

Mathematics teachers in context: Practices and perceptions

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In this paper, findings are reported from a recently conducted pilot study in which the Experience Sampling Method [ESM] was used to monitor the daily lives of a group of secondary school mathematics teachers in Victoria, Australia. The specific aims of the study were (1) to compare the work patterns of experienced and novice mathematics teachers, (2) to explore situations likely to produce teacher stress - a frequently cited concomitant of teaching, and (3) to determine the feasibility of a larger scale project on these and related topics.

The range of tasks undertaken by the participants in the study was extensive and stretched well beyond formal working hours.

In common with other researchers we found overlap as well as differences in the tasks and work patterns of experienced and novice teachers, and in the activities they appeared to find stressful. Administrative tasks were more likely to be a cause of stress for the experienced teachers; teaching related activities for the novices.

Based on the findings of this pilot study, we would argue that the ESM, supported by interviews, elicits informative descriptions of the realities confronting teachers and their feelings about them, and is a useful research tool.

Background to the study

Articles drawing attention to the shortage of skilled teachers and to the stress and exhaustion experienced by teachers regularly appear in the popular print media (e.g., Cleveland, 2003; Dowling, 2004; Stewart, 2003). Typically highlighted are: the vast range of teaching and non-teaching tasks that comprise teachers' daily work, and the many complex educational, psychosocial and cultural, as well as emotional issues with which teachers have to contend on a daily basis. More formal investigations covering job satisfaction, professional standards for teaching practice – generally and with respect to mathematics teaching – and to conditions of employment (e.g., Committee for the Review of Teaching and Teacher Education, 2003; Goodrum, Hackling, & Rennie, 2001; Sinscalco, 2002), testify to widespread concerns about

teachers and teaching.

Interest in defining and understanding teachers' work has sparked considerable research activity (Australian College of Education; 2001; Campbell & Neill, 1994; Drago et al., 1999; Goodrum et al., 2001; Harvey & Spinney, 2000; Smaller, Hart, Clark, & Livingstone, 2001). Issues examined have ranged from the most general question of the number of weekly hours teachers work, to more detailed analyses of time spent each day or week on various broadly defined types of activities (e.g., face-to-face teaching, administration, professional development), to very detailed investigations of teachers' use of time, sometimes including an analysis of their attitudes towards these activities (often focussing on stress levels).

Collectively these, and related publications, shaped the pilot study described in this paper in which we sought, within the limits imposed by our modest sample size, to compare the work patterns of experienced and novice mathematics teachers, and to explore factors associated with teacher stress. In addition we wished to assess the effectiveness of a key data gathering tool, the *Experience Sampling Method* [ESM], for capturing the activities in which teachers engaged inside and beyond school as well as their feelings about these activities.

The Study

The sample

Our sample consisted of 14 secondary mathematics teachers, six males and eight females, from six non-government, non-Catholic schools in Victoria, Australia. Both single sex and co-educational schools were involved, as well as one school from a non-metropolitan region. Teaching experience for males ranged from 8 to 32 years and for the females from 1.5 to 25 years. We defined "novice" teachers as those with less than two years teaching experience; there were two females who fitted this definition.

Method and instruments

The study spanned a three-week period early in the second half of the second semester of the 2004 school year in Victoria and comprised one week of intensive data collection, followed by interviews conducted over the following two weeks .

Biographical information sheet

Prior to the week of monitoring, participants were asked to complete a background information sheet listing biographical data (e.g., gender, age group) and work details (e.g., subjects and grade levels taught, years of mathematics teaching experience).

The Experience Sampling Method

Data gathering relied heavily on the *Experience Sampling Method* [ESM], developed about 30 years ago and used in various settings since then (e.g., Csikszentmihalyi, Rathunde, & Whalen, 1993). In response to a signal, sent five to seven times daily over a period of one week, participants chart the course of their daily lives and experiences by completing a specially designed *Experience Sampling Form* [ESF] in which they report their current activities, companions, thoughts, and feelings. Thus, over a sustained time period, information is gathered about the activities in which participants are engaged as well as their reactions to, and beliefs about, those activities. ESF response rates are typically high. Minor, Glomb, and Hulin (2001) commented that “participants respond to and complete the ... administered questionnaire about 75-85% of the time they are signaled” (p. 6).

The ESM has been used with a variety of samples, including teachers (Bishay, 1996) and university students (Leder & Forgasz, 1999, 2004), to describe the pattern and quality of individuals’ daily lives.

In the present study, the SMS text messaging facility of contemporary mobile telephones was used to signal participants to complete ESFs. The 14 participants were sent SMS messages six times a day for one week between the hours of 7.30am and 9.30pm on weekdays, and between 10am and 9.30pm on weekend days. The times that signals were sent differed each day but one message was sent daily within the following time periods: 7.30 to 10.30am, 10.30am to 12.30pm, 12.30pm to 2.30pm, 2.30pm to 4.30pm, 4.30pm to 6.30pm, and 6.30pm to 9.30pm. A typical SMS message read as follows: “DLMT study. 2.50pm Tuesday. Message 4. Complete ESF now, please” i.e., the SMS message included the time it was sent, the day of the week and the message number for the day. The technology we relied on allowed the same SMS message to be sent simultaneously to the 14 participants’ phones via a single email message. On receipt of a message, participants were asked to complete the appropriate ESF on, or as soon as possible after, receiving it – preferably within half an hour. Excerpts from the ESF used are shown in Figure 1.

EXPERIENCE SAMPLING FORM [ESF] (excerpts)

Name: _____

Date: _____ Time received/read: _____ Time filled out: _____

As you were contacted:

You may have been engaged in a work-related pursuit (teaching, professional development, administration, preparation), household chore, leisure activity, driving to or from school, etc. Any of these are relevant for the purposes of this study. Please provide specific details in response to each item – use examples provided to guide the form of your responses.

Where were you? (e.g., teaching Gr. 12 mathematics class; in staff room)	
Who were you with? (e.g., Gr. 9 mathematics class; the principal)	
What were you doing? (e.g., photocopying for Gr. 10 mathematics class)	
Was what you were doing directly work-related? Circle response	YES NO
Why were you doing this particular activity? Circle response	Had to Wanted to Nothing else to do
What were you thinking about? (e.g., how boring this meeting is)	

Tick the column which best describes how you rate:

	Very low	Low	Average	High	Very high
the challenge of the activity					

Tick the column to indicate your response to each of the following:

	Not at all	A bit	Average	Quite a lot	Very much
Was this activity important to you?					
Were you satisfied with how you were doing?					

In the table below you are asked to describe your mood when you were contacted. Two words, emphasising the extremes of a continuum are given for each line. Tick the appropriate column which best describes your mood along that continuum. (The full list consisted of 10 sets of adjectives)

	Very	Quite	NEITHER	Quite	Very	
irritable						cheerful
interested						bored
stressed						relaxed
distracted						focused
satisfied						dissatisfied

If you had the choice when you were contacted, what would you prefer to have been doing?

Figure 1. Excerpts from *Experience Sampling Form [ESF]*

Interviews

Interviews were conducted with selected participants to supplement the ESF data. Given our particular interest in the work patterns of experienced and novice teachers, a pair of teachers – one experienced and one novice – was identified in two schools. The interview protocol used was semi-structured, with some items tailored to expand on participants' ESF entries. Examples of questions asked included: "Tell me about your typical working day", "Do you have to work at home (i.e., out of hours)?", and "Please describe your reactions to the ESFs... Were any of the questions intrusive?".

Analyses

Information collected via the ESFs was transferred to Excel spreadsheets for analysis. The data on the types of activities participants were engaged in were coded into categories, based largely on the work of Campbell and Neill (1994). Other coding categories were defined as they emerged during the analyses. Category details are shown in the results section. The audiotaped interviews were transcribed.

Results and discussion

A summary of the background information provided by the four participants (3 female, 1 male) is shown in Table 1. It should be noted that for the entire sample of 14 participants, the response rate (out of $14 \times 6 \times 7$, i.e., 588 possible responses) was 96%; for the four participants whose data are discussed here, the response rate was 93%. These response rates are even higher than those cited by Minor et al. (2001), an implicit indication that these busy teachers thought the study was worthwhile. Also shown in Table 1 is the number of ESFs completed by each participant.

Space constraints do not allow a comprehensive overview of the data obtained. Given the emphasis in the literature on teacher stress, we focus the discussion here on those instances for which participants described themselves as *very* or *quite stressed* with what they were doing when they received SMS signals. The frequency of these responses is shown in Table 1. (It should be noted that overall, participants were more likely to describe their feelings about the activities in which they were engaged when they received the SMS messages in positive terms. For example, Lyn described herself as cheerful on 22 occasions; irritable seven times.)

Table 1.

Summary of the Backgrounds of Four Participants

Name	Andrea ¹	Susan	Paul	Lyn
School	Broadland ¹	Broadland	Hunterville	Hunterville
Years of teaching experience	24	1.5	24	1
Subjects taught	Mathematics only	Mathematics, Information Technology [IT]	Mathematics, Personal Development	Mathematics, Psychology, Industry & Enterprise
Lessons taught per week	20	26	20	26
Responsibilities	Head of Mathematics, Sport [Saturday], Community service	Head of Middle Years IT curriculum	Head of House [pastoral], Associate Dean of Students, teacher mentor	Tutor, coach of sporting team
No. of ESFs completed	42	31	42	42
No. of <i>stressed</i> responses	6	10	9	5

¹ Pseudonyms have been used for the names of the teachers and the schools in which they work.

Experienced and novice teachers

As can be seen from Table 1, the two novice teachers, Susan and Lyn, had heavier teaching loads than their experienced peers, taught a wider range of subjects, but had fewer administrative responsibilities. The number of times the participants responded that they were *stressed* showed no pattern by level of experience. The activities that caused stress did, however.

When teachers were stressed

An overview of the activities in which each of the participants was engaged and what they were thinking about when they responded that they were stressed is presented below. Interview data further illustrated the issues and activities which appeared to stress the participants; interview extracts have been included when appropriate.

School 1 teachers

Andrea (experienced)

On the ESFs, Andrea reported being stressed on six occasions. Interestingly four of these occurred on the same day – Monday. She indicated that all the activities were work-related and were ones that she *had to* undertake. Rather than directly related to her teaching, the tasks she found stressful were all related to administrative tasks.

On one of the Monday occasions (2.45pm), Andrea was with grade 11 students and was “putting boys on a bus to go to community service, then traveling on the bus with them for ½ hour. (I felt motion sickness, bus was stuffy)”. She was thinking “How annoyed I am to have to do this extra task as well as my own community service task”. She had been “... told/asked to do this extra task as well as my own” and “...had other things (work related) I had planned to do with this 45 minutes”. She would have preferred to be “sitting at my desk completing all the things that are on my list but I have not yet done today. This means I will have to stay later tonight to finish them”. She added that “When you are asked to do extra things you don’t really have a choice - you have to say ‘Yes’. This happens a lot here”. Staying back late at work on Thursday (6.15pm), alone at her desk packing her bag to go home, was another occasion that Andrea reported being stressed. She indicated that she wanted to go home as she was “tired... (having) been interviewing (teachers) for 2 hours”.

At interview, Andrea was asked “...what other types of tasks do you do at work?”

Andrea Oh look it can vary. Well you can do correction, you can develop curriculum, you can have meetings, you can talk to people about particular directions, you can do the normal things like yard duty and things like that The tasks I enjoy are the ones I said - developing new curriculum, just looking for new things ... and being able to make a difference I suppose.

Andrea’s reply reveals the types of work-related tasks that she enjoyed. When asked whether she did school-related work at home and what work she did, she replied:

Andrea ... Yes, but I don’t really consider what I do, a lot of it, extra work, it is just part of my life.... just me.... At the moment I am correcting year 12 exams for VCAA [Victorian Curriculum & Assessment Authority], I do my own correction, I do my own development, I write material, I write reports, I ... write minutes of meetings, I look up things for ideas, I correct students’ work. ... I tutor students...I’ve been heavily involved in the MAV [Mathematical Association of Victoria] for the last five years and so quite a lot of my work has involved going to meetings and I am

going to a meeting after this at 6... I don't just see my role in the school being a teacher here. I am head of department – I enjoy my work and I get a lot out of it as well.

When signaled and responding that she was engaged in such teaching-related tasks or tasks associated with her role as head of department, the ESF data did not reveal Andrea as stressed. This pattern contrasted with that of Susan, her novice colleague.

Susan (novice)

Susan reported being stressed on 10 ESFs. Four were related to her teaching responsibilities in mathematics, the other six to IT teaching. Occasions when Susan felt stressed included attending a meeting at recess time (10.45am) that was run by Andrea at which the focus was the grade 8 mathematics curriculum for the remainder of the year. Susan was concerned about “how behind we are!” Interestingly, Andrea also reported that she was stressed at that time but it was because “There isn't going to be enough time to get through this before the bell goes”. Two other occasions Susan reported being stressed were related respectively to her preparations for teaching about congruent and similar triangles to a grade 9 class and reflecting on the lesson. She wrote that, as a qualified IT rather than a qualified mathematics teacher, she felt that she needed to “make sure I understand the questions because I haven't taught the topic before ... I always worry about teaching a topic for the first time. Sometimes I check my understanding with other maths teachers”. Contacted soon after teaching the lesson she again felt stressed: the “lesson really wasn't a success”.

School 2 teachers

Paul (experienced)

Paul reported being stressed on nine ESFs. Two of these were directly related to his mathematics teaching and involved the same grade 12 class; the others were associated with his various administrative responsibilities. On the former occasions, he was checking that students had completed all compulsory tasks. He was thinking that this work needed to be done and that this produced a “list of students who still do not deserve an S [Satisfactory completion] for submitted work”. He was feeling very frustrated with the students and would have preferred to be doing something else.

For the other seven times Paul reported being stressed he was engaged in a range of different administrative tasks related to his role as Head of House. These included: meeting with other Heads of House; “collecting materials to take to House Dinner

tonight”; “writing message for tomorrow’s Bulletin summarising today’s House Sport results”; “trying to coordinate interview times for all Heads of House... in half hour blocks”; and “Trying to placate colleagues very annoyed about the arrangements that I’ve put together for tomorrow”. Many times he would have preferred to be tackling and crossing off tasks on his “to do” list or enjoying a lunch-hour like his other colleagues. He reported that other administrative tasks (e.g., parental phone calls requiring his attention) had also influenced his affective reactions at the time.

As Paul told us at interview, the ESFs did serve to monitor his activities at school:

Paul Amazingly over the course of the week, yes I think you did. I think I almost went through the first two days and I wasn’t even in class and you look at it and think well does this guy ever teach because we never caught him in class.... Here you are surveying me about being a maths teacher and you never actually caught me teaching maths until well, it might have been the second afternoon or the third day or something. ... [but] I think that ... over the course of the week you probably captured it quite well...

Lyn (novice)

Lyn reported on five ESFs that she was stressed. Each occasion was related to her mathematics teaching responsibilities. One time (Friday 1pm) she was in a grade 10 mathematics class “helping a student with a question”. She was thinking “Why does this student make the same mistake each time?” A day earlier (Thursday 1.45pm) she was at her desk “correcting maths homework”, a task she felt she had to do. She would have preferred to “eat my lunch”. Part of her frustration and stress had been influenced by an earlier happening: “Yr 10 maths class were horrible”.

Lyn felt that she was working very hard including weekends:

Lyn Of my free time... 60% preparing, 40% marking. But like I said, I try and get most of that preparation done on the weekend ... This is my first year. I’ve been really trying to get the preparation right to begin with. I am pretty sure that the mathematics I’m teaching next year is going to be the same... so I have been putting a lot of effort into that. So hopefully next year that will mean that I have a lot more spare time on my hands....

For the future, Lyn felt that she might take the lead from Paul:

Lyn Well one of the things that Paul was saying, that with the work sheets, at the lessons, he actually makes notes on them as he is going and at the end of the year he collects them... and just makes those adjustments ready for next year, so in fact he spends very little actual time other than the corrections he’s made. ... I’ve seen what he does and... I’ve been thinking that would probably be

worthwhile in ... my year 12 and my year 11 class.

About her first year of teaching, Lyn said:

Lyn ...I found it busy but it wasn't unexpected. I really enjoyed it. The school is great. I really get along with the staff well... [and] most of the students are fantastic. In particular I have enjoyed my year 12 class... [T]owards the later part of this year I have sort of started resenting the fact that I feel that I need to stay home and do work rather than go out, so I think I've put my social life on hold a bit this year. But I know that next year it will be easier, so it is something that I've been able to live with this year.

Concluding comments

Our modest sample size precludes generalizing beyond this study. However, in common with other researchers (e.g., Harvey & Spinney, 2000) we found overlap as well as differences in the tasks and work patterns of experienced and novice teachers, and in the activities they appeared to find stressful. Administrative tasks were more likely to be a cause of stress for the experienced teachers; teaching related activities for the novices. The four teachers discussed in this paper were diligent and hard working. The range of tasks they undertook, whether related to their mathematics teaching or administration, was extensive. Their work extended well beyond formal working hours and they seemed accepting, rather than resentful, of this.

In summary, the ESM data presented within our space constraints, provided contextualised information about the activities that participants found stressful. Based on the findings of this pilot study, we would argue that the ESM, supported by interviews, elicits informative descriptions of the realities confronting teachers and their feelings about them, and is a useful research tool.

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