Transfer of Online Professional Learning to Teachers’ Classroom Practice

ANTHONY HERRINGTON, JAN HERRINGTON, GARRY HOBAN, AND DOUG REID
University of Wollongong, Australia
tonyh@uow.edu.au
j.herrington@murdoch.edu.au
ghoban@uow.edu.au
dougr@uow.edu.au

Professional learning is an important process in enabling teachers to update their pedagogical knowledge and practices. The use of online technologies to support professional learning has a number of benefits in terms of flexibility and scalability. However, it is not clear how well the approach impacts on teachers’ classroom practices. This article outlines a research study conducted on behalf of a state-based Department of Education to evaluate the transfer of professional learning from online modules on the integration of ICT to the practices of K-12 classroom teachers.

TRANSFER OF ONLINE LEARNING TO THE CLASSROOM

The application of knowledge learned within an instructional environment is of paramount importance to any educational or training system wishing to effect change. Indeed, all that teachers do is based on a firm belief in transfer. As Bransford and Schwartz (1999) stated: “A belief in transfer lies at the heart of our educational system” (p. 61).

Recent developments in pedagogical research and theory have changed the way transfer is understood. For example, Grabinger (1996) contended that the assumption that people transfer learning easily by learning abstract and de-contextualized concepts, has been generally replaced, under the influence of more constructivist approaches, with the assumption that people transfer learning with difficulty, “needing both content and context” (p. 667). For example, Boud and Walker, (1990) emphasize the importance of a
context that enables teachers to reflect on their new experiences; Lave and Wenger (1991) and Analou (1993) argue for a context in which the learning takes place to be similar to that in which the new learning will be applied; and Feldstein and Boothman (1997) stress the importance of a supportive social context. Broudy (1977) proposed that transfer needs to be considered beyond the contexts of knowing that (replicative knowledge) and knowing how (applicative knowledge) to also knowing with, such as, knowing how to teach intended learning outcomes with the use of technology.

This notion of knowing with is one that resonates well with learning with technology. Perkins and Salomon (1992) have also noted: “Whether transfer occurs is too bald a question... One needs to ask under what conditions transfer appears” (p. 6). These conditions can include such factors as the teachers themselves, the time taken to learn new skills, the socio-cultural environments of the training and workplace, as well as the program design (Leberman, McDonald, and Doyle, 2006). The conditions for transfer of learning of educational applications of ICT were explored in a study of online modules designed for teachers in K-12 classrooms, and the findings are described in this article.

**BACKGROUND TO THE PROFESSIONAL LEARNING PROGRAM**

One hundred and seventy teachers, involving 85 schools, in a state-based educational system participated in a pilot implementation of professional learning using online modules designed to integrate technology into teaching and learning. The project focused on supporting K-12 teachers to increase their skills in using an information technology application, which they could then integrate into their teaching practice. Through two-hour modules, delivered online, teachers were provided with: step-by-step instructions on an ICT application (such as Microsoft PowerPoint, iMovie, Excel, etc.), teaching and learning samples from a specific Key Learning Area and Stage, an online facilitator, teacher relief, and project officer support. Teachers involved in the program completed the following activities as part of the professional learning program. Specifically, the teachers:

- completed an online, self-paced module (approximately 2 hours);
- designed a sequence of lessons integrating an aspect of ICT into their teaching and learning practice;
- taught the sequence of lessons;
- refined the sequence of lessons after teaching;
- submitted the sequence of lessons to the project manager;
- submitted three student work samples generated from the lessons;
- evaluated the module, using the template provided online; and
• completed a written evaluation form.

In evaluating the effectiveness of this program in facilitating transfer to classroom practice, the research addressed the following questions:

• What are the challenges and consequences for teachers when they transfer professional learning into practice?
• What are the conditions that support teachers to expand the use of ICT in their teaching and professional learning?
• What is the impact of teacher professional learning on student ICT experiences?

METHODOLOGY

The research employed a telephone survey and a multiple case study approach to investigate the impact and transfer of knowledge of teachers who participated in the online modules program. The study sought to establish the critical factors for teacher engagement and success in integrating ICT-based practice. Thirty-six of the 170 teachers were targeted to participate in the study.

Phase 1: Interviews with participants

A representative number of teachers was targeted for interview to sample all 18 ICT modules (2 teachers for each), selecting a total of 36 teachers for interview across subject areas, school types, and locations. Telephone interviews were conducted, using non-scheduled standardized interviews with the teachers covering: development of work programs subsequent to PL completion, implementation of lessons, outcomes, challenges encountered, impact on students, and willingness to improve. Interviews were taped via speakerphone to a digital recording device. Digital voice recordings were then transcribed into a word processing document for analysis.

Phase 2: Selection of in-depth cases

Of the 36 teachers who were interviewed, 30 indicated their willingness to be involved in the follow-up case studies. Of these, a purposive sample of eight teachers was chosen to participate in the more in-depth inquiry based on willingness to be involved and the recommendation of the researcher who interviewed the teachers of those most likely to offer quality in-depth data. The teachers were nominated based on the (self-reported) extent to which the knowledge they learned in completing the modules transferred to their classrooms and for their willingness and ability to articulate their successes, problems, issues, and accomplishments. The cases also needed to represent primary and secondary school systems, and regional and metropolitan schools.
Eight cases were researched for in-depth examination of factors and conditions associated with transfer of learning from online modules. The eight cases comprised of three metropolitan comprehensive high schools, one regional comprehensive high school, one regional selective high school, one rural primary school, and two regional primary schools. Two researchers from the team visited four schools each, for one day, to collect data for the in-depth case studies that involved:

1. *Teacher and class observation*: With permission, the researcher visited the teacher’s classroom, and observed and documented the context of the implementation of the ICT skills learned in the online modules. The researcher made note of pedagogical strategies manifest in the ICT modules, and observed the nature and extent of transfer to teaching practice. Notes were collected for analysis.

2. *Teacher interviews*: A non-scheduled, standardized interview was conducted face-to-face with each teacher. Each interview lasted approximately 30-40 minutes, and was recorded on a digital recording device or cassette tape recorder for transcription.

3. *Student interviews*: At each site, the researcher interviewed a small group of 2-3 students in each class to obtain student perspectives on the use of the ICT teaching approaches. Each interview lasted approximately 10-20 minutes, and was recorded on a digital recording device or cassette tape recorder for transcription.

4. *Additional artifacts*: Lesson plans and student work samples from the observed classes were collected to provide further corroboration of findings.

**ANALYSIS OF DATA**

Qualitative analysis of the interviews was conducted using the constant comparison method (Merriam, 1998) of determining major themes and issues. Data was further considered within the framework suggested by Miles and Huberman (1994) of the three stages: data reduction, data display, and conclusion drawing and verification. Draft versions of data analysis were considered at several meetings of the research team to consolidate the findings and verify that the analysis and report did not misrepresent the views of any individual researcher. Themes and issues identified in the interview and case study data have been discussed below.
FINDINGS

WHAT ARE THE CHALLENGES AND CONSEQUENCES FOR TEACHERS WHEN THEY TRANSFER PROFESSIONAL LEARNING INTO PRACTICE?

The transfer of learning within a professional learning context is not necessarily a simple matter of taking what is learned about a technology application in an online module and implementing it in a classroom context. In the pilot implementation of the online modules, a complex range of factors was revealed in the research that impacted on teachers’ readiness and willingness to effect change in their approach to using technology for student learning. Each of these factors is explored in more depth below.

Usefulness of Modules in Preparing Teachers to Integrate ICTS

The quality and usefulness of the online modules themselves was an issue that affected teachers’ preparedness to implement appropriate strategies within their teaching programs. Both the benefits of the online approach, and the difficulties, emerged in the interviews with teachers. The major issues appeared to be that the modules, when they were well-designed, assisted greatly in providing teachers with new ideas and skills, but at times there were problems and difficulties associated with this form of professional learning.

Learning New Ideas for Effective Use of Technology

Many teachers valued the ideas they gained for integrating technology more fully into their classrooms and overall teaching approaches. One teacher described her enthusiasm to engage with an appropriate online module in an effort to learn strategies for encouraging students to use the web in creative and responsible ways:

We [wanted] to get students thinking more about selecting and actually querying the information that they’re given… so that they can make value judgements about reliability of what they’re dealing with.

Learning New Skills

Learning new skills was also a significant positive outcome of the professional learning, and one that resulted in a great deal of personal satisfaction from the teachers in terms of their own learning and skill development. One teacher expressed the belief that he felt more prepared, compared to other teachers he knew, to implement the technology usefully in the classroom. Another teacher was pleased with his own professional learning from the module when he learned a new piece of software:

We worked with Microsoft Works, which I really haven’t worked with before, and I think it helped because we’re trying to use the database
and we’re actually building it into an assessment task for one of our subjects, so it worked really well.

**Problems or Difficulties with the Online Modules**

A few of the teachers found the online modules difficult to access for a range of reasons, and it appears that many simply gave up. Many found the professional learning not very helpful, or worse, a waste of time. For example, when questioned about how the modules helped teachers in their own learning or their use of the technology in their classes, there were a few comments like:

- It didn’t help at all.

- I don’t think it gave us any further skills... it hasn’t enhanced [my teaching] one little bit.

Another teacher expressed disappointment with the lesson plans provided to implement the use of the technology with a class. The teacher appeared to see the plans as fairly restrictive and linear, and had himself thought of more innovative, authentic means to use the technology:

- It became evident that doing just a short series I think of three lessons really does not prepare the kids... instead of doing iMovie as a short sequence of lessons, I’d be looking at doing it as a complete topic within technology and taking a timeframe of around about a term.

**Problems Implementing Learning from the Modules**

In some instances, teachers felt positive about the professional learning experience and learned much from the online module, but were discouraged from implementing the strategies because of restrictions in their own classroom or school context.

**Availability of Technology: Hardware and Software**

The lack of access to reliable computers and other technology appears to be a major problem for many teachers wishing to implement learning from the online modules. For example, one teacher, who was very positive about her own learning from the online module, and saw the value in using the technology as a powerful tool in the classroom, was constrained by the availability of computers in her school:

- The library is used by everybody and anybody, [the network] is often down, sometimes there are other things happening and sometimes you just can’t even get a booking.
Other teachers pointed out similar difficulties in accessing computers when they needed them for their classes, particularly in terms of competing with other classes to access overbooked computer labs. Many teachers also reported software problems, often involving the installation and availability of the software that was explored in the online modules. Many teachers were keen to use strategies learned in the modules with classes, and when it involved a particular piece of software, it was often a challenge to obtain it for the school computers. For example, one teacher had difficulty ensuring that all computers had database software, nominating it as one of the real challenges in implementing new strategies. Another teacher described the nature of her problem downloading relevant software:

I found that my dial-up network at home was too slow to use it. It was going to take me 27 hours to download the program and I just went, "no, you're kidding."

**Reliability of Technology**

In those cases where availability and supply of hardware and software was adequate, the reliability of the technology (or lack of it) often caused problems. One teacher described at length how frustrating the experience of trying to implement the technology-based approach he learned in an online module. He faced difficulties loading software, learning how to use it, obtaining access to relevant data, and then finding that what he had was not really appropriate for the class he was teaching. However, in spite of these difficulties he did come away from the experience with important knowledge on using technology in the classroom:

It raised awareness of some of the issues that you had to face in planning and implementing. It made me aware that they were there.

**Lack of Time**

Lack of time was often cited as an impediment to teachers’ own learning about and use of technology in the classroom. While a school may provide verbal support for innovation, in many cases this support is not carried through by providing the time and resources to make it a reality in the classroom. For example, one teacher pointed out that while there was notional support within her school for more effective teaching and learning strategies, it was expected that such professional learning and preparation should be done in the teacher’s own time. Teachers in the study appeared to be acutely aware of maximizing PL time to best advantage.

**Inadequate Student Computer Literacy and Competence**

One difficulty mentioned by a few teachers was the varied levels of stu-
dent computer literacy that can be found within a class. While there can be an expectation that most students today are very computer literate, this is not necessarily the case. Variations, from very competent self-directed users to novices, can cause delays in teachers being able to implement their planned approach. One teacher described the problems he encountered in this regard:

The first [problem] was the varied level of computer literacy within the students. I realized that I needed to go back to very basic instruction, so that was a learning experience for me. I had assumed knowledge about the competence of the students and that was a false assumption.

**Whether the Modules Facilitated Pedagogical Changes**

One of the most meaningful consequences of a teacher’s involvement in the professional learning would be the extent to which the completion of an online module facilitated pedagogical change in the teacher’s approach. An exploration of this issue with teachers revealed that pedagogical change did occur for many, and the means by which this happened are described below.

**By Teaching Teachers New Content and Strategies**

A few teachers described the professional enhancement and enjoyment they derived from adding new teaching skills and strategies to their pedagogical approaches. For example, one teacher described how his greater knowledge of spreadsheets has not only added to his own knowledge, but also changed his approach to teaching in some ways:

I’m integrating spreadsheets into Year 9 science so it’s changed it [his teaching]. It’s given me an extra methodology. I use spreadsheets which I didn’t before, didn’t use them at all.

Even when teachers had knowledge of a particular technology or piece of software, some described how the online module helped to extend and diversify their knowledge and pedagogy in new ways. For example:

The kids were already doing digital portfolios at the end of the year, I think we’ve done them for about 3 years… [After the online module], instead of just photos, we were putting copies of their work and scanning their artwork into it. They were recording their own spelling results each week, and they made up a graph, so we inserted that into their digital portfolio.

**By Stimulating Teachers’ Own Learning**

Some teachers acknowledged that the online PL impacted on their approaches to teaching health across the board. One teacher, who had previ-
ously expressed dissatisfaction with the content of the module she had completed, admitted to learning a lot about questioning, an important but unintended outcome of the module:

[My colleague] and I ... reviewed the lessons we had taught and we decided to refine our questioning to make the children think more critically, and to me that was the big benefit of the module, having the time to think about our questioning techniques... My questioning has become a lot more in depth, so the children to me are more engaged because the activities and the questioning are more well thought out. I think the quality of work of some of the children has improved and the children’s critical literacy skills are improving... because of the questioning technique that we’ve adopted.

Other teachers also indicated that their teaching strategies had changed to incorporate more technology in meaningful ways.

WHAT ARE THE CONDITIONS THAT SUPPORT TEACHERS TO EXPAND THE USE OF ICT IN THEIR TEACHING AND PROFESSIONAL LEARNING

An important factor in the transfer of learning from the modules into classroom practice was the teacher’s overall approach to the experience of completing an online module. When the experience was an extremely positive one, facilitating student learning with the relevant technology seemed to follow easily through the enthusiasm and determination of the teacher to achieve it. However, there were several other critically important aspects of implementation that supported this transition, largely within the teacher’s school environment itself.

Positive Response to Undertaking the Modules

The reasons for teachers undertaking the modules seems to have impacted on the extent to which they immersed themselves in the experience, their later use of the learning in their teaching, and the ultimate worth they placed on the professional learning experienced. Those teachers who had a good reason for completing the modules were generally more positive as a whole to the professional learning and seemed to have fewer difficulties implementing technology-based strategies.

Learning New Approaches and Strategies

One important reason for undertaking the professional learning was to learn new ways of motivating and encouraging students in their use of ICT. For example, one teacher’s reason for taking the online module course was to explore new ways to deal with students’ widespread use of the Internet to download chunks of information without critically questioning the quality.
Learning New Ways to Incorporate Technology

A physical education teacher expressed an interest in trying to incorporate more technology into the subject as he felt that, to date, technology was under-used in the subject area at his school. Other teachers also commented in a similar vein:

It was definitely just an introduction for me but it got me on the right track. The work I was involved with was word processing, database and spreadsheet type work so I hadn’t actually done anything in the creative arts area so it… broadened my horizons.

Factors that Supported Implementation in Schools

Within the school environment itself, several factors emerged as critical to teachers’ views of how successful the online modules were in changing their professional practice.

Provision of Additional Time

Just as lack of time was an impediment to the implementation of learning from the online modules, the provision of time was a critically important factor for teachers in its success. Three professional learning release days were invaluable for teachers in coming to grips with subjects which often required sustained effort and concentration to master. For example:

We were provided with day release, a couple of days to write our lesson or go through the PD, write out a lesson sequence and then to test that on our class… so that was very good.

Support of Others in the School Community

Two teachers within a school generally completed the online modules at the same time. This proved to be a valuable strategy in providing in-built support and collaborative opportunities for the teachers. Many teachers commented on the value of this professional dialogue:

For me, it was the other person doing the same work at the same time and sitting beside me… every time I messed up I was able to say: “Help, how do I fix this?” If I hadn’t had someone supporting me here I think I would have found it much more difficult… just having someone to do some networking with and brainstorm ideas…. So I think that professional dialogue seemed really critical to the whole thing.

The support of designated (often by reputation) ICT proficient teachers or non-teaching support personnel was also appreciated by teachers in their efforts to fully apply their learning from the modules. For example:
We’ve got the real guru, he’s the ICT man. He’s not only got expertise, but he’s got a passion… he’s the bloke that I go to see [with questions] because he answers them quickly.

The support and encouragement of the principal or head teacher in a learning area was an important factor that supported implementation of ICT in schools. One teacher described the support given by his head teacher, not only in allowing time but also by providing hands-on assistance in learning the software. Although not a major influence, one or two teachers mentioned how helpful the support of parents was in implementing technology-based initiatives with students. For example, one teacher in a fairly small school pointed out:

I’ve got a really supportive parent body who, any time I mention technology are only too happy to go buy things for me. They’ve bought the digital camera and the data projector and they bought a whole lot of other stuff this year… having them on board’s been really good.

Culture of the School

Whether or not the teacher’s school instantiates a technology-rich or technology-friendly culture appears to be another important support factor in whether or not a teacher’s learning from the modules transfers to classroom practice. Such a culture is often reflected in a critical mass of knowledgeable and supportive peers who might have used similar strategies in their classes, and in technical support that might be available from a range of sources:

The school is a very strong technology school so we’ve got a whole lot of other teachers around the place who have used [the software] in a number of different ways. And then of course we’ve got technical support people as well who can come into the class and assist.

Collective knowledge about what it takes for technology-based innovation to work (at both the pedagogical and practical levels) is often seen as a characteristic of supportive school culture.

WHAT IS THE IMPACT OF TEACHER PROFESSIONAL LEARNING ON STUDENT ICT EXPERIENCES?

The data collected in the study indicates that teacher professional learning through the online modules impacted substantially, not only on students but also on the wider school communities, often in unexpected ways.

Benefits for Students

Students learning with powerful and engaging technologies were the most profoundly affected group, in terms of learning from the online mod-
ules, beyond the teachers themselves. The teachers’ knowledge of technologies and appropriate strategies filtered through to impact on students in several key ways.

**Students Engage in Authentic and Meaningful Learning Experiences**

Perhaps the most significant effect for some teachers and their students was the use of the affordances of technology to create more meaningful and authentic learning tasks. For example, one history teacher described in detail how the learning from the PL affected a real benefit for students in the tasks she set for her class:

> Instead of just pressing the [paste] button and giving me facts, which anyone can do, they had to put it into a newspaper format of the time. So they were talking about women going on strike, and demanding their say in education, and [the students were] taking an angle. By sorting out their questions, it was forcing them to actually take an angle.

A physical education teacher described a very practical outcome for students, in addition to the general benefits of using technology, through the production of an online, first aid manual that students and their families can subsequently use at home:

> They do a first aid journal. We usually do it just on paper but now we use computers so they can find the information and research it, and then it’s actually on the computer for them. They can take it home and have a copy of the first aid manual so they can use it at home.

One teacher described in detail how he planned to engage students with video editing software (learned in the online PL) through the use of a realistic video production exercise that related to their own curriculum areas:

> The design brief was that they needed to compile a segment for a lifestyle TV program. So those students who were in either the woodworking or metalworking areas, they were doing [a segment] along the lines of a DIY, and students who were in the food or textiles technology areas were doing more of a lifestyle kind of thing.

Learning generic, lifelong learning skills, beyond those explicitly taught, was a very real benefit for students, as one teacher explained:

> What we’re seeking to do there is to address some of the non-technical outcomes… getting them to do some teamwork, and they need to do some of the documentation, taking minutes for meetings, and assigning tasks for each other, and… introducing the kids to the concepts of working as a team.
Students Take Greater Control of Their Learning

Using technology to create portfolios proved, in the view of one teacher, to engage students more and facilitate higher order thinking in the preparation of their work:

They’re more engaged as learners because they can see more results of the learning process, they are taking greater control of their own individual learning... There’s a lot of decision making that the children do as to what goes into their portfolios now, and they’re operating at a higher level with their thinking.

Students Respond Well to Technology

Several teachers felt that students benefited a great deal from their increased knowledge of technology, and its use in the classroom, as young people are more familiar with many forms of technology and have readily embraced it in their day-to-day lives. For example, one teacher made the point that:

If you use technology you are in their medium. If you use computer technology particularly you are working at something that they like, that engages them because it’s immediate.

Students Use Technology to Express Themselves

Especially with language learners or very young children, although not exclusively, technology can help students to express their ideas when their verbal and vocabulary skills are still developing or inadequate. One teacher described how her students used PowerPoint:

They really seemed to enjoy the activity because they could put their own personalities into it, but it’s still very language-focused. It’s very hard to find things that are really interesting that they can do with the little language they have, and I think they really enjoyed being able to use pictures and use the different decorative effects that PowerPoint has to express their personality when they were talking about themselves.

Or as this teacher pointed out, students use technology to express themselves in ways that amaze their teachers:

I basically tried to help the kids become more familiar with it, then they take off with it. You show them one bit of it and they come back and have taken it somewhere else and developed it. Oh yes, they were gone with it. They run with it quite readily. It is amazing what they come back with – ideas you never even thought of.
Transfer of Modules Across Curriculum Areas or Years

Regrettably, the use of ideas and strategies from the modules were frequently confined to the subject areas and stages that were part of the learning experience for many teachers. However, not all teachers were constrained by the original context of the learning within the modules and used their imaginations to find new ways to use their new technology skills across the curriculum and year levels. One history teacher said that she adapted ideas learned in the online module for her Years 7, 8 and 9 history classes, with subsequent benefits for students. She described the results of one activity:

I adapted that Year 8 [activity] to Year 7, and while it was hard work and it took them a while to actually get the idea, I think they came up with far better product as a result of it.

Because many of the teachers in the study were specialist secondary teachers, many did not have the opportunity to apply their technology-related learning across different learning areas. Nevertheless, where possible within the constraints of their own teaching profiles, teachers used the ideas across subject areas, especially primary teachers. One teacher was so excited about the potential learning experiences and engagement that the Robotics topic offered, that he and his colleague (who had also studied the PL module at the same time) intended to start a robotics club for students and staff at the school:

I'd like to do it again with my class this year... I prefer to integrate it into the general classroom where you can make the links with other things, but there has been so much interest that we are starting a robotics club as well.

Benefits for Educational Community

Sharing learning and resources within a school, district, or learning area community was a very positive outcome of the professional learning. One teacher used the PL lessons while a pre-service teacher was on practicum in her classroom, and in so doing, provided further valuable professional learning beyond her own experience. Another teacher described how the work she had done as a result of the online module was starting to impact on the whole lower school language program, and further, through her own presentation of the module content to other teachers:

We sat down as a Faculty at Staff Development Day at the beginning of this term to discuss extending that activity so that it's a whole new group activity across the two language [areas].

A beginning teacher who used a totally different piece of software with
students, which he felt few teachers in his school were familiar with, intended to conduct professional learning sessions within his school.

**CASE STUDY FINDINGS**

A member of the research team visited each case study school for one day. During the visit, discussions were held with the teacher prior to the observation of the teacher's class. After observation of the class, two interviews were conducted, one with the teacher and the other with a group of students from the class.

**Analysis of Transfer to Teaching Practice**

Six aspects of transfer were explored, together with an investigation of an implementation of the technology-based strategies in the teacher's classroom. These aspects reflect Haskell's (2001) typology of transfer levels and Bransford and Schwartz' (1999) notion of transfer as "preparation for future learning" (p. 68).

**Initial Learning Occurred**

It has been argued that transfer of knowledge is facilitated if it is well learned to begin with, a process that Prawat (1992) claimed 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). The first stage in investigating transfer was to try to determine how well teachers had learned a particular ICT approach within the online modules professional development program. Questions in the interview explored how well teachers learned the subject of the package, whether connections were made, whether teachers monitored their learning and reflected, and whether they could speak knowledgably about the subject or they would have to go back to their notes.

**Transfer of the Subject of the Learning Module**

The second indicator of transfer explored was whether the subject of the learning module transferred to other contexts; that is, the same technology strategy taught to a different year level or curriculum area. For example, if the teacher did an online module on PowerPoint, was the knowledge of that package used again, with the same subject matter with different classes, or different subjects areas than the original class?

**Transfer to the Ready Use of other Software Packages**

The third indicator of transfer was whether teachers' learning in the module subsequently extended to the use of other software packages or programs. For example, if a teacher completed an online module on PowerPoint, has he or she readily used other software like Inspiration, Excel, or iMovie?
Transfer to the Use of Other Technologies

Fourthly, transfer to other types of technology was explored with teachers. For example, if a teacher completed an online module on a computer-based application, like PowerPoint, has it inspired him or her to use other types of technology with students, such as making movies, showing video, using palm pilots, or audio taping?

Transfer of Pedagogical Approach

The fifth type of transfer explored was transfer of a pedagogical approach from the technology context to any other (not necessarily technology-based) context. For example, did completion of an online module encourage a teacher to think about different pedagogical approaches that might be applicable elsewhere, such as designing and presenting assignments as in Webquests (tasks, process, resources), or using headings to organize a document as in outline view in PowerPoint?

Transfer as Preparation for Future Learning

The final type of transfer investigated was perhaps the most nebulous but potentially most significant, as it investigated whether the experience of completing the online module prepared a teacher for future learning. For example, if a teacher completed an online module, whether it has helped to change his or her attitudes to technology generally, whether he or she might no longer be afraid to try technology applications with classes or whether he or she is now prepared to take on new challenges with technology.

Finally, teachers were asked to describe a real example of their use of technology in their teaching. It was thought that asking a teacher to project to a real case might help to gain further insight into the practical aspects, advantages, and disadvantages of using technology in their classes. They were also asked to nominate the kinds of professional development they now considered appropriate and necessary for their further development in the pedagogical use of ICT.

Teachers’ responses were summarized for display (Miles and Huberman, 1994) including, where appropriate, a short quote. A rating was given for each teacher on each of the dimensions of transfer, where a judgement was made as to the impact of the online modules in affecting change, that is as high, moderate or low impact. Finally the cases themselves were placed on a relative continuum of high to low impact. This analysis can be seen in Table 1.

**SNAPSHOT OF A HIGH IMPACT PD CONTEXT**

Case Study 4 appeared to gain the most benefit from the online module professional development. Although admitting to “always enjoying using computers,” this teacher had little prior knowledge of the subject knowledge
### Table 1
Transfer of teachers’ knowledge to teaching practice

<table>
<thead>
<tr>
<th>Case 4</th>
<th>Learning/knowledge of technology</th>
<th>Transfer of subject knowledge</th>
<th>Transfer to other software</th>
<th>Transfer to other technologies</th>
<th>Transfer of pedagogical approach</th>
<th>Transfer as preparation for future learning</th>
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<tbody>
<tr>
<td>High Impact</td>
<td>Very little previous knowledge, learned much from the module ‘it was new to me...yes, I feel quite confident now’</td>
<td>Used with Years 7 and 10, and would with other stages and subjects in future It could be used in history...and economics</td>
<td>Yes, and keen to teach other teachers the software of the module I’d like to teach the rest of my faculty how to use it</td>
<td>Yes, interested to use different technologies but not sure whether because of the PD ‘I don’t know, it was just an idea I thought I’d try’</td>
<td>Very positive generally but could not define any strategies that transfer ‘I suppose it’s given me more confidence’</td>
<td>Already positive and enthusiastic to use technology ‘It consolidated what I was doing...made me feel I was on the right track’</td>
</tr>
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</table>

| Case 6 | Teacher had knowledge of software ‘The module made me broaden my horizons’ | Yes, across K-6, and all KLAS I spent the holidays planning the K-6 technology program and that was a direct result of doing the module | Yes, but not as a result of the module I’d have to say no because I already use a range of software That aspect hasn’t changed at all | Yes, generally, such as movies to insert into PowerPoint etc. I do actively now try and incorporate a huge range of technology | Yes, to an extent in planning of lessons ‘It’s made me look at a truly integrated approach of technology within our curriculum’ | Yes, the module seems to have had a huge impact of outlook and confidence ‘It got me out of the old routines to start looking further afield’ |

| Case 3 | Teacher had prior knowledge ‘I was au-fait with their usage’ | Used with Years 9 and 10, and later with Year 12 ‘If I was going to use it with Year 12 again I’d make it harder’ | Yes, would use other software like databases on certain topics ‘The solar system lends itself to getting kids to make a database’ | Yes, to a certain extent, but already using a lot of technology | Confirmed approaches already known to work | Teacher already competent and enthusiastic about technology ‘I was never afraid of computers’ |

Continued on page 206
Table 1
Transfer of teachers' knowledge to teaching practice

<table>
<thead>
<tr>
<th>Case 2</th>
<th>Learning/knowledge of technology</th>
<th>Transfer of subject knowledge</th>
<th>Transfer to other software</th>
<th>Transfer to other technologies</th>
<th>Transfer of pedagogical approach</th>
<th>Transfer as preparation for future learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher already had knowledge prior to PD</td>
<td>Has used with other classes, and plans to do more</td>
<td>Yes, enthusiasm to use different software in class</td>
<td>Yes, but not related to modules</td>
<td>Teacher did not use the approach recommended in the module</td>
<td>Very positive and open to ICT</td>
<td></td>
</tr>
<tr>
<td>'I modified what was in the module and did it myself'</td>
<td>'It will possibly be more of a faculty thing ... let's see how we can put it all together'</td>
<td>'The more courses I do the more confident I get'</td>
<td>'I'm teaching myself as I go. I've always been interested but I wasn't very confident'</td>
<td>'I tailored what I learned to direct the students'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case 1</th>
<th>Learning/knowledge of technology</th>
<th>Transfer of subject knowledge</th>
<th>Transfer to other software</th>
<th>Transfer to other technologies</th>
<th>Transfer of pedagogical approach</th>
<th>Transfer as preparation for future learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>No previous knowledge of software; learned much but not expert</td>
<td>Used with two groups but at the same level</td>
<td>Minimal transfer</td>
<td>Yes, but not as a result of the module</td>
<td>Some transfer of strategies to other teaching</td>
<td>Open to new learning</td>
<td></td>
</tr>
<tr>
<td>'I'm at a point where if I wanted to explore further I could'</td>
<td>'It was too complicated to arrange and my head teacher didn't know if it was worthwhile'</td>
<td>'The module I did didn't do any more for me from that point of view because it was specifically on [the software]'</td>
<td>'I think the interest was already there, full stop. It's mainly been generated by being at a school'</td>
<td>'It's a way of teaching mapping and landforms'</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Case 5</th>
<th>Learning/knowledge of technology</th>
<th>Transfer of subject knowledge</th>
<th>Transfer to other software</th>
<th>Transfer to other technologies</th>
<th>Transfer of pedagogical approach</th>
<th>Transfer as preparation for future learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher had prior knowledge of the technology, but learned much more about pedagogy</td>
<td>Not yet, but planning to implement across the whole Year 8 TAS curriculum</td>
<td>Yes, but not as a result of the module</td>
<td>Yes, but not as a result of the module</td>
<td>Teacher not sure, probably not</td>
<td>Teacher already positive and open to using technology</td>
<td></td>
</tr>
<tr>
<td>'We were planning what to do at our last staff development day'</td>
<td>'I have a passion for technology ... it's just something I would have done anyway'</td>
<td></td>
<td></td>
<td>'From a teaching sense I got a huge amount out of it'</td>
<td>'From my perspective [completing the module] was good reinforcement'</td>
<td></td>
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</tbody>
</table>
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<tr>
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<tbody>
<tr>
<td><strong>Case 7</strong></td>
<td>• Teacher had prior knowledge of software Practised program and found new ways to use it ‘I feel like an expert’</td>
<td>• Yes, used with K and Year 1 intends to use with other stages in future ‘Something like this would be good for older kids as well’</td>
<td>• Yes, Microsoft Word, ABC website, Bananas in Pyjamas ‘We’ve mainly focussed on Microsoft Paint and the digital camera’</td>
<td>• No other technologies used ‘Maybe towards the end of the year we can make a video, but I think that would be a bit hard’</td>
<td>• No pedagogical approaches from module appear to influence other teaching ‘We just did what we thought we were supposed to do’</td>
</tr>
<tr>
<td><strong>Case 8</strong></td>
<td>• The PD experience was not positive for this teacher ‘It was really, truly just a set up for this project rather than real learning for either the kids or teachers involved’</td>
<td>• No transfer of learning beyond original class That’s our term four thing so we haven’t done any of that. I can see the value … but as I said you can’t do that in a fortnight’</td>
<td>• Yes, but not from the PD ‘I suppose from “Inspiration”. I don’t think that’s coming from that project, it’s coming from somewhere else’</td>
<td>• No technology use related to the PD ‘I can’t say that any of the things that we are doing in technology have related to that’</td>
<td>• Adapted pedagogy to fit the module, but no evidence of transfer to other teaching</td>
</tr>
<tr>
<td>Low impact</td>
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***High impact***  **Moderate impact**  ***Low impact or no impact***
of the module. Getting time to practice what was learned was viewed positively. The teacher had a number of thoughts and experiences about how to extend what was learned, how to apply it in other year levels and how to enthuse other staff to use it. On the other hand, the modules appeared to have less of an impact on the pedagogical approach used by the teacher. The student activities generated from the module essentially involved low level skills with students retrieving information in order to complete a worksheet.

From this case – although itself not a perfect instance – it is possible to propose the characteristics that might maximize the potential of a high-impact, professional development experience within the context of the online modules.

Successful professional learning of ICT applications in classrooms is facilitated by, and most likely to occur, when:

- Accurate and descriptive information about the professional development program (such as its purpose, methods, and requirements) is available to potential participants;
- Well-designed online modules are offered that are regularly updated and evaluated;
- Sufficient time release is given for learning and evaluating the module, for planning lessons, and reflecting on learning;
- Professional development support is provided by expert online facilitators;
- Mentoring support is provided by the school principal and other senior teachers;
- Peer support is provided by another teacher in the school completing the module at the same time;
- Technical support is provided by IT-knowledgeable support or teaching staff;
- Ready access is available to appropriate and reliable software and hardware, and to facilities within the school; and
- A collegial and supportive school culture exists that encourages innovation and growth, and provides the means to share knowledge at a school level.

This research study indicates that in such an environment, the professional development experience of the online modules would have the greatest chance of success in impacting the use of ICT in the classroom.

**SNAPSHOT OF A LOW IMPACT PD CONTEXT**

Case Study 8 appeared to gain little from the online module experience as the knowledge was not new. As the teacher indicated, "it was a good mod-
ule if you had no idea about PowerPoint presentations, about importing digital images, about making iMovies, but we’d done all of that sort of stuff.” In the teacher’s view, the content was not suited to school realities: “the examples were fine but not the timeframe.” The intention of the module was not clear: “It was really wishy washy and we thought that the online module would tell us exactly what it was that we had to do for this project, but we were still unclear.”

Apart from some of the concerns with the module and its suitability, the impact was low because this teacher already had a well-developed knowledge of technology and software applications, which were being used effectively with students. This highlights the importance of informing prospective participants about the nature of the module and its intended outcomes.

From this case – the least successful of the cases, but by no means itself a failure – it is possible to propose the characteristics that might militate against a successful experience in completing the online modules. It is unlikely that successful professional development through ICT online modules will occur when:

- Little information is provided to potential participants on the scope and sequence of the professional development content;
- Online modules are not flexible enough to allow for different backgrounds and prior knowledge of participants;
- Insufficient or no time release is given for completion of the professional development and teachers are expected to do it in their own time;
- Online facilitators are not readily accessible;
- Little support is provided by the school principal and other senior teachers, or they are unaware of the teacher’s involvement in the program;
- Individual teachers complete the program without another teacher in the school to provide peer support; and
- Little or no technical support is available within a school.

This research study indicates that in such an environment, the professional development experience of the online modules would have the least chance of success in impacting on the use of ICT in the classroom.

**HIGH IMPACT TRANSFER FACTORS**

The modules appeared to have the greatest impact in terms of Transfer Category 2; that is, the greatest impact of transfer appeared to have occurred with the subject of the learning module transferring to other year level or learning areas. It seems that teachers who have learned the content of the modules and applied it successfully in one context are more willing to extend this to other areas of their teaching. This suggests that the content of the modules need not
be targeted directly at a learning area or year level as teachers seem quite capable of modifying the subject knowledge for their own context. The modules also had a high impact on teachers’ preparation for future learning. Teachers’ confidence was consolidated and improved, and they expressed a need for further professional development with a focus on pedagogy. This idea was summed up by one teacher: “The technological skills aren’t the important thing. The pedagogical skills are probably where my interests lie.” Another teacher with a similar view offered the approach: “...if I could see examples of other people’s work then I’m sure I could modify it and use it here.”

LOW IMPACT TRANSFER FACTORS

The least impact in terms of transfer appeared to occur in Transfer Category 1; that is, how well teachers learned the subject of the package, whether connections were made, whether teachers monitored their learning and reflected, and whether they could speak knowledgeably about the subject. From the interviews with case study teachers, it appeared that they learned very little from the online modules themselves. This could be interpreted as either failure to learn from the instruction given in the modules, or alternatively teachers learned little because they already had the subject knowledge in greater depth than provided in the modules. In the majority of cases it was evident that many of the teachers already had a background in the use of technology generally and, in some cases, quite specific and advanced knowledge of the software being used. The modules also had a low impact on transfer to other technologies and using appropriate pedagogy that took advantage of the technologies. The last aspect was clearly in evidence during the classroom observations. The extent to which these areas could be improved requires further research and investigation.

DISCUSSION OF RESULTS AND IMPLICATIONS

Both teacher learning and student learning are seen as significant issues in initial learning and the transfer of learning. As Vrasidas and Glass (2004) observed:

Students learn best when they are actively engaged in meaningful activities; when they collaborate with peers, exchange ideas, and provide and receive peer feedback; when they reflect critically on what they are doing; when they work on real-world, challenging, authentic activities; when their work is constantly evaluated; and when they are intrinsically motivated. But we tend to forget that teachers learn best in these ways too. (p. 2)

The online modules as a professional development exercise appeared to have been moderately successful. Even the teachers who overtly stated that they were
frustrated or disappointed with the quality of instruction implicit in the modules, when probed, were able to report positive and sustained benefits for their pedagogy and their students' learning. Teachers used the modules in a variety of ways to suit their own needs and, in so doing, learned worthwhile strategies and approaches. Nevertheless, there were several recommended changes to the online program. The main observations that emerged from the analysis of teacher interviews and case studies relate principally to the design and implementation of the professional development program through the online modules, the community of support that teachers need, and the conditions that facilitate implementation of ICT based learning environments in schools.

Many teachers were critical of the online modules themselves for a range of reasons, as there were clear deficiencies in the design of many modules. As such, the initial professional development experience appears to have been a factor that influenced whether or not learning from the modules transferred to teaching practice. It appears that many modules did not reflect principles of adult education, nor were they based on recent research and theory in authentic learning. Tasks implicit in the modules appeared often to neglect the fact that teachers bring a variety of contexts and backgrounds to their own learning situations.

Another issue that seemed to have an impact on some participants' overall experience was some problems with the information that was available through the delivery of the online modules. Some had problems knowing whether they really wanted to do the modules and queried whether it would suit their level of professional need. In such cases, prior knowledge about the scope and sequence of the learning environment and the nature of the tasks would be important pre-enrollment information for participants. More flexible options for completion of the modules would also be valuable for teachers, many of whom felt constrained by the requirement to complete the modules within a given timeframe.

Teachers generally succeeded with the professional development when the learning environment was effective and when they gained appropriate support during the implementation of ICT-based strategies in their schools. School leadership that was open and enthusiastic toward ICT clearly facilitated teachers' professional growth, but it was helped even more by the support of colleagues and by IT knowledgeable teachers or support personnel. Time release given to teachers was crucial in ensuring that teachers had adequate preparation and reflection time. Facilitators were not mentioned often as being an important factor in teachers' professional learning, but they could provide the focus for the development of an online community of practice to support the consolidation and persistence of the experience. The establishment of such a community would allow teachers to share their strategies, ideas, and stories, and could be implemented as a standard feature of the professional development.

In spite of the best intentions of teachers to implement ICT-based strategies in their teaching, on many occasions their attempts were thwarted by inadequate support in schools and by inaccessible computer rooms and
resources. Further problems presented with unreliable equipment, networks, and software applications. Assurance from a principal that adequate support will be available might be advisable as a necessary prerequisite to the enrollment of any teacher in the professional development program.

The overwhelming impression of the case studies was that the teachers who completed the professional development were a committed and dedicated group of people who were keen to develop their own knowledge of ICT for the benefit of their students. In the main, they used creative and innovative techniques to facilitate their students’ learning. They are critical consumers of professional development, and do not like to spend valuable time completing courses that do not add substantially to their knowledge of effective pedagogy. However, if given substandard instruction, these teachers generally would actively seek to use the time they have been given to use all the resources at their disposal to make the experience worthwhile. Time is a luxury frequently denied teachers, and they were anxious not to waste the time given but to turn it into a productive and worthwhile experience. And generally they succeeded at this very well.

The findings of the study demonstrate clearly that professional development in ICT for learning cannot be conducted in measured doses without consideration of the school context, the mentoring and support available to teachers, the infrastructure and assistance available to ensure that technology use is relatively trouble-free, and the close connection that is necessary between technology use and constructivist approaches and pedagogies.

CONCLUSION

In determining the challenges and issues associated with the use and dissemination of learning within the professional learning program, a range of factors impacted on teachers’ experience. Factors such as the quality of the online modules themselves and how well they were supported, problems associated with implementing new technology-based pedagogy in the classroom, and whether the modules facilitated pedagogical change were all issues that affected the extent of impact of teachers’ professional learning on classroom practice.

An exploration of the kinds of factors that supported teachers’ expansion of use of ICT in the classroom and factors that impeded it revealed a range of critical factors both within the design of the professional learning itself and in the teacher’s school environment. A positive response to the professional learning generally saw a positive result in the school largely because of a teacher’s determination to implement the ICT. However, other general factors and constraints within a school could either support the changes or make the implementation of ICT impossibly difficult.

While for some teachers the professional learning was frustrating, time wasting and ineffectual, when teachers’ experiences were positive and valuable, the impact on student ICT experiences was profound. The benefits for
students were numerous, through their own enhanced learning strategies, their increased knowledge of ICT, and their powerful use of technology to express themselves when other means may have failed them. The transfer of knowledge, when it happened, was not constrained to the walls of a single classroom but went beyond to other subject areas, other levels, with and beyond the school community.

References