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Do you see what I see? Preservice teachers watching video excerpts of teaching

Kim Beswick

University of Tasmania, Launceston, Australia

Kim.Beswick@utas.edu.au

Tracey Muir

University of Tasmania, Launceston, Australia

Tracey.Muir@utas.edu.au

***Abstract:** This paper reports on the trial of video excerpts of mathematics teaching used in teaching preservice primary teachers in a Bachelor of Education program. Preservice teachers viewed, in either a lecture or tutorial setting, a video clip of an experienced mathematics teacher teaching a basic mathematics concept to a small group of students. They were then asked to identify the focus of the lesson and aspects of the of teacher's practice that they deemed effective; list any questions that they would ask the teacher; and then compare the practice demonstrated in the clip with that which they'd encountered on practicum. Findings highlight the need to work explicitly on developing the skills required to analyse teaching, and provide important directions for curriculum development in the course.*

***Keywords:** video; preservice primary teachers; teacher education*

There is a perceived dichotomy between the mathematics pedagogy that preservice teachers are encouraged to adopt through their university studies, and the practices that they encounter in classrooms through their practical experiences (Taylor, 2002). It is also well established that preservice teachers regard classroom experience as the best teacher (Richardson, 1996), and that the most highly valued aspects of their university studies are those perceived as having greatest classroom relevance (Beswick, 2006). There is also evidence that preservice programs are most effective in influencing preservice teachers' beliefs and attitudes in relation to classroom practices that can be modelled in university classroom settings (Beswick, 2006) but large preservice teacher cohorts and other constraints mean that university teaching settings are often necessarily quite different from school classrooms.

Such difficulties have lead to interest in the use of practice-based strategies, such as videos, which have been found to be effective in challenging pre-service teachers' images of mathematics and mathematics teaching (Taylor, 2002) and in developing their skills in observing teaching (Santagata, Zannoni, & Stigler, 2007). Videotapes can be used to examine teaching issues in the context of a classroom, where preservice teachers have the opportunity to take a critical look at the interactions between the mathematics teacher, the students and the mathematics being learned (Stein, Smith, Henningson, & Silver, 2000). They can also serve to bridge the perceived gap between theory and practice (Taylor, 2002); there is evidence (Clark & Walsh, 2002) that few students are able to see the connections between units undertaken at university and their future career until very late in their studies.

What observers ‘see’ when they observe teaching, either in real classrooms or recorded on video, is dependent upon what they bring to the experience. This includes their own experiences of learning and teaching; their knowledge of the subject (in this case, mathematics), of pedagogy, and of students; and their own beliefs, influenced by their experience and knowledge, about the subject and how it is taught and learned. As James (1890, cited in Mason, 2005) pointed out, we attend to that which we are tuned to notice. Everything that preservice teachers have attended to in the past, that is the sum of their experiences, therefore influences what they attend to when observing teaching. This helps to explain the finding of Philipp et al. (2007) that preservice teachers who watched and analysed videos of children solving mathematics problems showed greater change in their beliefs about mathematics teaching and learning than those who observed teaching in real classrooms even when the teachers they observed were chosen to be likely to model teaching that was consistent with the aims of their course. Philipp et al. (2007) concluded that it was the opportunity afforded by videos to prompt preservice teachers to reflect more deeply on what they observed that was critical. In contrast to this, in actual classrooms, including during professional experience, there is a tendency for preservice teachers to notice that which confirms their existing beliefs.

Santagata et al. (2007) pointed to the need for studies of the use of videos that document the effectiveness in terms of preservice teacher learning of specific observation frameworks and protocols. The study reported here contributes to addressing this need. It was guided by the following two research questions:

1. What do preservice teachers see as important in another teacher’s practice as captured in a video excerpt?
2. What connections do preservice teachers make between videos of teaching and their practicum experiences?

The study

The Bachelor of Education that provided the context of this study was a 4-year primary teacher education program. It included a sequence of four half-units of mathematics curriculum, one in each of the 4 years. Each half-unit ran for one 13-week semester and involved a 1-hour lecture and 1-hour tutorial in each of the first 3 years and weekly 2-hour tutorials in the final year. All classes, and particularly tutorials, were interactive with preservice teachers engaged in solving mathematical problems and discussing pedagogical issues. The lecturers sought to model appropriate pedagogies and emphasised the importance of understanding as the basis of procedural efficiency and problem solving ability. The aim was to provide preservice teachers with examples of real, local teachers engaged in exemplary mathematics teaching (in that it was consistent with the aims of the course), in an environment in which the preservice teachers’ observations could be guided by lecture and tutorial staff.

Participants

Two cohorts of preservice teachers (in the second and third years of the program in 2007) provided data for the study. The second year students (enrolled in EPC250) watched two different video excerpts during tutorials in two non-consecutive weeks of the second of four half-units of mathematics curriculum. The third year cohort (enrolled in EPC350) watched one of the video excerpts used with second years, as part of a lecture in the third mathematics

curriculum half-unit. The second year students had completed two practicums totalling 5 weeks in which they progressed from working with small groups to taking sessions with a whole class. The third year cohort had completed an additional 6-week full-time placement in which they had progressed to planning for, teaching, and assessing a whole class for substantial periods of the school week.

The numbers of students in each cohort and who watched each video excerpt are shown in Table 1.

Table 1: Summary of participant numbers by cohort and video watched

Unit	EPC250-1	EPC250-2	EPC350
Mode of delivery	Tutorial	Tutorial	Lecture
No. =	78	98	61
Year Level Subtotal =	176		61
Video	Making Connections	Teaching for Conceptual Understanding	
Video Subtotals =	78	159	

Instruments

The video excerpts

The video excerpts, entitled *Making Connections* and *Teaching for Conceptual Understanding*, used in the study featured the same secondary mathematics teacher with 20 years teaching experience. During this time he had been involved initially in undertaking, and then planning and delivering professional learning for primary and secondary teachers of mathematics and was respected throughout Tasmania's education systems. He shared the lecturers' beliefs in the importance of teaching for conceptual understanding. The four students with whom he worked in both video excerpts were in Grade 8 and even though this is the second year of secondary school in Tasmania his teaching uncovered shaky thinking about concepts that are central to the primary mathematics curriculum. *Making Connections* ran for just under 4 minutes and focussed on place value concepts involving whole numbers to three digits, and *Teaching for Conceptual Understanding*, with a duration of approximately 10.5 minutes, dealt with the extension of place value ideas from whole numbers to tenths.

Video observation pro-forma

The sections of the pro-forma relevant to this study asked preservice teachers to, in writing: identify the focus of the teaching shown in the video clip and aspects of the of teacher's practice that they deemed effective; list any questions that they would ask the teacher; and then compare the practice demonstrated in the clip with that which they had encountered on practicum. All items required open responses and no identifying information was requested.

Procedure

The video excerpts were created in 2006 and used in mathematics education units in semester 2 of the following year. Two video excerpts were shown to the second year cohort in the

weeks in which they considered the development of whole number place value, and then the extension of these ideas to decimals. In both cases the 1-hour tutorial time was devoted to working with the video excerpt. Discussion occurred throughout the excerpt, with the tutor stopping the video at key points in accordance with the Guiding Questions (see Appendix), and drawing the preservice teachers' attention to key aspects and eliciting their responses. The preservice teachers were able to complete the video observation pro-forma throughout the tutorial and were given a few minutes at the end of the tutorial to finalise their responses.

The third year students watched *Teaching for Conceptual Understanding* in the context of a lecture on decimals that built upon the introductory work from the previous year. The video excerpt was watched in its entirety, followed by a whole cohort discussion mediated by the lecturer, after which preservice teachers completed the video observation pro-forma.

Preservice teachers' responses were classified according to themes that were apparent in the data.

Results and discussion

In the following sections data related to each of the research questions are presented and discussed. In all cases the percentages provided are rounded and so may not total exactly 100.

Research question 1: What do preservice teachers see as important in another teachers' practice as captured in a video excerpt?

Table 2 shows the responses of preservice teachers to the question, "What is the main purpose of this lesson phase?" 'Place value' was a reasonable response in relation to both video excerpts, whereas 'decimals' was an appropriate response only in relation to *Teaching for Conceptual Understanding* which was viewed by cohorts EPC250-2 and EPC350. In each case more than 80% of the cohort identified an appropriate purpose with the slightly fewer of the third year group nominating an inappropriate purpose.

Table 2: Identification of main purpose of lesson phase in video excerpt

	EPC250-1 Number (%)	EPC250-2 Number (%)	EPC350 Number (%)	Total No. (%)
Place value	63 (81)	65 (66)	35 (57)	163 (69)
Decimals	0 (0)	14 (14)	17 (28)	31 (13)
Not place value or decimals	15 (19)	19 (19)	9 (15)	43 (18)
Totals	78	98	61	237

Table 3 shows the preservice teachers' responses to, "Identify three aspects of the teachers' practice that you see as being effective" in order of frequency of mention. Here and subsequently, the category, Other, includes diverse responses none of which attracted more than three similar responses from any given cohort. Although there was some variation across cohorts and contexts in which the video excerpts were viewed, the top four aspects of the teaching shown were the same in all instances. The most commonly cited aspect, the use of concrete materials and/or hands-on activity, comprised close to one quarter of the all aspects identified by each cohort. Features that could be interpreted as relating directly to an emphasis on teaching for understanding have been shaded in Table 3 and together comprised between 7% (EPC250-2) and 14% (EPC350) of aspects listed. Although the figure was higher for third

years it is still low, suggesting that more readily observable and arguably superficial features of teaching that may or may not in fact be effective were the primary focus of the preservice teachers' attention. Santagata et al. (2007) suggested that preservice teachers may not notice recommended practice because they lack concrete images of what it looks like, but it is also possible that preservice teachers form images of 'good' practice based upon readily observable actions, when we know that effective teaching is a far more subtle matter (e.g., Askew, Brown, Rhodes, Johnson, & Wiliam, 1997; Beswick, 2007; Watson & De Geest, 2005).

Table 3: Aspects of the teachers' practice identified as effective

Aspect of teaching	EPC250-1 No. (%)	EPC250-2 No. (%)	EPC350 No. (%)	Total No. (%)
Use of concrete materials, hands on, kinaesthetic	51 (22)	58 (24)	38 (25)	147 (23)
Scaffolding by the teacher	17 (7)	69 (28)	19 (12)	105 (17)
Use of questioning	39 (17)	36 (15)	27 (18)	102 (16)
Allowing student sharing/contributions	43 (18)	17 (7)	12 (8)	72 (11)
Teacher checking students' understanding before moving on	6 (3)	8 (3)	15 (10)	29 (5)
Learner/student centred	14 (6)	8 (3)	5 (3)	27 (4)
Emphasis on justifying/explaining thinking	10 (4)	7 (3)	6 (4)	23 (4)
Small group setting	5 (2)	2 (1)	13 (8)	20 (3)
Teachers' adaptability/flexibility	11 (5)	8 (3)	0 (0)	19 (3)
Providing opportunities for visualisation	3 (1)	1(0)	7 (5)	11 (2)
Use of real life links	4 (2)	2 (1)	2 (1)	10 (2)
Focus on the meaning of symbols	8 (3)	1 (0)	1 (1)	10 (2)
Personal qualities of the teacher	7 (3)	2 (1)	1 (1)	10 (2)
Use of examples	1 (0)	8 (3)	0 (0)	9 (1)
Re-stating/reinforcing student comments/understandings	4 (2)	2 (1)	0 (0)	6 (1)
Other	11 (5)	15 (6)	5 (3)	35 (6)
Totals	234	244	153	631

Tables 4 and 5 show data about the questions that the preservice teachers suggested they would ask the teacher about the teaching they had just watched. Table 4 shows the numbers of preservice teachers who suggested various numbers of questions, while Table 5 categorises the questions posed according to their subject. The preservice teachers were more likely to offer at least one possible question when they viewed the video excerpt in a tutorial context than when they viewed the video during a lecture.

Table 4: Numbers of questions suggested by preservice teachers

	EPC250-1 No. (%)	EPC250-2 No. (%)	EPC350 No. (%)	Total No. (%)
No questions	23 (28)	35 (32)	35 (57)	93 (37)
One question suggested	40 (48)	42 (39)	20 (33)	102 (40)
Two questions suggested	20 (24)	31 (29)	6 (10)	57 (23)
Totals	83	108	61	252

In contrast to the data shown in Table 3, the most common focus of the preservice teachers' questions was the students' understanding. This was particularly so in relation to the video excerpt, *Teaching for Conceptual Understanding*, in which students' misconceptions were most apparent. Many preservice teachers were also interested in finding out about where the teacher would next take the group, how the practice that he used in a small group context may or may not transfer to a whole class context, and why and how he changed his original plan.

Table 5: Subjects of questions suggested by preservice teachers

	EPC250-1	EPC250-2	EPC350	Total
	No. (%)	No. (%)	No. (%)	No. (%)
Students' understanding	9 (14)	19 (24)	9 (27)	37 (21)
What next?	13 (20)	13 (16)	6 (18)	32 (18)
Group size including applicability to whole class setting	11 (17)	8 (10)	7 (21)	26 (15)
Changing the plan/original plan	10 (15)	8 (10)	0 (0)	18 (10)
Value of lesson	5 (8)	4 (5)	1 (3)	10 (6)
Use of concrete materials	2 (3)	5 (6)	1 (3)	8 (4)
Inclusivity/student engagement	1 (2)	5 (6)	1 (3)	7 (4)
Other	15 (23)	17 (22)	8 (24)	40 (22)
Total	66	79	33	178

Morris (2006), in her study of beginning preservice teachers' skills in analysing videos of teaching, reported the difficulty they had with citing evidence in support of their analyses. Rather than pointing to relative disinterest in students' understanding, the data in Table 5 suggest that the results shown in Table 3 may be indicative of the preservice teachers' difficulties with identifying evidence of the students' understanding, as well as of teaching actions designed to elicit such evidence.

Research question 2: What connections do preservice teachers make between videos of teaching and their practicum experiences?

The preservice teachers were asked about the extent to which the video excerpts mirrored what they had seen on professional experience in schools. Their responses are shown in Tables 6 and 7.

In many cases (from one third to nearly one half of a cohort) it was difficult to determine whether the preservice teachers' responses were describing elements of the teaching that they regarded as similar to or different from the teaching they observed in schools. Many third year students (43%), in the lecture setting, did not respond to this question. Of the 15 students who did, and whose responses were clearly indicative of similarity or difference, nearly 80% regarded the teaching shown in the video excerpt as similar to that which they had observed. For the second year students who watched the same excerpt (EPC250-2), the equivalent percentage was nearer to one third. There are at least two possible explanations for this large difference, both of which need to be viewed cautiously due to the small numbers of responses involved. Firstly, it is possible that more of the third years had seen teaching that was like that shown in the video; they had after all had six weeks more of professional experience. This explanation seems unlikely given what is known about typical teaching in Tasmanian schools (Beswick, Swabey, & Andrew, 2008). Secondly, it is possible that the lecture setting resulted in more superficial engagement and hence a reduced tendency to discern differences. The third possibility is a combination of the first two; that is, that the additional time they had

spent observing teachers on professional experience had given them more opportunities to observe the superficial elements of the teaching shown in the video excerpt such as the use of paddle pop sticks or the teaching of place value generally. This is consistent with the greater frequency (see Table 3) with which preservice teachers mentioned as effective, readily observable aspects of the videoed teaching.

For the other video, *Making Connections*, 50% of the second year cohort considered the teaching shown to be similar to that which they had seen. This may reflect the ubiquitous attention afforded whole number place value in the primary curriculum.

Table 6: Preservice teachers' perceptions of the similarity of the video teaching to that seen on professional experience

	EPC250-1 No. (%)	EPC250-2 No. (%)	EPC350 No. (%)	Total No. (%)
No response	13 (17)	19 (19)	26 (43)	58 (24)
Similar	17 (22)	13 (13)	11 (18)	41 (17)
Different	17 (22)	21 (21)	4 (7)	43 (18)
Unable to determine	31 (40)	45 (46)	20 (33)	96 (41)
Total	78	98	61	237

Responses to the question about ways in which the teaching shown in the video excerpts differed from that observed were classified according to whether they related to specific aspects of the particular lesson or to more general pedagogical principles. Many preservice teachers commented on the fact that the video showed a group of four students rather than a whole class and so responses related to this specific feature of the lesson were placed in a separate category.

As shown in Table 7, the third years were more likely to comment on the group size shown in the video and they particularly questioned the transferability of the teaching shown to a whole class situation. They were also more likely than the second year students who watched the same video excerpt (EPC250-2) to focus on specific aspects rather than broad principles.

Table 7: Ways in which preservice teacher perceived the videoed teaching to differ from that observed

	EPC250-1 No. (%)	EPC250-2 No. (%)	EPC350 No. (%)	Total No. (%)
Focus on specifics of lesson	18 (29)	14 (19)	10 (29)	42 (24)
Focus on broader pedagogical principles	36 (57)	43 (57)	14 (40)	93 (53)
Focus on group size	7 (11)	6 (8)	8 (23)	21 (12)
Other	2 (2)	12 (16)	3 (9)	17 (10)
Total	63	75	35	173

Table 8 shows responses to the question, "Did the video confirm or contradict what you believe to be effective mathematics/numeracy practice? Of those students who clearly answered the question, the overwhelming majority indicated that the video excerpt confirmed their beliefs. Just one student suggested a contrary position. This is in spite of the fact that the second year cohorts watched the excerpts in a context in which questions were asked and discussion encouraged with the intention of assisting them to reflect on what they had observed.

Table 8: Preservice teachers' perceptions of congruence between the videoed teaching and their own views

	EPC250-1 No. (%)	EPC250-2 No. (%)	EPC350 No. (%)	Total No. (%)
No response or comment given but question not explicitly answered	17 (22)	36 (37)	38 (62)	91 (38)
Not sure/both	1 (1)	2 (2)	2 (3)	5 (2)
Confirmed	59 (76)	60 (61)	21 (34)	140 (59)
Contradicted	1 (1)	0 (0)	0 (0)	1 (0)
Total	78	98	61	237

Table 9 shows categories of comments that accompanied the preservice teachers' responses in Table 8. The comments are not separated into the Table 8 categories to which they related, but combined to show the elements of teaching that the preservice teachers chose to discuss. The most commonly cited aspect of teaching was the use of hands-on materials followed by unspecified references to effective practice.

Table 9: Aspects of teaching considered in comparing videoed teaching with own beliefs

	EPC250-1 No. (%)	EPC250-2 No. (%)	EPC350 No. (%)	Total No. (%)
No comment	44 (56)	59 (56)	41 (66)	144 (59)
Showed benefits of concrete/hands on materials	10 (13)	12 (11)	7 (11)	29 (12)
Showed effective practice	8 (10)	7 (7)	3 (5)	18 (7)
Showed good teacher scaffolding	1 (1)	6 (6)	0 (0)	7 (3)
Showed benefits of small groups	3 (4)	1 (1)	2 (3)	6 (2)
Showed peer scaffolding/discussion	4 (5)	2 (2)	0 (0)	6 (2)
Other	9 (11)	18 (17)	9 (15)	36 (15)
Total	79	105	62	246

Conclusion

The most readily observable aspect of the teaching shown in the video excerpts, namely the use of concrete materials, was most likely to be nominated by preservice teachers as contributing to the effectiveness of the teacher's practice. Interestingly, the use of hands-on materials was also the most commonly cited aspect of the mathematics curriculum units in an earlier but similar iteration of the same Bachelor of Education program that second and third year preservice teachers had nominated as most valuable to their own learning (Beswick, 2006). This is consistent with the notion that we attend to what we are attuned by the sum of our experiences to date, to notice (James, 1890, cited in Mason, 2005). A corollary of this fact is that we are more likely to notice that which confirms our existing beliefs and so it is unsurprising that almost all preservice teachers who provided a clear indication one way or the other reported that the video excerpts confirmed their existing beliefs about mathematics teaching and learning.

Nevertheless, the use of video excerpts can provide a context in which preservice teachers can be prompted to reflect on their existing beliefs and this can lead to changes in line with course goals (Philipp et al., 2007). This study was planned mindful of the need to direct preservice teachers' attention to salient aspects of the videoed teaching; the data suggest several factors that may have limited the success of the pro-forma that was used in prompting the type and depth of reflection we would like to see. They also represent features of preservice mathematics education programs that will inform subsequent iterations of the program that was the context of this study.

Firstly, the questions in the observation pro-forma that the preservice teachers completed focussed on the teacher. The onus was on the tutor to use the Guiding Questions (Appendix) to direct the preservice teachers' attention to the mathematics and the students' understanding of it. This is a demanding task made more difficult by the second contributing factor, namely that the preservice teachers had had relatively little experience of analysing student work in terms of the understanding that it evidences. This was a major focus of the final half-unit of the course that the preservice teachers had not yet done. The findings of this study suggest that students' work and students' mathematical thinking should be foundational to the entire mathematics education program that the preservice teachers undertake. Furthermore, this should include specific focus on what constitutes evidence of understanding and how such evidence can be elicited. Santagata et al. (2007) demonstrated that preservice teachers become more skilled at analysing video of teaching given practice and appropriate protocols. The extent to which these skills translate to analysing actual teaching in the practicum context is yet to be examined.

The findings are encouraging in that they show that many preservice teachers are interested in the development of students' understanding (Table 5) even if unsure of how to gauge it, and that the vast majority are also able to look beyond the specifics of the lesson observed to broader pedagogical principles (Table 7). The challenge for the researchers and others involved in curriculum development in this context is to assist them develop the skills needed analyse teaching in ways that allow it to challenge their preconceived ideas and to reflect deeply on their own and others' teaching practice.

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Appendix

Guiding Questions: *Teaching for Conceptual Understanding*

When viewing the video excerpt, pause the footage at the designated times on the counter below (verbal prompts have been included to provide an additional guide as to when to pause the video). Discussion questions have been provided to prompt you to think further about what you have observed.

Video counter	Verbal prompt	Discussion questions
35:43	(Tr.) "... connecting the new with the old ..."	<ul style="list-style-type: none"> • What do you think the teacher meant by this? • What prior knowledge would you expect these students (Gr. 8) to have in relation to place value? • What questions would you ask to establish students' understanding of place value? • Why do you think it is important to identify students' current understandings of a concept?
36:52	(Tr.) "... equal parts – need to go back and do this properly ..."	<ul style="list-style-type: none"> • What do you notice about the way the student (Jeb) is cutting the icy-pole stick? • What does it tell you about Jeb's conceptual understanding of place value? • What would you do if you were the teacher conducting the lesson? • What other materials/aids could you incorporate to facilitate Jeb's understanding?
38:08	(Tr.) "... is it important that all the group sizes are the same when we write a number like that?"	<ul style="list-style-type: none"> • What did the teacher say/do to emphasise the importance of equal group sizes? • Do you think this was effective in helping the students to understand?
39:50	(Tr.) "... write that on your pad. One dollar, five	<p>(Here the teacher has picked up on a student's question and this has led the discussion into a different area)</p> <ul style="list-style-type: none"> • How would you capitalise on this 'teaching moment' to draw the links between decimals and money?
40:08	(Tr.) "So have you written the same amount of money?"	<ul style="list-style-type: none"> • What does Aaron's answer of 1.5 tell you about his understanding of decimals/decimal currency?
42:07	(Tr.) "So what's that – that piece there?" (points to part of stick) (Jeb) "5 cent coin"	<ul style="list-style-type: none"> • Why do you think Jeb interpreted the 'piece' as a five cent coin? • What would you do to address this misconception?
End of video		<ul style="list-style-type: none"> • Are you convinced that these students understand place value and the decimal system? • What subsequent teaching decisions would you make based on your observations of what occurred in this lesson?