Full Paper

Enhancing Transfer from Interactive Multimedia to Real-World Practice

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Abstract

This paper describes the development of an interactive multimedia program based on principles of situated learning and its use with preservice teachers. The learning environment included an interactive multimedia program on assessment in mathematics, together with recommended collaborative implementation conditions in the classroom. A qualitative research study investigated whether student teacher teachers' learning from the interactive multimedia program on assessment transferred to professional practice in schools. According to the beliefs of the student teachers themselves, the multimedia program on assessment appeared to influence the types of strategies they employed and their thinking about assessment as they taught mathematics and other subjects.

Transfer

Situated learning places learning in the context in which it will later be applied. One of the principal effects claimed for the theory of situated learning is that it facilitates transfer of learning to new situations . Park and Hannafin cite the improvement of transfer as *the* distinguishing feature of situated learning as a theory in their analysis of new learning theories in relation to the design of interactive multimedia.

However, the literature is divided on the evidence for transfer. Several writers and researchers, indicate that, regardless of which instructional strategy is employed, there is little evidence of the effectiveness of transfer from one situation to another no matter how similar the problems. Sternberg and Frensch contend that the failure of transfer from one setting to another is common: 'Transfer of training often appears to be the exception rather than the rule, whether in school or outside of it' (p. 25).

Elshout (1990) cited in argues that the abstract representation of knowledge is not the problem. He contends that 'at the root of failure to transfer lies failure to comprehend complex information' (p. 136). However, others contend that in any discussion of the issue, transfer cannot be distinguished from learning , the assumption being that if something is learnt well it will be applied. The Cognition and Technology Group at Vanderbilt describe five types of transfer that they are trying to promote within the learning environments they design: (1) transfer to new analogous problems; (2) transfer to partially analogous problems; (3) transfer to 'What If' perturbations of the original problem; (4) transfer outside the classroom context; and (5) transfer as efficient learning (pp. 60-62). These last two points reflect the position that transfer of knowledge is facilitated if it is well learned to begin with, a process that Prawat asserts is best done 'by building connections-both of the knowledge-knowledge and of the knowledge-context variety. The richness of connections between elements of knowledge ... directly affects the accessibility of any aspect of knowledge in a novel situation' (p. 381).

Resnick and Resnick contend that the linking and interpretation of new knowledge of the kind proposed in a situated learning environment is vitally important if it is to be used dynamically in new situations:

> Recent cognitive research teaches us to be highly respectful of knowledge as a requirement for good thinking For concepts and organizing knowledge to be mastered, they must be used generatively-that is, they have to be called upon over and over again as ways to link, interpret, and explain new information. Education requires an intimate linking of thinking processes with important knowledge content. (p. 41)

The research described here investigated the extent to which those 'rich connections' have been made and whether knowledge learned in an

interactive multimedia program transfers to real-world practice.

The Research Study

The purpose of the study was to investigate the way preservice teachers learn from an interactive multimedia package and learning environment based on a situated learning model and whether learning transfers to teaching practice. To do this, it was necessary to identify the critical characteristics of a situated learning model based on the extensive literature on the subject . Nine characteristics of learning environments were identified: authentic context, authentic activity, multiple perspectives, expert performances, collaboration, reflection, articulation, coaching and authentic assessment.

An interactive multimedia learning environment for university-level preservice teachers was designed according to these characteristics . The learning environment comprised an interactive multimedia program on assessment in mathematics, together with recommended implementation conditions in the classroom . Specifically, the research sought to investigate the way preservice teachers used interactive multimedia based on a situated learning model, how they responded to the critical elements of the situated learning environment, and whether learning transferred to their professional teaching practice in schools.

Transfer was thought to have occurred if firstly, student teachers using the interactive multimedia program on assessment had a good understanding of the types of assessment appropriate in the mathematics classroom and were able to articulate this understanding; and secondly, they employed a rich variety of the assessment techniques shown in the program, as opposed to the singular reliance on pencil-and-paper tests.

Framework and Method of Analysis

Several weeks after the conclusion of the use of the assessment multimedia package in their mathematics method course, six student teachers in the study completed a two-week professional practice in different schools in the metropolitan area of Perth. All the student teachers were required to teach mathematics classes in this practice, and it was expected that they would have the opportunity to implement different assessment strategies at this time. The research took the form of an interpretive, qualitative study. The major methods of data collection were videotaping of preservice teachers using the interactive multimedia program, observation, and interviews with both the preservice teachers and their supervising teachers after their professional practice in schools.

Prediction of Assessment Practices

An interview protocol, based on the Prediction Technique devised by Miles and Huberman was used to investigate student teachers' experiences during professional practice in a three stage interview:

Stage 1: At the conclusion of the student teachers' use of the interactive multimedia program on assessment, a prediction was made that they would adopt the use of a range of appropriate assessment strategies. In the interviews, the student teachers were asked to read the prediction and then to describe what actually had happened on their professional practice with regard to assessment.

Stage 2: Student teachers were asked to nominate the factors that were most important in leading to the actual situation.

Stage 3: Student teachers were given prepared lists of factors which might have supported the prediction coming true (such as: 'encouragement and support from supervising teacher', 'awareness of other strategies from using the multimedia program on assessment', and 'awareness of other strategies from the methods you experienced as a student yourself'). They were also given a list of factors working against (such as: 'the supervising teacher dictated the type of assessment for each lesson', 'I was not aware of any other strategies that were appropriate' and 'pencil and paper is best for grading purposes on teaching practice, because any other method is too difficult to follow up'), and asked to nominate the relative importance of each. (The purpose of asking student teachers to nominate their own list of factors prior to being shown this list was to avoid contamination by the viewpoint of the researcher.) When shown the additional lists of factors, student teachers were asked to state whether each factor was *Important, Relevant but not important* or *Not relevant* to their adoption of, or failure to adopt, a variety of assessment strategies in the mathematics classes they taught.

Techniques of qualitative analysis recommended by Miles and Huberman , Eisner and McCracken were used to analyse the data using NUD�IST, a computer-based qualitative analysis program.

Assessment Practices Used in Schools

The prediction was made that the student teachers would use a variety of assessment techniques in their mathematics classes during teaching practice, and this was true of all six. In spite of the fact that one student teacher reported the prediction to be untrue and another was unsure, all the student teachers did use a variety of strategies. Evidence to support this conclusion was provided by the student teachers on their own admission in interviews, and this was generally corroborated by their supervising teachers.

The assessment strategies that were addressed in the multimedia program, which student teachers could emply, were grouped into six categories: *Observing, Questioning, Interviewing, Testing, Reporting* and *Self-assessment*. If student teachers had used only the traditional pencil-and-paper tests to assess students, only *Testing* strategies would have been used. However, all the student teachers used assessment strategies from the

Questioning and *Interviewing* groups of strategies, most used *Observing* and *Testing*, and some student teachers used *Reporting* and *Self-assessment* strategies featured in the assessment program. Generally, the student teachers used the assessment strategies that had been predetermined for use by the supervising teacher. However, this was supplemented by the use of strategies that were under the student teachers' own control.

All the student teachers were able to speak knowledgably and confidently about the assessment which appears to support the view that they deeply understood the issues. Lave and Wenger point out that learning the language and stories of a community of practice is necessary for full participation in that practice, and the student teachers' ability to speak both within and about the practice was clearly evident in their discussion.

Several other salient issues emerged from the analysis of the prediction data which relate to the investigation into whether student teachers' learning from the interactive multimedia program on assessment transferred to classroom practice. These issues concern: the influence of the supervising teacher, the student teachers' critical appraisal of exemplary teaching, the limited time allowed for the professional practice, and the influence of the interactive multimedia program. Each of these interrelated issues is discussed in more detail in the sections that follow.

Influence of Supervising Teacher

The most frequently cited influence for the use or non-use of a variety of assessment strategies was that of the supervising teacher. One student teacher summed up the difficulties associated with professional practice under the guidance of an experienced teacher:

> The hardest thing about a two-week prac is that teachers say 'assess them in this way' so that's what you have to assess. So you don't get much of a chance to put things into practice. (Interview with Rowan)

Several of the student teachers pointed out that the methods used by their supervising teachers were possibly simply routine, that they no longer thought about the strategies they used and they applied them mechanically almost by habit. Rowan expressed a very strong opinion about the techniques used by his supervising teachers:

> The end assessment, I think for most of them was a paper and pencil test. It's how they've always gone about it, it's just ingrained. (Interview with Rowan)

The following comment described the feeling of powerlessness and lack of ownership felt by one of the student teachers operating in what was effectively, another teacher's classroom:

> I'm not the qualified teacher. I'm in their situation, in their room, conforming to their rules. So you can't just suddenly say 'Hey, let's do some oral assessment'. (Interview with Carlo)

Many of the student teachers were inhibited in the choice of assessment strategies by the influence and authority of their supervising teachers, in a way which would not have been an issue if the student teachers were practising teachers with their own classes.

Limited Time for Teaching Practice

The professional practice period following the use of the multimedia program on assessment was used to gather data on whether student teachers used a variety of assessment techniques, or whether they reverted to the more traditional use of paper and pencil tests. This practice comprised just two weeks in a metropolitan secondary school for all the student teachers, a period of time which was inadequate for the use of many of the assessment strategies presented in the multimedia program. All the student teachers and many of the supervisors agreed that some of the more comprehensive and ongoing types of assessments such as journals, modelling and portfolios required a significant and sustained commitment over a substantial period of time.

Several of the student teachers indicated problems with assessment during such a short teaching practice. Zoe pointed out that she did not even know the names of the student teachers at the end of the two weeks, and used this as an argument for the usefulness of paper and pencil tests. David also pointed out that when time is an important factor, pencil and paper tests are efficient:

> It's pretty good because of the time. You can do a whole class of students at once, and I wouldn't say its the best but it's certainly a good one. (Interview with David)

Rowan commented that the time limit was a relevant factor in his choice of assessment strategies:

> A pencil and paper test is very easy. You just go bang. Some of the other ones, like anecdotal records need a period of time. They can't be done in two weeks. (Interview with Rowan)

The two-week time span appeared to severely restrict the choice of assessment strategies available to the student teachers on professional practice. Student teachers tended to employ strategies which could be done in a limited time span which meant that the more time-consuming strategies such as journals and portfolios were unsuitable.

Critical Appraisal of Exemplary Teaching

One of the principal challenges of teacher educators is to promote the view that teachers can be purposeful in the methods they use, and that they do not have to limit themselves to methods they learnt as school children from their own teachers-the view that 'you teach as you were taught' . An interesting issue to emerge from the analysis of the data on transfer was the manner in which student teachers critically appraised both their own school teachers and other teachers they had observed. One student teacher admitted to being influenced by his own school experience to the point where he found himself using the same style:

> You tend to teach like the teachers you liked, and in the ways you liked. It may not be correct but being human, it's just realistic. (Interview with Carlo)

However, most of the student teachers evaluated the experience more critically, some to the point of being determined to 'do the opposite' (Interview with Evie). Similarly, Rowan was not influenced positively by his school experience of learning mathematics:

> I think I'd actually try to teach differently to the way I was taught. It was very much like a test every week when I went through school. (Interview with Rowan)

Not all the school teachers were used as negative role models. One student teacher reported that she was very positively influenced by her mathematics teacher:

> I had Ms. X as my teacher when I was at school, and she's into a lot of discussion and explaining, not so much into the testing, like trying to get you to understand rather than assess in formal ways. So I think because I was able to succeed that way, I try to pass that on to teaching now. (Interview with Louise)

Student teachers also evaluated other teaching they observed on their professional practice. Some were positively influenced by the experience, some negatively. For example, one student teacher expressed a critical view of the habits of many practising teachers:

> It can influence, quite negatively actually, because the majority of teachers assess just with pencil and paper tests. It can encourage you to fall into the trap of accepting that it's just how it's got to be. (Interview with Rowan)

Generally, the student teachers in the study were active in choosing the methods of teaching and assessment they used on their teaching practice. With the exception of one student teacher who expressed the view that it is human nature to teach as you've been taught, most critically appraised both their own school experiences and exposure to other teachers and were not blindly duplicating either in their professional practice teaching.

Influence of Interactive Multimedia Program on Assessment

The fact that the prediction was true and student teachers used a variety of assessment strategies may or may not have been due to the influence of the interactive multimedia program on assessment. There is no firm evidence to assume a causal relationship between the two. It is possible, however, to assess student teachers' own beliefs about the program and its impact on their teaching performance.

The majority of student teachers believed that their use of the interactive multimedia program on assessment was a direct and important influence on their use of assessment strategies during their professional teaching practice. One student teacher was the exception by stating that the program had no effect on his teaching and was irrelevant to his choice of assessment strategies:

> You do things for a grade, not so you can put into practice what you've learned. There wasn't anything explicitly, mentally where I'd think 'I have to do this next' it was all just off the cuff. (Interview with David)

The remaining student teachers all attributed the interactive multimedia program as an influence in their adoption of assessment strategies, albeit to varying degrees. One student teacher believed that the program was a very important influence:

> I think it influenced me greatly, I really took it to heart. So I basically did implement a lot of the assessment types that were identified in the multimedia. I think it was a really big help in that part. (Interview with Evie)

Another student teacher pointed out how the program influenced his thinking as he prepared his lesson plans. Interestingly, some of the student teachers spoke about using the assessment strategies from the interactive multimedia program almost unconsciously. For example, Carlo admitted that he may have been influenced to use strategies without consciously knowing it. Similarly, Louise commented that her use of the strategies was unconscious but then went on to describe a very thoughtful and reflective response to children's concerns about assessment:

> It probably wasn't conscious, I was doing it unconsciously. I was trying to use a variety of things like the questioning and the observing and things like that rather than say 'If you didn't get that correct, that's wrong!' Rather I'd say 'What if you did it this way? ' I'd try to use the assessment strategies that made the students feel more comfortable and so knowing which ones were less threatening. (Interview with Louise)

According to the beliefs of the student teachers themselves, the multimedia program on assessment appeared to influence the types of strategies they employed and their thinking about assessment as they taught mathematics and other subjects during their professional practice in schools.

Conclusion

The study set out to investigate whether student teachers' learning from the interactive multimedia program on assessment transferred to professional practice in schools. Analysis of the data shows that all the student teachers could speak knowledgably and confidently about assessment, and all the student teachers used a variety of techniques to assess children's understanding.

Two factors influenced student teachers' use of assessment strategies during their teaching practice. Firstly, a limited two-week professional practice period appeared to severely restrict the choice of assessment strategies available to the student teachers. Secondly, the student teachers appeared to be influenced very strongly in their use of assessment strategies by the supervising teacher. Nevertheless, the student teachers had clearly internalised the assessment issues investigated within the situated learning environment, and were able to use them competently in situations where they had the discretion to do so. According to the beliefs of the student teachers themselves, the multimedia program on assessment appeared to influence the types of strategies they employed and their thinking about assessment as they taught mathematics and other classes during their professional practice in schools. There was no intention to establish a direct causal relationship between the assessment multimedia program and student teachers' approaches on teaching practice. However, their own reports of the program's impact, together with the other variables suggested in the research, add to the understanding of the processes involved, and provide insight into the effectiveness of an instructional design model for interactive multimedia based on the theory of situated learning.

References