1. participants' reactions,
2. participants' learning,
3. organisational support and change,
4. participants use of new knowledge and skill, and
5. student learning outcomes.

Evaluation of the certificate courses was primarily qualitative, conducted through self-report surveys. While questions related to all five of the critical levels listed above, there was a particular focus on Levels 1, 2, and 4.

Data collection for all four courses was extensive with the use of eight separate surveys seeking detail about teachers' learning, and confidence before and after each workshop. Teachers were also required to report the following week on any actions taken from the previous meeting. As the focus for this paper is to explore why participants chose to attend the courses, what knowledge they were seeking, and whether the course met their learning needs, the data included here relates to the first and last surveys only. While each of the certificate courses has been offered on at least two occasions since 2004, the courses of focus for this paper are the primary and secondary courses offered in 2005, and the middle years courses offered in 2007 and 2008.

Exploring Teachers' Motivation to Voluntarily Attend Professional Development

As part of the reflective survey administered at the end of the first day of the course, teachers were asked to provide background information (name was optional, years of teaching experience, role in school, and source of funding support), reasons for attending the course, as well as questions about each of the keynote presentations and workshops. The final summative survey sought information about whether the course had met teachers' needs as well as overall impressions of the organisation and support materials.

When considering teachers' motivations for attending the certificate courses another focus is to ascertain whether primary school teachers were seeking different knowledge to their secondary colleagues. It is possible primary teachers wanted to enrich their content knowledge because of the increased expectations in the new syllabus. Secondary teachers might be more interested in pedagogical content knowledge in relation to using technology to support teaching and learning or to further explore curriculum knowledge to implement Working Mathematically.

This section presents background information about the participants in each course as well as the data from particular questions on the first and last reflective surveys. The questions of interest include:

- Why did you decide to attend the certificate course? (first survey and last survey)
- Has the course met with your expectations? (last survey)

Participants

Background information revealed a range of teaching experience with the majority of participants in the primary and secondary courses having spent ten or fewer years in the classroom. In contrast, the middle years certificate had a greater proportion of teachers with 16 or more years experience and with almost half (26 out of 60) of the participants in leadership positions (Table 3). Overall, 59 of the 109 (54%) participants were classroom teachers. However, 42 (39%) reported being in the leadership positions of consultant, principal, assistant principal, mathematics coordinator or assistant mathematics coordinator. Such roles bring added responsibilities and potentially different needs. The middle years certificate attracted only 9 secondary teachers compared to 51 from the primary sector. In all courses and with only a few exceptions, there were at least two teachers from the same school with several schools sending more than two.

Table 3

Identified Roles of Participants in each of the Three Courses

Roles	Primary (N=22)	Middle Years (N=60)		Secondary (N=27)	Total
		Primary	Scondary		
Consultant (non school based)	2	3	-	2	7
Principal	-	3	-	-	3
Assistant Principal	4	9	-	2	15
Mathematics Coordinator	1	6	1	7	15
Assistant Maths Coordinator	-	-	1	1	2
Classroom teacher	13	27	7	12	59
Other	2	3	-	3	8
Total	22	51	9	27	109

Additional background information included gender and source of funding to attend the course. Reflecting the greater proportion of males teaching mathematics in secondary schools, the ratio of males to females attending each course was primary (3:19), middle years (8:52) and secondary (10:17). The source of funding for attendance indicates that for 80% of participants, attendance was funded by a system or by a school. This might suggest there was some coercion into participation. However, most participants indicated their attendance was voluntary except for some encouragement to attend with a colleague from the same school.

Motivations to Attend the Certificate Courses

The question on the first and last surveys asking why teachers decided to attend the course aimed to identify motivations for attendance as well as the types of knowledge teachers were seeking. Initially the responses to this question on both surveys were read to identify categories. There were six main reasons for teacher attendance: quality of the program; personal development; a love of mathematics; accreditation or recognition; casual reasons; or to gain knowledge and skills for teaching (Table 4). As some participants had several reasons for attending, their comments were placed into more than one category.

Motivations for participation ranged from personal growth and recognition to a desire to learn new ideas for implementation of the syllabus. The ‘personal development’ category included comments like “I want to do something for myself” and “for my own needs” reflecting a strong motivation to sustain and enhance teachers’ professional roles (Grundy & Robison, 2004). Accreditation was a goal for some participants in each course and took three forms: recognition as a teacher of mathematics; acknowledgement of participation in a university endorsed course; and accreditation to satisfy the NSW Institute of Teachers requirements for new-scheme teachers. For example:

My 9th consecutive year on Kindergarten – I need to see where I’m heading (as I don’t have a BEd) I need to reaffirm for myself I’m on the right track as younger teachers with a BEd and MEd consider you’re past it and they are the only ones connected – some are very confronting (Primary)

I have been teaching in a maths department for four years. I wanted something to help me [to] get reclassified to include maths teacher (Secondary).

Table 4

Number of Comments (first and last survey responses combined) for Each Attendance Reason for Each Course

Reason for attendance	Primary (N=22)	Middle Years (N=60)	Secondary (N=27)
Quality of the program	3	18	5
Personal development	5	25	13
Love of mathematics	4	8	5
Accreditation or recognition	5	10	10
Casual reasons, e.g., go with a friend	2	2	5
Gaining knowledge and skills for teaching	42	100	34
Total	61	163	72

The majority of reasons given for attendance related to knowledge, indicating teachers were seeking to develop knowledge, skills and understanding of teaching and learning mathematics. Unlike the teachers in Kennedy's (2005) study, the majority of participants in all courses reported a desire to extend or renew their knowledge, with few indicating they were attending for 'casual' reasons. To identify the type of knowledge teachers were seeking, the comments categorised into 'gaining knowledge and skills for teaching' were further classified using Shulman's (1987) knowledge types. The knowledge types represented by teachers' comments included (Table 5):

- content knowledge,
- curriculum knowledge,
- pedagogical content knowledge,
- knowledge of learners, and
- knowledge of educational contexts.

Table 5

Number of Comments for Each of the Knowledge Types for Each Course and Percentage of Comments for Each Knowledge Type

Gaining knowledge and skills for teaching	Primary (N=22)	Middle Years (N=60)	Secondary (N=27)	Overall Percentage
Content knowledge	7	9	1	10
Curriculum knowledge	11	16	13	23
Pedagogical content knowledge	12	28	17	32
Knowledge of learners (transition issues)	3	32	0	20
Knowledge of educational contexts (references to leadership and sharing)	9	15	3	15
Total	42	100	34	100

Teachers' comments about the knowledge they were seeking from the courses reveal similarities and differences between primary and secondary participants. Both groups of teachers reported seeking all five types of knowledge, particularly pedagogical content knowledge. All but one of the comments from teachers wanting to develop mathematical content knowledge, were from primary school teachers. This is not surprising, as most secondary school mathematics teachers have studied more mathematics in their teacher education programs. The greater number of comments about 'knowledge of learners' from middle school teachers involved comments about transition issues as well as the engagement and motivation of middle school students. Examples of teachers' comments for each knowledge type are presented in Table 6.

Table 6

Examples of Teachers' Comments for Each Knowledge Type

Knowledge Type	Examples of teachers' comment
Content knowledge	To extend/reinforce my prior learning in mathematics. (primary)
	I've just switched from primary to secondary maths teaching and I would like a refresher on maths concepts and principles (middle years secondary teacher).
Curriculum knowledge	Desire to learn more about the syllabus (secondary)
	Chance to develop better quality resources (secondary).
Pedagogical content knowledge	Love of maths and a need for more practical ideas and recent research and understandings in maths ed. I want to take these into the classroom and into my teaching (primary)
Knowledge of learners (transition issues)	To teach mathematics to my class of children at its full potential. To give my children the maximum opportunities to learn mathematics (primary)
	I am teaching Stage 3 this year. I have noticed the decline in engagement and motivation of Stage 3 students over a couple of years (middle years primary teacher)
Knowledge of educational contexts (references to leadership and sharing)	We would like to use the course to help us with whole school professional development. (primary).

Teachers' comments frequently revealed their passion and desire to improve their knowledge and understanding to support students' learning of mathematics. The following comment by a participant in the primary course reveals a desire to support children's learning in a way that she was not supported at school.

Passion for helping children understand as I never understood ANY maths as a kid (primary teacher).

This sentiment has been reported in earlier studies (e.g., Anderson et al., 2005) and possibly applies to more primary than secondary school teachers. However the comment reinforces that "passion" can drive teachers to attend professional development for deeply held personal reasons.

On the last survey participants were asked whether the course had met their expectations. For secondary teachers, 26 of the 27 teachers answered "yes" with many commenting that the course exceeded expectations. While almost all participants were satisfied, requests for additional support related to using technology and teaching mathematics to students with special needs. For middle years, 55 of the 60 participants answered "yes" with many additional positive comments. Participants wanted more input on implementing technology sessions and addressing transition issues from primary to secondary school. All primary participants indicated the course had met or exceeded their expectations with one stating,

> Yes. I have extended my learning in a lot of areas and feel more comfortable with a lot of the concepts that have been covered.

Capturing Teachers' Motivation to Attend Voluntary Professional Development

We are all familiar with teachers attending professional development sessions to obtain worksheets and 'good ideas' for use in class the next day. They will discuss useful professional development sessions as those which were 'practical'; some of the teachers attending the courses described here were no exception since several participants made comments about a particular session being 'more practical' than another. While a good teaching idea might be useful, focusing on interesting tasks in short workshop sessions may not substantially build teachers' knowledge for teaching. These courses aimed to go further by providing opportunities for teachers to engage in a sustained way with important issues in relation to the implementation of a new curriculum. Course evaluations provided evidence that teachers were seeking more than practical knowledge

or even curriculum knowledge. Most participants wanted to learn more about content knowledge, pedagogical content knowledge, knowledge of learners and knowledge related to leading teachers in their schools. While the data is taken from self-report surveys, follow-up interviews with participants will enable a more detailed investigation of teachers' motivations.

As noted in Kennedy's (2005) investigation of primary teachers areas of concerns in classrooms, teachers want advice and support about fostering student learning. Providers or knowledge vendors should focus on the ways teachers' knowledge about student learning can be better supported. Further support needs to be provided which combines theoretical and practical knowledge for teaching. Capturing the enthusiasm and passion teachers bring when they voluntarily attend professional development outside of school hours is an opportunity for all who provide professional development for teachers including those who work in post-graduate teacher education courses.

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