

Will the teacher's lap transform learning?

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This article explores how Year to 3 teachers have made use of laptops for teaching and learning in their classroom, examining how they fit with current recommendations for effective teaching, and whether teachers' use of a laptop has led to a transformation in teaching and learning. Findings show that there was an increasing degree of laptop integration into all areas of the curriculum over the three-year evaluation period. It appears that teachers are providing their students with the opportunity to experience transformative learning.

Introduction

There is now an implicit expectation that students in every year of school will make active use of information and communication technologies 11C-11 (Ministry of Education, 2007). A number of government initiatives have sought to support and promote ICT use, The TELA Laptops scheme for teachers is one of these initiatives. In 2002, the New Zealand government began the roll out of subsidised laptops to teachers. Year 9 to 13 teachers were the first to receive laptops, and Year 1 to 3 teachers were the last, with their first formal access in 2005. The ways teachers have made use of the TELA laptops have been monitored as part of a Ministry of Education funded project over three-year cycles of data collection for Year 9 to 13, Year 7 and 8, Year 4 to 6, and Year 1 to 3 teachers by a team of researchers from The University of Waikato (the New Zealand Council for Educational Research [NZCER] was a partner in the Year 9 to 13 evaluation), Teachers have reported they make substantial use of their laptops for the purposes of administration, communication and

collaboration, and lesson planning and preparation (Cowie, Harlow, Jones, & Gardiner, 2006). In this paper, we focus on how Year 1 to 3 teachers have made use of the laptops in their classroom for teaching and learning. We discuss the ways these uses fit with current recommendations for effective teaching (Alton-Lee, 2003; Ministry of Education, 2007), and whether teachers' use of laptops may lead to a transformation in teaching and learning.

Young children learning with ICT

While research has tended to focus on older students and their learning with ICT, it is now generally accepted that young students can benefit from using ICT in their learning (Ministry of Education, 2005). Indeed, Volman and van Eck(2001) found that, compared with older students, younger students demonstrated higher gains in learning outcomes with ICT and had a more positive attitude to using it in their learning. Margaret Carr and some of her colleagues (Ramsey, Breen, Sturm, Lee, & Carr, 2006) explored the integration of ICT into everyday learning and teaching in a kindergarten setting and concluded that ICT added another (predominant(y visual) mode of communication and representation for children who had not yet learned to read and write. Children used a digital camera to prepare their own learning stories,¹ and could explain their learning to others in PowerPoint Presentations. One of the key findings of this project was that adding more technology - cameras and laptops in particular - on its own made this work possible but not probable, Children's experiences in early childhood settings, coupled with increased home access and use of ICT, mean that many

young students are entering schools with developed ICT skills (Rideout, Vandewater, & Wartella, 2003). Students in the early years of school are often comfortable enough with their own computer skills to be able to focus on learning the content they are working with rather than the technology (Kilderry, Yelland, Lazaridis, & Dragicevic, 2003).

The use of ICT by young students in the early primary school years has its own unique potential and challenges for supporting learning (Bolstad, 2004; Clements, 2002; Dwyer, 2007; Goodison, 2002; Kilderry et al., 2003). ICT allows young children to communicate and represent ideas in ways that are less reliant on physical coordination, reducing the need for writing (Goodison, 2002). Dwyer (2007) proposes that the nature of ICT is that ideas are linked together in terms of associations - a reflection of the natural thought pattern, rather than linear ideas as is the case with print-based resources. Working with ICT allows a more natural approach to thinking and working with information and knowledge for a young child (Sheirdan & Pramling Samuelsson, 2003). Kilderry et al. (2003) propose that ICT allows young children to experience, work with and build on ideas that were previously inaccessible due to their abstract and complex nature. Clements (2002) argues that ICT enables young students greater opportunities for working with ideas creatively and for engaging in higher-order thinking.

The use of computers in the classroom not only impacts on learning but also on social processes and relations (Bolstad, 2004; fDwyer, 2007). Clements (2002) proposes that children are more socially interactive, and that they communicate and collaborate more around a computer. Wang and Carter Ching (2003) investigated group computer use by first-grade children within their classroom culture. They found that students were constantly negotiating between their own individual and collective goals in the classroom and the affordances of the environment, as they created their own definition of computer use while simultaneously conforming to the rules set by the teacher. The artifacts students used - the computer, a timer, and waiting lists - both enabled and challenged children's social negotiation. In this negotiation process,

children socially constructed not only their computer experience, but also their early school experience as a whole.

ICT and effective pedagogies

The e-Learning strategy for New Zealand schools (Ministry of Education, 2006) notes that effective teaching for all students will depend on teachers becoming confident and capable users of ICT and understanding how to integrate ICT effectively into their teaching practice. For example, teachers may delegate more responsibility to the students to self-regulate their learning, and there are opportunities for students to collaborate effectively through peer learning and mentoring. Recent research into effective teaching in the New Zealand context has set out indicators of quality teaching (Alton-Lee, 2003) and *The New Zealand Curriculum* (Ministry of Education, 2007) suggests that learning supported by or facilitated by ICT has considerable potential to support effective pedagogies. The examples provided in the curriculum include support to make connections, facilitating shared learning, creating a supportive personal learning environment, and enhancing opportunities to learn. There is a recommendation that teachers explore the potential of ICT to transform teaching and learning.

Examples of effective pedagogy in Year 1 to 3 classrooms

From 2006 to 2008, the Laptops for teachers evaluation project team sought the views and experiences of teachers of Year 1 to 3 students via a written questionnaire and three regional focus groups. Around 300 teachers from over 100 schools responded to the questionnaire each year. Over the three-year period, the use of the laptop as a stand-alone tool to individualise learning and to engage students in interactives had grown in particular, from just over a third to two thirds of teachers reporting this use. Laptop access to the Internet in the classroom had increased from 83 per cent to 96 per cent of Year 1 to 3 teachers, which may have contributed to this increase as well as to that of using the laptop to access the Internet during lessons that showed an increase from a half to over two thirds of teachers. It

is also possible that this was due to an Inquiry Learning² focus as this emphasis was mentioned by focus groups. There had been also been an increase in laptop use with peripherals over the three-year period – the proportion of teachers using a data projector had risen from 31 per cent to 54 per cent, and the number of teachers who used an interactive whiteboard had risen from 8 to 47.

Across all ability groups, occasional use for all uses was usual.

The evaluation asked teachers to give an example of how they were using their laptops in the classroom for teaching and learning. Each year there were increasing numbers of examples given in most learning areas (see Table 1). An increasing proportion of teachers reported that the area they most wanted development in was the use of the laptop in teaching and learning 12006:43%; 2007:52%; 2008:57%).

What was striking was how broad the uses were, covering all areas of the curriculum, and how well they illustrated the Ministry of Education's ideals for effective pedagogy (Ministry of Education, 2007) and e-learning (Ministry of Education, 2006), and also Alton-Lee's characterisations of effective pedagogy (Alton-Lee, 2003). Some examples are now detailed, along with the relevant results over the three-year period of the TELA evaluation, to highlight how teachers' laptops have been used in the classroom with very young children in Years 1 to 3 of their schooling.

Enhanced opportunities to learn

'E-learning may enhance opportunities to learn by offering students virtual experiences and tools that save them time, allowing them to take their learning further' (Ministry of Education, 2007, p. 36).

The *New Zealand Curriculum* (Ministry of Education, 2007, p. 34) discussion of effective pedagogy asserts that when children encounter new learning in a variety of ways and through different tasks they are more likely to learn well. Teacher commentary suggested teachers were using their laptops to allow students to encounter learning in a variety of ways and through different tasks and contexts.

Use of Software introduce new learning

Prior to introducing new learning, teachers used their laptops with flowcharts and software to stimulate the curiosity of their students and to find out what children already knew.

We brainstormed all the uses of water and put it onto Kidpix while children were talking - they could see their answers go up as they gave them (using data projector). (2008 comment – science)

Created a Kidspiration mind map of modes of transport and asked children to classify these into 'past and present', 'uses', 'fuel and no fuel', or 'land, sea, air', etc. (2008 comment – social studies)

Use of the laptop with other equipment

The teachers used a laptop with a range of other equipment that allowed them to take the children's learning further.

Looking at honeybees using a digital microscope, the children were able to see the three body parts easily and we also managed to see the difference between wasps and bees and their stingers. (2007 comment – science)

Used digital camera to create sequence of children counting numbers to use as tool to learn forward and backward counting. (2007 comment – maths)

Some teachers described the use of the laptop-plus-a-data projector to engage the whole class in revision and discussion.

I found an image off stuff.co.nz and projected it on to the screen. The children discussed the image and helped me write about what they thought was happening in it. (2008 comment – English)

Use of the Internet

In science each year, there were about thirty examples of how the laptop was used in a lesson. Half of these involved accessing the Internet:

Flight. To show the main principles of flight using the website. Children could see diagrams and pictures relating to the concept taught – what a time-saver! (2008 comment – science)

Table 1: Year 1 to 3 teachers' laptop use in curriculum areas (2006-08)

Teachers' laptop use in Year 1-3 classrooms	2006 (n.271)	2007 (n=340)	2008 (n.317)
Language	52	64	67
Mathematics	13	41	48
Science	23	27	36
Social Studies	11	20	19
The Arts	5	8	10
HPE	3	7	7
Technology	6	2	1
ICT	-	21	8
Integrated	8	23	31
Total examples	121	213	227

Use of interactive websites

Teachers used their laptops to provide different ways of introducing and reinforcing new learning. They reported that students were more motivated and engaged when there was an interactive component to activities. Often these were accessed via the web:

When connected to the data projector I can do whole-class warm ups using interactive educational websites, and also using our school intranet page to guide children to the correct activity for their maths group. (2008 comment – mathematics)

Ambleside school math games: group of nine children currently working on single digit addition to improve their basic fact recall speed. Games on this website are fun and easy to play together in a small group. It is interactive (but can be played by one or more children). (2007 comment – maths)

Using interactive web sites to learn about various systems in the human body. (2008 comment – science)

Access and demonstrate interactive sites showing translation in geometry and then show, using an Interwrite Pad, how to make patterns. This was part of an integrated unit on Maori culture and we also viewed a DVD showing a powhiri. (2008 comment – integrated)

Reading and alphabet. Starfall.com has a wonderful reading resource where children can interact with a reading game and learn how to spell, manipulate, sound out and read at the same time as learning other concepts like shape and colour. (2008 comment – English)

Virtual experiences

By using the laptop to access Internet images from another time and place, students could enter and explore a new learning environment, and they were able to encounter new learning in a new way, such as using Google Earth to 'fly over a country' or by going on a virtual field trip. Teachers provided examples from science and social studies:

Participation in Learnz virtual field trip – accessing support material, participating in online discussion. (2008 comment – integrated)

Around the World, Google Earth,

location of country and a focus on capital cities and get pictures of famous landmarks. New entrant children at the start of visiting each country pretend to fly there using Google Earth. Made comparisons between buildings and locations as part of the topic. (2008 comment – social studies)

The use of multimodal materials

Children today live in and are comfortable with a digital/visual world. Research suggests that the use of multiple modes (text, images, talk, music) leads to qualitatively different knowledge and meanings. Hull and Nelson (2005) argue that with digital multimodality, the meaning that a viewer or listener experiences is qualitatively different, transcending what is possible via each mode separately...

Our enquiry topic was 'Sound' and the children wanted to know how we can hear. So one of the Knowledge net resources has an example of a digital learning object where you went inside the ear. First of all, I showed that to the children using the data projector and then using the pod of laptops that the children can use they could navigate the game go right into the tubes of the ear. It was really visual and there is no way that I could have held up a diagram out of a book. It was like a game, it was fantastic (if you can find digital learning objects like that for juniors – some of them talk, so the instructions of how to navigate are very supportive, it is limiting for Year Ones if there is a lot of writing). (2007 focus group comment)

Alton-Lee (2003) noted that teachers can optimise learning opportunities for diverse students by complementing language use with opportunities for students to have access to, generate and use non-linguistic representations such as diagrams, movies and photos. Over the three years, there was increased use of the laptop to manipulate images (2006:52%; 2007:59%; 2008:66%). There were numerous reports of teacher manipulation and use of images (static and dynamic) accessed from the Internet, books and other sources including video and digital photographs

taken by the children or teachers themselves. Examples from science included the following:

Made a book about Wetas. No access to library, so researched on Internet for information, took photos of Weta that had been brought to class, put all this together on PowerPoint. I inserted the photos and the children's drawings. (2008 comment – science)

Accessed Utube for a teaching video on making Yoghurt. The children then had an example of how to present a cooking show then were able to work on their own and be videoed. They learnt a lot about having essential information, and speaking clearly. (2008 comment – science)

The Year 1 to 3 teachers used images to motivate oral language discussion and the writing that followed, and often attached photos to the children's writing.

Display photos of hands-on opportunity class have had (using PowerPoint), oral text recorded by children – key vocabulary essential to write about experience displayed. They view images, key vocab, hear oral text. (2007 comment – English)

In the preceding examples it can be seen that the teachers used their laptop to help them find out what their children knew, challenge their ideas in a constructive way, provide different ways of introducing and reinforcing new learning, take the learning further, and access or design motivating activities that engage students in actively managing their own learning.

Making connections

'E-learning may assist the making of connections by enabling students to enter and explore new learning environments, overcoming barriers of distance and time' (Ministry of Education, 2007, p. 36)

Teachers provided examples of how they used the Internet to expand the learning environment, by bringing real-world examples into the classroom. Students and teachers accessed information from a range of sources over the Internet. When children wanted to find out more about someone they were learning about in reading or social

studies, they could use the teacher's laptop to search the Internet for further information:

We were reading a book on Sir Edmund Hilary – questions arose. We used the Internet to answer– 'Where in the world is Mount Everest?' 'What does Nepal look like?' 'Is Tenzing Norgay still alive?' etc. Finding the answers was instant. (2008 comment – social studies)

Children were looking up information on planned class trip destinations and learning about key aspects before they even left the school:

Learning about mammals and we were going to the zoo, so we accessed the zoo site before to learn about the animals we would see. (2008 comment – science)

Looking at different types of Marae – relating to our current topic. What the Marae we are going to will look like. (2008 comment – languages: Maori)

Once a class trip had been undertaken, the laptop was found to be useful to enhance new learning that had been first encountered outside the classroom (Alton-Lee, 2003). Teachers used the laptop to show images taken with a digital camera to re-engage children in a topic:

Zoo trip photos, used a data projector connected to laptop. Viewed photos taken on the zoo trip. Discussed ideas for a writing lesson – focusing on formulating simple sentences. (2008 comment – integrated)

Our class went on a bush walk. We took digital photos and downloaded them onto laptop and showed them later. We used our experience as a motivation to create artworks. We were able to revisit the scene to get true representation of plants found in the forest. (2007 comment – arts)

This example of laptop use in technology came after a class trip to remind students of designs before they designed a similar product themselves:

Made slide show of zoo enclosures following a zoo trip to aid the children's design of enclosures. (2007 comment – technology)

Facilitate shared learning

'E-learning may facilitate shared learning by enabling students to join or create communities of learners that extend well beyond the classroom' (Ministry of Education, 2007, p. 36).

There was an example given by a teacher who had completed Assess to Learn (AtoL)³ professional development:

I have shown the class an example of a child's work and how this meets the criteria that we have set as a class. (2008 comment – English)

Year 1-3 students were being supported to share their work with others...

Sharing children's work at published level with others in the class. (2007 comment – English)

Shared photos of activities or experiences we have had together. The children are motivated to] do their writing in their books then publish it on the laptop. (2007 comment – social studies)

...and to make connections with other students around the world:

Emailing students across the world. (2007 comment – English)

We Skype with a class on Pitt Island using my laptop. ... They talk about themselves and can look into our Slog and we can leave messages for them. Their teacher is going to set up a project for the two classes to do together. My laptop can do things that my brand new PCs cannot do. (2007 focus group comment)

Podcasting is done on laptop with microphone plugged in. This is used for our oral language programme several times a week. We also use the laptop and microphone for interview skills. (2008 comment – English)

Creation of supportive learning environments

'E-learning may assist in the creation of supportive learning environments by offering resources that take account of individual, cultural, or developmental differences' (Ministry of Education, 2007, p. 36).

Customised materials allow content

to be selected, modified and paced to meet student needs and interests, Teachers using laptops could make use of personal material to create ownership for learners and provide feedback on individual learning. Laptops, because of their higher specifications, had proved invaluable for planning programmes for special needs children:

My syndicate leader, she has a special needs boy in her class and he likes to play games all those reading and writing types of software, but we can't get them to work on any of the computers except her laptop so he's using the teacher's laptop to do all these games and activities. None of the other computers will play the games. (2007 focus group comment)

The laptop had accommodated the individual learning styles of children in teachers' classrooms:

I believe that it has helped cater for children with varied learning styles, especially children who are stimulated by visual images, to learn. (2007 comment)

They have more ownership of the work they do, especially helps special needs children to be successful. (2007 comment)

Using the laptop to adapt worksheets for students was a task that around 68 per cent of teachers made use of their laptops for 'routinely' and 25 per cent 'occasionally'. This suggests that teachers were making use of the ease with which electronic resources may be adapted and customised. In this way, the laptop brought immediacy, authenticity, and ownership to learning tasks:

Starfall website, as an activity for my special needs student when she is unable to participate with the other activity set for the class. (2008 comment – English)

To access spelling programme from a CD, to model for children, and produced PowerPoints of each spelling level so can show children on big screen monitor - children run class spelling programme independently (2007 comment – English)

These examples of teaching created a supportive learning environment for

the children to explore and be active members of the learning community in their classroom (Ministry of Education, 2007, p. 341).

A more flexible learning environment

In some classrooms, the more flexible learning environment has allowed teachers to become more a facilitator of learning. Children were guided to complete activities, to report on, present, and to evaluate their own work. Teachers were using the laptop to support student involvement in assessment for learning, thereby assisting students to take responsibility for their own improvement (Alton-Lee, 2003), as these examples show in physical education. Student performance was captured on a digital camera, then students reviewed their performance:

Made a DVD of the class doing Gymnastics, watched it with class and discussed our learning intentions and whether they had achieved them or not, discussed changes they would like to make for the next lesson. (2008 comment – HPE)

Photographs of the beginning stages of each child swimming freestyle. Correcting their techniques while viewing this and explaining how they can improve. (2007 comment – HPE)

Using the teacher's laptop students were encouraged to learn to explore and think creatively. (Ministry of Education, 2006):

Children retold Maui and the Sun, an illustrated story, with paint, fabric, stones, ferns. Used digital camera to make slide show of story. Children read the captions which were recorded. Children read back their story and loved to see their art work. (2008 comment – languages: Maori)

Children use the laptop to play particular games to reinforce maths skills, e.g. counting cars from Rainforest maths to practice counting forwards and backwards. (2008 comment – mathematics)

Imported a photo they want from photographs taken within a topic unit on blowing bubbles and they typed a story under the photo and printed it for the

wall. (2008 comment – English)

Brainstorming using Inspiration software, Internet searches, using images, displaying work and teaching skills were features of integrated learning units and inquiry learning topics that teachers described using their laptops for. The laptop played a role in inquiry learning, enabling easy access to information:

For inquiry learning pupils need to be able to source info from a variety of Internet sites. I have searched for best ones and book marked them so pupils have freedom to begin without getting lost. (2007 comment – integrated)

Teachers were using the laptop to model ways of carrying out learning tasks and in doing so to help make the learning goals and processes transparent (Alton-Lee, 2003):

Portrait sketching, scanned sketches, notes, and photographed model. I hooked up laptop to data projector and played slideshow while teaching sketching skills – students sat on floor with clipboards and pencils and followed visual steps of process. (2008 comment – the arts)

Teachers gave examples of how they were helping the children to make connections between lessons:

My laptop is hooked up to an interactive whiteboard. In writing each day, we open the Learning Intention and Success Criteria previously saved. Recently the children were learning to plan a narrative story. I shared the Learning Intentions and Success Criteria. (2008 comment English)

The Monarch Butterfly – we had in the class from egg through to butterfly – we went online to view a video clip by other students and developed our Life Cycle data from our own experience and the new information gained. (2008 comment – science)

Discussion: Exploring the transformative learning potential of ICT

Year 1 to 3 teachers reported that they were using their laptops to expand the learning environment beyond the

classroom and to allow students to encounter learning in a variety of ways through different tasks. The laptop enabled teachers to select, modify and pace content to meet student needs and interests in way that is impossible with written texts and whole class presentation. In the process of teaching, students were being guided to take responsibility for their own learning:

The most exciting thing is that my laptop has become just a part of everyday learning, it's almost always on and always being used for something. It's just normal to be making use of it in the classroom now. (2007 comment)

Pearson and Somekh (2006) set out a theory of transformative learning for understanding the complexities of schooling in an age where ICTs are constantly reshaping and redefining accepted notions of what it means to teach and learn in a school environment. A key aim of their research project was to investigate the possibilities that ICT tools offer for transformative learning. Their provisional working model suggests that when students meet the following conditions, they can be said to be experiencing transformative learning:

- learning creatively: contributing, experimenting, solving problems;
- learning as active citizens: acting autonomously, taking responsibility for their own learning;
- engaging intellectually with powerful ideas: using thinking skills, grappling with ideas/concepts;
- reflecting on their own learning: evaluating their own learning through metacognition.

Pearson and Somekh (2006) experimented with various pedagogical strategies, including supporting students to take on the role of teachers; an emphasis on students as the producers of media content so their skills and predispositions towards working creatively with digital content were nurtured; and the use of online environments to extend the boundaries of the classroom and create a learning space where the cultures of both home and school can interact. Teachers used these factors to evaluate the project work to determine the extent to which transformative learning was taking

place. The examples given in this paper indicate that Year 1 to 3 teachers in these classrooms would indeed be providing opportunities for their students to experience transformative learning. With the help of the teacher's laptop, these very young learners were being guided to contribute their own experiences to the learning process and were able to share their success with the class when they had achieved the set learning intentions. They were experimenting with new software and ways of presenting their work and taking responsibility for this themselves – making their own decisions about what to include and how to present it. New software and internet sites were made available through the teacher's laptop to assist students to engage intellectually with ideas by using thinking skills, and students were assisted to reflect on their own learning through seeing what others had done and knowing where their learning was heading.

There was an increasing degree of laptop integration into all areas of the curriculum over the three-year evaluation period. Although the findings here are from teacher self-report data and may not be representative of how most primary teachers of Year 1 to 3 students are making use of their TELA laptops, they do show what is possible and how teachers who take the risk to try different ways of teaching benefit greatly from their experience, as do the children in their care. It would seem that the idea of transformative learning may be within reach as teachers embrace new technologies and realise the benefits of using ICT in their teaching.

Much of the Year 1 to 3 teachers' use of laptops in the classroom for teaching and learning detailed in this paper, involved the use of multiple modes (text, images, talk, music) and it has been suggested that multimodal transmission can lead to qualitatively different knowledge and meanings. An aspect for further research might be to examine the ways in which new learning can be transformed by the use of these modes, what value there is in using multimodal materials, and how, or if, they enable or constrain the learning.

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Footnotes

- 1 A learning story is a documented account of a child's learning event. These stories are structured around five key behaviours: taking an interest, being involved, persisting with difficulty, expressing a point of view or a feeling, and taking responsibility.
- 2 Inquiry Learning is a process where students formulate investigative questions, carry out research using a series of structured investigations to obtain factual information, build knowledge that answers their original question, then evaluate and report on their findings.
- 3 Assess to Learn 1, (AtOL) is an in-depth professional development programme for teachers in the use of assessment for learning principles and is delivered by nine providers across New Zealand.

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