

Integrating learning technology into classrooms: The importance of teachers' perceptions

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ABSTRACT

A qualitative study of experienced high school teachers' perceptions of learning technologies is reported. Underlying the study was a research-based theoretical background that highlighted the importance of appropriate perceptions to successful integration of learning technologies into classrooms. The transcripts of 31 semi-structured, open-ended interviews with a group of teachers were combined to form a pool of decontextualized statements about learning technologies. The pool of statements was analyzed using a phenomenographic research approach. A limited number of qualitatively different perceptions of learning technologies were identified. The perceptions varied with respect to "what" and "how" components. The "what" component concerned perception of what constitutes a technology. The "how" component concerned perception of how the technology impacted on learning. Some of the perceptions were considered inappropriate with regard to the "how" component and unlikely to lead to successful integration. For teachers holding these perceptions professional development is proposed in how learning technologies can be used to encourage enhanced learning outcomes.

Keywords

Learning technologies, Phenomenographic research, Student perceptions, Teacher perceptions

Introduction

The integration of learning technologies into high school classrooms is being promoted and supported around the world. Underlying the promotion and support are claims that successful integration will lead to enhanced learning outcomes (DoE, 1998). These claims are difficult to justify, however. Research into the impact of learning technologies on the quality of students' learning outcomes is limited and outdated according to Honey, Culp and Carrigg (2000). A limiting factor has been the difficulty of defining and measuring enhanced learning outcomes attributable specifically to the use of learning technologies (Mitchell & Bluer, 1997).

Recent research has avoided this difficulty and focussed on investigating the requirements for successful integration of learning technologies into classrooms. The research is beginning to show that success requires understanding the complex interactions in classrooms between teachers, students and technology (Honey, Culp & Carrigg, 2000). This understanding is currently incomplete. Parr (1999) studied students' perceptions of learning contexts that incorporated learning technologies. Students' perceptions were found to influence the success of integration, specifically the amount of technology use, the ways in which the technology was used, and teachers' and students' expectations about learning. Teachers' perceptions of learning technologies and influence on students' perceptions have not been studied recently. To further understanding, our study investigated experienced teachers' perceptions of learning technologies. The research also considered the likely impact of teachers' perceptions on students' perceptions and, consequently, on the integration of learning technologies into classrooms.

Underlying our study was recent research into teacher and student perceptions of their own experiences. Contributions to this research come from a number of different perspectives on teaching and learning, principally relational (Ramsden, 1988), phenomenographic (Marton & Booth, 1997), constitutionalist (Prosser & Trigwell, 1999) and constructivist (Biggs, 1999). While these perspectives differ on precisely how knowledge is formed, common is a focus on understanding teachers' and students' perceptions of learning contexts in order to improve teaching and learning.

The research into teachers' and students' perceptions of teaching and learning contexts established a series of systematic associations linking teachers' perceptions and approaches with students' perceptions, learning approaches and outcomes (Biggs, 1999; Marton & Booth, 1997; Prosser & Trigwell, 1999). An explanation of these associations is important to understanding the significance of investigating teachers' perceptions of learning technologies. The associations are summarised diagrammatically in Figure 1, then described.

Teachers conceptualise and approach teaching in a limited number of qualitatively different but related ways. Broadly, teachers who perceive learning as the accumulation of information are more likely to view teaching as the transfer of information. Such teachers are more likely to use a teacher centred approach where the teacher imparts information to students and uses assessment techniques which encourage and test rote learning. In contrast, teachers who view learning as conceptual change are more likely to view teaching as facilitating conceptual change. Such teachers are more likely to use a student centred teaching approach where independence in learning is encouraged through discussion, debate and questioning among students, and assessment which reveals conceptual change (Prosser & Trigwell, 1999).

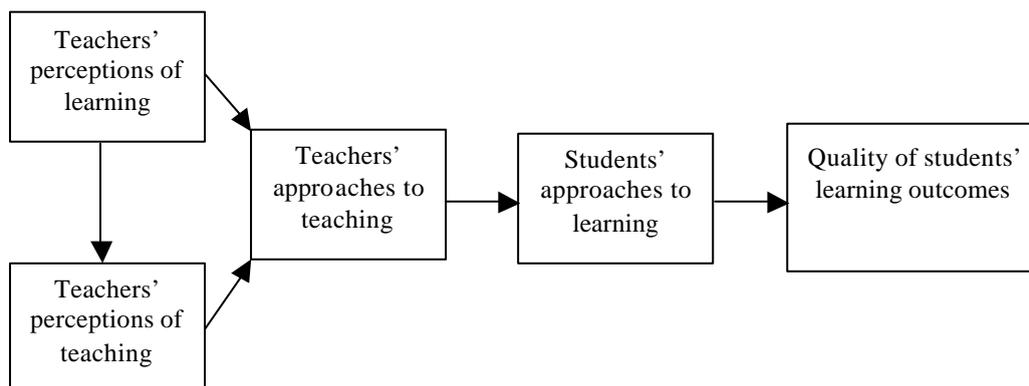


Figure 1. Teacher-student perceptions and the quality of learning outcomes

Students' approaches to learning are related to their teachers' approaches to teaching (Trigwell, Prosser & Waterhouse, 1999). Teachers who describe using a conceptual change/student focussed teaching approach are more likely to be teaching students who report using a deep approach to learning. Deep learning approaches have an intention to seek meaning in learning situations through linking aspects of the content. With a deep learning approach there is the possibility of the conceptual change and deeper understanding which is assumed in this paper to constitute an enhanced learning outcome (Cope, 2000; Marton & Booth, 1997). Indeed, in many empirical studies deep learning approaches have been found to be strongly associated with conceptual change learning outcomes (e.g., Marton & Säljö, 1976; Prosser & Millar, 1989). In contrast, teachers who describe using an information transfer/teacher centred teaching approach are more likely to be teaching students who report using surface learning approaches. Surface learning approaches focus on memorising aspects of the content in isolation with the intention of recalling the content in assessment situations. There is little intention to seek meaning in the content, and little likelihood of significant conceptual change (Ramsden, 1988).

An explanation of the association between teacher and student approaches has been proposed and supported empirically by Prosser & Trigwell (1999). The learning context provided by a teacher is the practical implementation of the teacher's perceptions of learning and teaching, and approach to teaching. Students have been found to vary their learning approach in response to certain factors they perceive in the learning context. Students using deep learning approaches are more likely to value independence in learning, good teaching and clear learning goals, factors consistent with a student-centred teaching approach. Students using surface learning approaches are more likely to have different values, and, consequently different perceptions.

The major contention underlying our study was developed from the research findings just outlined. Teachers' perceptions and approaches and, consequently, the learning contexts they provide, are known to influence students' perceptions. Successful integration of learning technologies leading to enhanced learning outcomes is unlikely unless teachers perceive and use technology as an integral part of a student centred/conceptual change teaching approach. Only through students perceiving learning technologies as part of a learning context which encourages independence in learning and deep learning approaches are enhanced learning outcomes likely.

So how do teachers perceive learning technologies? Pre-service teacher perception studies indicate that constructivist uses of learning technologies may lead to conceptual change (Carr-Chellman & Dyer, 2000; Marra

& Carr-Chellman, 1999). Our concern was with experienced classroom teachers without the benefit of recent pre-service teacher education programs. Some studies (Parr, 1999) provide a basis for investigating perceptions of experienced teachers. In the past decade the nature of learning technologies has changed, with text-based, locally-networked, computer-assisted instructional software being replaced by graphics-rich, globally-networked computer environments, which makes earlier studies less helpful (Honey, Culp & Carrigg, 2000). Professional development programs have been targeted at keeping experienced teachers' knowledge current. Research indicates, however, that brief-exposure programs about technology made available to experienced teachers have been unsuccessful (Schrum, 1999). Our research investigated the questions:

1. How do experienced high school teachers perceive learning technologies?
2. Are the perceptions consistent with the integration of learning technologies in classrooms in a manner likely to encourage enhanced learning outcomes?

Method

The first research question was investigated as part of a larger empirical study which identified and monitored changes in teachers' perceptions of learning technologies over a two year period. The participants were 15 experienced high school teachers at Euroa Secondary College (ESC), Victoria, Australia. The teachers volunteered to be part of the research. The group had an average age of 39 years. Data was collected through semi-structured, open-ended interviews. A series of guide questions were designed, piloted and refined. Examples of the guide questions can be found in the illustrative quotes in the Results section of the paper. Two pilot interviews were held; 15 teachers were interviewed at the beginning of the research period; and 14 of the same teachers at the end. Teachers' responses to the guide questions were probed during the interviews until an understanding was achieved between the interviewer and the teacher whereupon the next guide question was introduced. The interviews were recorded and transcribed.

The combined pilot, beginning and end transcripts (31 in all) were analysed by one researcher using a phenomenographic research approach as described by Marton (1986). Phenomenographic research approaches were designed in Sweden in the early 1970s to investigate the qualitatively different ways that phenomenon in the world can be perceived, conceptualised or understood. There has been a consistent finding in the results of hundreds of published phenomenographic studies. A particular phenomenon can be perceived in a limited number of qualitatively different but hierarchically related ways. Perceptions of a particular phenomenon higher in a hierarchy are inclusive of those lower in the hierarchy and represent a more complete perception and deeper understanding of the phenomenon (e.g., Crawford et al., 1994).

The phenomenographic research approach used in our study sought to analyse some of the distinctly different ways that learning technologies can be perceived by experienced teachers. Through combining the interview transcripts a large pool of decontextualized statements about learning technologies was created. Analysis was an iterative process of considering and comparing the statements. During analysis the researcher was constantly asking questions adapted from Bowden (1994). 'What does this statement tell me about the way that learning technologies were perceived?'. 'How must learning technologies have been perceived if this statement is to make sense?'. Gradually the researcher divided the statements about learning technologies into groups with a similar underlying perception. In an extended, iterative process, statements within and between groups were compared as part of clarifying and defining the critical differences and relationships between the groups of statements. When the analysis was complete the perception of learning technology underlying each group of statements was given a label, elaborated and illustrated with statements from the pool. Finally the different perceptions were presented in a hierarchy based on more complete perception and, hence, level of understanding.

Establishing validity and reliability in a phenomenographic analysis is important. Justification of validity lies in a full and open account of a study's method and results. The judgement of credibility and trustworthiness then lies with the person reading the study (Booth, 1992). For this reason, the method of our study has been described in some detail. Further, the perceptions of learning technologies that were identified are described and illustrated in detail in the next section and the interview transcripts are available on request.

In this type of research, the communicability of the perceptions identified needs to be established (Cope, 2000). Judgement of reliability is not appropriate because no two researchers can be expected to find identical perceptions underlying interview transcripts. While some call for researchers to suppress prior knowledge in phenomenographic research, in practice this is not possible. Different researchers bring different prior knowledge to the process. The outcome space of related perceptions which form the findings of the research are, therefore, constituted as a relation between an individual researcher and the data. What is important, however, is

that the findings are described and illustrated in a manner which communicates to other researchers the critical differences and relationships between the perceptions. Given a description of the perceptions and the interview transcripts, other researchers should be able to see the different perceptions in the data.

In our study the communicability of the results was tested through both the researcher who undertook the phenomenographic analysis and another researcher separately classifying each interview transcript against the hierarchy of perceptions of learning technologies. Classifications were compared and disagreements discussed. Disagreement between the two researchers over the classification of a transcript occurred in less than 10% of cases. Given the interview transcripts and the hierarchy of perceptions, the researcher who was not involved in the phenomenographic analysis was able to recognize the perceptions in the data.

Results

The phenomenographic analysis of the combined interview transcripts identified variations in perception of learning technologies. In general, learning technologies were perceived as technology which enhanced learning. Perceptions varied, however, with regard to “what” and “how” components. The “what” component concerned the technology aspect of learning technology - what constituted a technology? The “how” component concerned the nature of the impact of the technology on students' learning – how does the technology enhance learning? As a response to the first research question, each variation is described with a label, the researcher's elaboration of the perception and illustrative quotes from the interview transcripts. Each perception represents a distinctly different way of perceiving the aspect of learning technologies.

“What” component - what constitutes a learning technology?

Perception W1: Anything which can be physically manipulated by the learner. In this perception learning technologies included anything with which students interacted physically in the learning process. Examples given in the transcripts included a pencil and paper, a lump of clay, or something electronic like a computer.

When learning to draw an object a pencil and paper are normally used. Would you consider the pencil and paper to be a learning technology?

Yes.

What makes them a learning technology?

The fact that a human being, the pencil and the paper can combine to produce a drawing. It is a physical process conjured up and manipulated by human beings to record or communicate.

Can you think of a teaching aid that you would not call a learning technology?

There are very few things that aren't used in a physical way that if you use them to learn you learn from.

Perception W2: Any mechanical or technical equipment. Learning technologies were viewed as any mechanical or technical equipment. This perception did not incorporate objects which were strictly manual rather than technical or mechanical. For instance, textiles or clay would not be considered as learning technologies. All other mechanical and technical aids to learning were incorporated.

What makes a pencil and paper a learning technology?

They are a tool operated by a human.

Can you think of a teaching aid that you would not call a learning technology?

A person, because they are not mechanical.

Perception W3: Progressive pieces of mechanical or technical equipment. The nature of the mechanical or technical equipment was important here. Learning technologies were restricted to equipment which demonstrated some development over and above an older piece of equipment.

Can you give me an example of a learning technology?

Computers.

What makes them learning technologies?

The fact that it is a technological piece of equipment and progressive as opposed to something that was done by hand in the past.

Perception W4: Computer related equipment. In this perception learning technologies had to be something electronic.

What do the words “learning technologies” mean to you?

Well I think it is something which enhances students' learning and requires something to be plugged into the wall.

The different perceptions of the “what” component of learning technologies were generally found to be related in a hierarchy based on logical inclusiveness. Perception W1, for example, includes three other perceptions and represents a broad view of the technology component of learning technologies. Perception W4, in contrast, is a narrower view of the technology component of learning technologies.

“How” component - how does the technology enhance learning?

Perception H1: Encouraging the seeking of meaning. In this perception learning technologies were considered to enhance learning through encouraging and simplifying the seeking and grasping of the meaning of the content being taught. The use of learning technologies in the classroom by students was perceived as leading to learning outcomes which involved deeper understanding.

If two students of equal ability completed a work requirement and one used learning technologies and one didn't, how would you expect the one who used the learning technologies to use them in their work requirement?

..... Alright then if they were using the new technologies then the presentation might be more glamorous and also they might have access to information that they might not have otherwise had and also sometimes when they are using things like computer graphics to present something it helps them to understand it more quickly or more visually, or they grasp it and therefore they can explain it in their answer more clearly because they have understood.

Perception H2: Encouraging the development of better learning techniques and strategies. Deep learning approaches with the possibility of enhanced learning outcomes require particular learning techniques and strategies. In this perception learning technologies were seen to enhance learning through enabling students to develop these techniques and strategies. The focus of this perception was on the learning process rather than the quality of the learning outcomes.

What do the words “learning technologies” mean to you?

They would be pieces of technology, instruments, machines which enable students to enhance and develop their learning techniques, learning strategies.

Do you think the World Wide Web is a learning technology

Without a doubt.

Why?

Because it is making use of facilities that go beyond the immediate human body in terms of being able to resource information, to resource a whole of aspects of learning that can't take place without it, it enhances the learning process.

Perception H3: Developing skill with and knowledge about the technology. In this perception learning was considered to be enhanced because skills in using the technology were learnt.

What do you think the Department of Education means by enhanced learning?

I would imagine that they mean it broadens learning in a particular area so they can take in what is available in the modern day and learn how to use the equipment.

Is this the same as what you think enhanced learning is?

Well I think that learning now encompasses the use of modern devices. You have to prepare kids for the modern world. I don't consider that we necessarily couldn't get most of the ideas and basic understanding across without these technologies in most areas.

Perception H4: Assisting the learning process. Two different senses of assisting learning were evident in this perception. Firstly, the technology makes teaching and learning easier through better access to more information. Secondly, the technology assists learning through motivating students and making the learning process more enjoyable.

What makes your example a learning technology?

Simply because it is a tool that is a development or enhancement and that has become available recently. It is something which enables kids to do their work more easily and allows you to teach them more easily. It makes my job easier.

What impact would your example (digital camera) have on your students' learning?

It would have a very large impact, it can make it relevant to the kids, keeping them involved in all the facets of the process of designing a product and making it, they don't have to rely on someone else to take the image.

What about a normal camera?

Yes it's a learning technology. It will assist kids with their learning.

Are there any differences in the learning?

A digital camera is much more immediate and the kids are involved in the whole process much more easily and they can see the image, the immediacy is a big advantage. The big advantage with many learning technologies is the more technical it becomes its much more immediate, which kids really appreciate and respond to.

Perception H5: Allowing quicker, better presentation of more up-to-date, expansive information. The focus here was on enhanced learning involving better presentation of the material to be handed in.

If two students of equal ability completed a work requirement and one used learning technologies and one didn't, what differences would you expect to see in the work requirement?

I think you would see it in the end product in terms of it being printed out and typed up, but I wouldn't expect to see more or better information.

The different “how” components of the perceptions of learning technologies were also found to be related in a hierarchy based on logical inclusiveness. Perception H1 is inclusive of all the other perceptions and represents an educationally more desirable perception and deeper understanding of enhanced learning outcomes. Enhanced learning outcomes resulting from the use of learning technologies require grasping meaning; better learning techniques and strategies; skill in using the technology; assistance and motivation from the technology; and more effective presentation of the learning outcomes. The quote used to illustrate Perception H1 demonstrates the inclusive nature of the different “how” components.

Discussion and Conclusion

The finding of components of learning technologies in which there was distinct variation in perception that can be described in a hierarchy of logical inclusiveness is consistent with the findings of many phenomenographic studies into other phenomena (see Marton & Booth, 1997, for an overview). This variation in perception of learning technologies among experienced high school teachers has, to our knowledge, not been described previously. While data was obtained from a specific group of experienced high school teachers in Australia, the process of decontextualizing the data and analyzing across the pool of statements suggests that the perceptions are likely to be found in other contexts. The specific and limited context of our study suggests that only some of the possible variation in perception of learning technologies has been identified. Other contexts may evoke additional, distinctly different perceptions of learning technologies.

The second research question concerned whether the perceptions identified are consistent with the successful integration of learning technologies into classrooms. The theoretical background to our study and the findings of Parr (1999) suggest that teachers' perceptions of learning technologies are likely to be vital factors in the successful integration of learning technologies. Parr found that students' perceptions shaped the way that the learning technologies were used. Our theoretical background suggests that students' perceptions are likely to be influenced by teachers' perceptions and use of learning technologies in their teaching approaches. For successful integration leading to enhanced learning outcomes, teachers need to perceive learning technologies as part of a student centred/conceptual change teaching approach. The learning technologies need to be perceived as tools in the learning context which encourage students to use deep learning approaches – to seek meaning in the content being studied through interrelating the various aspects of the content, looking for a deeper understanding.

We believe that the findings of our research are relevant for experienced teachers with limited professional development and inappropriate perceptions of learning technologies. Such perceptions are unlikely to lead to the use of learning technologies in the classroom in a manner that facilitates successful integration and enhanced

learning outcomes. Teachers holding these perceptions are unlikely to use learning technologies in a manner perceived by students as encouraging deep learning approaches. Without deep learning approaches, conceptual change as a principal learning outcome appears highly unlikely.

Our findings provide empirical support for claims made by other researchers about the nature of professional development in learning technologies for experienced high school teachers. In addition to instruction in the use of learning technologies, experienced teachers need professional development in modern research knowledge about the nature of learning and how learning technologies can be used to encourage enhanced learning outcomes in students (Carr-Chellman & Dyer, 2000). The current support for and promotion of the use of learning technologies in classrooms, whilst admirable, needs an additional focus – increased time release for experienced teachers to undertake this professional development.

Further research involving teachers' perceptions of learning technologies is warranted in a number of areas. The impact of relevant professional development programs on experienced teachers' perceptions of learning technologies could be assessed. Investigation of the interactions in classrooms between students, teachers and technology is only just beginning. Of value to these investigations would be research into the impact of teachers' perceptions of learning technologies on teaching approaches, students' learning approaches, students' perceptions of learning technology use, and the quality of learning outcomes.

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