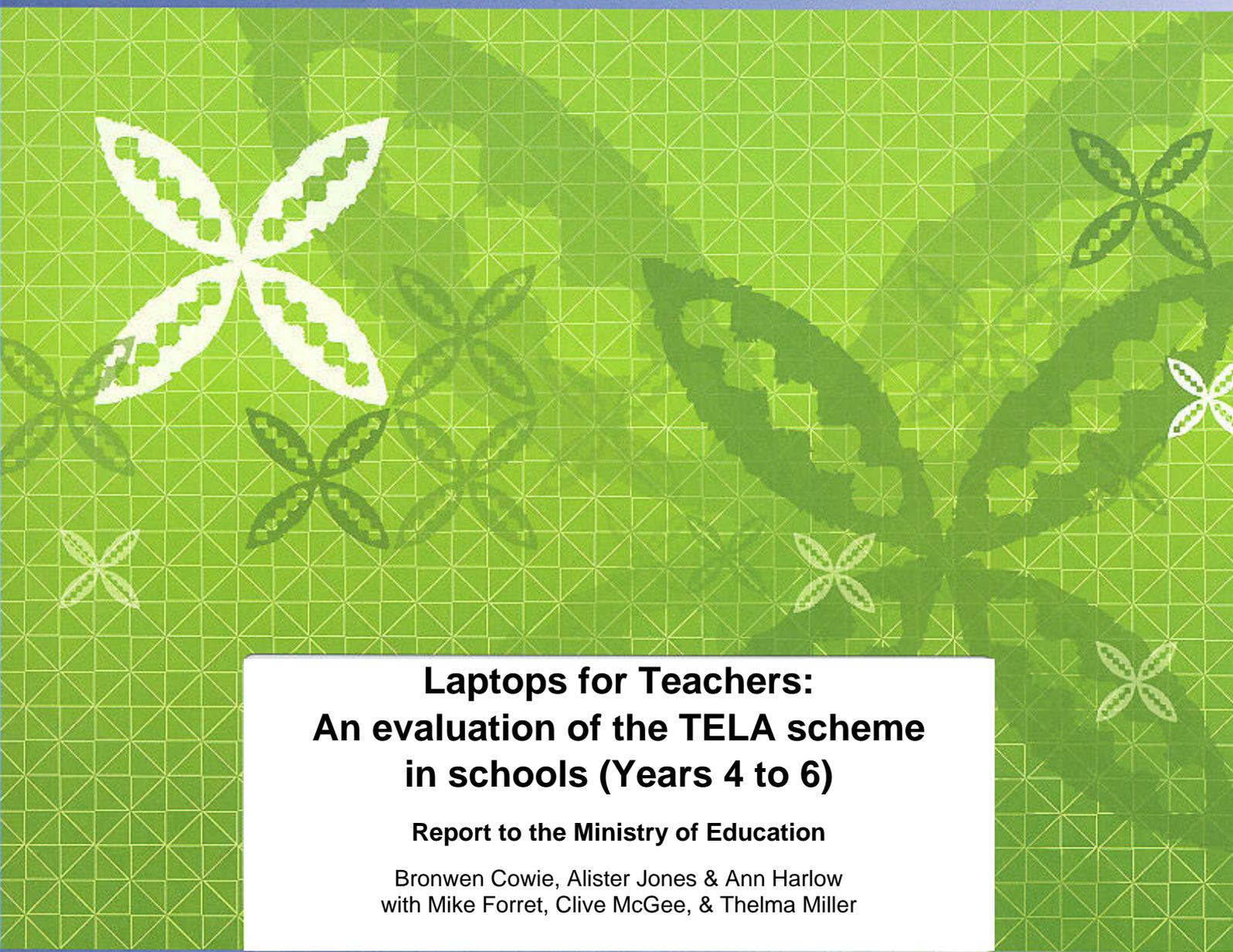




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**Laptops for Teachers:
An evaluation of the TELA scheme
in schools (Years 4 to 6)**

Report to the Ministry of Education

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with Mike Forret, Clive McGee, & Thelma Miller

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LAPTOPS FOR TEACHERS: AN EVALUATION OF THE TELA SCHEME IN SCHOOLS (YEARS 4 TO 6)

Final Report

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The evaluation team has appreciated the ongoing contact with the schools and teachers in this evaluation project. Teachers have had a unique opportunity to tell their stories of their emerging experiences with their laptops. This valuable information will have an important part in informing (and hopefully enhancing) future policies and practices, ultimately to the benefit of students, teachers and schools.

Executive Summary

The purpose of this evaluation was to investigate the impacts of the Laptops for Teachers Scheme (referred to from here as the TELA scheme) on Years 4 to 6 teachers' work over a period of three years (2004-2006) and to record emerging changes in laptop use. The investigation focused on the Ministry of Education expectation (Ministry of Education, 2004) that teacher access to a laptop for their individual professional use would lead to gains in confidence and expertise in the use of ICTs, to efficiencies in administration, would contribute to teacher collaboration and support the preparation of high quality lesson resources. It was also anticipated that teacher would use their laptop in the classroom for teaching and learning.

This evaluation report presents findings from three annual cycles of national questionnaires and focus groups with Years 4 to 6 teachers in New Zealand primary schools. An annual questionnaire asked teachers about various aspects of their laptops experience, including school support for laptops, professional development, their use of laptops at home and in school, and their goals for future use. Each year, two focus groups were held – one in an urban area and one in a rural area. The focus groups allowed teachers to talk about their experiences and changes in their use of the laptop over the three years. In this final report, questionnaire results are presented together with the results from focus groups held over three years.

Main findings

As a direct result of the TELA policy to provide teachers with laptops rather than desktop computers, teachers reported that they now had flexibility of time and place for working and had experienced efficiencies arising from the ability of the laptop to act as the sole repository of work-related documents. Teachers commented on the improved access to resources afforded by TELA laptop ownership, and how the laptop had helped them to become more confident in the use of ICT. For some the laptop had been a stimulus to their exploring the use of ICTs. Nearly a quarter of the 2007 respondents reported the most exciting outcome of their having a TELA laptop derived from its value as a motivational tool in the teaching and learning process.

The evidence in this report demonstrates that the implementation of the Laptops for Teachers scheme has resulted in progress towards the achievement of the goals for this initiative. It indicates:

- increasing confidence and expertise with ICT in many teachers
- increasing use of laptops to strengthen collegial relationships
- efficiencies gained in lesson planning, preparation, administration and reporting
- growing use of laptops for classroom practice and student learning activities.

It needs to be pointed out, however, that while a random sample of schools were surveyed, the conclusions are based on self-report data from a group of volunteer respondent teachers. Furthermore, there was considerable variation between individual teachers – first, in terms of where they began in 2005, second, their degree of progress, and third, their self-reported competence and confidence at the end of 2007. In spite of these factors, a number of broad conclusions can be made.

1. Confidence with ICT

Since the distribution of laptops to Years 4 to 6 teachers in 2005, there has been an improved confidence and expertise with ICT, with an increasing proportion of teachers reporting that they were comfortable using their laptops for a range of tasks.

Over the three years, the proportion of those teachers rating themselves as experts rose from 18% to 32%. There was a trend towards teachers becoming more comfortable over time with a wider range of tasks. Throughout the study, those who rated themselves as beginners tended to be more likely to be comfortable using their laptops for word processing, emailing and searching the Internet than for other tasks.

2. More effective communication and collaboration

By 2007, four fifths of teachers were using the laptop to email colleagues, both in their own school and in other schools, and half of the teachers used email to contact parents. The provision of a permanent record of communication was seen to be an advantage of email, particularly since the laptop provided easy access when required. Laptop-based collaborative work was becoming more prevalent, and over the three-year period there had been increased use of laptops for the three listed collaborative tasks – participation in online discussions (2005–25%: 2007–33%), to access the Internet for professional readings, teacher association news, etc. (2005–78%: 2007–86%), and for the collaborative development of units and lesson materials (2005–76%: 2007–86%).

The laptops had enabled effective communication with colleagues and parents, and ease of collaboration among teachers, strengthening collegial ways of working. The laptop provided for increased connectivity and a forum for feedback and discussion between teachers and students for curricular and extra-curricular activities.

3. Efficiencies gained

Exclusive access to a portable laptop computer gave teachers the flexibility of time and space to carry out their professional work; the laptop serving as the sole repository for all work-related documents amplified this benefit.

Over the three-year period, there was an increase in the routine use of the laptops for all listed administrative tasks. In particular, the majority of teachers were routinely using the laptop to write reports (2007–86%), and three-quarters of teachers used the laptop routinely to record student grades and monitor progress. Use for administration was a commonly noted school expectation and linked with other initiatives such as school use of electronic student databases.

When schools had well set up administration systems, many teachers found that using the laptop for administration saved time and was more efficient.

The most prevalent ‘routine’ use of laptops made by teachers across the three years, for lesson planning and preparation, continued to be to prepare customised student handouts and worksheets that were likely to be linked to curriculum documents, with four-fifths of teachers using the laptop ‘routinely’ for this task by 2007, and nearly all teachers making some use of laptops for this purpose. By 2007, nearly all teachers made some use of their laptops to access the Internet to get information to help plan or prepare lessons and to get assessment-related documents. Laptops have allowed teachers to keep all lesson materials in one place that is easily accessible as well lesson materials in an electronic format are easy to adapt and share, which may be factors influencing the growing use of laptops for planning tasks.

Improved access to resources afforded by TELA laptop ownership meant that planning and preparing lessons was more efficient with the widespread use of planning templates, shared folders and resources, suggesting standardisation and sharing across schools in planning.

4. Use of laptops for classroom practice

At the end of three years, over three-quarters of teachers made use of the laptop for classroom practice. In 2007, around 78% of the 353 Years 4 to 6 teachers spoke about using their laptops with individual students, small groups of students, or with the whole class. Information from both questionnaire and focus groups responses indicated that Years 4 to 6 teachers used their laptops in a range of curriculum areas and in varied ways. By 2007, around three-quarters of teachers made some (either 'routine' or 'occasional') use of the laptop as a stand-alone tool in the classroom to view work produced by students or the teacher, to access the Internet during lessons and to provide extra assistance to individual students. Teachers were also using the laptop plus data projector in all phases of lessons to present visual material, to build the Internet into a lesson and to present student work. Teachers used their laptops to provide students with opportunities to reinforce their learning by completing tasks that were often interactive. The laptop was used by teachers to facilitate shared learning, to show students how to carry out certain tasks by providing structured assistance, and allowed teachers to make learning outcomes transparent to students.

There was *increased laptop access to the Internet* in classrooms and teachers were using this to enable students to enter and explore new learning environments, overcoming the barriers of distance and time, by allowing students to go on virtual field trips, to bring real-world examples into the classroom and to communicate with students in another country. In this way, one of the impacts of teachers' laptop use on student learning has been to help students to make connections across learning areas as well as connections to the wider world.

There was *increased easy access to a data projector*, allowing three-quarters of teachers to use their laptops with a data projector in the classroom for whole-class use. The most prevalent uses of the laptop and peripherals were to show CD ROMs or DVDs, to present student work and to introduce a topic.

There were *opportunities for students to encounter learning in a variety of ways and through different tasks* by using the laptop with a range of tools or peripherals and with software that enhanced the relevance of new learning. In classes where students were allowed to use the teacher's laptop (up to two-thirds of teachers allowed student use with supervision), students were able to use a range of tools such as digital cameras, and recorders with specialised software, and the Internet that allowed them to take their learning in English, mathematics, science and social studies further. When the laptop was used in a classroom where there was access to the Internet, easy access to digital resources, software and peripherals, teachers had the opportunity to provide multi-modal resources.

5. Influences on teacher laptop use

A system of contextual and teacher personal factors interact to frame and shape teacher integration of laptops into their professional lives. The findings indicate leadership, professional learning opportunities and the school technological infrastructure, influence teacher laptop use. There was anecdotal evidence of the laptop supporting teacher engagement with other initiatives and also of other initiatives promoting laptop use.

Leadership support from the principal, syndicate leader and/or the ICT lead teacher was considered to be 'very important' by over half of the 2007 questionnaire respondents in influencing their use of the laptop in the classroom. Overall, a higher proportion of teachers felt that school leaders were 'very supportive' in schools with expectations for laptop use. There had been a substantial increase in the proportion of teachers reporting the support of an ICT lead teacher or computer committee – up to 75% in 2007, and a full-time or part-time technician – up to 55% in 2007.

Just under three-quarters (72%) of teacher in 2007 rated their own confidence and understanding as a very important influence in their use of their laptop. Linked with this, two-thirds rated time to experiment with their laptop as very important. Just under half rated access to professional development as a very important influence on their use of the laptop. There was a growing participation and presumably provision of formal professional development opportunities in the use of the laptop for teaching – for support or ideas for classroom use, use of specific software programs and

developing resources. Nearly three-quarters of Years 4 to 6 teachers (243-70%) had received formal laptop-based professional development in 2007 (2005-42%: 2006-71%). Sharing ideas with other staff members was mentioned positively as a source of professional development with over two-thirds of teachers reporting that other teachers in the school were very supportive. Just under half rated a collaborative culture for laptop use as a very important influence on their use of the laptop.

Teachers appreciated the increased access to the school network, the Internet and additional equipment over the three-year period. In 2007, over three-quarters (77%) of teachers selected school networking and school connections and over two-thirds (68%) selected prompt technical assistance as being 'very important' influences on their use of laptops for teaching and learning. There was increased laptop access to the Internet in classrooms (2005-73%: 2006-87%: 2007-92%) and teachers' easy access to a data projector had increased over the three-year period (2005-55%: 2006-69%: 2007-74%). Easy access to an interactive whiteboard remained low at 12% in 2006 and 14% in 2007. There was also an increase in the proportion of teachers reporting technical support over the three-year period with the support of colleagues remaining the most frequent form of technical support for laptop use.

At least half of the 2007 respondents indicated each of the preceding factors was a very important influence on their laptop use, which suggests the need to consider these factors as a system. The variation in expertise of those who rated these different factors as the most important influence on their laptop use indicates that all of the factors need to be considered in an ongoing way, albeit with a different priority and in a different form for teachers at different stages of personal professional development in laptop/ICT use.

Teacher anecdotal commentary indicated that the laptop had enhanced their involvement in ICT PD cluster activities, supported their use of school-wide student data management systems and facilitated their work in numeracy and literacy, and vice versa.

6. Teachers' main goal for their laptop use

Over the period of three years, 'learning about the potential of ICT to support teaching' rose from 48% to 59% overall, as teachers' main goal for future development in. In 2007, expert users (70%), intermediate users (58%) and beginners (27%) reported that this was the main area they needed development in. For beginners, a greater need was 'to improve skills' (58%).

Implications from the findings

Implications from these findings have relevance for the parameters of the TELA policy, for school leaders and for teachers.

The evaluation indicated that school and teacher use of the TELA laptops is shaped and framed by an intersection between school and individual teacher vision for, and expertise in, the use of ICT, school technological infrastructure, school leadership and systems for ICT use and teacher opportunities for professional learning. Each of these aspects is important at any time but they are important in different ways for different schools, teachers and tasks suggesting a nested systems approach is required to encourage and sustain the integration of the laptops into teachers' work.

- We recommend that policymakers adopt a systems approach to the development of policy and practices to initiate, extend and sustain the integration of the laptops/ICT into school and teacher work, particularly in relation to teaching and learning.

- We recommend school leaders be encouraged and supported to adopt a systems approach to the development of policy and practices to initiate, extend and sustain the integration of the laptops/ICT into school and teacher work, particularly in relation to teaching and learning.

School leader support for and understanding of the potential of the laptops/ICT was influential with regard to the development of a school technological infrastructure for laptop use, and school organisational support for, expectations of, and culture for ICT use. Principal active use and leadership was said to be desirable not essential, as long as the principal provided for an overall supportive environment for ICT use.

- We recommend school leaders, particularly the principal, and including board of trustees members, are supported to learn about and lend their active support for the use of laptops/ICT within their schools.

The percentage of active use reported by Years 4 to 6 teachers was greater than that for Year 7 and 8 teachers. It may be that this is a consequence of greater awareness and use of ICT in society overall. It may also be that this has occurred because teachers in Year 1-8 schools have been able to build on the experiences of Year 7 and 8 colleagues.

- We recommend that school leaders encourage and support all teachers to participate in the TELA scheme as a means to promote whole-school development in the use of ICT.

The indication from this evaluation was that irrespective of teacher self-reported confidence, teachers saw a need for further professional development on, and time to explore, how to extend their laptop use for teaching and learning, including the use of the laptop with other equipment. There was general support for the value of peer mentoring in this. Peer mentoring was considered to provide teachers with help and support that was specific to their needs and peers were usually on hand for ongoing help. Indications were that teachers were making considerable use of their laptops in teaching English.

- We recommend that schools be encouraged and supported to make provision for teachers to work together to develop and share ideas and activities for teaching and learning, particularly in areas other than English, so as to increase laptop/ICT use across the curriculum.
- We recommend schools be supported and encouraged to provide opportunities for on-site 'experts' to continue to extend their expertise including their expertise in mentoring and working with colleagues.
- We recommend ongoing support for schools to collaborate to share knowledge and expertise in ICT use, particularly for teaching and learning.

Laptops provided flexibility of time and place for working but teachers being able to utilise this flexibility is dependent on school policies for ICT use and teacher access to a robust and reliable school technological infrastructure (networking and technical assistance). The development of school technological infrastructure has expertise and resource implications.

- We recommend that a mechanism is put in place to ensure that schools have access to advice and guidance about infrastructure development, including the resources and systems needed to operationalise their vision for ICT use within their school.
- We recommend a mechanism be put in place to ensure that schools have quality access to technical support.

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1. Introduction

1.1 Years 4 to 6 context

For Years 4 to 6 of their primary education, most New Zealand children are educated in a full primary school where there are Years 1 to 8 classes, or in a contributing school where there are Years 1 to 6 classes. Others attend Years 1 to 13 schools. Data were accessed from Years 4 to 6 teachers from full primary and contributing primary schools for the evaluation of the impact of the TELA scheme. In this report the findings are not differentiated by school type. It should be noted that on the whole, Years 4 to 6 teachers in primary schools received their laptops a year after any Years 7 and 8 teachers, and a year before the Years 1 to 3 teachers in the same school, so certain support mechanisms may not have been fully in place for laptop teachers at the beginning of this evaluation.

1.2 Laptops for teachers in New Zealand

The Digital Horizons: Laptops for teachers scheme (TELA)¹ (Ministry of Education, 2003) was one component of the New Zealand compulsory school sector ICT strategy: Digital Horizons: Learning through ICT² (Ministry of Education, 2002a). In 2006, *Digital Horizons* was superseded by the *e-Learning Action Plan for Schools* (Ministry of Education, 2006a) which outlines the key outcomes and actions for e-Learning in the New Zealand school sector for 2006-2010.

From 2003 the TELA scheme has provided permanent full-time and part-time (up to 0.8) teachers in schools that opted into the scheme access to a laptop for a minimal or no cost. The stated goals of the TELA scheme are ‘to develop teacher confidence and competence in the use of ICT for professional growth and collaboration, for teaching and learning, and for administration’ (Ministry of Education, 2004, p. 4). Schools gained access to laptops for their teachers on the condition that they managed the integration of the laptops into the school environment, including providing and meeting the costs of additional ICT infrastructure, professional development and technical support. The Ministry information package for the scheme stated that school commitment to these requirements was essential for an application to succeed (Ministry of Education, 2003).

The TELA scheme reflects the Government’s commitment to increasing the use of ICT in schools to help improve student achievement and teaching practice (Ministry of Education, 2002b). It was set up in recognition of the value of the laptop as a teaching tool. Initial advice sent to schools with Years 9 to 13 teachers in September 2002 was followed by implementation commencing in November 2002. The scheme was extended to Years 7 and 8 teachers in 2004 and to Years 4 to 6 teachers in 2005.

1.3 Laptops for teachers (TELA) evaluation

The purpose of the evaluation summarised in this report was to investigate the impacts of TELA on Years 4 to 6 teachers’ work over a period of three years beginning in 2005, the first year that laptops were made available to these teachers through the TELA scheme (see evaluation timeframe in Appendix A). The TELA specifications indicated that it was anticipated that access to a laptop for their individual professional use would lead to gains in teacher confidence and expertise in the use of ICT. It was also expected to enhance teacher professional growth and collaboration; lesson planning and preparation; administration and access to and the quality production of teaching, learning and assessment resources. The TELA information package (Ministry of Education, 2004) also indicated that it was expected teachers

¹ <http://www.minedu.govt.nz/goto/tela>

² *Digital Horizons: Learning through ICT* is the foundation policy document for ICT in the New Zealand compulsory education sector. It outlines the Government’s goals in relation to ICT as an area of knowledge relevant to all students.

would use the laptops in the classroom for teaching and learning. These anticipated uses were a main focus for the evaluation. The evaluation also sought to identify and understand the factors that enabled and hindered these uses.

1.4 Structure of this report

This final report is a summary and synthesis of the three years of data collection (2005-2007) carried out with Years 4 to 6 teachers who were participants in the TELA scheme.

The report begins by providing background information regarding the TELA scheme and how the international setting and trends for the use of laptops/ICT in education provides a background for this evaluation. The evaluation methodology is explained in section three. In section four the impacts of teachers' access to a TELA laptop on their professional work are examined. Enablers and constraints for teacher laptop use are described in section five. Section six outlines where teachers see the future of laptop in schools. Recommendations at national, school and personal levels are made in section seven.

2. Trends: ICT in education/laptops for teachers

ICT use is increasingly implicated in what it means to be socially, economically, culturally and politically involved in 21st century society (Selwyn & Facer, 2007). ICTs are at the heart of global flows of knowledge, people and services that characterise the knowledge economy and social inclusion. An ability to bring people and places together has emerged as one of the defining characteristics of ICTs: they can be seen to underpin the development of a more networked and interconnected society (Castells, 1996). In this section, we provide an overview of key studies and findings that have looked at how teachers integrate laptops into their professional lives, what the classroom use of the laptops might look like, and how ICTs fit into the wider school context.

2.1 Integrating ICT/laptops into teachers' professional lives

Research suggests that the impact of computers on teaching and learning has not been as great as was anticipated. Balanskat (2007), reporting on comparative international evidence on the impact of digital technologies on learning outcomes, found that only a small percentage of schools in some European countries had embedded ICT into the curriculum and demonstrated high levels of effective and appropriate ICT use to support and transform teaching and learning across a wide range of subject areas. Most schools in most countries, however, were in the early phase of ICT adoption, characterised by “patchy uncoordinated provision and use, some enhancement of the learning process, some development of e-Learning but no profound improvements in learning and teaching” (p.1). Erstad (2005) employed case study methodology in Norwegian schools to examine the potential for benefit (affordances³) that new technologies might provide for student learning activities. He found that the biggest impact of technology was in how the learning space was made larger, in the sense that the students could reach out of the classroom and work on and with issues in the outside world, and it created more flexibility in relation to subject content. The resources to be included in the learning activities were more varied and stimulated different learning approaches among the students. This more flexible learning environment appeared to indicate that there was a transition from a teacher/book/blackboard-learning environment towards a student-centred learning environment. However, it was found that teachers were not changing their teaching methods – they used similar pedagogies but found that with new technologies they were able to motivate students more than before. Alongside this, Bebell, Russell & O’Dwyer (2004) propose that recent developments in ICTs support the need for a broad conceptualisation of the potential impacts of ICTs. Their survey of 2,894 teachers in the United States indicated that the teachers were making substantial use of computers out of the classroom in support of teaching for tasks such as lesson planning and preparation, administration and management, and email communication with colleagues. This evaluation, in line with the goals of the TELA scheme, adopts this broad conceptualisation of the possible impact of teacher access to a laptop for their individual professional use.

Research is beginning to explicate the impact of laptops on ICT integration in schools and on teachers and students. Indications are that access to a laptop afford different opportunities for teacher use of ICT than do desktop computers owing to their portability, the opportunity for teacher exclusive use and the generally higher specifications that laptops have compared to existing school desktop computers. Laptops offer the possibility that teachers will have access to the same set of documents and resources at home and at school and as such they go a long way towards meeting the proposal that, “any given technology can support learning only to the degree that it is available for frequent, integral use within and outside school” (Means, Roschelle, Penuel, Sabeli & Haertel, 2003, p. 165). Research indicates teachers are taking advantage of the flexibility that laptops provide in terms of time and place of teacher use of ICT. For instance,

³ Norman (1988) defines affordances as “the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used” (p. 9).

Cunningham, Kerr, McEune, Smith and Harris (2004), reporting on teacher perceptions at the end of the first year of their having access to a laptop for their individual professional use, note that teachers had become more confident and competent in their ICT use since receiving their laptops. Teachers reported greater access to a range of resources and an increase in the professional quality of lesson materials. The laptop was said to provide for the streamlining of management and administrative tasks. Teachers appreciated the flexibility in time and place of work provided by the laptop. There was some evidence that laptops supported increased communication between teachers, students and parents and greater sharing of information between teachers. Teachers felt they were gaining maximum impact from their laptops when they used them in conjunction with peripherals. Simpson and Payne (2005), in an evaluation of personalised laptop provision for teachers and some students in two Scottish primary schools, found that the main impact of teachers' regular use of the laptops and peripherals was increased pupil motivation and increased availability of information to pupils. They cautioned that personalised ICT within schools in the form of laptops was not a means to achieve a student-centred learning environment in schools in which learner-centred pedagogies had not yet developed. Taken together, these studies suggest that the introduction of new technologies without adequate prior changes in pedagogical practice would tend to result in the technologies merely being fitted into current practices. These studies indicate that understanding teacher use of laptops needs to consider the ways teachers might be taking up the particular affordances of a laptop computer in relation to the broad scope of teacher professional activities.

2.2 The importance of context

Aside from individual understandings and preferences, the affordances of ICT use are organisationally and socially based (Cushman & Keicun, 2006). They derive from a combination of technological possibilities, user capabilities and understandings, and the wider social context. As Selwyn and Facer (2007, p.14) point out, ICT use is not just based on the individual being able to 'understand' the potential benefits of ICT use but also on how well ICT-based activity 'fits' with the wider contexts within which they are operating. If the wider cultural context of use (such as the workplace, school or home) does not fit well with the culture of the ICT application, then use will not easily follow. Adding weight to this point, Becker (1998) found that elements relating to professional development and support were predicative of effective teaching practice. Research by Efaw, Hampton, Martinez & Smith (2004) into the general use of laptops by teachers, but with a focus on use for teaching, found that teachers who observed other teachers' effective strategies and those who shared effective strategies via a server were more likely to integrate laptops into their teaching. On the other hand, Fishman, Marx, Blumenfeld, Krajik and Soloway (2004) assert that if integration is left completely up to individual teachers and schools, it may be only the minority who are willing and able to put in the time and effort required to succeed. Individual teachers and schools may not have the resources needed for this task pointing to the need to consider national policy as part of the context for laptop use (Kozma, 2005). Policy, through the provision of vision and or professional development and resources to enhance the capacity, plays a role in change. Spillane, Reiser and Reimer (2002) assert there is a need to take into account the interaction of the "policy signal, the implementing agent's knowledge, beliefs and experiences and the circumstances in which the local agent attempts to make sense of the policy" (p. 420). This conceptualisation of the context as pertaining to the local (syndicate, school) circumstances and the broader policy environment underpins this evaluation study of teacher laptop use.

To sum up there are a number of factors that influence ICT use and innovation by teachers and schools. Access to ICT on its own, does not necessarily result in changes for teachers or schools. To bring about changes a number of factors must be considered that are related to school-wide opportunities and incentives for ICT use, along with teacher personal and classroom factors. We were interested to know how these identified factors manifest themselves in the New Zealand context and thereby impact on New Zealand teachers when they are working to integrate technology into their professional lives. In this report we focus on the nature of and support for innovation with ICT as teachers use laptops accessed through the TELA scheme in New Zealand.

2.3 The New Zealand context for teaching with ICT

The Ministry of Education has promoted the use of ICT in New Zealand schools through a range of initiatives. One of the early Ministry of Education ICT initiatives, begun in 1998, was the national '*Information and Communication Technologies Strategy for Schools*' (Ministry of Education, 1998). The following are some examples of the ICT related projects associated with this initiative: the development of Te Kete Ipurangi (an Online Resource Centre); Te Hiringa i te Mahara (a project designed to help Māori secondary teachers reduce their workloads through the use of ICT); the provision of 'Principals First' one-day workshops for principals to develop leadership skills in planning for school implementation of ICT; the provision of ICT funding to schools that completed an ICT plan (99% of schools have received the funding); and the allocation of laptops to principals. A 'national' system of funded professional development, known as the ICT PD School Clusters programme, was established in 1999. To date, over 60% of New Zealand schools have been involved in the programme. A school commitment to the cluster programme is for a three-year period and programmes focus on the integration of ICTs into a variety of teacher professional practices with a particular emphasis on use in the classroom for teaching and learning. Teachers from schools involved in the cluster groups are led by a facilitator and encouraged to learn through regular discussion group meetings and by visiting each other's schools to see ICT being used effectively by teachers in the classroom.

In 2002, the Government released the *Digital Horizons: Learning through ICT* (Ministry of Education, 2002b) strategy. This outlined the Government's goals in relation to ICT as an area of knowledge relevant to all students. It reflected the New Zealand Government's commitment to increasing the use of ICT in schools to help improve student achievement and teaching practice (Ministry of Education, 2002a) and to provide students with the skills and knowledge they need to achieve 'personal goals and to be full participants in the global community' (Ministry of Education, 2002a, p. 3). The TELA teacher laptops scheme is part of this initiative.

Effective teaching using ICT was the key component of an e-Learning action strategy formulated by the Ministry of Education in 2006 (Ministry of Education, 2006a). The main idea of this is to place learners and teachers at the centre of their own communication and information networks. The strategy suggested that teachers use e-Learning to create a blended learning environment where students could explore and experiment, think critically and creatively, reflect and plan, use feedback and self-assessment, and create new knowledge using ICTs. Teachers were encouraged to become more effective and efficient by using customised tools to aid their lesson planning and preparation and administrative tasks. Using group-learning opportunities that recognise individual differences and giving students opportunities to learn outside the classroom were suggested as ways that teachers could integrate ICT effectively into their teaching practice.

An analysis of the idea of effective teaching in the classroom has been included in a number of Ministry of Education documents. Alton-Lee (2003) identified ten characteristics of quality teaching as part of a literature review commissioned to strengthen the evidence base that informs education policy and practice in New Zealand. The report set out evidence about what works to improve education outcomes and what can make a bigger difference for the education of all children and young people. The evidence revealed that up to 59% of variance in student performance was attributable to differences between teachers and classes. The central professional challenge for teachers was to manage simultaneously the complexity of learning needs of diverse students. Amongst the ideas for effective teaching that emerged from the research were the need to contextualise pedagogical practice, make links between the school and other settings in which students live, and provide students with tools to enable them to take responsibility for their own learning. Most recently, the revised *New Zealand Curriculum* (Ministry of Education, 2007) discussed effective teaching and listed ideas from current research showing that students learned best when teachers encouraged reflective thought and action, made connections, provided multiple opportunities to learn, facilitated shared learning, enhanced the relevance of new learning and created a supportive learning environment. The document outlined the ways in which

e-Learning (learning supported or facilitated by ICT) could support effective teaching approaches, such as by enabling students to enter and explore new learning environments, to join or create communities of learners that extend beyond the classroom, and by offering students virtual experiences and tools that save them time, allowing them to take their learning further. It was suggested that schools should explore how ICT could “open up new and different ways of learning.” (Ministry of Education, 2007, p. 36). In this evaluation, these notions provide a framework for analysing teacher reports of how they made use of their laptops for teaching and learning with ICT.

3. Laptops for teachers (TELA) evaluation

3.1 Evaluation focus

The focus of this evaluation was to monitor the impacts of the TELA scheme on teachers' professional lives with particular emphasis on the impacts on administration and management, lesson planning and preparation and classroom teaching and learning. Consistent with Ministry of Education expectations for the TELA scheme the evaluation sought to find out "what kind of professional tasks are undertaken using the laptop" and "patterns of use over time and what kind of professional tool the laptop becomes" (Ministry of Education, 2004). The goal was to understand the impacts of TELA so that the scheme might be adjusted to best support the integration of the laptops into school and teacher practices.

3.2 Evaluation framework

Initially, research on teacher adoption of ICT tended to discuss teacher personal, professional and contextual factors as if they were independent (Zhao & Frank, 2003). This contrasts with recent research on teacher and organisational learning, which construes it as much a situated social process as an individual process (Putman & Borko, 2000; Senge, 1994; Spillane, 2004). It also contrasts with current research on teacher ICT use, which positions ICT as a tool that shapes, and is shaped by, the immediate and wider school environment in which it is deployed (Lim, 2002; Zhao & Frank, 2003). Research that has sought to explicate what contributes to the sustainable systemic use of ICTs has highlighted the role of national policy in shaping the context for ICT (see for example, Kozma, 2005; Olson, 2000; Selwyn, 2002; Venezky, 2004). Taken together, this research indicates that any evaluation of teacher use of laptops needs to take into account the setting in which teachers find themselves, along with their personal preferences and views, in order to understand how and why they come to use technology in different ways over time. In line with this, Fisher, Higgins and Loveless (2006) found a nested and multi-dimensional approach, as suggested by Shulman and Shulman (2004), was useful in the analysis of the integration of ICT in schools in the United Kingdom. Shulman and Shulman's (2004) model for teacher learning has individual reflection at the centre, this is supported by individual, community and policy factors. This multi-faceted approach is consistent with what Patton (2002) has described as the "Interdependent System Relationship Maps" conceptualisation of evaluation.

In a systems evaluation approach, the phenomenon under study is understood as a complex system that is more than the sum of its parts. The focus is on the complex interdependencies and system dynamics that cannot meaningfully be reduced to a few discrete variables and linear, cause/effect relationships (Patton, 2002, pp. 40-41). The main question to be answered is, "How and why does this system as a whole function as it does?"

A system is a whole that is both greater than and different from its parts. Indeed, a system cannot be validly divided into independent parts as discrete entities of inquiry because the effects of the behaviour of the parts on the whole depend on what is happening to the other parts. The parts are so interconnected and interdependent that any simple cause/effect analysis distorts more than it illuminates. Changes in one part lead to changes among all parts and the system itself. Nor can one simply add the parts in some linear fashion and get a useful sense of the whole. (Patton, 2002, p.120)

The TELA evaluation therefore sought to identify and portray both how teachers were using their laptops and the set of inter-related factors that affected the integration of the laptops into teachers' professional lives with the overall goal of developing an understanding of how and why Years 4 to 6 teachers came to use their laptops in different ways over time. The emphasis of the evaluation was on the immediate impacts of the TELA scheme on teachers' professional

practices and the factors that enabled and constrained these practices. Although this generated incidental data about changes in the school context and wider policy initiatives, these were not the direct focus of the study.

3.3 Evaluation methodology

The TELA evaluation design was to use three-yearly cycles of annual nationwide surveys via a written questionnaire, and regional focus groups. The different methods and how they relate to the evaluation focus is now given:

Questionnaires

Surveys are useful for generating prevalence data on first-hand experiences (Cohen, Manion & Morrison, 2000). In this evaluation the survey questionnaires were designed to provide prevalence data on different types of teacher use of the laptops and the kinds of support they had experienced for these uses. The Year 4-6 questionnaire built on some years of experience with other teachers (Years 7-13 teachers who had TELA laptops). Many of the same questions were used across the year groupings and across the three years of the study so that comparisons of frequency of use and patterns of use over time could be made. The impacts of the TELA scheme on teachers' professional lives were monitored by the inclusion of questions on laptop use for teacher professional growth and collaboration, lesson planning and preparation, administration, access to and quality production of teaching, learning and assessment resources and classroom practice. Questions also prompted teachers to report on their self-assessment of the expertise and comfort with a range of tasks. Free response questions were included where categories had not been defined, so that teachers could describe more fully their experiences, such as what they had found useful about any laptop-based professional development and describing an example of laptop use in the classroom.

Questionnaire data were analysed using the statistical package SPSS. Frequencies and ratios were calculated – percentage numbers have been rounded up to the next whole number. Qualitative data from free-response questions were coded into categories. Frequencies and ratios were calculated, but reporting these data was designed to highlight particular trends and weightings given in teachers' responses. The combination of quantitative and qualitative survey data provided for a deeper understanding of the ways teachers were making use of the TELA laptops, and the factors that contributed to these uses.

Focus groups

Focus groups can also be used as a method in their own right but they are also a useful complement to other data collection methods (Cohen, Manion & Morrison, 2000). In this study, the focus group discussions enabled researchers to understand more fully the impacts on teachers' professional lives and to explore the factors that influenced these impacts, albeit for a very small group of teachers. The focus groups served as a check that the questionnaire addressed key concerns and practices as these evolved for Years 4 to 6 teachers over the three-year period of the study. The focus group discussions allowed the researchers to validate their interpretations of the qualitative questionnaire comments. They also allowed for the fuller exploration of some of the issues associated with teacher use of laptops. Topics for the focus group discussions included what kind of professional tasks were being undertaken using the laptop and how these uses had changed from one year to the next. Teachers were also asked to comment on factors that enabled and constrained their laptop use and their goals for the next year. Focus group discussions were taped and transcribed. In this report the focus group data have been included to illustrate points made in teacher written responses.

3.4 Participants

3.4.1 Questionnaire respondents

For this evaluation the final sample of 330 schools with Years 4 to 6 students consisted of 179 full primary schools, 134 contributing schools, 10 composite schools and 7 special schools. In 2005, the procedure to recruit Years 4 to 6 teachers for the questionnaire began with creating a random sample from a list provided by the Ministry, as at August 2004, of schools involved in the laptop scheme. From a pool of 1195 schools, a random sample of 120 schools was generated. The 76 Years 1 to 8 schools that had taken part in the Years 7 and 8 evaluation were added to bring the sample of schools to 196 schools. The sample was stratified, in case of non-response, leading to a sample of 204 schools. In 2006 a further 126 schools were added, making the sample up to 330 schools, so as to ensure wider coverage of schools and teachers.

The researchers contacted the principals of the schools in the sample, notifying them about the Ministry of Education Laptops for Teachers evaluation and inviting their school to take part in the evaluation. Principals were advised that questionnaires would be sent out in the second term of 2005, and then again in 2006 and 2007. The principal was asked to nominate one teacher who would accept responsibility for distributing, collecting and returning the completed paper questionnaires to the research team, and for forwarding the website address to teachers who chose to complete the questionnaire online.

Respondent teachers represented schools in all deciles, mostly in main urban areas, and all schools were co-educational. Seventy-one schools returned completed questionnaires in 2005 (25 contributing, 44 full primary, 1 composite/restricted composite, and 1 special school), 112 in 2006 (66 contributing, 29 full primary, 1 composite) and 131 in 2007 (72 contributing, 56 full primary, 1 composite/restricted composite, and 2 special).

The number of respondents was 200 in 2005, 279 in 2006 and 353 in 2007. Nearly all respondents had a teaching role in their school. Around a fifth were heads of department, syndicate leaders or senior teachers. Each year around a quarter (2005–24%: 2006–28%: 2007–31%) of questionnaire respondents had responsibility for ICT in their schools. Across the three years around a fifth had between 0-5 years teaching experience (2005–22%: 2006–25%: 2007–22%). There was an increase in those with 6-15 years experience (2005–32%: 2006–31%: 2006–36%). Just over two-fifths in each year of the evaluation had spent more than 15 years teaching (2005–45%: 2006–43%: 2007–41%). Between three-quarters and four-fifths were female teachers (2005–79%: 2006–82%: 2007–76%).

It is important to note that it is impossible to know if the respondent teachers in this evaluation are representative of the Years 4 to 6 teaching population that have accessed TELA laptops. Because of this, and because of the self-report nature of the evaluation data, caution is needed interpreting the findings. The data reflect what teachers considered relevant in relation to the questions about their laptop use and what supported and constrained this use. No classroom observations were conducted and so the examples of laptops for teaching and learning are also teacher self-report. This said, teacher perceptions and beliefs are important because they have been linked to teacher use of ICTs.

3.4.2 Focus group respondents

There were two focus group meetings each year – one for urban schools and one for rural schools. Focus group schools were selected on their geographical location, with due regard to achieving a spread of school socio-economic status, and size. Consideration was also given to a mix of state and integrated schools. In 2005, at which time 46% of all schools had been involved in an ICT PD cluster, avoiding schools that had been involved, or were involved in an ICT professional development cluster, was not practical and so these schools were included when selecting the focus group schools. Having selected the schools, the researchers contacted them initially by phone followed by letter. Schools that

declined to be part of the study were replaced by similar schools in relation to the variables identified above. Every effort was made to encourage teachers to attend a focus group by pointing out the benefits of participation.

Each year between six and seven teachers from urban schools and between five and eight teachers from rural schools took part in focus group discussions. Focus group discussions were held in non-school venues and lasted for up to three hours. Those attending commented on the positive experience of attending focus groups and on the professional development that it had given as a space to share ideas and examples of practice using ICT. Discussion was lively and positive.

3.5 Evaluation timetable, evaluation reports and dissemination

The evaluation timetable is in Appendix A where it can be seen that evaluation findings were presented in reports at six monthly intervals informing the ongoing thinking (about the TELA scheme) of the policy and programme manager stakeholders. There have been numerous formal and informal discussions with the TELA project manager about the findings and their implications for TELA policy. Data has been presented to key stakeholders. One research paper has been given at a national educational conference (Harlow, Cowie & Jones, 2006), and as results from other primary levels come in there will be further papers that include findings from the Years 4 to 6 evaluation. This final report of the Years 4 to 6 findings should be viewed as one element in a total utilisation process.

4. Impacts on teacher professional practice

In this section, we set out key findings over the three years on the impacts of teacher access to a TELA laptop on individuals and schools.

4.1 Changes in perceptions of expertise and comfort levels

One of the immediate impacts of laptop access was expected to be that teachers would experience gains in ICT confidence, appropriate skills and knowledge. They were expected to broaden and increase their use of electronic resources. Teachers were asked to rate their ability to use the laptop and were given three categories from which to choose – ‘expert’, ‘intermediate’ and ‘beginner’. There was an increased confidence in ability to use the laptop over the three-year period as shown in Table 1.

Table 1: Perceived ability to use a laptop (2005-2007)

Perceived ability	2005 %	2006 %	2007 %
Expert users	18	26	32
Intermediate users	68	67	61
Beginners	14	7	7

Table 1 shows a rise in those teachers considering themselves to be ‘expert users’ over the three-year period and very few ‘beginners’ by 2007. Teachers became more comfortable using their laptops over the three-year period for a range of tasks. Tables 2 and 3 compare the figures from 2007 with those of the first two years.

Table 2: Most comfortable tasks (2005-2007)

Task	Expert (%)			Intermediate (%)			Beginner (%)		
	2005 (n=35)	2006 (n=72)	2007 (n=111)	2005 (n=137)	2006 (n=188)	2007 (n=216)	2005 (n=28)	2006 (n=19)	2007 (n=26)
Use as a word processor	100	100	100	95	98	98	82	79	69
Send emails	100	100	100	88	93	93	64	63	77
Search the Internet	100	99	100	84	88	89	46	42	62

Table 2 shows that overall teachers were more likely to be comfortable using their laptops over the three-year period for the three core tasks of word processing, emailing and searching the Internet. Intermediate users had become more comfortable using their laptops for these tasks over the three-year period and the proportion of beginners who were more comfortable using their laptops for two of the three tasks had increased.

Table 3: Percentages of teachers who felt 'comfortable' (2005-2007)

Task	Expert (%)			Intermediate (%)			Beginner (%)		
	2005 (n=35)	2006 (n=72)	2007 (n=111)	2005 (n=137)	2006 (n=188)	2007 (n=216)	2005 (n=28)	2006 (n=19)	2007 (n=26)
Locate online information	77	89	87	47	57	47	29	26	31
Use graphics	97	99	97	64	75	72	14	11	23
Use presentation software	94	96	88	50	45	48	7	5	8
Spreadsheets/charts	83	75	70	26	30	26	7	5	4
Movie editing software	43	55	39	7	15	7	0	0	4
Create/use database	29	35	34	8	6	8	0	0	0
Create web pages	26	26	28	4	3	4	0	0	0
Download photos/use images	-	92	95	-	46	49	-	11	20

Table 3 shows how levels of comfort changed over the three-year period for the other listed tasks. Expert users remained more likely to be comfortable with all listed tasks than other groups. Bearing in mind the rise in the proportion of expert users over the period, there were three tasks where the proportion of expert users feeling comfortable dropped: using presentation software, using a spreadsheet and using movie-editing software. There was little change for intermediate users over the three-year period. Although there were very few beginners, they too appeared to be starting at a higher skill level than they had in 2005 regarding using graphics. The proportion of teachers comfortable with downloading digital photos nearly doubled (up to 20%).

It is interesting to note that although there appears to be a trend towards teachers becoming more comfortable over time with the listed tasks, expert users remained considerably more likely to be comfortable than intermediate users or beginners. There were a low proportion of beginners but they still tended to be more likely to be comfortable using their laptops for word processing, emailing and searching the Internet than for other tasks. As can be seen in Table 3, expert users were twice as likely to be 'comfortable' as intermediate users using the laptop to download digital photos (expert users–95%: intermediate users–49%). This trend can also be seen in use with presentation software [58% of teachers reported being 'comfortable'] (expert users–88%: intermediate users–48%), and using a spreadsheet [38% of teachers reported being 'comfortable'] (expert users–70%: intermediate users–26%).

Summary comment

Teacher-reported gains in ICT confidence, skills and knowledge indicate the TELA scheme has been successful in expanding the number of teacher who are comfortable with using computers, in this case a laptop computer, for a range of tasks. Of note, over 90% (93%) of the Years 4 to 6 teachers who participated in this study rated their level of expertise as expert or intermediate suggesting a high level of overall confidence within this group as to their ability to use ICT.

4.2 Changes in use for administration

One goal of the TELA scheme was that teachers would experience significant efficiencies in administration and reporting.

Table 4: Change in levels of laptop use for administrative tasks (2005-2007)

Use for administration	Level of laptop use					
	Routine use			Occasional use		
	%			%		
	2004	2006	2007	2005	2006	2007
Write reports	81	87	86	9	9	8
Record grades	69	76	75	20	19	20
Check lists/records	55	61	68	26	22	23
Check notices	35	46	53	18	21	19
Take notes at meetings	-	40	48	-	35	32
Schedule appointments	8	11	14	17	19	26
Record attendance	-	9	12	-	6	7

Over the three-year period, there was an increase in the routine use of the laptops for all administrative tasks (see Table 4). In particular, writing reports for parents (up to 86% from 81% in 2005), recording student grades and monitoring student progress (up to 75% from 69% in 2005), and, checking student records (up to 68% from 55% in 2005). Around half (53%) of the teachers now used their laptops routinely to check school notices; this proportion had increased from 35% in 2005. There was an increased proportion of teachers who occasionally used the laptop to schedule appointments (up from 17% to 26%). A new task identified in 2006, the taking of notes during meetings, saw an increased proportion of teachers making use of their laptops routinely (up from 40% in 2006 to 48% in 2007). For recording attendance there continued to be less than a fifth of teachers who made any use of the laptop.

As international studies have found, laptops have provided for the streamlining of management and administrative tasks. However, it should be borne in mind that administrative tasks such as writing reports, and recording grades and attendance, more than likely depended on school policy requiring such tasks to be done on computers. Indeed in 2007, around three-quarters (73%) of Years 4 to 6 teachers reported that there was some school expectation for teacher laptop use. Of the 255 teachers who gave details of these expectations, 110 teachers cited administration tasks that were expected to be done on the laptops: with a majority describing the keeping of records, assessments and test results of student achievement and/or record keeping and report writing (97).

Focus group teachers were using their laptop for a range of administration tasks, such as entering and analysing student achievement data, taking staff meeting minutes, emailing absences to the office, submitting news items to daily notices via email and sending newsletters to parents via email. The 2007 focus group teachers regard the reduction in paper use as a positive outcome. In schools where the administration systems were electronic and all teachers used their laptops to contribute to record keeping, indications were that whole-school student data analysis had become more commonplace and comprehensive.

Everyone across the school uses their laptop – they have to keep up with the school administration matters. We are an eTAP (electronic Teaching Assessment-Planning) school and access student records and load all our assessment data on in term four and that's now being used – I think there are five or six student management programs now which can talk to each other, we post our stuff so when a child leaves our class the next school can access it. (2007 urban focus group comment)

Having the student management system on the laptops was said to have been the catalyst for change in some focus group schools. All focus group teachers now used their laptops to access and input student data.

Summary comment

The findings indicate increased teacher use of their laptop computer for administrative purposes with the implication, given the busyness of teacher lives, that this use contributes efficiencies. There was some indication that increased use could be linked to school requirements which in turn related to greater availability and use of electronic student data management systems. In this case the TELA scheme, in providing most teachers in a school with access to a laptop would seem to have been a key factor in supporting the viability of a shift to electronic administrative systems.

4.3 Changes in use for communication

It was anticipated the TELA laptops would support teacher collaboration and communication (Ministry of Education, 2004) and teachers were asked to report on the frequency of using their laptops for activities indicative of communication – contacting colleagues within school and in other schools via email, and contacting parents via email.

Table 5: Change in levels of laptop use for communication (2005-2007)

Use for communication	2005 (n=200) %	2006 (n=279) %	2007 (n=353) %
Email colleagues	78	-	-
Email colleagues within school	-	74	81
Email colleague outside school	-	67	79
Email parents	-	40	50
Email students	-	25	30

The question on contacting colleagues via email had been broadened in 2006 to show contact with colleagues within and outside the school. Table 5 shows the increased use of laptops for communication. Four-fifths of teachers were using the laptop to email colleagues within and outside their school by 2007

By 2007, teachers were making active use of email to communicate with colleagues and, increasingly, with parents and students. Written questionnaire comments suggested they were also using their school intranet and website for communication.

We use our website and our intranet to communicate with students, colleagues and professionals. I am teaching the children to do this as well. (2007 comment)

Responses from the questionnaire showed that teachers also used shared spaces such as iChat, Windows Live, Messenger and Skype on their laptops for contacting others.

Evidence from the 2007 focus groups suggests that email has become an important form of communication in schools now that there is a critical mass of laptop teachers. The provision of a permanent record of communication was seen to be an advantage of email, and the laptop provided a repository for communications that teachers had easy access to when necessary. Two of the focus group teachers said that their schools had moved even further with communication:

We've got teaching stations, so when I go into a classroom I just put my laptop onto the teaching station and so I am back online again. Every time I go in with cell phone, laptop and PDA. I use it and we've

been issued with phones by Vodafone to enhance paren/ teacher communication, and so we've been looking into that. So, your laptop is up and ready in ETAP – our student management system all the time. Like today, I was in a class and I rang four parents. I've got it sitting up there, I scroll down, find the phone number and phoned the parent saying xyz was on task, doing the right thing, making the right choices. (2007 urban focus group comment – teaching deputy principal – decile 2)

We have set up our own school website through KnowledgeNET and our own classroom pages. On KnowledgeNET on my classroom page, because I want one reading group to do a webquest, I have put the tasks on there, and they go straight to the PC and access their work via the Internet 'cause it's all on there. I said if you've got the Internet at home, you can go home and access it via home as well. So, they're [students] accessing their work. (2007 rural focus group comment – decile 8)

Some focus group teachers in smaller schools emphasised the value of face-to-face communication. There were focus group teachers who reported that they did not use the laptop for communication because they did not have classroom or home access to the Internet, lacked confidence or they taught where the school server could not support the use of the laptop in this way.

Summary comment

Indications are that Years 4 to 6 teachers are increasingly using their laptop for email communication. It is not possible to determine whether this has led to more frequent communication or simply replaced other means of communication but the upward trend in use indicates email is now an important means of communication and connection for teachers.

4.4 Changes in use for professional dialogue and collaboration

One of the expected outcomes of teachers accessing a TELA laptop was that teachers would initiate professional growth opportunities using their laptops and share their knowledge and resources with colleagues. For the evaluation teachers were asked to report on the frequency of using their laptops for activities indicative of collaboration and professional dialogue:

- participating in online discussion lists or forums
- accessing the web for professional readings, teacher association newsletters, etc
- collaborative development and sharing of units and lesson materials.

Evidence of change

Over the three-year period there had been increased use of laptops for the three listed tasks – participation in online discussions, to access the Internet for professional readings, teacher association news etc, and for the collaborative development of units and lesson materials, as shown in Table 6.

Table 6: Change in levels of laptop use for collaboration (2005-2007)

Use for collaboration	2005	2006	2007
	(n=200) %	(n=279) %	(n=353) %
Participate in online discussions	25	24	33
Internet – professional readings	78	85	86
Collaborative development of materials	76	86	86

There was growth in online discussion participation (up to 33% from 25% in 2005), which according to focus group teachers, often occurred when they were doing further study or belonged to an ICT PD cluster group. Collaborative development of materials was growing. The flexibility of place of working that other laptop studies had found to be useful (Cunningham et al, 2004; Windschilt & Sahl, 2002), was evident in the questionnaire findings as laptops were taken to staff and syndicate meetings to record discussions and to plan collaboratively.

A lot of communication within the syndicate over planning is done using laptops, and we often make adjustments to our planning. Great to put something on the server and another teacher can have a look at it and make changes. (2007 comment)⁴

Teachers in well resourced and well organised schools were using the server to share work.

I've just come from a sole charge school to a bigger 10 teacher rural school and they've got things very well organised as far as putting virtually anything that people have done on the intranet, so that we can share our planning, share our formats, share assessments, share portfolios. It's brilliant that sharing of resources. (2007 rural focus group comment)

One focus group teacher who had come from a well resourced school was beginning to offer her expertise to teachers who were less confident, so that sharing might become a part of her new school's culture. She said that sharing varied depending on relationships within each part of the school.

It in part depends on the school culture. The shared planning is fairly well established in the junior school but not so in the middle school and it varies in the senior school. So, it depends on the relationship of colleagues in our school. It varies according to confidence – one or two of us are confident in the middle school. For me my laptop is an extension of my fingers, whereas for other people it is something to go, 'Oh, what on earth do I do?' They close the lid and leave it. I have started to offer help to teachers who are scared of their laptops just to try and get that openness going for a start, for things to be shared generally. (2007 rural focus group comment)

Summary comment

Other studies have reported that New Zealand primary teachers value collaboration and the sharing of ideas and resources (McGee, Jones, Bishop, Cowie, Hill et al., 2002). Indications are that the laptops appear to have fitted easily with the practice of collaborative development of resources and teachers accessing the Internet for professional readings. Teacher participation in online discussions remained low, raising questions about teacher perceptions of the overall value of this practice, particularly when compared with their active participation in the other activities.

⁴ Where a quotation is identified by a date and 'comment', it comes from the questionnaire responses of that year. Other quotations are identified as coming from focus group participants.

4.5 Changes in use for lesson planning and preparation

One of the ultimate outcomes of the TELA scheme was expected to be teachers producing high quality lesson resources and plans that creatively respond to student learning needs. Data across the years shows some progress towards this goal with between 85% and 97% of teachers using their laptops for all listed planning tasks by 2007.

Table 7: Change in levels of laptop use for lesson planning and preparation (2005-2007)

Use for lesson planning and preparation	Level of laptop use					
	Routine use			Occasional use		
	%			%		
	2005	2006	2007	2005	2006	2007
Prepare student handouts	74	84	84	22	15	12
Use planning templates	-	74	83	-	18	14
Access internet information for lessons	-	73	77	-	18	18
Adapt worksheets for students	-	-	77	-	-	22
Check schemes and units	46	57	62	29	30	29
Access Internet for assessment materials	-	54	57	-	34	35
Review resources for student use	28	38	38	51	47	48
Combine use/other equipment	34	37	36	41	45	49

Table 7 shows how the most prevalent 'routine' use of laptops made by teachers across the three years, for lesson planning and preparation, continued to be to prepare student handouts and worksheets, with four-fifths of teachers using the laptop routinely for this task by 2007 and nearly all teachers making some use of laptops for this purpose. Table 7 shows that by 2007, teacher 'routine' and 'occasional' use of the Internet was 95% for planning purposes and 92% for assessment purposes.

A central professional challenge for teachers is to manage the learning needs of diverse students. 'Adapting worksheets' was a new task added in 2007 – as it was evident that focus group teachers appreciated the ease with which electronic materials could be altered to meet the needs of their classes. Over three-quarters of teachers (77%) reported routine adaptation of lesson materials for their students, suggesting that teachers found the laptop supported the customisation and personalisation of lesson materials.

Using the laptop in conjunction with peripherals was possible as laptops had higher specifications than desktop computers and could be used with curriculum-specific software, CD ROMs and peripherals. The routine use of the laptop to review resources such as CD ROMs to be used by students increased, with occasional use remaining stable. Using the laptop to produce lesson materials routinely in combination with other equipment such as a digital camera, video or scanner showed little increase over the three-year period but occasional use of laptops for this task rose steadily.

Using planning templates was a new task added in 2006, as a result of focus group discussions, and routine use had increased to 83% of teachers by 2007, up from 74% in 2006 suggesting some standardisation across schools in planning. Written and focus group comments indicated teachers found the use of electronic resources and templates made the planning process more efficient.

After the first initial time-consuming effort of setting up templates, I now find planning and creating set tasks not so time consuming. (2007 comment)

Laptops have allowed teachers to keep all lesson materials in one place that is both portable and easily accessible, which may also contribute to their widespread use for planning tasks.

It's just so much easier to have it on your lap in front of TV and you haven't got fifty bits of paper – you used to sit there and be swamped, the whole sitting room – no-one was allowed to touch your pieces of paper or they would get all mucked up. Now it's all on there [the laptop] and you just push a button and it all comes up. (2007 rural focus group comment)

Focus group teachers commented on how they believed their teaching materials were more likely to be linked to curriculum documents and on the professional look of the resources they were now preparing for the students.

It is planning for me way more thorough; just jump onto the curriculum documents the objectives and things like that. Even I used to hand make all my displays and I still do that but other times I make signs and posters on the laptop which is far quicker and looks more professional than hand drawn ones. I can access the printer. (2007 rural focus group comment)

Summary comment

There was increased use of laptops for lesson planning and preparation, with over four-fifths of teachers making some use of the laptop for listed tasks by 2007. Indications are that the teachers experience efficiencies in lesson planning and preparation with the laptop through greater access to lesson materials. On the one hand, teachers reported they were utilising the affordance of the laptop to customise and adapt lesson materials for their students in a manner consistent with the expectations for the TELA scheme. On the other hand, they reported increased use of templates suggesting some standardisation across schools. The design of the study is such that it is not possible to explore the tension between these two practices but this aspect is worthy of further investigation.

4.6 Changes in classroom practice

One of the Ministry of Education's expected outcomes of the laptop scheme was that teachers would creatively introduce a range of learning resources in the classroom using a variety of appropriate technologies and pedagogies. In 2005, the questionnaire asked teachers about three areas of classroom use: teacher access to the Internet during lessons, presentations in class and using curriculum-specific software in class. In 2006, the question on classroom use of laptops was split into use as a stand-alone tool and use with a data projector or interactive whiteboard. The categories of use for questionnaire participants to respond to were derived from focus group and questionnaire comments. Teachers were also asked to provide an example of how they used their laptops in class and to describe what they saw as the benefits for student learning of their laptop use. This section sets out teacher self-report data on the ways they used their laptop for teaching, along with their perceptions of the benefits of their laptop use for student learning.

Changes in laptop as a stand-alone tool in the classroom

The 2006 and 2007 questionnaires data indicates that teacher use of the laptop as a stand-alone tool in the classroom increased over these two years (see Table 8).

Table 8: Use of laptop as a stand-alone tool in the classroom (2005-2007)

Use for classroom practice as a stand-alone tool	Level of laptop use					
	Routine use %			Occasional use %		
	2005	2006	2007	2005	2006	2007
View work produced by students or teacher	-	32	37	-	43	46
Teacher access to Internet during lessons	10	22	32	52	45	45
Provide extra assistance to individual students	-	17	27	-	45	51
Manipulate images	-	22	26	-	45	45
Use curriculum-specific software in class	12	17	19	54	45	53
Facilitate group work and collaboration	-	-	19	-	-	46
Engage students with interactives	-	12	16	-	48	49
Use as a source of text for reading	-	17	14	-	39	46

The data indicate an emphasis on the provision of student-centred materials. In 2007, a majority of teachers reported they made some use (either 'routine' or 'occasional') of the laptop as a stand-alone tool in the classroom to view work produced by students or the teacher (83%) and to provide extra assistance to individual students (78%). Around three-fifths of teachers used the laptop as a source of text for reading (60%) and to support small group work and collaboration (65%). Combined, this suggests that the teachers' TELA laptop was integrated into individual and group work in the classroom. However, three-quarters of teachers used their laptop to access the Internet during lessons (77%) and to manipulate images (71%) suggesting they also used it as an individual professional tool during lessons.

These data are consistent with teacher reports of student use of teacher laptops during lessons. Over the three-year period, the proportion of teachers responding to the questionnaire who had been allowing students to use their laptops rose from two-fifths to just under two-thirds (2005–43%: 2006–58%: 2007–62%), with just under a fifth (18%) in 2007, allowing 'routine' student use. A declining proportion 'never' allowed students access to their laptop. (2005–57%: 2006–43%: 2007–39%).

The Years 4 to 6 teachers responding to the questionnaire saw benefits coming from student use of their laptops. Focus group teachers felt that the computers in their classrooms did not meet the needs of their students. Even in schools with Computers on Wheels (COWs), these laptops for the students needed to be booked ahead so did not allow for spontaneous use in the classroom. Teachers said that this was when they allowed students to use their laptop. One focus group teacher described the enthusiasm with which students made use of her laptop.

As soon as I walk into the classroom I get 'Whaea can we use your laptop? Come on hook it up, please, please.' They know how to do everything! (2007 rural focus group comment)

Changes in the use of the laptop-plus-peripherals in the classroom

In 2005, fewer than a fifth (16%) of teachers made routine use of the laptop-plus-data-projector during lessons. By 2006, the focus group data were rich enough to justify extending the questionnaire categories for the classroom use of the laptop plus peripherals. The 2006 and 2007 figures in Table 9 show the extent of teacher use.

Table 9: Use of laptop-plus-data-projector/interactive whiteboard (2005-2007)

Use for classroom practice with a data projector or interactive whiteboard	Level of laptop use					
	Routine use			Occasional use		
	%			%		
	2005 (n=200)	2006 (n=279)	2007 (n=265)	2005 (n=200)	2006 (n=279)	2007 (n=265)
Present visual material	-	33	32	-	57	46
Build Internet into lesson	-	27	28	-	47	41
Introduce a topic	-	26	26	-	54	49
Present student work	-	27	26	-	62	56
Illustrate way of performing an activity	-	16	23	-	55	40
Organise and sequence instruction	-	26	21	-	64	43
Show CD ROMs/DVDs	-	20	19	-	61	59
Allow interaction	-	-	18	-	-	30
Do a classroom presentation	16	-	-	46	-	-

Overall in 2007, two-thirds of teachers were making some use of the laptop-plus-data-projector for most listed applications with over a quarter making ‘routine’ use and nearly half making ‘occasional’ use of the laptop-plus-data-projector for most applications. This level of reported use can be contrasted with teacher reports of easy access to a data projector. This increased over the three-year period from 55% of teachers reporting easy use in 2005, to 69% reporting easy use in 2006 and 74% in 2007. It can be seen that perception of easy access did not translate to routine use although the proportion of teachers reporting easy access and some use (routine and occasional) use of the laptop-plus-data projector was similar. This said, some teachers asserted the laptop and a data projector were essential teaching tools.

Every day I hook up the laptop to the data projector and use it for shared reading, topic, maths, teaching ICTs like Paint, PowerPoint, and Outlook, publishing on class Blog, Pod casting, watching class videos...I can't teach without my laptop and data projector. (2006 comment)

The few teachers (14% of questionnaire respondents) who had the exclusive use of an interactive whiteboard in their classroom indicated this had led to their laptop becoming an essential teaching tool.

It is an essential teaching tool as it is hooked up to the interactive whiteboard. (2007 comment)

This point was also made by one of the two focus group teachers who had an interactive whiteboard in her classroom.

My laptop is open all the time. I use it for teaching. My handwriting is on it as well. We do charts. The active whiteboard would be the only reason it is open all the time. I did not use it all the time before I got an interactive whiteboard. (2007 rural focus group comment)

An urban teacher who had exclusive access to an interactive whiteboard was very enthusiastic about its use for classroom practice.

The use of the laptop within different curriculum areas

In 2006 and 2007, Years 4 to 6 teachers gave examples of their uses of the laptop in all curriculum areas and within integrated units, special topics, and in ICT teaching (see examples in each curriculum area in Appendix B). These uses are summarised in Table 10 although we can draw no definitive conclusions from the numbers shown.

Table 10: Examples of laptop use within curriculum areas (2006-2007)

Examples of laptop use in Y4-6 (questionnaire)	2006 (count)	2007 (count)
Language (English)	70	92
Mathematics	14	47
Science	22	36
Social studies	27	25
The arts	16	15
Health & physical education	5	2
Technology	4	2
Integrated units	14	20
ICT	-	17
Special topic	-	10

Teachers' examples of how they use their laptop were further analysed in relation to the principles of Quality teaching as set out by Alton-Lee (2003). Teacher description of their laptop use in the different curriculum areas indicated the scope of reported classroom uses fits into and aligns with current policies on effective teaching (Alton-Lee, 2003; Ministry of Education, 2006b) and effective teaching using ICT as outlined in the e-Learning action plan for schools (Ministry of Education, 2006a). Examples of laptop use for the different curriculum areas included setting up expectations for learning, making learning outcomes transparent to students (Alton-Lee, 2003) and encouraging reflective thought and action amongst their students (Ministry of Education, 2006b). Teachers were using the laptop to access information that students could use to evaluate their work in a shared learning situation (Ministry of Education, 2006b). Teachers were providing structured assistance to students by using their laptop to model or scaffold new work (Alton-Lee, 2003).

Showing how to make a graph using Excel on data projector and then children having a go. (2007 comment - mathematics)

The children see me model a journal entry on home page of class Blog site and then use the laptop pod to go and add an article on their individual Blog for personal experience writing. (2007 comment - English)

Students had been tasked to design a solar cooker based on discrete knowledge. At task end we could compare, contrast and discuss our models with some online examples as a whole class (in conjunction with data projector). (2007 comment)

By 2007, almost all teachers taught in schools where there was Internet access and Internet access in the classroom was available to 92% of Years 4 to 6 teachers by 2007. In 2007 teachers provided examples of how they used the Internet to expand the learning environment, for instance, by allowing students to go on virtual field trips various curriculum areas, to bring real-world examples into the classroom, and to communicate with students in another country.

It enables me to offer opportunities to view sites, places and things that the children don't have ready access to. (2007 comment)

We had a student go to Germany and we kept in contact via email with her. She knew exactly what was happening in our classroom and she couldn't escape school! I was sending her homework to her. I planned a worksheet that was adaptable to wherever she was going. She put together two books and presented them when she got back. (2007 rural focus group comment)

Using the laptop to access Internet images from another time and place allowed students to explore new learning environments, overcoming the barriers of distance and time.

As part of the motivation to begin making Amazonian Indian masks, we viewed a PowerPoint presentation, which included photographs and pictures of Amazonian Indians. We viewed each one and discussed the features. It is [the laptop] a great tool to encourage discussion. (2007 comment)

In the focus groups, one teacher spoke of children looking up information on a planned class trip destination and how they could recognise some of the plants and animals before they even left the school. Another teacher used an Internet-based simulation of tide pools as part of a Rocky Shore study in science. The portability of the laptop meant that teachers could take it with them on class trips and excursions and make use of it as a learning tool.

We are going to do a survey on cars, so we will make the spreadsheet up before we go and use it outside and feed the data straight into it, rather than use pen and paper and have double handling. (2007 rural focus group comment)

As a result of the teachers' use of the laptop with curriculum specific software and other resources, students were encountering learning in a variety of ways and through different tasks (Ministry of Education, 2006b). 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 (Alton-Lee, 2003). Laptop teachers had found different ways of presenting information to different students, for example, animations and dynamic images, and of stimulating student interest, for example, by providing real-world examples. In this way, the laptop brought immediacy, authenticity and ownership to learning tasks. There were examples of the use of images as non-linguistic representations to assist children with their learning in English, science, social studies and the arts.

Showing examples of an artist's work, finding out about his life and the impact it had on his art. (2007 comment – the arts)

Visualisations/Audios to draw language, prior knowledge and vocabulary from my students. (2007 comment)

We had read the book 'Holes' and written a book review as well as various other tasks. We then watched the DVD and completed a 'compare and contrast' between the book and movie. (2007 comment)

Children recorded a legend into GarageBand, then added music behind the voice track. (2007 comment – English)

Teachers using laptops could make use of personal material to create ownership for learners and provide feedback on individual learning. Laptops allowed teachers to incorporate images, names and events that the whole class could share. This had a motivational aspect in that it 'hooked in' students. Customised materials and opportunities for students to engage with interactive resources were also described as valuable.

It saves me a lot of preparation time and allows for me to be creative and create work that is specific to the student's needs. (2007 comment)

Special needs children will use my laptop to work through CD ROMs and other software to engage their learning. (2007 comment)

One focus group teacher said she had 20 out of 21 non-readers at the beginning of the year – struggling learners who found it difficult to listen. She had found the interactive parts of websites fascinated them and kept them focused.

The laptop provided a forum for feedback and discussion between teacher and students as both a stand-alone tool and in conjunction with a data projector. One focus group teacher described how she had videoed her students and used this to show them how their swimming stroke needed improvement. She said that the result was ‘amazing’ because they could see their bodies and said, “Oh, that’s what you mean!”

In some classrooms the more flexible learning environment has allowed teachers to become more a facilitator of learning.

With the increased use of ICT in the classroom you notice what some kids can actually do. They are often more clued up than I am, and they teach you. The roles have changed a bit. (2007 rural focus group comment)

By using digital technologies and the Internet students were able to produce resources themselves.

The kids are different. Their attitudes to learning have changed, because I've got that [active] board in my classroom. They want to know: 'Whaea can we use the board to do this please?' They are really excited about getting on to do PowerPoint presentations, Photostory presentations, drawing pictures, typing, even typing stories. It's not just a glorified publisher any more. We do a lot of research and it's really good 'cause we've got computers as well, if somebody's struggling on something and we're all at the same thing, they'll watch what's happening on the active whiteboard and go 'Oh, OK' or they'll look for their website and go 'Cool, they've got my website' and they'll look it up. It's just changed the whole culture of my class and the way I teach. (2007 rural focus group comment)

To sum up, the examples provided by the teachers indicate they are making use of their TELA laptops in a wide variety of ways. Teacher provision of individual assistance, access to texts for individual reading and the use of interactives to engage students suggests teachers were able use the laptop to realise a student-active classroom with students managing their own learning. Teachers reported students were more motivated and engaged when they used multimodal resources and students could actively participate in managing their own learning, particularly when there was an interactive component. It is not possible however to make any claims about the extent of the changes in teachers, on the basis of the instances of use reported by respondents; this would require sustained classroom-based investigation. Nevertheless, the teacher self-report data indicates they are using their TELA laptops for teaching and learning in ways that align recommendations of best practice.

Teacher perceptions of the benefits of their laptop use for their students

In 2007, there were 109 questionnaire respondents who when asked commented specifically about the impact of their use of the laptop on children's learning. Thirty-one of these responses indicated that laptops had impacted student learning in two or more different ways. As other research into teacher laptop provision has highlighted (Phillips, Bailey, Fisher & Harrison, 1999; Simpson & Payne, 2005; Sockwell & Zhang, 2003), the major benefits to students appeared to be indirect, with eighty-five teachers commenting on how the laptop had had an impact on them as teachers, and subsequently on the students. They reported that the laptop had made planning easier, produced better quality resources

and freed up time for them to spend with students. Eleven teachers said that because their own IT skills had improved, the students had benefited.

The laptop has made a huge difference to my children's learning as I am much more computer literate and able to produce a much more interesting programme and resources because of its use. (2007 comment)

Thirty-five of the 109 teacher comments related how their use of a laptop had increased motivation and student engagement in the learning.

Definitely makes interest levels rise and very good at provoking discussion in small and large groups. (2007 comment)

It has been a motivating presentation and teaching tool that helps children pick up skills that they can apply on the classroom computers. (2007 comment)

Twenty-seven comments indicated that the teacher's use of the laptop had increased students' IT skills. Many of these teachers explained that this was because children saw their teacher modelling laptop use and setting expectations.

They are confident to try things I have. After seeing how I navigate around use toolbars they pick up how to do it very quickly. (2007 comment)

The children see me making full use of my laptop and have an understanding that ICT is fully integrated into our programme of learning. (2007 comment)

Twenty-five comments indicated that the laptop extended students' knowledge through access to up-to-date resource material. These teachers had found that the laptop provided instant access to a wide range of reference material that gave children a greater exposure to the world. A couple of teachers commented on how the laptop provided opportunities for extension purposes.

Added to students' enthusiasm of a topic, greater access to information and learning tools. (2007 comment)

Nineteen teachers described how their use of the laptop had presented students with another way to learn. They had found that the laptop encouraged students to learn from others and share knowledge.

Being able to share, learn from others, another learning style prompts more discussion and makes for more collaborative learning. (2007 comment)

Children really enjoy the different way we can view information and interact with it – it hooks them in and generates a lot of sharing, making connections and communication. It is more in touch with them and their lives. (2007 comment)

Ten responses were specifically about how the teacher's use of 'visuals' with the laptop had been useful in engaging their students.

Made it more motivating. Children can view visuals better. Better visuals for conveying concepts and information. (2007 comment)

Six comments mentioned how the laptop helped the teacher to work with individual students.

Part of the way I use my laptop is to organise Support Learning programmes for children – cross curriculum – both to extend and to up skill ESOL (English for Speakers of Other Languages) and other individuals – so of course that is definitely supporting children's learning!! (2007 comment)

Forty-two of the 109 teacher comments provided a variety of ‘other’ responses based on use of their laptop in the classroom. Some found the laptop useful as an extra computer in the classroom for students to use (eight comments) and as another teaching tool (four comments). One teacher indicated that their students felt valued because of the sharing power of the laptop and data projector.

My students see how their prior and learnt knowledge is valued because when work is presented on the laptop for whole-class viewing, they feel valued, I normally ask for permission to use work..... (2007 comment)

This teacher summed up the general feeling of the responses to this question:

I couldn't imagine not using it as much as I do. It would be a return to the Stone Age!! (2007 comment)

Before teachers had TELA laptops, students would report on their work and discussion would ensue. But focus group teachers talked about how students had recently begun to initiate their own learning as a result of the way teachers were now facilitating classroom discussion, and perhaps as a result of teacher modelling, that began with laptop use.

We are always using the board and I just sit back and they show what they have been doing that day with flipcharts – that is not a direct result of laptops but the laptop may have been the kick-start that we needed. As we began to use them [laptops] and found we didn't have the tools. Then the data projector came in because you wanted to show the children something you had found. Then you heard about the Smartboard and now it is interactive learning. This morning we were doing friendly shapes and they said, ‘What's the name of a rugby ball?’ And I said I had no idea and suggested that they Google it. So they jumped on and there was huge discussion and I wasn't even involved in it. They typed up something and one of them said, ‘No, you haven't used the right key word!’ and I wasn't even there. (2007 urban focus group comment)

4.7 Benefits of the TELA scheme

In 2007 questionnaire respondents were asked summarise what for them had been the most exciting or innovative outcome of having a laptop. The aim was to triangulate the open responses against the fixed response data. Table 11 summarises the 254 responses.

Table 11: Most exciting or innovative outcome of laptop ownership

Most exciting/innovative outcome of having a TELA laptop (n=254)	Percent	Example of comment
Motivating teaching tool	23	Using it with a data projector to teach helps keep my students motivated and gets my message across quickly. More interactive learning opportunities for my digital native students. Being able to deliver content in a way that grabs their attention more than on a whiteboard. As a motivational tool for children who are not focused on learning.
Flexibility of workplace/portable	23	FREEDOM of working at home in a warm, comfortable environment after school, in weekends and holidays. Being able to create my own work from home. I have a young family and it has been great to be able to work from home. Being so organised! Also, by not having to stay at school and work on the computer has made me less tired!
Stimulus to use ICT	17	Trying new programs like Movie Maker, Photo Story, Front Page and others. It has given me confidence to have a go. It's not really the laptop – it's the ICT PD related to cluster work, however, we wouldn't be able to implement or access any of that without laptops.
Access to resources/information	14	Being able to provide more interesting units, as a result of having access to the Internet. Instant researching on Internet as a question arises, with monitor.
Sole repository/saves time/provides for efficiencies	12	I love the ease of keeping planning, templates, assessments, etc. filed, because I know that if I lose the hardcopy, I have access to it on my laptop – it is easier to keep myself organised.
Exclusive access to a computer	4	Independence, not needing to wait for computer to be free in teacher prep room. Access at any time. I live in a very computer-savvy family and I had to fight for access at home. Now I can work when I choose, which gives me time to surf for learning resources, etc.
To use to create resources	4	Saves a lot of preparation time. You can create your own resources specific to your class in a professional way.
Tool that supports communication and collaboration	3	Creating weblogs to showcase children's work and collaborate with other classes, e.g. for writing poetry. To communicate with classes in other countries via email.

Almost a quarter (23%) of the comments referred to the excitement of using the laptop as a motivational tool to capture and engage student interest. For Years 4 to 6 teachers (23%) there was also the flexibility of time and place of work that the laptop allowed because it was a 'portable' computer and could be used at school and at home. Almost a fifth (17%) reported that the laptop had helped them to gain ICT confidence and skills, which they had been able to pass on to the children in their class. A similar proportion (14%) reported they appreciated their greater access to resources and

information. Just over a tenth (12%) commented that with the laptop as a sole repository for all their work, teachers felt they were more organised and more professional.

Focus group teachers were also asked to describe the main benefit they had derived from access to a TELA laptop. From their comments it was obvious that the TELA scheme is just one of many initiatives that teachers are involved in. Some teacher comments indicated the laptop assisted them in applying newly learnt concepts from other projects that they were working on, such as the Literacy and Numeracy contracts. For others the laptop, in association with their involvement in an ICT PD cluster, had initiated a shift to a more inquiry learning-based model of teaching⁵. The following comment exemplifies the nature of the linkages that were described.

Once again, I still think the laptop was a kick-off and [alongside] the pilot scheme with the ICT clusters. It's been a pedagogical change in our own thinking. I know that when I first started teaching and then when I came back, my entire teaching has changed completely. But that's been a number of things – it's been to do with the NumPA⁶ project and the way we are doing guided reading and task boards, and us empowering the children and moving away from that traditional model to the connectivist way of teaching and that all-encompassing... like we do here (in the focus group meeting) – we are all having a time to speak and we are all listening to each other and we are actively engaged with one another. That's where the pedagogy of teaching, especially in the primary school, has moved to – the inquiry learning as well. (2007 urban focus group comment)

4.8 Summary of impacts

Overall, the teacher commentary in the evaluation indicates that teachers have gained confidence and expertise in the use of computers/ICT. They are using their TELA laptops for the tasks those who designed the TELA scheme had hoped they would – administration, communication and collaboration, for lesson planning and preparation and, to a lesser extent, for teaching and learning. They had experienced efficiencies owing to the portability of the laptop, having all their resources in one place, being able to easily access and adapt resources and because the laptops afforded communication and collaboration. Teachers were becoming more effective and efficient by using customised tools to aid their lesson planning and preparation, and administrative tasks. TELA laptops have helped teachers to begin to integrate ICT effectively into their teaching practice.

Teachers generally agreed that a major impact of their use of the laptops on student learning was increased pupil motivation and engagement. At the Years 4 to 6 level it was also evident that in classrooms where teachers were using laptops and peripherals effectively, teachers were able to provide structured assistance to students by using their laptop to model or scaffold new work, and this had resulted in students having increased confidence in using ICTs in their learning. The examples show how the laptop had afforded students access to a wide range of reference material that gave them a greater exposure to the world outside the classroom. Teachers using laptops were increasingly creating a supportive learning environment for their students, encouraging reflective thought and action, enhancing the relevance of new learning, facilitating shared learning and providing multiple opportunities to learn, as the new curriculum (Ministry of Education, 2007) requires.

⁵ 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.

⁶ The Numeracy Project Assessment (NumPA) is an integral part of the new teaching approach. Through their professional development teachers learn to use the assessment as part of their regular classroom teaching. The NumPA results are entered on a national website database and record students' progress. Schools can access the national data to establish targets for planning and reporting purposes.

5. The system of support for teacher laptop use

The contextual factors that shape and frame the opportunities and incentives teachers have to make successful use of their laptops relate to the nature of school leadership and organisational support for ICT use, professional learning opportunities and support for peer mentoring, access to the school technological infrastructure, and national policy supporting the use of ICT in schools. Teachers were asked to comment on each of these and also to rate their importance as an influence on their use of their laptop.

5.1 The nature of support for teacher use of laptops

Within the school environment, the evaluation examined teacher perceptions of the nature and influence of school leadership support, teacher professional development opportunities and school technological infrastructure on teacher use of laptops.

5.1.1 School leadership support

'School leadership' includes the principal, the deputy or assistant principal(s), syndicate leaders and senior teachers, and the ICT lead teacher. Table 12 details the extent to which different school leaders were found to be very supportive in helping teachers to use their laptops effectively as a teaching tool.

Table 12: Very supportive leaders in schools (2005-2007)

Leadership support	2005 (n=200) %	2006 (n=279) %	2007 (n=353) %
Principal	37	32	36
Deputy principal	25	21	31
Syndicate leader/senior teacher	-	22	26
ICT lead teacher	52	60	60

Across the three years, around one-third of teachers reportedly found the principal supportive. An increased proportion of teachers found other school leaders to be 'very supportive' in 2007: three-fifths of teachers found the ICT lead teacher to be very supportive and a quarter of teachers considered the syndicate leader or senior teacher to be very supportive.

School leaders have a role in setting expectations for teacher laptop use. Expectations signal what uses of the laptop are of value in the particular school. Just under three-quarters of teachers (73%) reported that there were expectations for their use of the laptops. In many cases, teachers cited several expectations: administrative tasks were predominant, with use for planning and lesson preparation, communication, use in the classroom and security measures also being listed as school expectations. These expectations are consistent with the high levels of routine use of the laptops for a variety of administrative tasks, lesson planning and preparation, and communication, as reported in Section 4. Teachers were expected to and do make use of their laptop for these tasks.

Table 13 looks at perceptions of school leader support where there was a perceived expectation for laptop use and where there was no expectation for laptop use.

Table 13: Leadership and expectation for laptop use (2007)

2007	Principal very supportive %	Deputy principal very supportive %	Syndicate leader/senior teacher very supportive %	ICT lead teacher very supportive %
Expectation for laptop use (n=258)	38	36	29	64
No expectation for laptop use (n=50)	32	12	10	42
Unaware of expectation for laptop use (n=41)	27	15	22	54

There was evidence that teachers who reported their school had expectations for their laptop use found school leaders to be more supportive and that they used their laptops more frequently and for longer periods. Laptop access to the school network from classrooms was equally available to teachers in schools whether there was an acknowledged expectation for laptop use or not. However, Years 4 to 6 teachers in schools where there was an expectation for laptop use were more likely to have received formal professional development in the use of the laptop. Overall, this data indicates a link between expectations, leadership, teacher laptop use and professional development, which is supported by focus group commentary.

One rural focus group school principal was well aware of potential influence on teacher use of the laptops. He considered his staff needed to see him modelling the use of a laptop and also to see the benefits other teachers were gaining from the use of laptops. His goal was to develop shared expectations and ‘buy into’ laptop use. A focus group teacher from a decile 10 urban school where there was roll growth and new classrooms being built, reported the principal and board of trustees were very supportive of ICT, to the extent that it was announced that ‘our new currency is in interactive whiteboards’.

The principal had told the staff that it would be ‘a horrendous two years, but bear with us and you’ll reap the rewards’. That’s what is happening now – the data projector that has just gone into the hall is a direct result of the BOT managing their funds well. (2007 urban focus group comment)

In contrast, two rural focus group teachers said there were no expectations in their school for laptop use. They felt this was a negative thing.

A focus group teacher from a rural school had a story that illustrated the interplay of some of the issues involved in leadership: the need for the person who was leading ICT use to have ongoing access to professional learning themselves and the importance of the principal’s vision for, and understanding of, ICT use.

There has been no ICT growth; a lot of our staff do not take their laptops out of the cupboard. I have been able to help people but it does not work without support from the top. Before I went away and did my ICT professional development, I was in charge of ICT, and the Year 8 teacher used to come and take my class in the afternoons and I taught ICT and loved it. But there was nothing coming from the school so I went out and did my own professional development and then when I came back I found that the school organisation had changed and the principal was in charge of ICT. I can see the opportunities but the school has not gone forward because he hasn’t had the broader picture – he is an admin person and his laptop is absolutely wonderful. But he is not a teacher and has no experience with inquiry learning. When we started three years ago I felt quite confident that our school was going places and it just hasn’t gone any further. Part of it is probably my choice – I thought that I would be leading ICT when I came back, but when I wasn’t I didn’t make a fuss. (2007 rural focus group teacher)

A focus group teacher from an urban school who had been in charge of ICT during the first two years of the study had a similar story. A new principal had been appointed and had taken over ICT in what was seen to be a non-supportive way. The laptops were seen as important in maintaining some teacher focus on ICT.

The principal has been there for 18 months. We were quite a progressive IT school. Three years ago I was released for one day a week with people in the class, training staff. When that stopped...they still come to me but the effectiveness of the programme in the computer suite has been dropping and the principal said, 'That's not really important' so the effectiveness dropped even further and then there were people saying 'it's not being used'. So, the computers will go into classrooms but they are all about 3-4 years old. We are losing our suite – that's going to become a resource room, it will be a classroom first till a new classroom is built. It is not going to be replaced at this stage – there is some talk about 2009, 2010, having laptops on a trolley or something like that. So, it's the laptop that is keeping us in the game as far as IT goes. (2007 urban focus group comment)

5.1.2 Professional development/peer mentoring and support

Teachers described both formal professional development and support mentoring from peers.

Formal professional development

Nearly three-quarters of Years 4 to 6 teachers (243–70%) had received formal laptop-based professional development in 2007 (2005–42%: 2006–71%). Of these teachers, 142 had received this through being part of an ICT PD cluster group. Teachers were asked to indicate what the focus of any laptop-based professional development (PD) they had undertaken was and Table 14 shows the proportion of teachers in each ability group who had undertaken the different programmes.

Table 14: Formal laptop-based professional development undertaken (2007)

Laptop-based professional development - 2007	Total (n=353) %	Expert (n=111) %	Intermediate (n=216) %	Beginners (n=26) %
Support/ideas for classroom use	50	57	50	23
How to use the school network	42	41	44	31
Specifics of software program	41	47	38	42
Use for administration	37	40	38	27
Developing resources	37	42	35	23
Beginning computer skills	30	23	34	27

Expert users were taking advantage of professional development opportunities particularly in laptop use in the classroom including ideas for classroom use, the specifics of software programs, and resource development. Half of the intermediate users had also received professional development in the use of the laptop in the classroom as well as the use of the school network. There were few Years 4 to 6 teachers who considered themselves to be beginners, but rather than beginning computer skills, most had learnt about the specifics of software programs and how to use the school network. Overall, the data indicate a different professional development focus for teachers at different levels of self-assessed expertise.

2007 data show that the use of the laptop as a tool for teaching had begun to be more of a focus for professional development than it had been in the previous years, as can be seen in Table 15.

Table 15: Laptop-based professional development (2005-2007)

	2005 (n=200) %	2006 (n=279) %	2007 (n=353) %
Support/ideas for classroom use	22	42	50
How to use the school network	26	35	42
Specifics of software program	13	39	41
Use for administration	21	32	37
Developing resources	9	21	37
Beginning computer skills	17	27	30

Teachers across the questionnaires and the focus groups were looking for information and ideas about how they might exploit the affordances of the laptop and ICT in teaching and learning. They were looking to colleagues, or better still to models of effective practice for teaching and learning using ICT. There was a growing participation and presumably provision of professional development opportunities in the use of the laptop for teaching – for support or ideas for classroom use, use of specific software programs, and developing resources. Professional development on using the school network, the use of laptops for administration, and beginning computer skills had also increased, although had not doubled as was in the case of use for teaching.

Questionnaire respondents in 2007 described what they had found useful about any laptop-based professional development they had received. There were 194 comments about the usefulness of professional development. Many of these (75) outlined the skills that had been learnt and the increased confidence (10) that resulted. In relation to what was useful, professional development that was specific to ideas for teaching was found to be useful by 32 teachers.

Exploring new ways to enhance learning for children with the use of ICT in ways I had never thought about. (2007 comment)

Twenty-four teachers noted professional development ‘relevant to my own needs’ was useful, and 18 had found that other teachers sharing their knowledge had been useful, within and between schools.

It was contextual and based around what I needed at the time. It was at my own learning pace and catered for my learning style. (2007 comment)

Teachers (13) commented on the influence of the leader of the course, and 12 found it useful to have time away from the classroom with their laptop, to apply the knowledge learnt immediately.

Ten teachers specifically mentioned the value of the ICT PD contract. They appreciated the support of the facilitator, liked the hands-on practical ideas and had used the laptop to collaborate with teachers from other schools, and some continued to do this with teachers in their syndicate.

Probably cluster group meetings [ICT PD] are the most beneficial as you get to see what other schools are up to and share ideas. (2007 comment)

One of these teachers felt that the ICT contract had ‘raised the profile of ICT in schools and the amount of support provided’ thereby indicating the importance of school-wide support and culture for laptop/ICT use.

Peer mentoring and support

In response to the question on who had been very supportive in helping to use the laptop effectively as a teaching tool, 68% of questionnaire respondents said that other teachers in the school were very supportive. Sharing ideas played a role in this.

A lot of communication within syndicate over planning and we often make adjustments to our planning. Great to put something on the server and another teacher can have a look at it and make changes. (2007 comment)

Having a laptop has ensured that meetings are recorded and sent on to each other. Planning can be done with another teacher and saved. Time is cut down, duplication minimised. (2007 comment)

It was suggested in one focus group that sharing of resources and knowledge was perhaps dependent on the school culture, as in some schools certain areas of the school collaborated while others did not. Those who had been in an ICT PD cluster group had used the laptop extensively to collaborate with teachers from other schools, and some continued to do this with teachers in their syndicate.

The ideas that we shared as a cluster provided motivation and resources to use in everyday classroom situations. Hands-on practical ideas helped a lot. Becoming more aware of programs out there. (2007 comment)

Taken together, teacher commentary indicate incentives and opportunities to learn more about how to use their laptop/ ICT were linked with the culture for ICT use and the nature and extent of collaboration amongst the group of which a teacher was a member.

5.1.3 School ICT technological infrastructure

The questionnaire and the focus groups provided teachers with an opportunity to comment on the nature of school technological or ICT infrastructure and the implications of this for what teachers could and could not do with their laptops.

Teachers appreciated the increased access to the school network and Internet from most areas of schools over the three-year period – there had been a steady increase in the proportion of teachers who had laptop access to the school network in their classroom (2005–71%: 2006–89%: 2007–93%). Likewise, there was an increase in the availability of laptop access to the Internet in classrooms (2005–73%: 2006–87%: 2007–92%). This increased availability was reflected in the increased teacher access to the Internet during lessons (Table 8). When asked in 2007, between 28% and 42% of teachers reported wireless capable areas in their schools.

To maximise the efficiency of their use of laptops as a teaching tool, teachers need easy access to additional equipment. There was an increase in easy access to additional equipment available to teachers over the three-year period, with teachers reporting easy access to digital cameras (up from 88% to 92%), printers (up from 81% to 89%) and data projectors (up from 54% to 74%). Teachers indicated they were making use of this equipment for lesson preparation (Section 4.5).

There was an increase in the proportion of teachers reporting technical support over the three-year period. The support of colleagues remained the most frequent response (2005–79%; 2006–79%; 2007–82%). There had been a substantial increase in the proportion of teachers reporting the support of an ICT lead teacher or computer committee (2005–40%: 2006–74%: 2007–75%), a full-time or part-time technician (2005–31%: 2006–28%: 2007–55%). Help from an outside expert remained relatively constant with just under half of the teachers reporting this availability.

The school's ICT technological infrastructure, especially the easy classroom access to the school network, the Internet and to other equipment, in particular a data projector, was considered to be the main influence on the use of the laptops in the classroom by urban focus group teachers. It was clear that those who had access to the cabling, the school network and additional equipment were making the most use of their laptops for classroom use. Rural focus group teachers expressed concern about future funding for ICT equipment as their major source of funding [Telecom] had recently announced that it would no longer be directing funds to schools through the national Telecom Points system.

You have to be enterprising but it will be a 'major' once Telecom Points stop. We have got a digital camera, data projector, CD player, portable sound system with a cordless mike and a memo since 2002 through Telecom Points. We have been earning about 600 points a month. (2007 rural focus group comment)

Focus group teachers reported that setting up a school network and testing could be very frustrating. There were teething problems with student management systems being experienced by many teachers. In one rural school, there was an ICT specialist who was in charge of an ICT suite where there were six PCs and a laptop for the use of four classrooms with 89 children. She explained her role:

We have just got SchoolZone and SmartNet where teachers put their work up. If they come across any problems, they see me. I do the backup tapes morning and night. It's a bit of a learning curve for the children to log in to the computer than log on to the Internet but they've got it all sussed now. (2007 rural focus group comment)

5.2 Important influences on teacher laptop use

Research on the nature of, and support for, systemic sustainable innovation with ICT is converging with research on policy implementation and studies of school change and improvement to highlight the complex interplay of personal and contextual factors. The 2006 and 2007 questionnaires listed a number of personal and contextual factors that teachers had identified as influences on their use of laptops in the classroom. Teachers were asked to note the importance of each factor to their own use of the laptop in the classroom at the time of responding. They were then asked to identify the factor they found most important. The goal here was to develop an understanding of how the factors operated as a system of influences.

5.2.1 Very important influences on teachers' laptop use

Table 16 shows the proportion of teachers who regarded each of the listed factors as 'very important'.

Table 16: Very important influences on teachers' laptop use in the classroom (2006-2007)

Very important influences on teachers' laptop use in the classroom	2006	2007
	(n=279) %	(n=353) %
School networking	76	77
Confidence/understanding	-	72
Prompt technical assistance	72	68
Time to experiment	67	66
Leadership support	56	55
Easy access to equipment	46	53
PD/support	47	47
Collaborative culture	49	46

Teachers were asked to rate each factor independently and so were able to select more than one factor as being 'very important'. 'School networking and school connections' was considered to be very important by over three-quarters of teachers. 'Confidence and understanding of how to use the laptop for teaching', was also considered to be very important by just under three-quarters of teachers in 2007.

'Prompt technical assistance' and 'time to experiment with laptop capabilities and practice with use for teaching' were both very important for just over two-thirds of teachers.

'Leadership support from principal, syndicate leader or ICT lead teacher' and 'easy access to a data projector and other equipment, such as a digital camera' were very important for just over half of the teachers. 'Professional development and support for using the laptop in the classroom' and 'sharing with colleagues in school or syndicate' were considered to be very important by just under half of teachers.

Although it was not identified in the above list and so was not a direct focus for data collection there was some indication that other government policies and initiatives shaped and framed teacher laptops. Teachers having a laptop for their individual professional use could also be seen to shape teacher and school engagement with other government initiatives. For instance, the ICT PD school cluster programme was rated highly by many teachers who appreciated the support of their facilitator and the opportunity to visit and learn from teachers at other schools. The laptop coupled with the ICT PD cluster work was said by three teachers to have 'kick-started' a pedagogical shift towards inquiry-oriented teaching. There was also some comment that the laptop had supported teacher participation in the numeracy and literacy projects in that it facilitated teachers recording, analysing and sharing data on student learning. This is an aspect worthy of further exploration.

5.2.2 The most important influence on teacher laptop use

When teachers were then asked to indicate the 'most important' influence from this system of eight factors nearly a quarter (2006–23%: 2007–22%) chose 'confidence and understanding of how to use the laptop for teaching' as being the most important factor, followed by 'time to experiment with laptop capabilities and practice with use of the laptop for teaching' (2006–18%: 2007–17%); this was followed by 'school networking and school connections' (2006–16%: 2007–15%). Then came 'easy access to a data projector and other equipment' (2006–14%: 2007–14%), and 'professional development/support for using the laptop in the classroom' (2006–13%: 2007–13%). Taking 'school networking', 'easy access to equipment' and 'prompt technical assistance' over a third (37%) of respondents rated school technological infrastructure as the most important influence on their laptop use. When 'time' and 'professional development/support' are combined 30% of teachers can be seen to give priority to their learning more about how to use their laptop. If those rating 'confidence and understanding' are added to this group then over half of the 2007 respondents selected factors associated with personal knowledge and expertise and the extension of this as the most important influence on their laptop use in the classroom.

Teachers in the focus groups considered easy access to reliable technology to be the most important influence on their use of the laptop for classroom use, followed by professional development and confidence. Leadership was considered by focus group teachers to be the most important influence on their school's use of laptops, then reliable technology and professional development.

5.2.3 The most important influence and teacher expertise

The relative importance of these factors was different for users with different levels of self reported confidence and ability. Table 17 shows how teachers at each level of ability selected the most important factor.

Table 17: Most important influences on teachers' use of laptops in the classroom (2007)

	Total (n=353) %	Expert (n=111) %	Intermediate (n=216) %	Beginner (n=26) %
Confidence/understanding	22	12	27	23
Time to experiment	17	19	16	19
School networking	15	20	13	12
Easy access to equipment	14	23	10	4
PD/support	13	5	15	27
Prompt technical assistance	8	12	6	4
Collaborative culture	4	5	4	4
Leadership support	4	3	5	0
No response	3	2	3	8

Looking across this system of factors in 2007, those who rated themselves as expert users identified 'easy access to equipment' (23%–14% overall) as the most important influence in a greater proportion than the norm and either beginners or intermediate users. Just over a half of expert users identified technological infrastructure issues (school networking, access to equipment and technical support) as the most important influence on their laptop use.

Teachers who rated themselves as intermediate-level users identified 'confidence and understanding' (27%–22% overall) as the most important influence in a greater proportion than the norm and either expert users or beginners. Nearly three-fifths of intermediate users identified personal growth needs (confidence and understanding, time to experiment, and professional development) as being most important, suggesting that they were aware of their own knowledge and expertise as a limit on their laptop use.

Those who rated themselves as beginners identified 'professional development/support' (27%–13% overall) as the most important influence in a greater proportion than the norm and either expert users or intermediate users. Over two thirds of beginners identified professional learning needs (professional development, confidence and understanding, and time to experiment) as the most important influence on their laptop use.

5.3 A system of influences on teacher laptop use

Taken together, this data suggests that laptop teachers bring their own experiences, abilities and knowledge to laptop ownership and contextual factors such as leadership, opportunities for professional learning, school technological infrastructure along with the affordances of the laptop itself enable and constrain teacher use. When leadership in the school values ICT use, and supports and encourages a collaborative culture within a school where teachers feel able and are supported by an expectation, to share with others they benefit from wider opportunities to learn new ways of doing things. The hardware and software, including the school network and Internet access are readily available to the teacher, they are also supported by reliable technical help, and the school electronic administration practices are in place. This is the system that supports teachers to use their laptops both in and out of the classroom. It is these factors, as a system, that support and sustain and/or inhibit teacher use of laptops and ICTs. Individually, and as a system, they are manifest as enablers and constraints in different ways in different school settings and in different forms at different stages in

teacher and school integration of the use of laptops and ICTs. With this support, the teacher uses the laptop and gains confidence and ICT skills, and is thereby able to increase the use of the laptop for tasks that are part of the professional life of a teacher.

The finding indicates that this system of factors has nurtured teacher confidence, supported the move to electronic forms of administration, enabled efficient and flexible communication and facilitated customised lesson planning and preparation. Teachers are now focused on maximising the use of the laptop in the classroom. Focus group teachers reiterated this goal of learning more about laptop use for teaching. Their discussion revolved around the support, particularly in professional learning opportunities that they needed to achieve it.

6. Where to next: future realities

The area of immediate concern identified in this evaluation is the need for professional learning opportunities with a focus on the pedagogies that would enable the best use of laptops and ICT at the Years 4 to 6 level.

Each year, teachers were asked to identify the ‘main’ area that they wanted to develop for their use of the laptop in their teaching role. In 2005 and 2006 teachers selected from a list of seven goals. The main, and growing, area for development in both years was to learn about ICT as a tool in teaching and learning (2005–48%: 2006–45%). Learning to use the laptop and creating resources were the next most prevalent goals chosen by fewer than 15% of teachers in both years. In 2007, the seven goals were reduced to four, so for the purposes of comparison, figures from previous years have been combined under these four categories – numbers of teachers responding each year are indicated in brackets (see Table 18).

Table 18: Teachers’ goals for using their laptops in their teaching role (2007)

	2005 (n=175) %	2006 (n=260) %	2006 (n=353) %
Learn more about the potential of ICT to support teaching and learning	48	45	59
Learn to use/improve ICT skills	15	14	17
Learn how to create/develop teaching and learning resources	14	14	12
Learn about accessing teaching, learning and assessment resources	-	-	11

Over three years, ‘learning about the potential of ICT to support teaching and learning’ rose from 48% to 59% as teachers’ main goal for future development. In 2007, this goal was particularly important for expert users (70%) and intermediate users (58%), just 27% of beginners had this goal. They continued to be more interested in improving skills (58%), however, the proportion of questionnaire respondents focusing on skill-related tasks remained at around a fifth. The proportion focusing specifically on ‘learning to create and develop resources’ remained at less than 15%, and ‘learning about accessing resources’ rose from less than 10% to just over 10% by 2007.

The goals in the focus groups were also mainly related to use in the classroom as a tool for teaching and learning but also focused on the support needed to achieve this main goal, including time for self-directed professional development, release time for helping reluctant laptop users and improved technological infrastructure. In 2007, the main goal for focus group teachers was to have enough computers or laptops for their children to use and to be able to integrate the laptop into the whole-class programme by having a data projector installed in their classrooms.

To have ICT integrated throughout every learning area in my own classroom and enough computers to have at least half a group on computers in every subject and rotate them through. (2007 focus group comment)

I would like to see at least one computer, laptop, notebook, whatever, between two children in a classroom. Either an interactive whiteboard, a data projector, easy access to the Internet, a wireless system perhaps in classrooms, so that children can find out what they need to know when they need to know it. (2007 focus group comment)

There was also a call for more professional development in such things as animation and Podcasting.

To be more confident with my own knowledge. I am not too sure how to obtain that knowledge. Knowing what's there and what I can use in the classroom. I'd like to explore Skype to have chats with other people to bring the distances down. Podcasting. (2007 focus group comment)

Teachers in urban focus groups who had been in the ICT PD contract said they would like to continue to visit other teachers, as when they had been to see other teachers at work it inspired them.

Teachers in this evaluation considered the laptop to be a valuable tool in the teaching and learning process and were able to describe a number of activities that fit in with the quality teaching principles, some of which would be very difficult to operationalise without a laptop, for example, the use of images at the most appropriate time and in the most appropriate place. Teacher descriptions of their ICT use, however, did not show that teachers had embraced new pedagogical practices although some teachers indicated their role in the classroom might be changing. It appears that most of the teachers in this study were using ICT to enhance and extend existing pedagogical practice. The reasons for predominance of more traditional approaches may lie in the limited professional learning opportunities as well as in the few models of innovative pedagogies, the organisational set up in schools, and leadership issues. It is for this reason that we now make recommendations for improvements in the system that supports teachers in their use of laptops for teaching and learning.

7. Recommendations

From the findings of this report we have identified implications or options that may have the effect of maximising the TELA scheme and building capacity for laptop teachers' integration of ICT into their professional lives, for three levels of the New Zealand education system: national educational policymakers, schools leaders and teachers.

7.1 National policy

The findings of this study lend support to the contention that any analysis of the impact of ICT cannot afford to decontextualise it from the wider context of schools, and that a systems analysis is required (Selwyn, 2002). The evaluation indicated that teacher professional learning opportunities and technological infrastructure shape and frame teachers' opportunities for laptop use. Each of these aspects is important at any time but they are important in different ways for different schools, teachers and tasks suggesting a nested systems approach is required to encourage and sustain the integration of the laptops into teachers' work.

Support for teacher development and the use of laptops for teaching and learning

The e-Learning strategy states that teachers "must be supported in developing and enhancing their own ICT knowledge and skills, through professional learning and consistent ongoing support across the education sector" (Ministry of Education, 2006a). The Years 4 to 6 teachers in this study wanted to learn more about the use of ICT in teaching and learning. They said they needed more time to experiment and to learn to use new technologies for teaching and learning.

We recommend that:

- A programme be established for the dissemination of innovative and effective quality ICT teaching and learning ideas and practices.
- Teachers be provided with time and opportunities to access and pursue professional development, particularly in relation to teaching and learning.

Support for school technological infrastructure development

'School networking and school connections' were considered to be 'very important' influences on how teachers used their laptops in their teaching role, by over three-quarters of Years 4 to 6 teachers and the 'most important' influence by around a sixth of teachers (2006–16%: 2007–15%). In 2007, just 55% of teachers reported that their school had a full-time or part-time technician, with over four-fifths of teachers relying on colleagues for technical support.

We recommend that:

- Schools be supported to upgrade their technological infrastructure.
- Consideration be given to supporting schools to find ways of funding onsite school technical positions.

Alignment with other policy initiatives

There was some indication that TELA laptops supported teacher engagement with other policy initiatives and, conversely that the other initiatives fostered teacher laptop use. The alignment between and cumulative, or not, impact of different policies is worthy of further investigation, particularly in relation to the sustainability of any change in practice.

We recommend that:

- Research into the combined impacts of different policies on laptop use.

7.2 Schools

School leaders would be advised to adopt a systems approach to the integration of laptops that includes attention to teacher professional development opportunities, technical infrastructure support and leadership in the use of laptops/ICT in the school. Indications were that these aspects were important to all teachers, with different aspects having more or less importance depending on self-reported ability with laptop use.

Professional learning opportunities

The evaluation study has shown that there is potential for TELA laptops to expand possibilities for learning and to influence teaching practices. ‘Confidence and understanding of how to use the laptop for teaching’, was considered to be ‘very important’ by just under three-quarters of teachers in 2007. When teachers were then asked to indicate the ‘most important’ influence from a list of eight factors, nearly a quarter (2006–23%: 2007–22%) chose ‘confidence and understanding of how to use the laptop for teaching’ as being the most important factor, a sixth chose ‘time to experiment with laptop capabilities and practice with use of the laptop for teaching’ (2006–18%: 2007–17%).

It was evident from the findings that by 2007 laptops had begun to influence teaching practices indirectly, and teachers’ images of their own work had begun to evolve to take technology into account. This does not mean that it is enough for a teacher to have exclusive use of a laptop for pedagogical change to occur. It is of concern that any use of technology may serve only to fit into current practices. A focus for development could be the understanding and development of new kinds of relationships between learning and teaching and the technology, teachers, students and the curriculum.

We recommend that:

- Schools make provision for time and professional learning opportunities and consideration be given to how best to utilise peer mentoring which provides for professional learning that is relevant and timely.
- The provision of carefully managed professional development opportunities for all teachers with laptops should be coordinated by someone in the school who has the role of ICT professional development facilitator, and who is supported to help teachers to work in sustained ways with colleagues.
- Boards of trustees or school management teams provide opportunities for school or syndicate leaders to learn more about how to provide professional development for staff with laptops.
- The focus for future professional development be how teachers might use the laptop for teaching and learning, and use of the laptop with other equipment, with a focus on pedagogy.

Development of school technological infrastructure

We recommend that:

- Schools’ technological infrastructure improvement programmes be seen as ongoing as teachers are keen to take advantage of the connectivity offered by Internet connection in the classroom.

- Schools ensure that there is adequate technical support available for teachers using their laptops.

School leadership

We recommend that:

- Where practical and possible, school leaders model use of the laptop/ICT for administrative and management tasks and communication.
- School leaders give consideration to setting realistic and achievable expectations for teachers' laptop use.
- School leaders take up opportunities to learn more about the possibilities of ICT use.

7.3 Teachers

The findings indicate that access to a laptop for their exclusive use resulted in Years 4 to 6 teachers gaining more confidence and capability in the use of ICTs. By 2007, they were making use of the laptops for communication with colleagues, a range of administrative tasks including reporting to parents, and the development of lesson materials, and in the classroom with individuals, groups and the whole class.

Professional development: developing and supporting a community of learners

There needs to be a collaborative culture for teachers to share effective strategies and techniques for integrating laptops into the classroom. Teacher commentary in this study attests to the efficacy of professional development, albeit not formal professional development provided by external experts but rather peer mentoring. Teacher development was heavily influenced by internal factors in a school, such as help from colleagues. Easy access to models for teaching students using ICT would seem to be essential. Given the evolutionary nature of ICT and its possible uses, it seems likely that opportunities to share will continue to be important. Increasingly, it would seem that all teachers have an obligation to use ICT, so that their students are not disadvantaged in comparison with those of teachers who are exploring its use in teaching and learning. It is also becoming increasingly imperative to communicate and be collaborative via electronic means. It is therefore essential that all teachers have the skills needed for word processing, accessing and searching the Internet and sending emails.

We recommend that:

- Teachers take advantage of what opportunities they have to access professional development on the potential of ICT.
- Peers are the most accessible source of professional development. Teachers would be advised to seek out help from and share ideas with colleagues, particularly those in the same syndicate.
- Teachers who are proficient laptop users, pool and share their expertise.

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Appendix A: Evaluation timetable

01 December 2004 – 30 April 2005

Planning meeting with Ministry of Education

Design and carry out initial focus groups (2) (phase 1)

01 May 2005 – 30 November 2005

Develop and administer baseline questionnaire (phase 1)

Analyse questionnaire responses

Meet with Ministry of Education (October)

30 November – Research Report One – results focus groups (1), questionnaire (1)

01 December 2005 – 30 April 2006

Undertake focus groups (2) (phase 2)

Develop second questionnaire

Meet with Ministry of Education (April)

07 May 2006 – 30 November 2006

Administer second questionnaire (phase 2)

Analyse questionnaire responses

Meet with Ministry of Education (July)

30 November 2006 – Research Report Two – results focus groups (2), questionnaire (2)

01 December 2006 – 28 February 2007

Undertake focus groups (phase 3)

Develop third questionnaire (phase 3)

01 March 2007 – 30 June 2007

Undertake final focus groups (2) (phase 3)

Administer third questionnaire (phase 3)

Analyse questionnaire responses

30 June 2007 – Progress Report Y1-6

01 July 2007 – 15 December 2007

Prepare final report for Y4-6 inclusive of all surveys and focus groups

15 December – Final Report Y4-6

Evaluation reports

Cowie, B., Jones, A., Harlow, A., McGee, C., Miller, T., Cooper, B., and Forret, M. (2005). *Digital Horizons: Laptops for teachers evaluation. Year 4-6. Research Report One*. November 2005. Hamilton: University of Waikato.

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Appendix B: Examples of laptop use in curriculum areas (2007)

In both 2006 and 2007, Years 4 to 6 teachers indicated that they used their laptops in a range of curriculum areas, including English, social studies, science, mathematics, the arts, technology and health and physical education. There were also examples of laptop use within integrated units, special topics and in ICT teaching. The trends across the two-year period were similar and for this reason only the 2007 examples are described here. Of the 229 teachers who gave examples in 2007, 37 indicated that they had used their laptop for more than one purpose, so for the purposes of this discussion we are looking at 266 examples of laptop use. The descriptions have been investigated in terms of recent research into effective teaching (Alton-Lee, 2003; Ministry of Education 2006a, 2006b).

English

There were ninety-two instances of teachers using their laptop in an English lesson. Using the categories as found in the New Zealand Curriculum (Ministry of Education, 2007), there were examples relating to speaking, writing and presenting (57) and to listening, reading and viewing (31). In addition, there were four examples of 'other' usage of the laptop in an English session, such the use of digital learning objects and using the laptop with a data projector to display a sequence of learning steps. Teachers were providing structured assistance to students by using their laptop to model or scaffold new work, especially in written work (Alton-Lee, 2003).

The children see me model a journal entry on the home page of class blog site and then use the laptop pod to go and add an article on their individual blog for personal experience writing. (2007 comment)

We used the site 'Instant Poetry' with the interactive whiteboard to model how to use the site. A teacher model of a complete online poem was used. Children created a poem online, copied and pasted it to a word document and then added clip art. (2007 comment)

Students were able to use a range of tools with the teacher's laptop such as digital cameras and recorders with specialised software and the Internet that allowed them to take their learning in English further (Ministry of Education, 2006b).

Children recorded a legend into GarageBand, then added music behind the voice track. (2007 comment)

Creating books in iPhoto to retell legends and practise camera shots. (2007 comment)

Doing an argumentative writing session, the children were able to view speeches from Martin Luther King before writing – this gave them motivation for learning. We then recorded their voices onto the laptop, so they could hear how effective they were. (2007 comment)

As a result of the teacher's use of the laptop with curriculum-specific software, students were encountering learning in a variety of ways and through different tasks (Ministry of Education, 2006b).

Reading using Inspiration template to complete a reading response. (2007 comment)

Using software for reading – highlighting language features and editing text. (2007 comment)

There were examples of the use of images as non-linguistic representations to assist children with their learning in English, often used to stimulate oral or written language (Alton-Lee, 2003).

Scanned sophisticated picture book and projected on to screen so everyone could see – large class. (2007 comment)

Visualisations and audios to draw language, prior knowledge and vocabulary from my students. Draw awe and wonderment if any from my students. Children to share in discussions – the first thing that comes to their mind. (2007 comment)

Teachers also used their laptops for preparation and planning resources for their students (Ministry of Education, 2006a).

I have created worksheets based on 'Holes' by Louis Sachar. I also used the Internet to look for online resources so that the children could then access these resources on other computers. (2007 comment)

Mathematics

There were forty-seven teacher responses that cited use of their laptops in a mathematics session. Over half of these were providing students with the opportunities to reinforce their learning by completing tasks that were often interactive (Ministry of Education, 2006b).

Used the sorted.org website to teach giving change (money) and then the children had a game to reinforce the skill learnt. (2007 comment)

The laptop has been used for interactive use with a maths group on an Internet site to reinforce student learning. (2007 comment)

There were examples of teachers using their laptops to demonstrate (model) mathematical examples (Alton-Lee, 2003).

Showing how to make a graph using excel on data projector and then children having a go. (2007 comment)

Some responses indicated the laptop as being useful in providing a tool for giving new depth to student learning experiences (Ministry of Education, 2006b).

Taking photos of certain geometrical shapes around the school in its natural environment: the plants, playground. (2007 comment)

Science

There were 36 comments made by teachers about their use of their laptop in a science lesson. Teachers had used their laptop to model scientific processes to their students. This type of teaching helps scaffold the student towards new learning (Alton-Lee, 2003).

Accessed interactive website to demonstrate to children the parts of a plant and their jobs. (2007 comment)

Model how to label a diagram. Students drag and drop labels and label diagrams. (2007 comment)

I have often used downloaded science videos and Java applets (program written in the Java programming language that can be included in an HTML page) to model concepts in lessons. (2007 comment)

Teachers used the laptop to provide non-linguistic aspects in their science lessons (Alton-Lee, 2003).

Set up website with a tectonic plate sequence for students to view in small groups during related paper jigsaw activity. (2007 comment)

Used with data projector to illustrate life cycles, food chains, etc. (2007 comment)

Teachers commented that they had used their laptop to provide students with a range of tools to help their students save time and give depth to their learning (Ministry of Education, 2006b). The Internet was found to be very helpful for providing this depth of learning, and enabled teachers to take students on ‘virtual field trips’ to look at subjects such as tsunamis, volcanoes and ‘The Rocky Shore’.

Use of a learning cave – show internet-based tide pools for Rocky Shore study. (2007 comment)

View websites on volcanoes to explore the effects an exploding volcano could have. (2007 comment)

Social Studies

There were twenty-five examples of use of the laptop during a social studies lesson. Teachers can optimise learning opportunities for diverse students by complementing language use with multiple opportunities for students to have access to, generate and use non-linguistic representations such as diagrams, movies and photos (Alton-Lee, 2003). There were examples of this use in social studies lessons.

Showing a movie that was made by children that is related to a topic area. (2007 comment)

Used digital photos as a motivator for social studies topic and writing prompts. (2007 comment)

Teachers used their laptops to access images from another time and place, allowing their students to explore new learning environments, overcoming barriers of distance and time (Ministry of Education, 2006b).

Showing children website with stories of refugees’ lives. Children viewing maps and listening to stories from website (used with projector). (2007 comment)

To show children actual scenes of Gallipoli during an ANZAC study. (2007 comment)

Several teachers used their laptops to access information via the Internet during a lesson to help them and their students save time and to give depth to student learning (Ministry of Education, 2006a, 2006b).

We were able to use the Internet to seek information on Anzac day activities, play the Last Post, etc. (2007 comment)

Teachers gave examples of how they had used their laptops to foster students’ abilities to organise their ideas about a topic by modelling the research process, thereby engaging students constructively in goal-oriented learning (Alton-Lee, 2003).

As a tool for recording student brainstorming during a topic discussion. (2007 comment)

Modelling research and created a digital learning experience on the rainforest topic – hyperlinked it to great videos and images on the web – shared it with the children. (2007 comment)

The Arts

Fifteen teachers indicated that they used their laptop in the arts area. Half of these involved the use of non-linguistic representations (Alton-Lee, 2003). Teachers used the Internet to bring images from other places into the classroom and to stimulate children with these examples from another time or place (Ministry of Education, 2006b).

Showing examples of an artist's work, finding out about his life and the impact it had on his art. (2007 comment)

I have made a PowerPoint presentation using photographs of the koru symbol to kick-start my art programme. (2007 comment)

As part of the motivation to begin making Amazonian Indian masks we viewed a PowerPoint presentation which included photographs of Amazonian Indians. We viewed each one and discussed the features. It is a great tool to encourage discussion. (2007 comment)

Teachers indicated the use of modelling (scaffolding) to help students learn arts concepts (Alton-Lee, 2003).

I used the laptop with the data projector to demonstrate to the whole class how to use Photostory and how we as a class could produce our own. (2007 comment)

Technology

Two teachers commented on how they used their laptop in technology lessons. One example involved the teacher using the laptop to provide modelling (scaffolding) of a new technology concept. (Alton-Lee, 2003).

Showed DVD of a Claymation movie, discussed how it was made, how could we do it, looked at movie-maker, music programme to make own background music, speech, etc. Children then created scenes, used digital camera to photograph them and made movie. (2007 comment)

Health and Physical Education

Two teachers reported the use of their laptop in a health and physical education lesson. One of these teachers used a PowerPoint presentation to introduce a new topic and the other used the laptop to encourage reflective thought and action amongst their students (Ministry of Education, 2006b).

The students watch a video of a physical education lesson and make reflections on their learning. (2007 comment)

Integrated Units

There were twenty comments relating to teachers using their laptops in what they called an integrated unit. These units seemed to encompass several areas of the curriculum and elements of inquiry learning were sometimes referred to. Several teachers used their laptops to model ways of doing things (Alton-Lee, 2003).

Teaching skills of inquiry learning – finding and highlighting key words, note-taking skills and accessing information on the Internet. (2007 comment)

One teacher used the laptop to set up expectations for learning, making learning outcomes transparent to students (Alton-Lee, 2003).

Aims and objectives displayed, then areas to be accessed on the Internet and shown on projector – always in front of children and they can ask how you got to here or how you get to there. (2007 comment)

In the same way a teacher who used an interactive whiteboard found it helped in organisation of the classroom for learning.

I have an interactive whiteboard, so we use it all the time for classroom organisation (tumbles), brainstorming and to present work. (2007 comment)

The role of effective feedback can be one of the strongest influences on student learning (Alton-Lee, 2003), and teachers were using the laptop to access information that students could use to evaluate their work in a shared learning situation (MOE, 2006b).

Students had been tasked to design a solar cooker based on discrete knowledge. At task end we could compare, contrast and discuss our models with some online examples as a whole class (in conjunction with data projector). (2007 comment)

Building animations in PowerPoint to reinforce the concept of movement. Both in demonstrating the idea then sharing and evaluating student work. (2007 comment)

ICT

Seventeen teachers gave examples of how they used their laptops in ICT lessons. Most of these specifically related to modelling (scaffolding) new learning for students (Alton-Lee, 2003).

I was able to run whole class and small group teaching sessions focusing on website design as needed while others worked in pairs on other computers. (2007 comment)

When teaching a new skill on computer such as photography and the manipulation of the image I can work with individuals and walk them through the process. They can then show me the process and then they can go and work independently on one of the classroom computers. (2007 comment)

Special topic

Ten teachers gave examples of laptop use within a 'special topic' that they had taught. These focused on whole-class teaching, where the laptop was used to introduce the topic, conduct a brainstorm using software such as Kidspiration, use images to help explain a concept, or share completed work.