Laptops for Teachers:
An evaluation of the TELA scheme in Auckland schools

Report to the Ministry of Education

Assoc. Prof. Judy Parr and Dr. Lorrae Ward

Research reports are available on the Ministry of Education's website Education Counts: www.educationcounts.govt.nz/publications.

Opinions expressed in this report are those of the authors and do not necessarily coincide with those of the Ministry of Education

Our Ref: 11115.00

LAPTOPS FOR TEACHERS EVALUATION

Final Milestone Report

AUCKLAND UNISERVICES LIMITED

a wholly-owned company of

THE UNIVERSITY OF AUCKLAND

Prepared for:

The Ministry of Education
St Paul's Square
45-47 Pipitea St
Thorndon
Wellington

Prepared by:

A/Prof Judy Parr
Faculty of Education
The University of Auckland

Dr. Lorrae Ward
CYPERUS

Date: 2010

Executive summary

The purpose of this report is twofold. Firstly, it provides a summary of data reported earlier in this longitudinal evaluation of the TELA (Teacher laptops) initiative in primary schools within the Greater Auckland area. These data have already been reported to the Ministry of Education in three interim reports and, as such, they are not reported in full again in this final report. Secondly, it describes and considers new data gathered in 2008 at the conclusion of the evaluation. Shifts in practice and use between 2005 and 2008 are considered where appropriate.

The results of the evaluation demonstrate clearly the value of such a programme for participating teachers. The high levels of functionality and the portability of the laptops were key factors in their use. The teachers in receipt of them reported increased levels of confidence and skill in using an increasing range of functions on their laptop computer. The laptops became, for many teachers, an extension of their professional being; if they were temporarily unavailable, the teachers felt bereft!

The case study work, in particular, showed how the laptop was central, became a hub, in terms of teaching and learning in the classroom. While the initiative aims were to provide an efficient professional management tool and to increase confidence and competence so that technology was more widely used in teaching and learning, the centrality of the laptop in actual classroom practices was a somewhat unexpected, but very positive, outcome.

The first chapter of this report briefly introduces the TELA initiative and places it within the policy context in which it was implemented. It also introduces the evaluation. In chapter two the methodologies used across this evaluation are described in depth. Findings from the evaluation are reported over six chapters as outlined below.

In the first of these, chapter three, findings from a baseline survey completed early in 2005 are summarised. These findings concerned the reported beliefs, practices and computer usage of the participant teachers PRIOR to the TELA initiative being introduced. They showed, amongst other things, that most teachers were reasonably confident in their ability to use computers for a range of professional purposes. They reported, on average, having a fair range of skills and a good level of skill across that range. They believed that the laptops were a valuable tool for teachers and that all teachers should have access to one. They also believed that doing so would impact on most areas of their professional lives. They did not see the laptops having as great an impact on classroom practices or student academic outcomes as they did in other areas, such as preparation and planning.

Chapter four summarises data gathered during the latter part of 2005. These data provided an understanding of the early impact of the initiative and considered the extent to which policy goals were being met in these early stages. At this stage of the initiative the laptops had become the most commonly used type of computer, as reported by these participants, in all areas except pedagogical use (use in the classroom with students). However, teachers did report that the laptops facilitated the use of other computers. There was also reported a marked increase in pedagogical use of computers overall, suggesting the introduction of the laptops was having an effect on student learning experiences. The most commonly reported use of the laptops was for the planning and preparation of lessons. This was also, reportedly, one of the areas of high impact. Overall, teachers reported gains in both their level and range of skills. They also reported gains in their levels of confidence in using computers over the previous six months, the time most had had their laptops for.

Focus group data gathered during 2006 are discussed in chapter five. Two sets of focus groups were undertaken. The first considered participant usage of laptops during the year and the second the perceived barriers to laptops use. In nearly all instances, teachers reported an increased dependency on their laptops in all areas of their professional lives. They valued their portability and the flexibility to work 'anywhere, anytime'. For many, the key barriers to use seem to

have been related to a cost-benefit analysis. For low users at two schools it seems the effort to learn how to use and integrate their laptops was too great for the perceived benefits. Being an expert teacher seems to have had a negative impact on laptop use as such teachers already had extensive resources and knowledge to draw upon. At one school there were no identified barriers, although all teachers interviewed spoke of their desire for more sophisticated technology in the school. The existing technology no longer seemed to be sufficient to meet their needs.

Data gathered in 2008, including case study visits to schools, are then considered in chapters six and seven. The purpose of these chapters is to paint a picture of the impact of the TELA initiative four years into its implementation. Some comparisons with the picture drawn through the 2005 data are also made in chapter six. The survey data gathered in 2008 showed that the laptops had become an important tool in terms of classroom use. Nearly a third (29%) of the surveyed teachers reported their laptops were essential tools in their classroom practices. For most, their use of laptops had changed significantly from what it had been three years earlier. There was, however, considerable variation in the levels of computer use for all computer types across all areas of use. Professional development remained the least commonly reported use, with the exception of personal use. There were, again, increases in both the level and range of skills reported, although the latter was not significant. It seems that in 2008 teachers were deepening their skills in fewer areas.

The case studies confirmed the centrality of the laptops in teachers' professional practices. In the three schools visited the use of technology was linked to a clearly articulated vision and perceived student need. Laptops were a key feature of this integration. In all schools common features included this clearly articulated vision, strong leadership and teacher champions as well as a professional learning culture.

The final findings chapter (chapter eight) discusses responses to both the 2005 survey and the 2008 survey. Only data gathered from those participants who completed both surveys are used in this discussion. Across the group, as in the preceding chapters, it was found that laptop use had increased significantly. This group of teachers had remained on a learning curve in 2008, building further on their increases in skill and confidence, as reported in the 2005 survey data.

Finally, in chapter nine, the findings from the previous chapters are drawn together. This chapter considers the overall impact of the laptops on teacher practice, the conditions required for the successful integration of the laptops into classroom teaching and learning and their future potential as a tool.

Table of contents

List of tables

List of figures

1. Introduction to TELA, the policy context and the evaluation

In this first chapter of the report we briefly describe the TELA scheme before considering the strategic and operational policy contexts within which the scheme was both developed and implemented. This policy environment has shifted considerably since the scheme was first introduced. Where appropriate, references to relevant literature have been included. We also briefly outline our approach to the evaluation.

The TELA scheme

The Laptops for Teachers (TELA) initiative began with the provision of laptops to Secondary School teachers in 2002 (STELA).The scheme was then extended to teachers of Years seven and eight in the 2003/2004 Budget and Years four to six in 2004/2005.Years one to three teachers became eligible as of the 1st of July, 2005.Therefore, all permanent full-time and part-time teachers (at least 50% full-time equivalent (FTE)) in state and integrated schools became eligible for a laptop under the TELA scheme.

The TELA scheme was implemented in recognition of "the value of the laptop as a teaching tool" (Ministry of Education, 2005a, p.4). The objective of the scheme was:

> *to encourage teachers to develop greater confidence and competence in the use of information and communication technologies (ICT), so that they increase their use of ICT for teaching and learning, class management and administration.*

A key objective for the Ministry, therefore, was the increased confidence and competence of classroom teachers in the use of ICT in all aspects of their professional lives. The implication here, and the view taken in this evaluation, is that one aspect of successful impact of the laptops could be to increase the use of other digital technologies,[1] such as desktop computers and peripherals (smart-boards, cameras, iPODS etc).

More specifically, the goals of the scheme, as outlined in the Request for Proposal for case study research, were, firstly, to enable teachers to:

1. develop new ICT skills

2. access online professional development and support

3. create and access quality curriculum and assessment resources.

The subset of goals was to provide schools with:

1. an additional resource to support their ICT development programme

2. an opportunity to motivate teachers who have yet to engage with ICT

3. a tool for professional development initiatives.

---

[1] The term digital technologies is increasingly being used to represent the full range of technologies available to schools rather than the more restricted Information and Communication Technologies (ICT). It is this more recent term that will be used throughout this report unless within a specific quotation.

The strategic policy context

The broader strategic policy context within which the TELA scheme sits is a constantly evolving one, which has had, at best, mixed success in terms of its implementation. The TELA scheme was launched under the umbrella digital policy of the time: *Digital Horizons – Learning through ICT.* (Ministry of Education, 2002).This strategic policy focused on the challenge of integrating ICT more fully into the curriculum. It superseded the 1998 strategic policy, *Interactive Education: An Information and Communication Technologies Strategy* (Ministry of Education, 1998), which had focused on building infrastructure and school capability. Arguably, if one considers the implementation of both, the aims of the earlier strategy have been achieved (for evidence of levels of infrastructure and professional development see Johnson, Kazakov & Svehla, 2005; Sullivan & Anso, 2000).

Whether either has been truly effective in terms of impacting on the classroom experiences of students and the learning that occurs, the desired outcomes of the second strategy, remains a moot point at best. A number of international, and New Zealand, studies suggest that the integration of ICT into classrooms, into pedagogical practices, has not yet been achieved to any real extent (Becker, 2001; Cox et al 2003a, 2003b; Hayes 2007; Lai et al 2001; Ward & Parr, 2010).A comment by Shakeshaft (1999, p.4), although made some time ago, would still seem to be relevant in many schools: "just because ICT is present does not mean that students are using it". The reality is that in many instances digital technologies still seem to have barely begun to "dent the daily routines of classrooms" (Loveless, 1996, p. 448).

More recently, an e-Learning action plan entitled *Enabling the 21st Century Learner* (Ministry of Education, 2006) was developed. This action plan shifted the focus of ICT integration further towards notions of 21st century learning and a learner-centred education system. In this action plan e-learning is defined as "learning and teaching that is facilitated by or supported through the smart use of information and communication technologies" (p.2).Very clear statements are made linking e-learning with educational reform.

These three strategic policy documents have all informed a number of initiatives that have been introduced by the Ministry over the past decade including the TELA scheme. These are briefly described in the following section.

Operational policy

In 2005 the Ministry of Education distributed a booklet outlining all initiatives designed to facilitate 21st century learning in early childhood education centres, schools and tertiary institutions (Ministry of Education, 2005b). These initiatives were grouped into three categories: confidence and capability, content and connectivity. Within the first category, confidence and capability, were 17 initiatives, the majority of which were professional learning websites related to a range of topics and content areas. Only two initiatives were primarily focused on raising capability in the area of digital technologies.

The second category, content, again contained primarily professional resources stored in an electronic medium. The TELA scheme lies within the third category, connectivity, which contained ten initiatives.

The purpose of these initiatives is to provide teachers with the necessary resources to change the experiences of their students should they wish to do so. They do not directly promote educational reform nor do they make explicit how to implement 21st century learning – or even what that really looks like. A leap of faith is required, whereby teachers are able and willing to implement the vision that underpins these initiatives. One of the key foci, in the latter part of this evaluation, was to consider the extent to which this vision had been implemented and under what constraints.

It is within this policy environment that the evaluation of the TELA initiative, described in this report, was largely undertaken. Indeed, as the subsequent methodological chapter explains, the nature of the evaluation shifted in 2007 to reflect this changing policy context.

It is important to note here that this evaluation occurred within primary schools. Other evaluations, such as those of the ICTPD contracts (Information and Communication Technologies Professional Development) suggest primary schools are more receptive than secondary to the pedagogical innovation possible through the integration of digital technologies into the classroom (Ham, 2008). It is also important to note that what is deemed an innovative use of digital technologies in one setting may not be so in another (Grünbaum, Pederson & Nielsen, 2004).

The evaluation[2]

This evaluation was part of a wider programme of evaluation/research undertaken on the provision of laptops to teachers. Waikato University and the New Zealand Council for Educational Research (NZCER) have undertaken longitudinal research into the experiences of both secondary and primary school teachers with regard to their laptops. Their work has included baseline and annual surveys, focus groups of teachers and case studies of use. In addition, Otago University has completed case study research.

The purpose of the evaluation, or discrete case study research, undertaken in the study described in this report was to look more closely at teachers' actual practice and the interplay of teachers' laptop use with other school factors.

The Ministry in tendering this work wanted to know how the provision of laptops for teachers impacted on teachers' professional practices and student learning. At the time of the tender process, three key themes had emerged from the TELA initiative relating to an overall objective of strong teaching practices and enhanced student learning. These were:

- professional growth and collaboration opportunities

- access to, and creation of, quality ICT-based teaching, learning and assessment resources

- effective lesson planning, preparation and administration.

This material was the starting point for the design of the case-study research/evaluation discussed in this report. As is explained subsequently in the methodology, the nature of the study changed over time.

---

[2]   This material was taken directly from the RFP documentation (p.2).

2. Methodology

This evaluation utilised a range of data collection tools, including surveys, teacher logs, focus groups, interviews and classroom observations. It was undertaken over a four-year period, with the baseline data collection occurring early in 2005 and the final round in November 2008.

The evaluation consisted of two parts. The first was a longitudinal study, which aimed to focus on teacher use of their laptops over time. The surveys and teacher logs were the key sources of data for this part of the study.

In the second part, data were gathered through individual and group interviews and classroom observations. There was a different focus for each year of the study. Initially, the focus involved inquiry into values and beliefs and current use of technology. Then, in 2006 the focus was on barriers to use. Finally, in response to the data gathered in 2006 the foci for both 2007 and 2008 were changed to better reflect the situation found in the participant schools and to minimise the difficulties experienced in retaining school participation, particularly in relation to surveys. The focus became the place of laptops in the wider learning environment, and indepth studies of selected schools were undertaken. This shift in focus also enabled a consideration of the impact of the TELA project within the changing policy context as elaborated previously.

Participant schools

Participant schools were purposively selected from the Greater Auckland area with the intention of providing a cross-section of schools in terms of decile, size and type (contributing, full primary and intermediate). A list of 20 schools was compiled from information regarding the number of teachers who had initially taken up the Ministry offer for laptops at schools in the wider Auckland region.

The criteria for this shortlist were more than 10 teachers with laptops at the school and that the school was within relatively easy access for the evaluation team. A range from intermediate, contributing and full primaries was selected. An attempt was also made to select both urban and rural schools.

These schools were initially contacted by letter and phone. Participant information sheets and consent forms were supplied for the board of trustees at a school level and for individual participant teachers. Thirteen of these schools agreed to participate.

Baseline data were received from the 13 participating schools, through the initial survey. It was the intention of the evaluation team to continue to gather longitudinal survey data from these 13 schools in each year of the study. However, as is discussed subsequently, the reluctance of teachers to continue to participate, at the regular intervals intended, meant this did not occur. Rather, participation in some cases was sporadic, and no survey data were gathered in 2007.

In addition, in 2005, six case-study schools were selected to participate in focus group interviews and to complete the teacher logs. These were determined based on responses to the surveys, where teachers had been asked to indicate their willingness to be part of the case studies. Again, an effort was made to ensure a representative spread of schools.

In 2007, a different group of three schools was selected as case-study schools. Two of these three schools were selected based on earlier findings, which had indicated that ICT was being used extensively in teaching and learning. They were part of the initial six case-study schools. The third was selected based on its decile and its status as an ICTPD lead school, also suggesting the likelihood of extensive use of ICT. There was no comparable school amongst the initial six case-study schools so it was necessary to look further afield.

Table 2.1 provides a summary of the demographic factors of each of the thirteen participant schools in May 2005. The original case-study schools for the 2005 and 2006 foci are indicated with an asterisk. The 2007-08 indepth case-study schools are indicated by a plus sign.

Table 2.1: Participant school information

School ID	School type [1]	School decile	School roll [2]	Staff no [3]	No of laptops [4]
100 *+	Intermediate	10	911	49	26
200 *	Intermediate	5	622	33	33
300	Contributing	2	657	38	21
400	Contributing	5	344	15	12
500+	Full	1	464	28	17
600	Full	10	340	17	10
700 *	Full	3	577	24	24
800 *+	Full	8	316	16	13
900	Full	10	154	8	6
1100	Full	7	615	30	14
1200	Contributing	10	512	31	11
1300 *	Contributing	7	553	28	15
1400 *	Full	2	683	32	23
Totals			**6748**	**349**	**225**

1. Contributing primary are Years 0 – 6; full primary Years 0 – 8 and intermediate Years 7 – 8 schools.

2. School rolls and deciles listed here are based on the 2004 returns as recorded on the Te Kete Ipurangi (TKI) website.

3. Staff numbers are close approximations only, based on Education Review Office (ERO) reports available in 2005 for each school.

4. These numbers are based on figures from the Ministry TELA administration database and were accurate at the beginning of 2005. However, as roll outs continued through 2005, and subsequently, these numbers increased in many of the schools.

Data collection

A range of data collection methods was used across the time of the evaluation. This included surveys, teacher logs, focus groups, observations and interviews. Table 2.2 summarises when these data were collected.

Table 2.2: Summary of data collection

Tool	2005	2006	2007	2008
Baseline survey	X			
Longitudinal survey	X	X		X[2]
Focus groups – use, values, attitudes	X	X		
Focus groups – barriers		X		
Observations and Interviews [1]			X	X

1. Note two schools were visited at the end of 2007 and one early in 2008.

2. Note this survey was different to that implemented in 2005 and 2006 in that it contained additional questions given it was the final data collection process.

Longitudinal surveys

Surveys were distributed to the 13 participating schools in May 2005. The purpose of these surveys was to gather baseline data regarding teachers' expectations of the impact of the laptops, their use of computers prior to receiving their laptops and their perceived skill and confidence level in using computers. A total of 188 surveys were returned and analysed from across 13 of the schools. This represented a return rate of 83% based on the reported number of laptops across the 13 participating schools. In terms of total staff numbers, the return rate was 54%.

A second survey was administered in November 2005. As is described in more detail in chapter four, some changes were made to the baseline survey for this longitudinal survey. This was the first of what was intended to be an annual survey considering teacher self-reported use of their laptops; their competence, or capability, and confidence in using the laptops; and the extent of impact on various areas of their professional lives. A total of 190 surveys were returned and analysed from 11 of the initial 13 schools. This represented a return rate of 54%, if one considers the total staff roll across the 13 initial participant schools. While this is the same return rate as for the earlier survey, it should be noted that more staff had laptops in these schools as a result of further roll-outs by the Ministry. Therefore, one could expect a higher return rate.

The same survey was administered in November 2006[3].This allowed for a consideration of changes in competence, confidence and use over the preceding twelve-month period. Unfortunately, only 157 surveys were returned and analysed from ten schools, a return rate of only 45% if one considers the total staff numbers at the 13 participant schools in 2005.

This low return rate was problematic for the ongoing validity of the longitudinal study as it was originally designed. Not only had the overall participant levels dropped, the number of staff completing both November surveys was less than 70 suggesting any ongoing longitudinal data sample would be very small. In addition, informal feedback from schools completing both surveys suggested that a subsequent survey, in 2007, would be completed by even fewer participants. This feedback, along with the participant numbers and the data gathered, which showed little change between the two surveys, resulted in an agreement with the Ministry that no survey would be administered in 2007.

A final survey was administered in November 2008. This survey asked the same core set of questions as the previous two surveys but also considered other areas, which had arisen during the 2007 focus on classroom practice. A total of 195 surveys were returned from across 12 schools, a return rate of 56% if one considers staff numbers from 2005.

Table 2.3 summarises the total number of surveys returned and analysed from each of the schools across the four surveys administered. Table 2.4 summarises the total number of participants returning 1, 2, 3 or 4 surveys from each school. The total number of surveys returned by participants was 738[4].

---

[3] Data from this survey are not reported in this final report. They are discussed in detail in the second interim report provided to the Ministry of Education in February 2007.

[4] Eight surveys were counted in the overall return rate but were not analysed for reporting. This was owing to lateness of return and/or missing data.

Table 2.3: Number of surveys returned and analysed by school for each survey

School ID	Surveys returned and analysed				
	Baseline	**2005**	**2006**	**2008**	**TOTAL**
100	18	0	19	19	**56**
200	19	14	21	17	**71**
300	14	27	25	28	**94**
400	10	12	0	4	**26**
500	11	22	0	20	**53**
600	9	11	9	12	**41**
700	24	22	5	23	**74**
800	11	13	13	10	**47**
900	8	8	8	8	**32**
1,100	16	0	23	20	**59**
1,200	13	19	8	20	**60**
1,300	15	21	0	14	**50**
1,400	20	21	26	0	**67**
TOTAL	**188**	**190**	**157**	**195**	**730**

Table 2.4: Number of participants completing one or more surveys

School ID	one	two	three	four
100	24	13	2	0
200	15	10	8	3
300	33	8	10	4
400	5	6	3	0
500	16	14	3	0
600	6	3	7	2
700	12	15	8	2
800	7	2	4	6
900	1	1	3	5
1,100	20	12	5	0
1,200	16	9	6	3
1,300	23	14	0	0
1,400	19	16	6	0
TOTAL	**197**	**123**	**65**	**25**

As Table 2.4 shows, only 25 teachers completed all four surveys. This reflects the difficulty in gaining ongoing participation in evaluations and the extent to which staff change schools over time.

Given the small number of participants completing more than one survey, the decision was made to compare results from November 2005 and November 2008 only. A total of 70 participants from across ten schools completed both of these surveys.

Teacher logs

Teacher logs were developed and distributed to teachers who taught in the first group of six case-study schools. The purpose of these logs was for teachers to detail their use of computers over a 'typical' school week. The types of use contained in the log (and their descriptors) were taken from a study by Ward (2006). The logs were distributed in 2005 and again in 2006 providing snapshots of use in each period.

There were two key methodological concerns with the logs. Firstly, only the school week was included. As became clear subsequently, a key advantage of the laptops was their portability and the enhanced ability they gave teachers to work outside school hours. While teachers may have included weekend use into their reports of use during the school week, it is likely that the reported use is much lower than actual in some instances. Secondly, the logs were not always completed by the same teachers in 2006 as in 2005. While the same schools were used, the issue of staff turnover and lack of regular, ongoing participation found in the surveys were also of concern here.

Given these two concerns and the relatively small shifts in use seen through an analysis of the teacher logs, these were not used in either 2007 or 2008[5].

Qualitative data

Individual and group interviews, as well as classroom observations, provided a range of qualitative data across the four years of the study. The focus of the data collection and the questions posed varied each year.

2005 group interviews

In 2005 group interviews involving between three and eight teachers in each school were undertaken in six schools. Table 2.5 provides a summary of the number of teachers participating at each school.

Table 2.5: Numbers participating in 2005 group interviews

School ID	Number of participants
100	5
200	6
700	8
800	3
1,300	6
1,400	3
Total	**31**

The interviews were taped and transcribed in four of the schools. Detailed notes were taken at the other two, where the interview situation was not conducive to taping owing to background noise in one instance and teacher reluctance in the other. All the interviews were conducted after school and were semi-structured in nature. The teachers who were interviewed predominantly self-selected, others were asked by their principals to participate.

In 2005 the questions asked focused on:

- the perceived value of the laptops

- innovative and/or 'cutting edge' use in the classroom

- current skill and confidence levels

- what differentiated a highly confident user from other teachers.

2006 group interviews

Two series of group interviews were undertaken in 2006. Four schools participated in both sets of interviews, while one participated in the first set only. Teachers at the sixth school declined to participate further in the study in 2006.

---

[5] Detailed data from the logs are not reported in this final report although they can be found in the second interim report provided to the Ministry of Education in February 2007.

The first set of group interviews focused on shifts between 2005 and 2006. Questions again centred on participants' use of laptops, their skill and confidence levels and the perceived value of the laptops.

The second set of group interviews considered barriers to laptop use. Schools were asked to select teachers whose own laptop use was limited either in terms of the level of use or the breadth of the nature of use. However, in one school there were no teachers in this category as the teachers in this school all appeared to be relatively high users of their laptops.

2007/2008 case studies

Data gathered during 2005 and 2006 suggested teachers were regularly using their laptops and that little would be gained from continuing with the initial evaluation design. In consultation with the Ministry the focus was shifted for the last two years of the evaluation. As a result three of the original 13 schools were purposively selected in 2007 as case studies for a consideration of the place of the laptops in learning.

Over a two- to three-day period the evaluation team visited, in turn, each of the three schools selected. We interviewed individual teachers, senior managers and students at each school. Teacher participants were nominated by the schools and the students came from their classrooms. In this instance, we had outlined our intention to map effective use of technology in the classroom; thus we required the teachers be relatively high users. Table 2.6 details the interviews undertaken at each school. We also observed classroom practice.

The focus of these visits was to consider more broadly the place of the laptops in teaching and learning. The hypothesis was that the impact of the laptops was more far reaching than their direct use might suggest. Rather than asking teachers what they used their laptops for, we asked them about the teaching and learning that was occurring in their classrooms. We then looked to see where the laptop sat in relation to these wider activities.

Table 2.6: Participant information by school

School ID	Senior Manager	ICT leader	Teachers (Interviews)	Students (Focus groups)
800	1	1	3	8
500	1	1	3	4
100	3	-	4	10

In the subsequent sections of this report, data from each of these data collection methods are reported under timeframe headings. Not all the data gathered and reported in the relevant interim reports have been repeated in this final report. In particular, the data gathered in 2006 from the surveys, interviews and logs are not included. These data showed that little change had occurred from 2005 and, as such, add nothing to the overall evaluative findings.

3. Beliefs, use and readiness in the beginning

Baseline data were gathered through an initial survey early in 2005. This initial survey provided data regarding teachers' expectations of the impact of their laptops, their use of computers prior to receiving their laptops, and their perceived skill and confidence level (readiness) in using computers prior to receiving them. A total of 188 baseline surveys were returned from across 13 schools.

Teacher beliefs

The baseline survey asked teachers about their beliefs with regard to their laptops. They were, firstly, asked to what extent a given list of factors had influenced their decision to get a laptop. They responded using a scale of 1 = not at all through to 6 = extremely. This question provided some insight into what these participants perceived to be the value of having a laptop. The factors given were:

- the encouraging attitude of senior management

- other staff members were getting one

- I did not have a computer and I wanted one

- I believe a laptop is a valuable tool for teachers

- the computer I already had needed updating

- I believe all teachers need to have access to a computer for their work

- we all had to get one

- it was a good deal

- no particular reason.

The responses to this question are shown graphically in Figure 3.1.

Figure 3.1: Average level of influence for each potential influencing factor
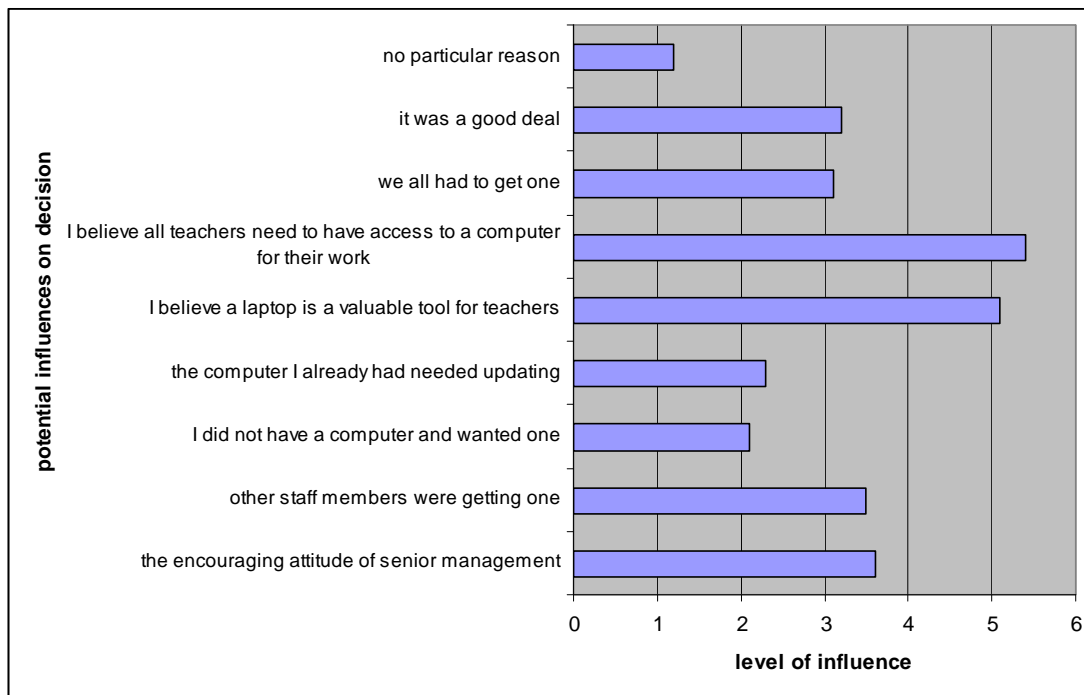
The participants mainly reported two inter-related reasons for getting a laptop. These were that they believed it was a valuable tool for teachers and that they believed teachers needed access to a computer for their work. Both these reasons had average levels of influence greater than five (very influential) while the level of influence for all other factors was between two and four.

The least influential reasons were to do with the need for a computer or to update a current computer. This is not surprising as, in the baseline survey, 78% of participants reported they already had access to a computer at home. The need for a computer per se cannot, therefore, have been a primary driving force in joining the laptop scheme. Also, the extent to which teachers already have access can be seen as a mediating factor on the potential impact of the laptops. One could assume that teachers with access to computers at home would already have a reasonable level of familiarity and skill, although this is not a given as access does not necessarily equate to use.

Participants were also asked how much impact they thought their laptop would have in six different areas of their professional lives. Again a six-point response scale was used with 1 = none at all through to 6 = extensive. The areas were:

- improving academic outcomes for your students

- improving your ICT skills

- your professional development and learning

- administrative work – reports, recording marks etc

- professional work – the development of resources etc

- classroom teaching practices – what they do in the classroom with students.

As Figure 3.2 shows, all participants reported reasonably high expectations regarding the impact having a laptop would have on their professional lives, with the expected levels of impact either approaching four (large) or between four and five (very large) for all areas listed.

Figure 3.2: Average level of expected impact in different areas of a participant's professional life
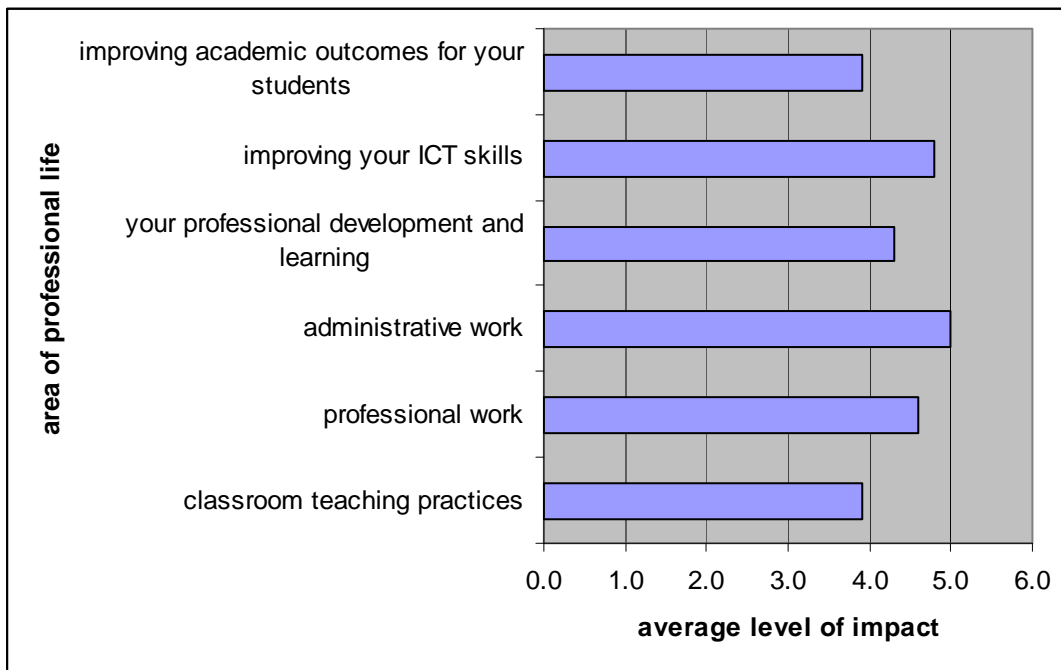
The areas with the greatest reported impact were administrative work and improving ICT skills. This is important as both these areas are specifically mentioned in the Ministry goals for the TELA initiative. The implication is that both the teachers and the Ministry have similar expectations for the outcomes of the initiative.

The areas with the least expected impact were classroom teaching practices and improving academic outcomes for students. Presumably, the laptops would have been intended to have an indirect, if not direct impact, on these areas, but neither was mentioned specifically in the Ministry goals, which focus on teacher use in ways that indirectly impact on actual student learning experiences, such as preparation and administration[6]. However, as other aspects of this evaluation subsequently show, the laptops do appear to have impacted on classroom practices to a greater extent than, perhaps, either the Ministry or the participants anticipated.

This evaluation did not attempt to consider the impact of the laptops on academic outcomes and indeed this would be problematic without a carefully constructed, randomised experimental study. In addition, it is possible that the use of digital technologies has an impact on a much broader range of desirable outcomes than can be readily measured academically.

Levels of computer use

The baseline survey also asked teachers about their computer use within specified areas of their professional lives[7] **prior** to the introduction of the laptops. Seven time periods, based on hours of use per week, were used on the response categories (1-5, 6-10, 11-15, 16-20, 21-25, 26+).

The types of use identified in the survey were:

---

[6] While Ministry objectives for this project include references to teaching and learning, the focus in the goals is on teacher professional practice and skill rather than on changing classroom practices with students. That is, the laptop is described primarily as a tool for teacher practice.

[7] These areas were determined based on previous research undertaken by the authors and a consideration of relevant literature.

- pedagogical use – in the classroom with students as part of their learning

- preparation and presentation of classroom materials – creating worksheets, presenting material, accessing lesson materials on the web etc

- administrative purposes – reporting, attendance, marks, communicating with colleagues etc

- professional development and learning – membership of professional communities, online courses, accessing research etc

- personal use – anything not work-related.

Table 3.1 displays the percentage of participants for each type of use reporting the various time periods[8].

Table 3.1: Percentage of participants reporting each time period for each type of use

	Average hours of use per week						
	not used	1 to 5	6 to 10	11 to 15	16 to 20	21 to 25	more than 26
pedagogical use	13	60	12	7	6	1	1
preparation and presentation of classroom materials	5	54	28	6	3	2	2
administrative use	15	54	22	4	2	1	3
professional development and learning	32	48	12	3	3	1	1
personal use	15	63	16	4	1	0	1

Due to rounding, percentages may not sum to 100 across the rows.

What this table shows is that for all types of use the most frequently reported time period was 1-5 hours, although there were outliers (responses that is markedly different from most others) suggesting high levels of use by some individuals within each school. It should be noted that the overall level of use could be as high as 25 hours if a participant reporting in the category between 1 and 5 hours for each usage type was actually using it for near to the maximum level, that is five hours.

The most commonly reported type of use was the preparation and presentation of classroom materials. Only 5% of participants did not report using computers in this way and 28% reported doing so for between 6 and 10 hours a week. This was one of the Ministry goals and expectations for the laptops, although these findings suggest teachers were already using computers in this way and that, while laptops might have made it easier for them to do so, they were unlikely to substantially increase the levels of use in this area.

The least frequently reported type of use was professional development and learning, with 32% of participants reporting never having used computers in this way, and a further 48% reporting only 1-5 hours use. This was certainly one area in which there was substantial room for improvement and, again, this was a focus area for the Ministry. It was an area considered likely to expand with access to laptops.

Teacher readiness to use laptops

A third section of the baseline survey asked participants about their readiness to use computers in terms of the range and level of their skills and confidence in using computers prior to getting their laptop. Each of these areas is considered in this section.

---

[8]   The breadth of the time periods meant that the responses to this question were more useful as a comparison across types of use than as an indication of level of use and this question was changed substantially in subsequent surveys.

Raising teacher skill levels could be seen as the key purpose of the TELA initiative. The objective quoted earlier talks of raising competence and confidence. Increasing teacher skill was a specific goal of the initiative and is a key feature of both competence and confidence. Added to this it could be claimed that without increased skills and, probably more importantly, increased confidence, teachers are unlikely to use their laptops, or other digital technologies, extensively. Indeed, in the focus group interviews one participant suggested that *"People don't feel confident about it when they're only using it for their planning and think that's you know, all that, all they need to do"*.

In this report, capability (competence) is considered in terms of both the range of skills and the level of skills. In the baseline survey, teachers were asked to report on their ICT capability prior to getting their laptops. They were asked to indicate, firstly, how many different things they could do, what their range of skills was (largely in relation to software or peripherals they could utilise). A six-point response scale was used where 1 was very limited and 6 extensive. Across all participants the average for range of skills was 3.5 (SD=1.2). Secondly, they were asked about their level of skill and how good they were at what they could do. Responses were also on a six-point response scale where 1 was very poor and 6 excellent. The average level of skill was 3.8 (SD=0.9). In all schools there were outliers who reported very high levels of skill and/or a very wide range of skill. Figures 3.3 and 3.4 display the percentage of participants, in each category, for both range and level of skill.

Figure 3.3: Percentage of participants at each reported range of skills
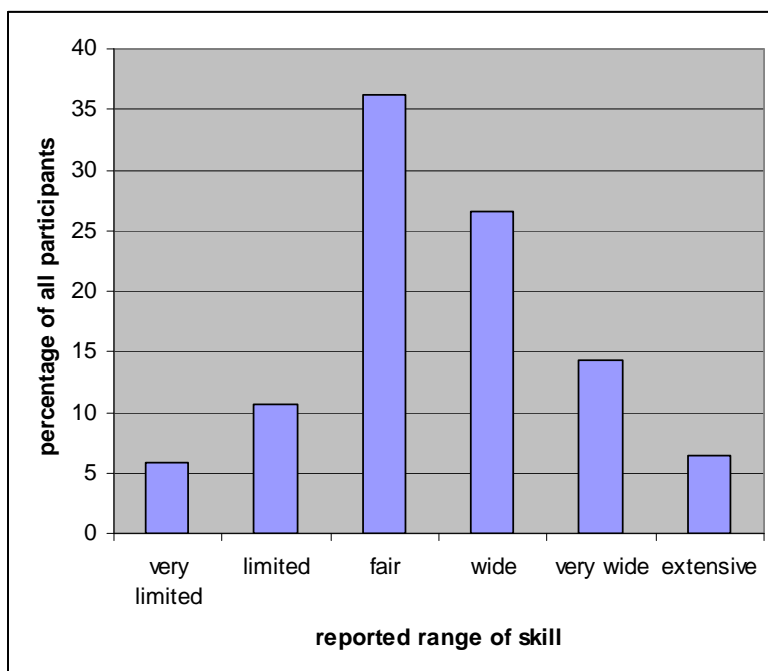
What this shows is that a clear majority of participants saw their range of skills, before they got their laptops, as either fair or better. Fair was the most frequently reported category (36%) followed by wide (27%). Only a few participants (6%) reported an extensive range of skills while the same percentage reported a very limited range.

Figure 3.4: Percentage of participants at each reported level of skill
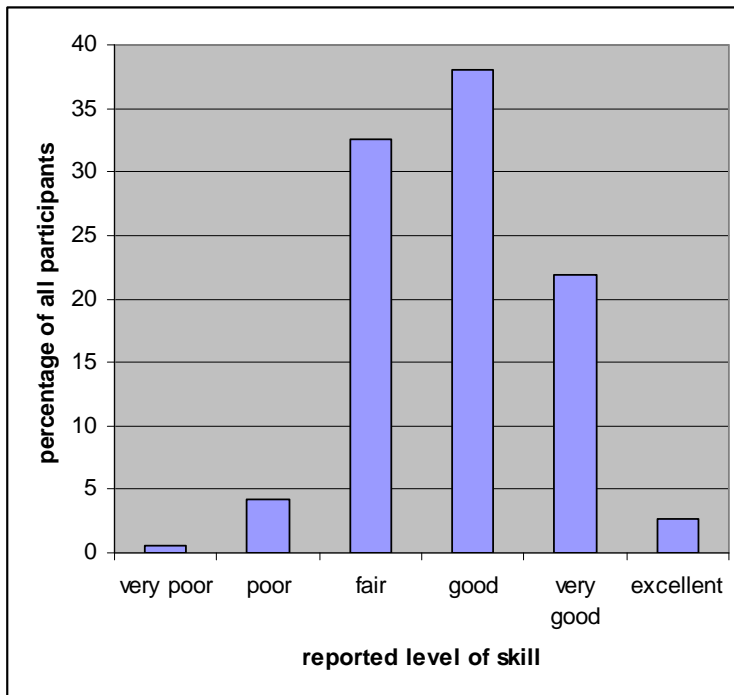
The most commonly reported level of skill was good (38%). This suggests that the reported level of skill is higher than the reported range of skills. It would appear, therefore, that these teachers' skills are across a limited number of areas. Findings from the focus groups suggest this is most likely to be related to need, in that many teachers, apparently, learn only what they have to or what they see a benefit in being able to do. For example, one participant explained that she only learned how to do PowerPoint because she had to do a presentation, while for another, her motivation to learn was related to a desire *"to try and keep up with the students in my class"* (she had an e-class).

Only two participants reported very poor skills and only 4% poor skills (n=8). The implication is that most of the participant teachers felt they were already reasonably skilled in using computers when they got their laptops. Given the large number who already had access to computers at home, this should not be surprising. It does suggest, though, that there may be limited room for teacher skill to improve as one could question the extent to which teachers need to be highly skilled users of ICT. This is an idea reinforced by the participant who commented that *"You can only fit so much computer teaching into – you know – your timetable so, maybe we know as much as we need to know"*.

Participants were also asked, on a six-point scale (not at all to extremely), how confident they felt about using laptops in a variety of ways. Confidence has been shown to be an important determinant of teacher use of computers and to be related to more than skill alone (Ward & Parr, 2010). The areas of use were to:

- present materials to students in the classroom
- prepare instructional material using basic applications, such as Word
- use multimedia tools to prepare instructional material
- access a wide range of classroom material on the Internet
- participate in professional learning online
- communicate with other people using email
- facilitate student use in the classroom.

Table 3.2 shows the percentage of participants reporting the various levels of confidence, while Figure 3.5 compares the average reported level of confidence across the different types of use. Only three types of use have a reported mean confidence level approaching 5 (very confident) while none is above 5. However, in all instances the reported levels of confidence were above 3 (moderately).

Table 3.2: Percentage of participants for each reported level of confidence for different types of use

Type of use	Not at all	Slightly	Moderately	Quite a lot	Very	Extremely
present material to students in class	4	10	27	26	18	15
prepare instructional material using basic applications	1	3	5	25	31	36
use multimedia tools to prepare instructional material	6	15	27	24	19	9
access a wide range of classroom material on the Internet	1	5	14	25	30	24
participate in professional learning online	10	16	24	19	18	12
communicate with other people using email	2	7	9	14	27	41
facilitate student use in the classroom	6	8	25	30	23	9

Figure 3.5: Average reported confidence across categories of use
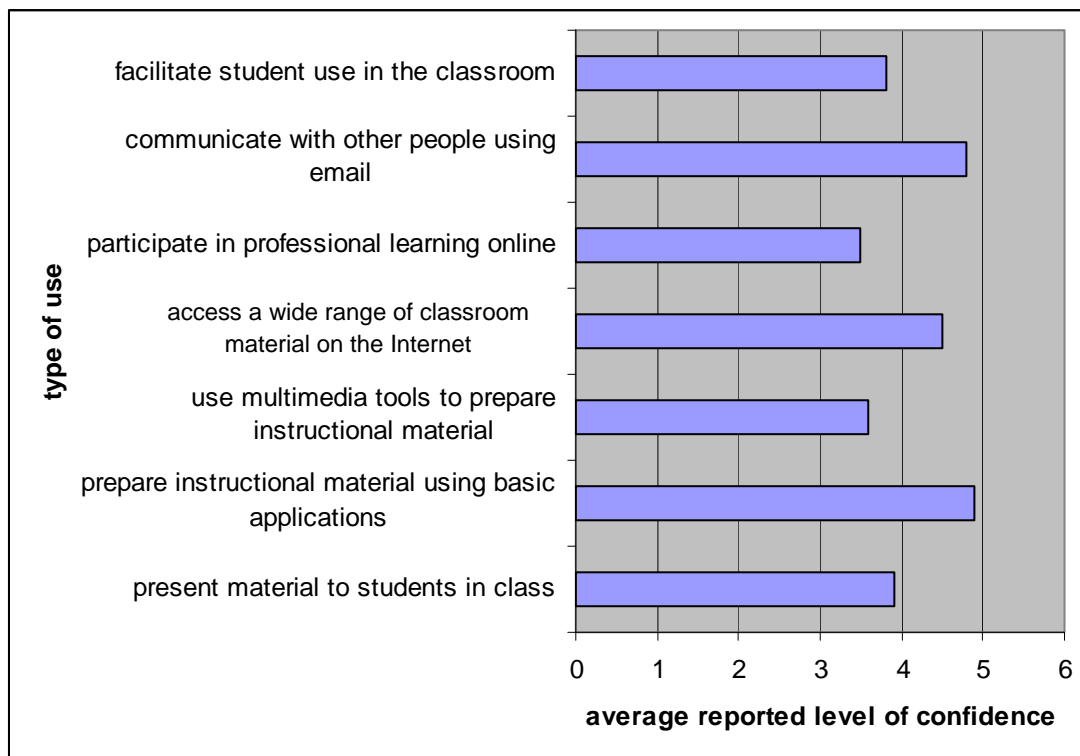
The types of use for which participants reported the highest levels of confidence were using email (4.8), using the Internet (4.5) and preparing instructional material using basic applications (4.9). These are areas within which the earlier data indicated there were likely to be higher levels of use, suggesting a relationship between use and confidence,

although the direction of causality is difficult to determine. Indeed, this was alluded to in the group interviews where one group of teachers spoke of how need led to use, which led to increased confidence, which led to more use.

The areas where teachers reported being the least confident were using multimedia tools to prepare instructional material (3.6) and participating in professional learning online (3.5). These were two areas where the Ministry had explicitly stated it wanted to enable teacher use.

4. Early attainment of the Ministry goals

This chapter considers data gathered in 2005 and provides a snapshot of the implementation of the TELA project in its early stages. In 2005, data were gathered through a second survey administered in November[9], teacher logs and focus group interviews. A total of 190 surveys were returned from across 11 of the original 13 schools, while focus groups and logs were completed in six schools, the first set of case-study schools.

Use of computers in 2005

The question regarding the use of computers was substantially changed for the longitudinal survey from those asked in the baseline survey. Rather than using categories of time, participants were asked to estimate the actual number of hours, in a typical week, they would use their laptops, a school desktop or home computer across different areas of use. The areas of use were also changed from those in the baseline survey to reflect better the degree of complexity in the range of professional tasks teachers undertake and to make greater differentiation between types of task. The areas of use in the November survey were for:

- pedagogical use (in the classroom with students as part of their learning)

- preparation and planning of classroom materials (creating worksheets, presenting materials using PowerPoint, accessing lesson materials on the web etc)

- administrative tasks (reporting, attendance, recording marks, communicating with colleagues etc)

- professional tasks (planning, analysing and interpreting achievement data, commenting on student work online, providing feedback to students)

- professional development and learning (membership of professional communities; online courses; accessing research etc)

- personal use (anything not work-related).

Table 4.1 summarises the findings for each of these types of use in terms of reported hours of use.

---

[9] Data from this survey were discussed in both the first and second interim reports provided to the Ministry of Education.

Table 4.1: Reported hours of use across types of use.

	Laptop				School desktop				Home desktop			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
For pedagogical use (in the classroom with students as part of their learning	2.4	4.202	0	28	4.2	5.534	0	30	0.5	1.533	0	10
For preparation and planning of classroom materials (creating worksheets, presenting materials using PowerPoint, accessing lesson materials on the Web etc)	4.0	3.667	0	20	1.1	1.670	0	7	1.5	2.196	0	10
For administrative tasks (reporting, attendance, recording marks, communicating with colleagues etc)	3.4	3.448	0	20	1.0	1.880	0	10	0.3	0.762	0	5
For professional tasks (planning, analysing and interpreting achievement data, commenting on student work online, providing feedback to students)	3.0	3.379	0	20	0.7	1.494	0	10	0.8	2.348	0	15
For professional development and learning (membership of professional communities; online courses; accessing research etc)	1.3	1.901	0	10	0.4	1.005	0	6	1.0	1.959	0	10
For personal use (anything not work related)	1.4	2.372	0	15	0.2	0.676	0	5	3.1	4.093	0	30

The responses to the question about extent of use of different computers showed that, in 2005, the laptops were being used more than any other form of computer in all areas except pedagogical use, where school desktops were the most commonly used computer. In this instance, it could be assumed that school desktops included those in computer laboratories, multimedia rooms and libraries. These are the computers students are most likely to have access to and the level of use described in this question was likely to include use by both teachers and students.

What these data also showed was that a marked increase was reported in the overall levels of pedagogical use of computers from that reported prior to receiving their laptops. Although much of this use appears to have been on school desktops, there was also considerable use of laptops reported for this purpose.

Findings from the focus groups suggested that the provision of laptops had enabled teachers to facilitate greater use of the school computers by their students. For example, one participant commented that *"You can save their work on your laptop and you can go and show it in the classroom"* rather than, as another participant commented, *"wasting your precious computer time watching slide shows"*. These findings suggest that, as early as 2005, the possession of laptops was having an impact beyond that anticipated by the participant teachers, particularly in terms of classroom teaching.

Teachers reported in the focus groups that their laptops were a valuable ICT resource in the classroom. As one participant stated *"It's that whole thing about having an extra computer in the classroom, it's been a huge difference"*. The value of the laptops in this way seemed to relate to their greater functionality, their speed, their ability to connect to the Internet through wireless networks and the additional programmes they offered. As one participant commented *"with the updating and skills [the laptop has] definitely had an impact in my classroom, cause I can go, look, this is what we are going to do with our laptop……which I would never have done without a laptop"*. This idea of the laptops as an additional resource for a school's ICT development programme was one of the Ministry goals and these findings suggest this had been achieved in 2005.

Participants were asked in the focus group interviews how they were using their laptops for 'cutting edge' classroom use, what they saw as their most innovative use of the laptop. The responses suggested some very exciting teaching and learning was occurring across these schools at this time. One such example was the use of Google Earth to stimulate student interest in other countries in the world and to enable them to see other facets of life they had read about. In this particular case it was with reference to Argentina, which they had just studied.

> *"....they were able to go onto the main street of Argentina and look at it and the kids just thought it was amazing; I mean we couldn't do that on the classroom computer it's too slow, it's not connected to the Internet."*

Another participant spoke of the creation and use of digital learning centres. In this instance the teacher had created a PowerPoint, which functioned as a learning centre for her students. The teacher created a number of digital learning objects on her laptop and then made these available on the server within a PowerPoint. A range of activities, tasks and sets of notes are linked by hyperlinks within the PowerPoint framework. These allowed students to select the activity or task they wanted to complete and to use only what they needed to, thus meeting both their different learning styles and their different learning needs.

A commonly reported pedagogical use of the laptops was allowing students immediate access to information sources, which could assist in the work they were doing. The two quotes that follow exemplify the way in which access to information stimulated student writing and promoted deeper understanding of a topic. They also show how using the laptop was allowing students to find answers to questions their teacher could not provide.

> *"One of the children was writing a Māori myth and they used a stingray and they didn't know the parts of the stingray so they used Worldbook to look up parts of a stingray, things like that I don't know."*

> *"Elena said to me, what do plankton eat then? I'm like, oh I don't know ...they went on and it was really easy to go on right there and then and actually do the research."*

Other activities mentioned include the use of KidPix, creating movies and creating digital stories. The teacher who spoke of using Google Earth (quoted earlier) was asked directly how this activity contributed to student learning. Her response was:

> *"You know it's about the whole oral language development, you know when they're using Google Earth, huge, you know like they're so focused, their talk is all focused. You know, it might be about the computer skill that they're using or its going to be about the images they're seeing but it – you know huge development that you wouldn't get by looking at a book."*

The comparatively high level of use reported for the preparation and presentation of classroom materials in the baseline survey was also reported in the November 2005 survey. While this might suggest little impact by the laptops, a tall order as use was already high, comments made in the focus groups suggested that some teachers, at least, had begun to do different things and to use their laptops to present material to students in different ways. For example, there was the teacher quoted above who had used Google Earth to present information about Argentina to her students. Another teacher explained how the wireless connection on the laptop meant she was able to show her students how to do things in the classroom, which she had not been able to do before:

> *"They take it back to the classroom [their work] and I can show them how to do things in the classroom with the wireless, ... before the only time we could do anything on the network or anything was in the computer room."*

Use of the laptops for professional development online remained the least reported type of use, suggesting the laptops were having little impact in this area in the early stages of implementation. The average reported level of use, for laptops at this time, was only 1.3 hours with a maximum of 10 hours. This was the only area of professional use where home computers almost matched the laptops in level of use.

The professional development that was reported seems primarily to have involved participation in web-based courses through universities. One or two participants mentioned sharing ideas and resources with other teachers through email or via the Internet but this was not common. However, there may have been an overlap here with the preparation and presentation of resources as some teachers commented that it was difficult to distinguish between what was for their own learning and what was for the preparation of resources. They felt that everything they did was ultimately for their students and any professional learning was what was necessary for that to occur. This may also be a result of the somewhat limited definition many teachers have of professional development. It tends to be seen as something that is 'done to them' as part of a structured course (Parr & Ward, 2005).

Figure 4.1 is a graphical display of the reported average levels of use of laptops in one week in November 2005 across the various areas of professional and personal work. What this shows is that, despite the high levels of pedagogical use of computers overall, the laptops were predominantly being used for professional work, planning and preparation and administrative use. As already discussed, the reasons for the high level of laptop use in these areas appears to be largely attributable to their portability. It must be noted here that this focus on the use of the laptop may be under-representing the indirect impact the laptops are having on the use of ICT in classroom practices.

Figure 4.1: Average reported levels of laptop use across the categories
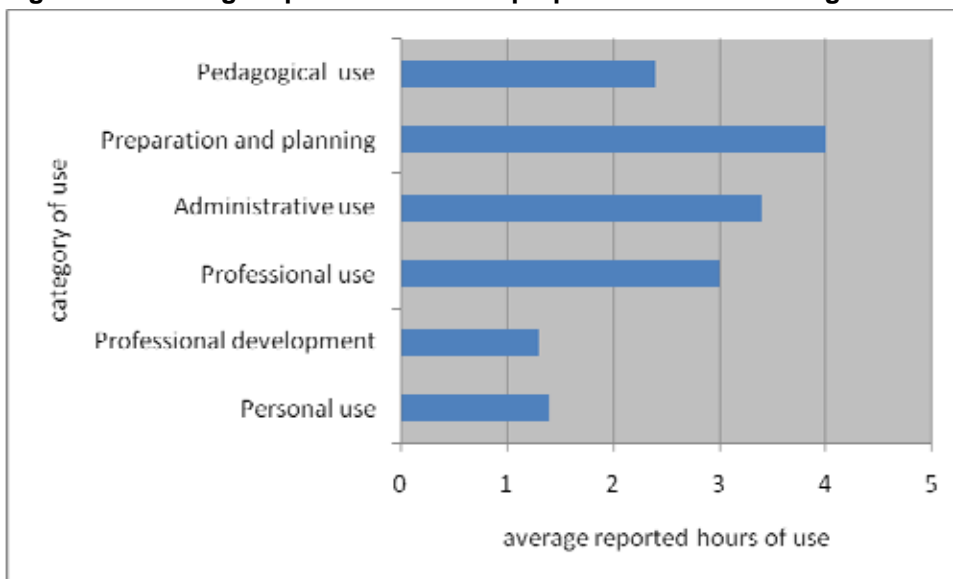
The teacher logs also provided data related to the extent of use of the laptops. Teachers were asked to record their use of computers over a typical week across a number of identified tasks. Table 4.2 summarises the data gathered from the logs on overall use.

It should be noted that a direct comparison of the actual levels of use between the logs and the survey data is not possible. This is for a number of reasons:

- the logs were completed by only a small percentage of the survey participants, who came from less than half the surveyed schools. Their responses are not representative of the overall survey population and should not be used in this way

- there are large standard deviations in both the survey and log data, reflecting the breadth of responses from participant teachers further compounding the issue of non-representativeness

- the units of analysis for the two tools are not the same. The log asks for actual use over a working week, while the survey asks for an estimation of average use in a week. We cannot determine the extent to which the reported actual use in the log is indicative of average use over a longer period of time

- one of the limitations of the logs was that they did not include weekend usage. The discrepancies reported between the surveys and the logs could also reflect the extent to which teachers use their laptops on the weekends for professional purposes.

However, common trends in use can be identified, as discussed below.

Table 4.2: Total computer, laptop and non-laptop use ín minutes for a typical week in 2005

Type of computer	Mean	SD
All computers	128.07	68.29
Laptop	69.93	45.72
Non-laptop	55.07	60.71

These data suggest that, on average, the participant teachers were more likely to use their laptops than other computers, although this was approximately only 14 minutes more per week. The standard deviations suggest there is considerable variation in the extent of use of both laptops and other computers amongst the participant teachers.

In their logs teachers reported using their laptops most frequently for administrative work, followed by professional work. These findings supported those of the survey. They reported using other computers (not laptops) most frequently in classroom teaching. These computers were only rarely used for professional work. It is likely the computers referred to here are desktops for student use. The amount of time spent on professional work was found to be correlated with own development and learning, classroom teaching and administrative work. This is possibly owing to computer use on the other tasks coming about as a result of its use in professional work. For example, classroom teaching could have been prepared on the computer.

Impact of the laptops in 2005

In the November 2005 survey, participants were asked to quantify the extent to which the provision of the laptops had impacted on their professional lives. The scale remained one to six (none at all, to extensive). The areas considered were the same as those listed in the usage section and again these had been modified somewhat from the baseline survey.

Figure 4.2 shows a direct comparison between the expected impact of the laptops, as reported in May, and the actual reported impact at the end of 2005 in November on those areas which were the same across the two surveys. In all instances, the reported level of actual impact was not as great in November 2005 as the anticipated level of impact early in 2005. This is particularly marked for improving ICT skills and for professional development, two specific Ministry goals.

Figure 4.2: Expected impact compared with reported impact
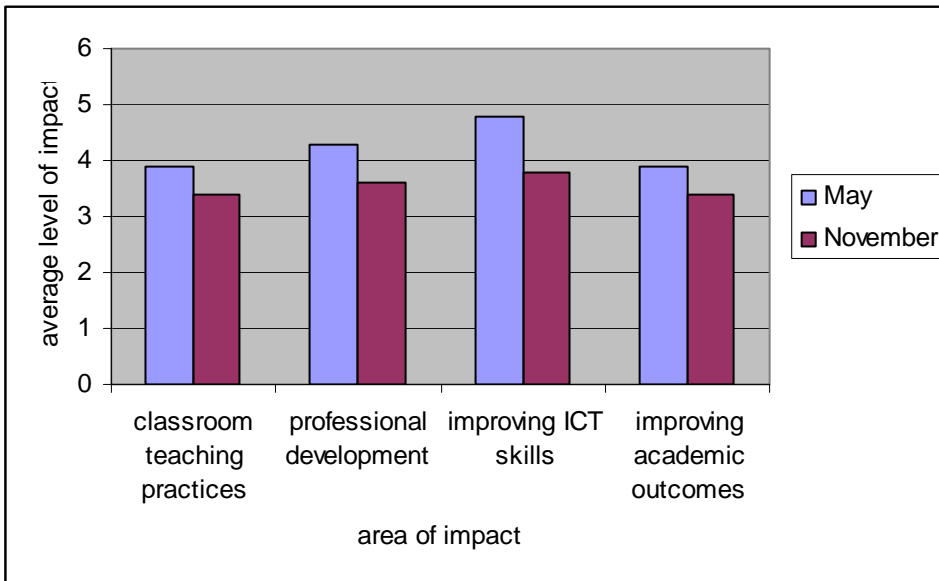
Despite this, as shown in Figure 4.3, having a laptop had had a noticeable reported impact, on average, across all areas of professional life in November 2005.

Figure 4.3: Average reported levels of actual impact of laptops on areas of professional life
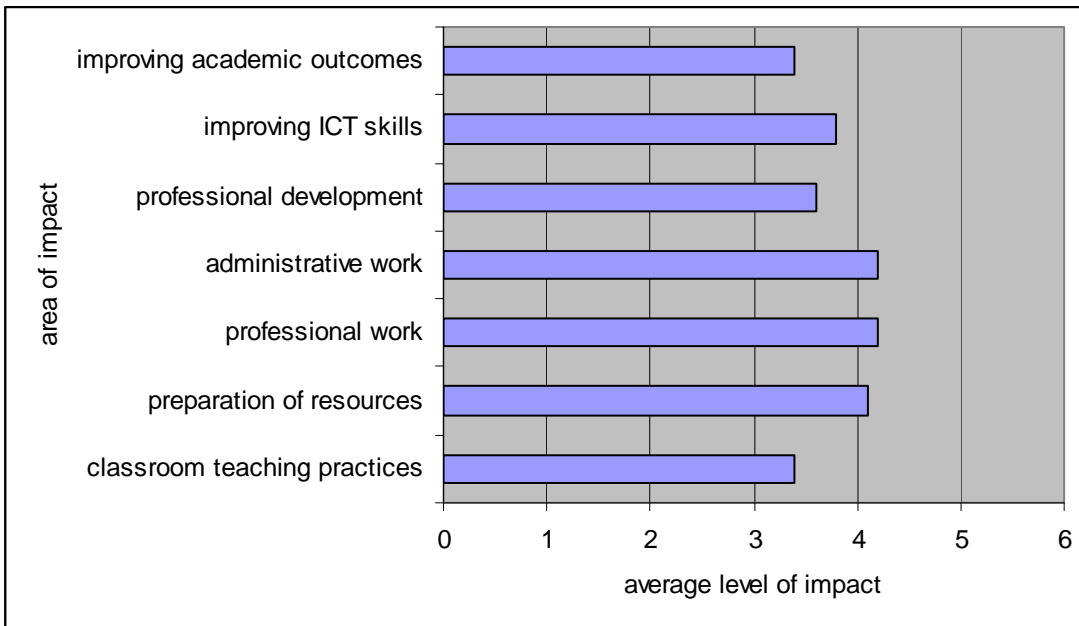
The areas of greatest reported impact were also the areas of greatest reported use: administrative work, professional work and the preparation of resources. Improving ICT skills and professional development were the next areas of greatest reported impact. Despite classroom teaching being an area where there was a marked increase in the reported use of computers, in general, the participant teachers did not seem to have perceived a major impact in this area attributable to the laptops.

In the focus group interviews teachers were asked what they perceived the value of their laptops to be in order to better understand the impact described above. In all schools, a recurring theme was the portability of the laptops, which was

seen as offering teachers a degree of flexibility in terms of both work place and time that they had not had before. The following quotes exemplify this:

> *"I think it is valuable because it gives us flexibility in where and when you can work."*

> *"So you can take things home with you ... which you wouldn't do if you only had them up on the computer."*

> *"I wouldn't have time to do it, or the information to do it, sitting in my classroom at school at the end of the day, but I'm at home on the couch."*

> *"Don't have to spend hours trapped in the classroom."*

This idea of flexibility and being able to work at home was also related, by some participants, to less stress in their lives:

> *"In terms of stress I think it helps a lot, in terms of being able to like, OK, I've had enough of this environment right now, I wanna go home and have like my own cup of tea or like, do my own thing and then maybe come back to it or whatever –."*

It was also related to upskilling themselves in that they felt more readily able to 'play' and to develop new skills in a time and location that suited them.

> *"I tried that – because you have the laptop at home like for stuff I've learnt to do, it's so I can practise on the laptop at home, so my computer skills are definitely going up".*

Other areas of perceived value, which help explain the reported impact, include the personal, almost exclusive nature of the laptops as well as efficiency in completing administrative and other tasks. As one participant stated *"They're their personal computer so they can organise how they...so they can find things easily, they get used to it and they can use it in the classroom as well".*

Efficiency included the idea of being able to *"manage your own time"* and *"manage the way you do it"* as well as not having to *"do everything from scratch [but being able to] open up the file of the last time you did it and adapt it".*

Teacher readiness to use laptops

Raising teacher skill levels could be seen as the key purpose of the TELA initiative. The objectives of the initiative, discussed in chapter one, include raising competence and confidence while increasing teacher skill is a specific goal of the initiative. Added to this it could be claimed that without increased skills and, probably more importantly, increased confidence teachers are unlikely to use their laptops extensively. Indeed, in the focus group interviews one participant suggested that *"People don't feel confident about it when they're only using it for their planning and think that's you know, all that, all they need to do".*

For these reasons, teacher readiness, a combination of skill and confidence was again probed in November 2005. The relevant dimension was the extent to which participant teachers felt they had improved in both confidence and skill since the introduction of the laptops.

The mean extent of reported improvement for range of skills (3.6) and level of skills (3.5) was very similar, both being between moderate improvement and quite a lot of improvement. This would suggest that the laptops had had an impact on teacher skill level and that both their level of skill and the range of skill had improved over 2005.

Participants were then asked the extent to which their confidence had improved across a number of areas. Table 4.3 shows the percentage of participants reporting the different levels of improvement in confidence. Figure 4.4 compares the extent of average improvement across the individual areas over 2005.

Table 4.3: Percentage of participants for each reported level of improvement in confidence for different types of use

	not at all	slightly	moderately	quite a lot	very	extremely
To facilitate student use in the classroom	14	16	24	29	12	5
To communicate with other people using email	17	16	23	19	18	7
To participate in professional learning online	39	26	20	11	5	0
To access a wide range of classroom material on the Internet	6	17	28	21	20	7
To use multimedia tools to prepare instructional material	10	22	23	25	16	4
To prepare instructional material using basic applications such as Word	8	16	20	27	20	9
To present material to the students in the classroom	7	14	24	33	16	5
To undertake professional tasks such as planning, analysing and interpreting data	5	15	25	29	20	6
To undertake administrative tasks such as reporting, attendance etc	8	14	31	22	18	7

Due to rounding, percentages may not sum to 100 across the rows.

Figure 4.4: Average levels of improvement across categories of use type in this figure is different?
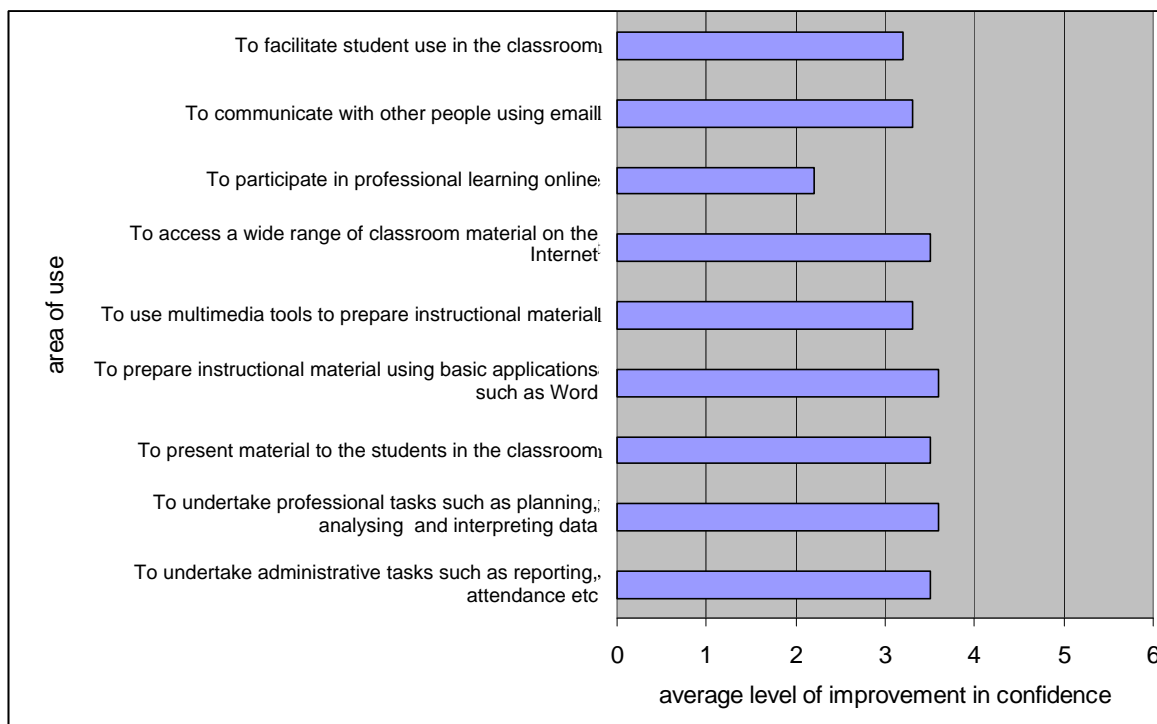
The areas showing the most reported improvement, compared to prior reported practice, are professional tasks such as interpreting student data, presenting material to students and preparing materials using basic applications. These are all

skills needed for the areas of greatest reported use of the laptops, namely, preparation and planning, professional tasks and administrative tasks. The implication is that there is a relationship between use and skill, as well as between need and skill. What is not determined is the causality of that relationship or whether it is even linear in nature.

Participants in the focus groups made comments that suggest that need is the most important determinant of increased skill but that there is a cyclical influence chain between need, use and confidence. The implication, from comments made, was that where there is sufficient need, or perceived benefit, teachers will learn the skills they require and, therefore, will be able to use computers in that way. The more they use them the more their confidence will grow and, therefore, the more willing they will become to try new things out and learn new skills. One participant was clear in her opinion that confidence came before skill in that:

> *"If you've got the confidence of using the computer you're not going to worry – you'll learn as you go, you can teach yourself a lot."*

That the laptops had impacted on teacher skills and confidence in 2005 was clearly evident. The teachers in the focus groups described the laptops as the *"best PD we have ever had"*. One participant went so far as to say *"I didn't have a clue until I got the laptop"*.

This reported impact appears to have been related to the greater flexibility the laptop offered teachers, as well as the increased need engendered by having them. As is often the case, time was reported as being the greatest barrier to the development of new, or more advanced, skills. The portability of the laptops meant, however, that teachers were no longer restricted in where and when they were able to 'play' and to practise computer skills. One participant stated that:

> *"It doesn't matter if you're shown once or ten times if you don't have the time to go away and fiddle about and practise yourself, you're not confident to do it in front of the class."*

For many teachers, as already alluded to, the laptops meant they could now go home and *"fiddle about"* and that this was often *"on the couch"* not *"trapped in the classroom"*. Laptops, therefore, increased both the need and the opportunity to learn.

Teachers were also asked in the focus groups what they thought differentiated a very confident computer user from a less confident one. There was a strong consensus that highly confident users shared what they were doing; that *"the key is demonstrating in front of others, their peers"*. They were also more likely to experiment, to try new things. Confidence was defined, by one participant, as *"willingness to have a go"*.

Slightly confident users, on the other hand, were seen as "not very outgoing in terms of trying to get other people to use things". They were, however, more likely to "approach people they think know more than them because they are not too scared about looking dumb because they do know some things" than low confidence users. As one such participant said, "If you think you are absolutely useless you don't want anyone to know how dumb you really are or think you are".

5. A qualitative snapshot of 2006

Two rounds of focus groups were held in 2006. First, focus groups were held with groups of teachers from five of the initial six case-study schools. These were simply available teachers although we had asked that Year levels across the school be represented. In each school, four to a dozen teachers attended, depending on the size of the school. The aim of the discussion, in the first round, was to ascertain whether there had been shifts in the type or level of use of the laptops from that reported in 2005 and also whether there had been shifts in reported attitudes and capacity. Questions asked centred around current use of laptops, current skill and confidence levels and the perceived value of the laptop and how these had shifted, if at all, from 2005.

The second set of focus groups involved four of the schools and discussion centred on barriers to laptop use (in effect, this equated to computer use in general). It should be noted that we asked specifically for low users and the size of these groups was smaller. In the following two sections, each of these focus groups is discussed individually before some overall conclusions are drawn.

Laptop use, attitudes and expectations in 2006

In this section, data from each of the focus groups in the five participating schools are reported separately.

Focus group one

At this focus group the teachers reported that they were using their laptops more than a year ago and that there was an increasing dependency on them. One participant felt that overall usage had increased at least 25% if not 50% on the year before. This was supported by another participant who commented that she "*very rarely [does] anything manually any more*".

The participants reported that everything they were doing, in an administrative sense (eg, absentees and behaviour management), was now electronic and they needed their laptops to access these systems. In addition, they reported receiving all notices through email. It would seem that the school substantially increased its use of computers for a range of administrative tasks over 2006 and this resulted in an increase in teacher use through mandated administrative tasks. This shift to electronic administrative processes was described by the participant teachers as a "*biggie*" in that it had been "*a big shift for a lot of teachers*". The increase in administrative use was seen as beneficial in that "*it is so much easier to do a lot of these things ...with the press of a button...than looking through heaps of paper.*" For these teachers "*laptops are making [their] lives easier in the classroom*". The installation of a wireless network also appears to have been an important factor in the increase in use at this school.

The teachers in this group felt that they had largely reached a stage where currently available technology was not always readily meeting their newly perceived needs and expectations. This failure to meet new needs may lead to dissatisfaction which, in turn, may impact on use. The teachers at this school reported having acquired many of their new skills through "*playing around at home*" with programmes such as Garageband (a programme which enables people to write and record their own music) and games. One participant made this clear when she stated "*I've learnt through games*".

However, it was not only skill that increased as a result but, perhaps, more importantly, confidence increased. One participant commented that "*if you're not confident you're not going to use it*". This confidence was reported as being across a range of programmes or in one or two areas only, depending on use.

The school reportedly provided opportunities to continue to learn about ICT through, for example, "*techie brekkies*" or technical breakfasts. These were held several times a term and the expectation was that teachers would attend one or more as needed.

A future goal for these teachers was "*to see the laptops used more by the kids*". However, as was often reiterated in these discussions, future use would be determined by need and that "*if something comes up you don't know you just learn that*". There seems to be no predetermined set of goals or course of learning for these teachers. New ways of using their laptops or increased use will, it appears, be determined by individual need and motivation.

Focus group two

At the second school there was also a clear message about the importance of the laptops and how necessary they were for the participants. It seemed that laptops were increasingly becoming an invisible tool; that is just part of a teacher's life rather than something new and exciting. These teachers were not readily able to calculate how much they used them or why, they just knew they needed them (rather as we feel about older technologies)! Whether this is necessarily a positive shift is open to debate and depends on whether we consider current types of use to be sufficient in both extent and nature to achieve the goals of strategic policy. Complacency and a high level of comfort with the tool may be barriers to the need to continue learning.

As has previously been commented on, it was the portability and flexibility of the laptops that was seen as their greatest feature. However, accessibility was often influenced adversely by security concerns and, positively, by the installation of a wireless network.

One participant described how she could "sit with [the laptop] on her knee and 'tell' a cooperative story, whereas to sit at a computer that's in a corner and they're behind you – it doesn't work". The suggestion here was that ease of use was also related to how readily the laptop allowed for current practice to be enriched while the core of the activity remained constant (in this case having the students sit around her while she recorded the story they were telling).

The nature of use appeared to have shifted at this school and participants reported using their laptops for creating movies and saving them on DVDs, for creating music and for saving their photos. One participant explained how her laptop "*before used to be [her] planning file…and now it's more than that*".

As with the first school reported on, here much of this different use had initially been personal, related to teachers' home lives and this was then transferred to the classroom. As one participant stated "*I think that is the trick, if teachers start using it for personal use then it's going to spill over into school*". This was probably related to confidence in that teachers were able to perfect skills in the safe environment of their personal lives and then, when they felt confident, transfer those skills to the more public arena of their professional lives without perceived professional risk. It was personal use that appeared to be driving innovative classroom use.

Confidence was once again seen by these participants as crucial to increased use. As one participant stated " I think confidence is more important than skill…I now think I don't know how to do that but it's not a problem because I learned how to do ….and I can figure it out now as long as someone will help me". What these teachers appeared to be referring to is computer literacy. They had realised that "once you've learned the tricks with one program those tricks are transferable to another program". The confidence came through knowing that they were "able to pick up most other things…just given the opportunity". That was seen as the difference between "confidence and proficiency". Maybe, though, it was the difference between computer literacy or fluency and skill. With a certain level of literacy comes confidence.

At this school, as with others, there was a strong sense of communal learning and support. Teachers appeared willing to ask for help and to recognise expertise in others.

Like those in the previous focus group, these teachers would have liked to see increased technology available for student use in their classrooms.

Focus group three

During this focus group, participants spoke of how the value of the laptops had remained centred around their portability and flexibility. As with other teachers interviewed, they had become dependent on their laptops and used them for a range of purposes, particularly administrative, such as planning and assessment. One participant commented that a laptop is "*not a luxury or a comfort, it is a necessity*". This teacher "*really dreads losing it or getting it misplaced*", while another "*can't imagine what [she] would do without one*".

The ability to log into the school network when they get to work and update files automatically appeared to be a key capability for them in promoting use. They reported doing much of their administrative work at home and then bringing it to school the next day. The linking of the laptops with a robust and extensive network appeared to be critical, and in a number of schools a key factor for increasing use was the installation of a wireless network.

These teachers did report using their laptops a lot with their students (as they did in 2005) despite being aware they were not really meant to (although there does seem to have been a change in school policy with support for the use of the laptops in the classroom). As with the previous focus group, at least part of this use with children was related to the ease with which the laptop could become part of the classroom routines. As with other focus groups, these teachers were also concerned over their inability to meet student expectations in terms of the infrastructure available for students. For many of these students, their active use seemed to be largely restricted to once a fortnight in the computer suite. Although there were one or two computers in classrooms these were not seen as adequate or reliable. While the laptops were meeting teacher needs in that "*they're having a huge impact there*" they were not meeting the students': "*the needs of the kids…that's more worrying*".

As alluded to earlier, it may be that raised expectations meant that a certain measure of disillusionment had settled in. While the value of the laptops for administrative and professional work remained, these teachers wanted much more for their students than they had previously, or maybe it would be more accurate to say they were now aware of what was possible. One participant seemed to confirm this when she stated:

> "*but it's frustrating because without the laptops we never would have realised how much we were missing…because there's all these neat things we find on the laptops but we can't use in the classroom…we have to wait for that one slot we've got in the ICT suite*".

Or as another said, the laptops have "*just highlighted…how lacking it is in other areas*". It was not that they wanted to give them back they just "*wanted another ten*". Much of this awareness of the potential of ICT appeared to have arisen, as with the earlier group, through playing with their laptops at home. Home was perceived as a much safer place to play "*if things go wrong*". This was often because there were family members able to help. Learning at home then raised their "*confidence to work with the children*".

As with the earlier groups it seemed that confidence came with a critical level of capacity. These participants also felt this confidence was not related to skill level but was about "*knowing that you can do that, which means you are willing to go out and find more things*" and having the knowledge to "*go through here and open that and you go to there and…*" when you want to do something.

Focus group four

Interestingly, at the fourth focus group, there did not seem to be the same level of confidence and ease reported around the laptops as reported above. While there were reported increases in use and an awareness of the potential of the laptops, these participants still seemed uncertain of their laptops and what they offered or the extent to which they valued them. They also seemed to have less peripheral knowledge about things impacting on laptop use, such as firewalls or the robustness of systems. There was more concern expressed around the potential for things to go wrong.

Need remained a strong driver of learning. For example, one teacher, the literacy coordinator, discussed how valuable the laptop was for her with the level of administration required in her role. All her work for the literacy project was electronic and, as such, the laptop was essential. Another participant reported increased use owing to the special needs of one of her students. Using her laptop and a data projector made it a lot easier for the teacher to meet the needs of this student. This was a very specific use, which reinforces the idea that often need drives use.

Another participant also reported more general increased use in that she now used her laptop "*all the time…where two years ago [she] couldn't do a thing*". She felt she could now do what "*normal people could always do*" suggesting a low entry skill level. This low skill level appeared to be linked to a low level of confidence with computers generally.

There were also issues around using the laptops in the classroom. One concern centred on classroom management; another on the physical safety of the laptops in the classroom and another on system incompatibilities.

Despite these concerns, as with other groups, the convenience of the laptops was a critical factor in their use. There were some for whom the cost-benefit equation still meant that the effort to change, for example, from tried and true planning books to electronic media, was too great.

Focus group five

This final school was reportedly very well resourced and appeared to have a strong culture of collegiality and professional learning. Reported laptop use was high across all participants and apparently school wide. The range of uses mentioned was diverse. The group were clear about what had enabled this level of use across the school and listed three factors: school leadership, school infrastructure and ongoing professional development and support. With respect to the first factor, the principal had communicated to them the expectation that they would learn and had provided the tools they required. With regard to the second, the school was well resourced with computers and laptops for student use (16 laptops on two Computers on Wheels (CoWs) and a well set up media suite); digital cameras in every classroom; projectors and a robust server which was well supported. In addition, things were repaired immediately. Finally, as well as external professional development there was internal support provided through key staff and a strong culture of professional learning.

Focus groups on barriers to use

Focus groups were held at only four of the case-study schools to discuss the barriers to laptop use. We had asked that the teachers included were ones whose laptop use was limited, either in terms of level of use or breadth of nature of use. However, in one school this was problematic as the teachers in this school all appear to be relatively high users of their laptops.

The nature of participants and of responses varied greatly between the groups. Therefore, each focus group is discussed separately before drawing some general conclusions.

Focus group one

In the first focus group three teachers were involved. These teachers all had many years of teaching experience and would have been in the 55 years plus age group. For them, the central barrier to use appeared to be related to their lack of previous experience with computers. They felt that their entry level, in terms of prior learning, was much lower than their younger colleagues and that, as a result, the training provided had not met their needs sufficiently. One teacher commented that it was "*demoralising*" to have to keep asking for help, particularly as she had always prided herself on being a highly effective and capable teacher more than able to meet the expectations of school leaders and the school community in the past. She, as with the others, was used to "*being on top of everything*" and did not feel sufficiently confident in using the laptop or other computers.

In addition, this group commented that they needed "*a clear purpose*" for using their laptop, which appeared to be determined by whether using the laptop "*is a better way*". One teacher did comment that she did use her laptop "*where there was a need*" and gave the example of showing artwork using a data projector. Indeed, all three teachers did use their laptops, just not as extensively as their peers.

It may be that their expertise as classroom teachers, linked with their entry level of skill, acted as a barrier to their perceiving any real need for their laptops. The reason for this seems to lie, at least partially, in the effort necessary for these teachers to use laptops as opposed to older technologies. As one stated, it is much easier "*to open a book than turn on a computer*".

The perception of the laptops as "*a better way*" is also, perhaps, limited by the length of time they have been teaching and a high trust in more traditional methods built up as a result. This was exemplified by another participant who commented that she preferred to "*handwrite reports*" as they "*are more personal*". As one of them stated they "*have worked and taught without [computers] for a very long time*" and to change that now would require a significant shift in their constructions of good practice.

Expertise as a teacher proved a barrier to laptop use in an interesting way for one of these teachers. Despite the mandated use through management systems, such as reporting and discipline records, this teacher had developed her own systems, which enabled her to avoid the mandated electronic systems. In her opinion, there was no need to "*replace other successful systems with computers*".

To overcome their reportedly low skill level, they felt, would require individual training including step-by-step instructions and detailed notes. This training would certainly raise their skill level and would overcome the first hurdle, which they saw as their very low entry levels and lack of prior expertise compared with younger teachers who had "*always taught with computers*". However, whether it would enable them to see that laptops offered "*a better way*" is less certain.

Focus group two

The second focus group on barriers was substantially different. The teachers spoken to did not perceive any real barriers to use at their school and, indeed, other focus groups, held previously at this school, would seem to suggest that all teachers used their laptop extensively for both professional and classroom activities. With this group, therefore, the focus group centred on what was needed for this level of use to occur across a school.

It would seem that the expertise and awareness of the potential of ICT had, in this school, outgrown the capacity of the laptops currently in use. That issue aside it would appear that there were high levels of use across the school and "*even the most reluctant is now [reportedly] on board*". This shift appears to have been achieved through the work of the teacher leader who felt that it had only been a matter of "*finding the right button*". She commented that this had been achieved primarily through a modelling approach and through the motivation of the students in the class who had taken the teacher with them.

The reported high level of use across the school appeared to be due to a number of related factors. The school was very well resourced, it had a leadership that empowered and supported the teaching staff, there was internal support and coaching readily available and the culture of the school appeared to be one of collegial professional support and deprivatised practice. In addition, the teacher leader appeared to have been instrumental in supporting her colleagues.

Focus group three

The third focus group on barriers was similar to the previous one in that the school was also very well resourced in terms of ICT infrastructure (in fact more so). High levels of use were reported across most of the school. However, at this school, there did appear to be more barriers mentioned than in the previous groups and the staff interviewed in this focus group were not as positive about their laptops. Indeed, there were similarities between them and the first group discussed in that they, too, commented that they used their laptop only when there was a clearly perceived need and when it was easy to do so. They appeared to have some cost-benefit formula that determined their use and was related to the perceived benefit compared with the required effort.

A key barrier appears to be related to the extent to which use of the laptops was bound by rules and conditions designed to protect both the laptops and the school's extensive network. Conversely, this apparently lessened the flexibility and ease of use for teachers. For example, the computers were set up so that only those with administrator rights were able to load software. These were only granted to "*power users*".

The teachers in this school agreed that knowledge and skill was a barrier but they related their skill level to need. That is, they were able to do, or learn to do, what they perceived as necessary and no more. One of the teachers commented that she was able to do everything she wanted to and did not see any need to use the computers more. While she admitted that she "*did not know what she didn't know*" she also felt "*comfortable with where [she] was at*". The issue here does not appear to be skill but the lack of desire to increase capacity. The participants spoke of how "*desperation drives learning*" and teachers "*learn on a need to know basis*".

A final reported barrier was related to how busy the school was and the range of expectations placed on the staff. In this context the laptops are "*one more thing to learn*" and for one participant given they "*do not readily fit into the curriculum*" they were not seen as a "*necessary added extra*" at that time. For this participant "*what is imperative gets done*", a view that seems very similar to that expressed at the first focus group. What is interesting here is the difference between these two schools and the second focus group, where the laptops appeared to be an integral part of everything. The difference appears to be related to school culture and strong leadership promoting and supporting a pedagogy that required the laptops.

Focus group four

At a fourth school only one teacher was interviewed about her use of laptops and the barriers limiting that use. This teacher commented that she had an already highly developed and, in her opinion, effective system for completing her work, which was based around her home computer. She, therefore, felt she had no real need to utilise her laptop. In many ways, this barrier is similar to those expressed at one of the other schools where expert teachers felt their own parallel systems and procedures were the most effective, implying there was little need to change what they had always done.

One of the issues with this, of course, is the need for organisational efficiency and effectiveness as well as individual. For this individual to have all her records and material only on a home computer and not part of an organisational database could have implications for the long term sustainability and effectiveness of the school as a whole. The teacher did comment that the school lead teacher was working to convince her and to assist her to shift to the school system.

6. The situation in 2008

This chapter reports the state of play towards the end of the project in late 2007 and then in 2008, the last year of the study. Responses to the final survey are presented as a snapshot, an indication of the current situation as regards reported laptop use and teacher competence. Material concerning the use of laptops from a more indepth consideration of the second group of three case-study schools is presented here to provide a richer picture of the situation in 2008.

The final survey contained the same questions as previous surveys, plus some additional ones. Comparisons are drawn with 2005 data where appropriate, but it must be remembered that these are snapshots formed from the responses of those who completed questionnaires at the time points in question. These are not data from exactly the same teachers.

Ownership and upkeep of laptops

As respondents to the final survey could have joined the participating schools at any point in the course of the project, we asked how long they had had their laptops. Figure 6.1 provides a graphical summary of their responses. As it shows, the period of time most frequently reported was four years. Overall, 91% (n=172) of the participants reported they had had a laptop for between one and five years.

Figure 6.1: Percentage of respondents reporting number of years with a laptop
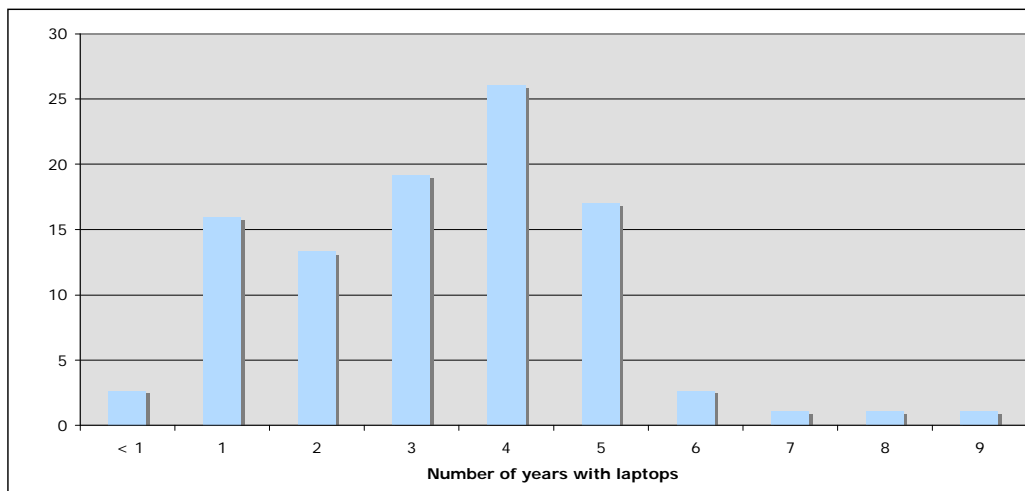
The teachers were also asked whether their laptop had been updated since they had acquired it. Of the 196 respondents, 89% (n=175) reported that it had while the remaining 11% said it had not. The majority of those whose laptops had not been updated had only had them for a year or less.

The third question the teachers were asked was whether the software on their laptops had been expanded since they first got them. Of the 193 respondents who answered this question 67% (n=130) reported that the software had been expanded by at least two or three additional pieces of software (expanded reasonably). More than five additional pieces of software (expanded substantially) was reported by 21% (n=41) of the respondents. These findings suggest that schools were making an effort to ensure that the laptops were kept up to date and that teacher access to a range of software had increased. Of some concern is that 18% (n=34) were unsure whether there had been any changes to the software or not; it may be, however, that they could not remember.

Figure 6.2: Percentage of respondents reporting extent of software update
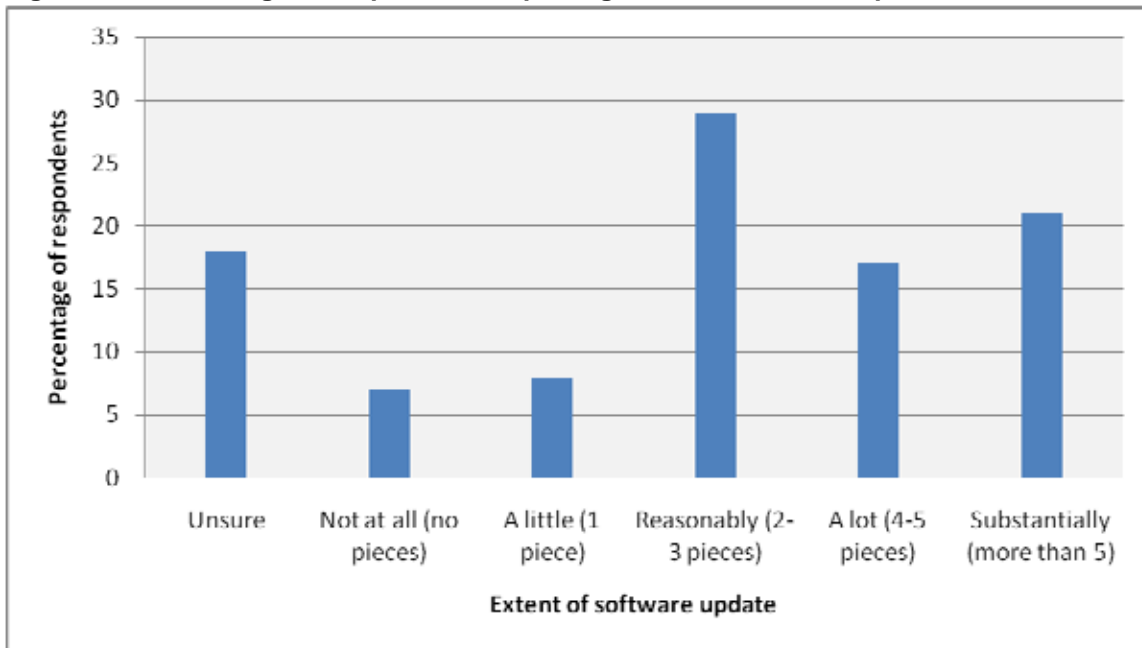
The teachers were asked to name the software that had been added. Over 100 different items were named. The majority of these appear to have been either updates of what was already on their laptops, including system updates, such as Windows, virus protection software, Excel or iPhoto; or operational tools such as Ultranet, Classroom Manager or Nero (CD burning). However, there was also a range of educational software, particularly that offering multimedia tools. Some examples of this are KidsPix, Frog Pond, Comic Life and Picasa.

Laptop use in the classroom

The 2008 survey respondents were asked to provide a description of the ways in which the laptops would be part of their classroom teaching programme in a typical week. All teachers reported multiple uses as part of classroom practice, reflecting the multi-functionality of laptops. These were largely the routine and expected: planning, searching for material on the Internet (or helping students to research), preparing resources, recording assessment and presenting information. There were also the less routine: downloading images from digital cameras and displaying photos taken; playing music; use in reading using interactive disks; reviewing results of assessment *with* the class using e-asTTle, and following the election results. Often teachers reported the laptop being used in connection with a smartboard or a data projector.

The 2008 survey also asked teachers to describe the extent to which the laptops were part of their classroom teaching on a scale of 1 – 5; where 1 indicates that laptops are peripheral and 5 that they are essential. Figure 6.3 graphically summarises their responses. These responses clearly highlight the importance of the laptops in terms of classroom use. Of the 190 respondents to this question only 2% (n=4) said the laptops were a peripheral part of the classroom and that they could do without them easily. Nearly half (46%, n=87) said the laptops played an important part in nearly everything they did while a further 29% (n=55) said they were essential in that they were fully integrated into their classroom teaching.

Figure 6.3: Extent to which the laptops were part of the respondents' classroom teaching
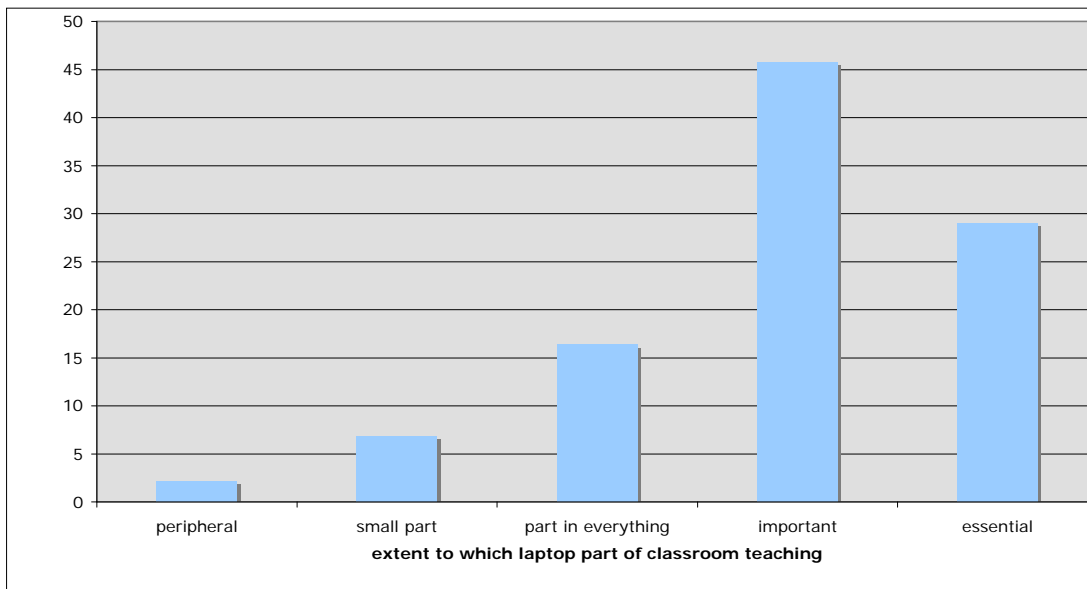
Following this question about the extent to which the laptops were part of their classroom teaching, teachers were asked to consider how different this was to the situation three years ago. Their responses to this question are displayed in Figure 6.4. Of the 168 respondents to this question only 9% (n=15) said there had been no change. Over half (56%, n=93) reported that things were either a lot different or vastly different. This supports the idea that there have been changes in either the extent or nature of use of the laptops in relation to the classroom between 2005 and 2008.

Figure 6.4: Extent to which classroom usage differs from previous twelve months
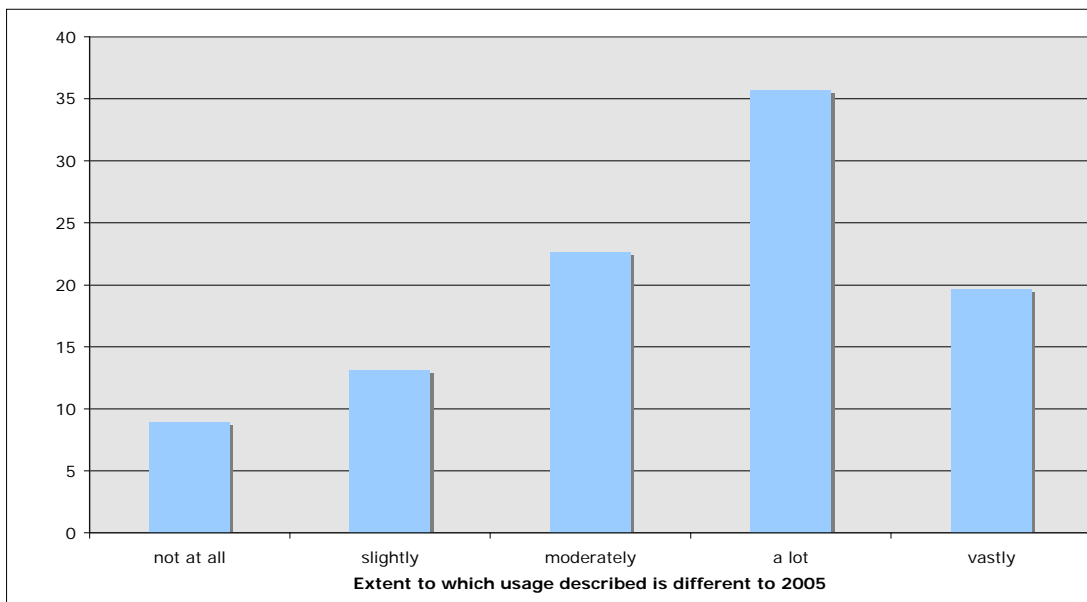
Computer use: Types and purposes

As with the 2005 survey, teachers in 2008 were asked to estimate the number of hours they would use laptops, school desktops and/or home desktops across a range of possible uses. Their responses are summarised below in Table 6.1.

Table 6.1 Reported hours of use of computers for different purposes

	Laptop				School desktop				Home desktop			
	Mn	Min	Max	Sd	Mn	Min	Max	sd	Mn	Min	Max	sd
For pedagogical use	3.37	0	30	5.031	3.01	0	30	5.874	.52	0	14	1.700
For preparation and planning of classroom materials	4.82	0	30	4.909	.81	0	25	2.980	.79	0	10	1.807
For administrative tasks (reporting, attendance, recording marks, communicating with colleagues etc)	3.34	0	20	3.747	.80	0	25	2.662	.40	0	10	1.266
For professional tasks (planning, analysing and interpreting achievement data, commenting on student work online, providing feedback to students)	3.91	0	20	4.120	.62	0	15	1.968	.34	0	6	.977
For professional development and learning (membership of professional communities; online courses; accessing research etc)	1.96	0	20	2.757	.47	0	17	1.849	.56	0	16	1.775
For personal use (anything not work- related)	1.81	0	20	2.449	.13	0	3	.488	2.39	0	30	4.164

Across all areas of use, with the exception of personal use, the laptops were the most commonly used computer type. The most commonly reported area of use for laptops was the preparation and planning of classroom materials, followed by other professional tasks, such as analysing achievement data and providing feedback to students.

There was considerable variation in the reported hours of use for all computer types across all areas. This is indicated by the very high standard deviations. In all cases the standard deviation was higher than the mean.

There was some difference across schools, worthy of a brief comment. A one-way ANOVA showed there were significant differences in laptop use by school (F = 3.92, p < .001). Tukey post hoc tests showed that this was due to one school reporting a mean usage of over 39 hours of laptop use a week. In this school, laptops were an integral part of the professional and classroom life of teachers, although, again, there was large variation.

Similarly, one school reported a significantly higher use of school computers (F = 2.66, p < .01). This school was known to have very powerful, high-end school computers, which may explain the high level of reported use.

The finding that laptops are preferred compared with other types of computer is shown clearly in Figure 6.5, which is a graphical representation of the average number of hours each type of computer was used across all types of use for all respondents. As this figure shows, laptops were used more than either of the desktops, on average, just under 20 hours a week. Paired samples t-tests showed that laptop use is significantly higher than both school and home desktop use (t = 10.96, p < .001 and t = 11.5, p < .001, respectively). As reported earlier, focus group comments indicated that laptops were liked because of their portability and functionality.

The standard deviations associated with average reported laptop use were higher in 2008 than they were in 2005 suggesting something of a polarising effect whereby those using laptops a lot before, had increased this usage. It may also be that those at the other extreme, after an initial push, had reduced use. The data following regarding increase in skill and on impact provide some additional light on this.

Figure 6.5: Mean hours per week of use for each type of computer (2008)
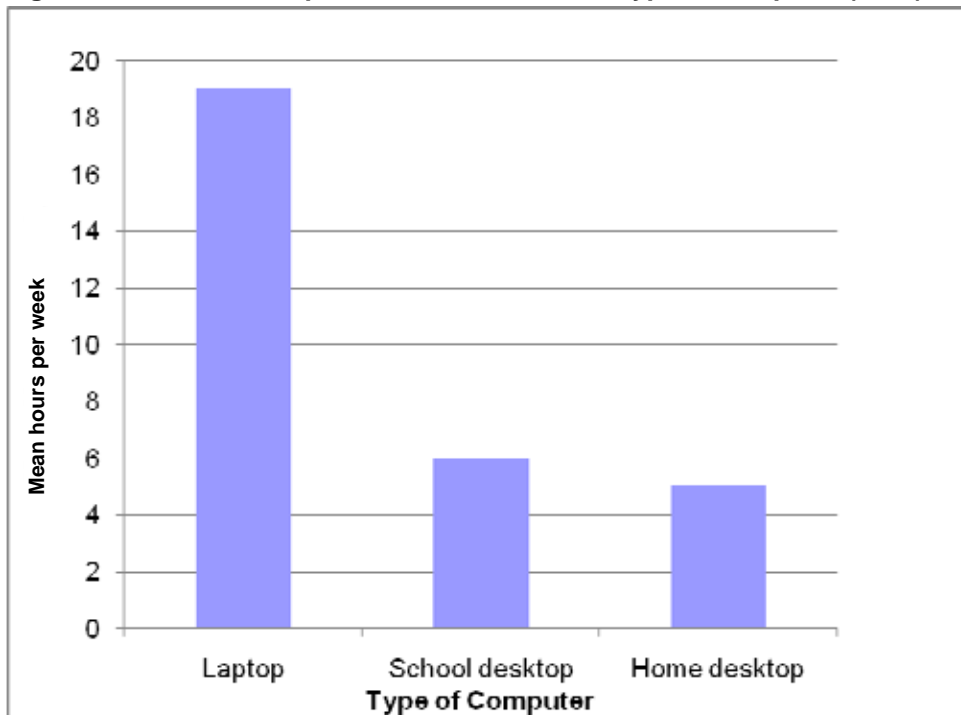
Teachers used computers for some purposes more than for other purposes as Figure 6.6 suggests. Paired samples t-tests were conducted to establish whether the apparent differences in reported time use for different purposes are actually significant. No significant differences for hours of use were shown between the two major types, pedagogical and preparation/presentation purposes (t=.93, p >.05). However, pedagogical and preparation/presentation usage levels are significantly higher than administrative, professional development and personal use, but are not significantly higher than professional use levels (t >3, p <.01). Once again, usage for professional development was significantly lower than all other forms of use (t > 3, p < .01).

Figure 6.6: Mean hours of computer use by type of use (2008)
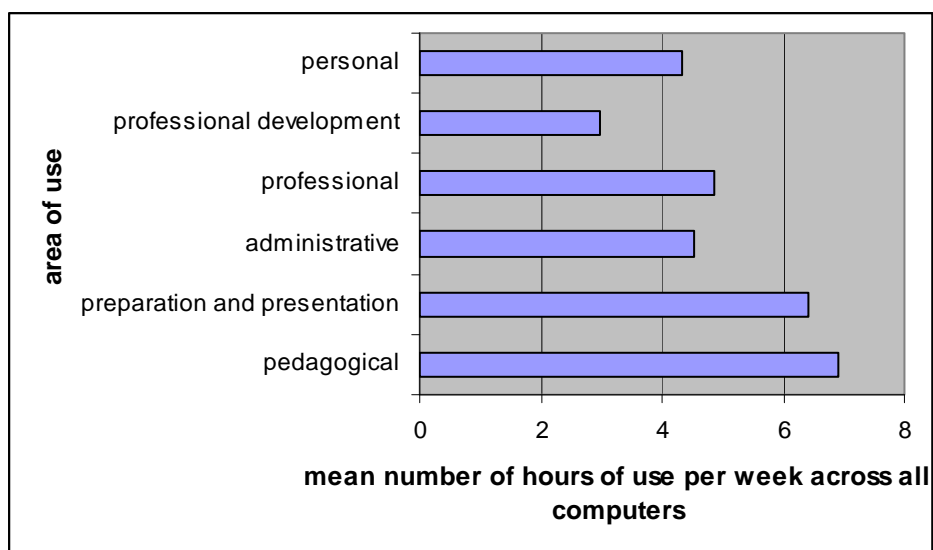
When laptop use for the different purposes is considered, the pattern does change somewhat with preparation/ presentation dominating followed by professional use. That there is less use reported for pedagogical use is not surprising. The laptops are predominately a tool for teacher use although, as is described subsequently, they can be the

hub of much of the teaching and learning that occurs in classrooms. Figure 6.7 illustrates the mean number of hours of laptop use across the various areas of use.

Figure 6.7 Mean hours of laptop use by type of use (2008)
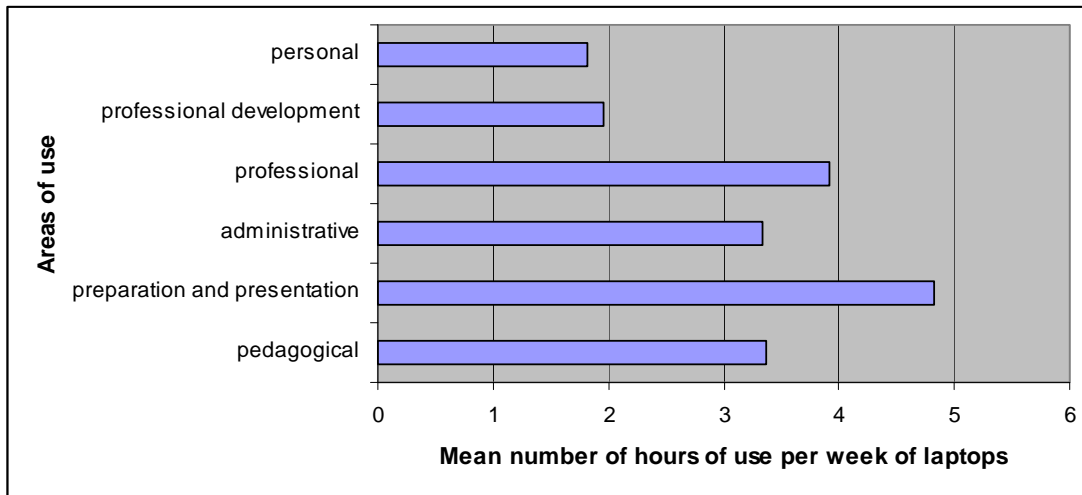
Participant readiness

Teachers were asked about the extent to which their ICT skills had improved over the last year. The scale ran from not at all to extreme improvement. The mean level of improvement reported for their range of skills was 3.71 (SD = 1.078) while for their level of skill it was 3.69 (SD = 1.124) (where 4 is quite a lot). Although a one-way ANOVA indicated that across schools there were significant differences in average reported improvement in level of skill and in range of skills ($F = 2.59$, $p < .01$ and $F = 3.33$, $p < 001$, respectively), post-hoc tests showed no reliable differences.

In 2008, teachers rated their improvement in the range of skills similarly to their improvement in skill level. However, there was a higher level of improvement over the last year reported in 2008, in relation to level of skill, than there had been in 2005 for the preceding six months. Although it needs to be acknowledged there is a longer period of time under consideration we would argue that one could expect the greatest increases to occur in the initial months (when teachers first got their laptops) owing to the novelty of a high-powered new tool. That this was not the case suggests a 'bootstrapping' effect, whereby when you reach a certain level of skill, advancement is more rapid.

In addition, teachers were asked to report the extent to which their confidence in using laptops for certain purposes had increased over the preceding twelve months. Figure 6.8 shows this in graphic form. Most areas approached a rating of 4, representing quite a lot. There was not much difference between areas of use in this reported increase in confidence except that participating in professional learning online is lower and this may simply be that teachers did not engage in such. For a number of areas the increase in confidence, as with level of skill, over the previous year was at a higher level than it had been in 2005 for the preceding six months.

Figure 6.8 Mean levels of reported improvement in confidence by type of use
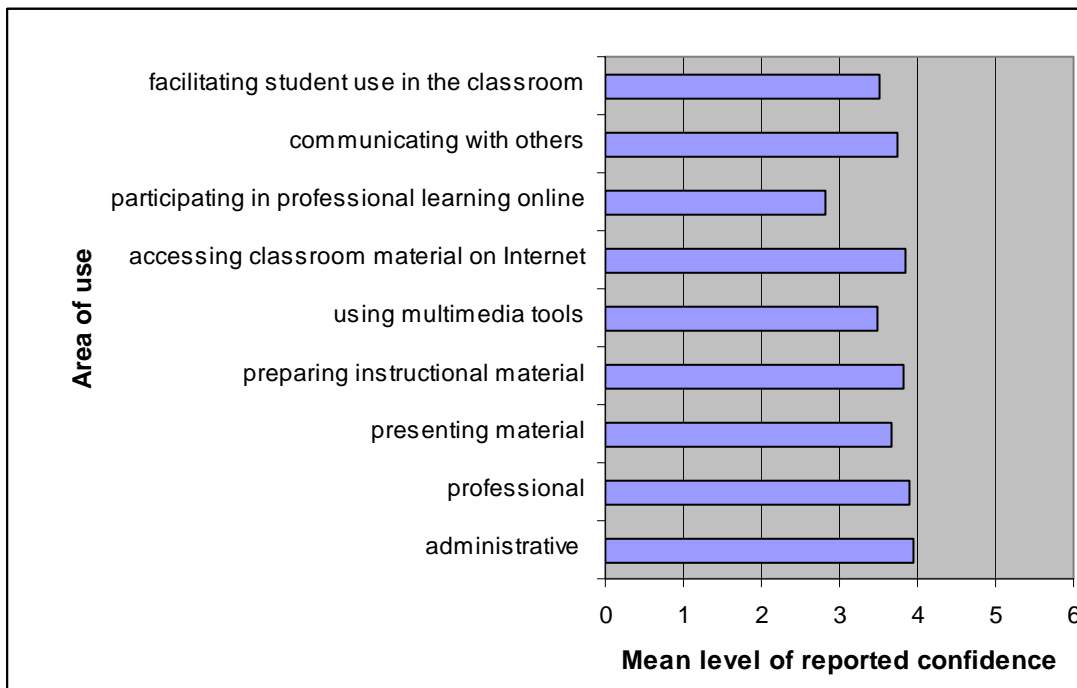
When differences across schools were examined, a pattern emerged of significant differences in average reported improvement for a number of areas; there were differences for all areas, except using multimedia tools. However, the post hoc tests did not reveal a reliable difference for two of the areas where there were significant differences. These were email communication and professional learning online.

For all other areas: administrative tasks, professional tasks, presenting classroom material, preparing classroom material, accessing classroom material and using computers to facilitate student use, it was generally the same two or three schools that were reporting significantly higher improvement than the same one or two lowest reported improvement schools. These two lower schools seemed to have reached a plateau, after an initial push.

Impact of the laptops

As part of the attempt to gauge the impact of the laptop on teachers' professional lives, they were asked to estimate its impact over the preceding 12 months. Figure 6.9 below shows the levels of impact the laptops reportedly had on particular areas. All areas approached or exceeded 4 (quite a lot); administrative tasks, preparation of resources and professional work were the highest rated at 4.5. Although the overall impact of the laptops was rated higher in 2008 than 2005, none of the increases by area was significant.

Figure 6.9: Mean level of reported impact across types of use
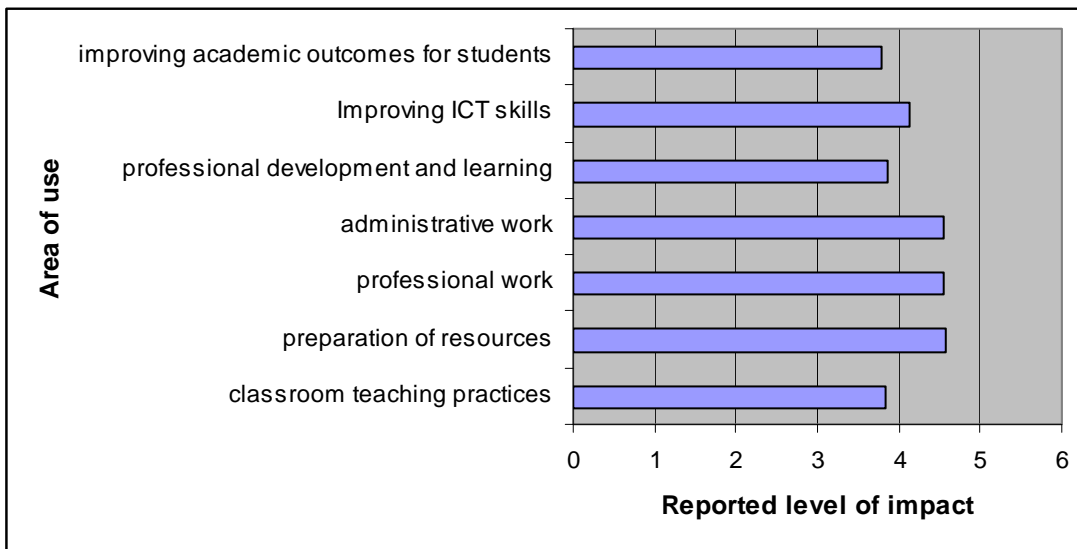
Again, although a series of one-way ANOVAs showed a significant difference between schools in average reported impact of the laptops in all areas, the post hoc tests indicated that only some of these differences were reliable (resource preparation, professional work, administrative work, professional development and academic outcomes). As discussed above, the pattern showed that a small group of schools appeared mostly in the higher than category and a couple of schools featured more frequently in the lower than group.

7. Enriching the picture in 2008

In this section, data are presented from three case-study schools. These data have been grouped to provide evidence of the similarities and differences between the schools and begin with contextual data regarding infrastructure. Then the data are organised thematically. The central ideas and themes, which emerged very early in the initial analysis of surveys and were further consolidated through the more detailed work in focus groups and logs in selected schools, are continued. The overarching notion that is developed is the idea of the laptop as a hub, as the tool at the heart of the work of the teacher.

Infrastructure in each school

In this section we comment briefly on the infrastructure in each school at the time of our visit. The nature of the resources varied between the schools but there was obviously a common strong commitment to providing teachers and students with what they require. In all instances this necessitated additional funding, which was sourced in a variety of ways. Common features were access to the Internet in classrooms and the provision of data projectors either in classrooms or in common spaces such as multimedia rooms. Also common was student access, either through portable computers or the provision of sufficient easily accessible desktops.

As the principal of School 100 said "I'm aware of the research and it is very critical of leaders…they can be the biggest barrier in school development and improvement. So we say 'yes' unless we have to say 'no'…and I can't think of a situation where this has happened." School leaders at this school worked on cutting costs in other areas to achieve what they wanted and in finding new sources of funding.

Similar sentiments were expressed at School 800 where the principal explained that s/he always tried to give the teachers what they needed to do their job. Extensive fundraising and strong support from the board and the parents' association had enabled the school to purchase CoWs (Computers on Wheels) and it was intended to purchase more. It was also intended to provide teachers with better quality digital cameras reflecting the value the school placed on these.

At School 500 the media centre had been provided through external funding and sponsorship. The ICT coordinator worked hard to source the necessary funds to provide what were seen as essentials of learning for the students.

Data projectors and/or interactive whiteboards were a feature at all schools to some extent. These allow the laptops to be used as an interactive resource and extend the functionality of a 'blackboard' considerably. Computer access for students varied across the schools from multimedia units to banks of computers in the classrooms. Computers on wheels were used very successfully in School 800.

In all schools it was apparent that Internet connections in the classrooms were integral, providing access to a wide range of resources for teachers and students. The data projectors in School 500 were very successfully used in conjunction with the Internet to provide students with access to the wider world. Digital cameras were extensively used in School 800 and School 500 to provide students with both records of their activities and authentic situations on which to base their learning.

The laptop as hub

The teacher laptops are an integral part of the infrastructure of each school, particularly in terms of classroom practice. They appear to act as the hub through which a range of teaching and learning activities and other resources are managed and connected. The importance of the laptops and their centrality is evidenced by the wide range of uses they are put to

and the extent to which they play some part in most of the classroom activities we observed. Many of the other pieces of infrastructure, such as the data projectors and the digital cameras, would have minimal use without them.

It also seemed that the innovation and/or enrichment that was occurring in the teaching and learning we observed would not be able to happen without them – or would be very limited in extent and nature. These uses included: providing immediate links to a range of software and other resources; links to other people through email and the Internet; connecting to other infrastructure and extending the classroom through greater access and usability. They also included increased efficiency in planning and preparation as well as in the delivery of lessons.

The centrality of the laptop to teacher practice was captured most clearly when the lead teacher at School 800 described teacher reaction when the laptops were taken in to have Classroom Manager updated so that they could write reports. Seemingly one said, *"Oh! I feel like my fingers have been chopped off"*, and another *"Where's my laptop? I want my laptop"*. As she observed, this gave her a clear indication that everybody was using them. They had been taken away and *"teachers were like, well, I need that"*.

In School 500 there was similar sentiment from one of the interviewed teachers.

> *"This year I think I was without my laptop for a couple of days, without it for a day and I'm really unhappy and I'm at XX's office beating on the door. The same thing with the smartboard ... the smartboard is my link between getting the class to use the laptop together or in groups and without it I'm left with just a whiteboard".*

This teacher used the smartboard very effectively in all her lessons and had extended the student learning experiences considerably as a result of access to the technology. That she felt having a whiteboard was a lesser option reflects how the smartboard had been infused into her practice as a norm not as an added extra.

Teachers often described how their laptop was an entry point into using a variety of other tools and resources and how there was more freedom for them to work from a variety of places and times. One teacher in School 100 stated that s/he did

> *"...all my work at home on my laptop and then I plug it in the network and just copy it to our network files. I've got um, [Smartboard] software on my laptop, so if I want to use something that I've devised then I can do that at home, it enables extended work...spend a lot of time globally looking for stuff...try and bring it back together and synthesise it in to something different. Sometimes you don't need to do that, sometimes it's just there in black and white and that's good...I make it mine... useful for the specific target audience; your classroom".*

A teacher in School 500 described how her/his laptop was central to everything that s/he did

> *"I come into class, I set my laptop up. I do all my planning on the computer as well, [Links to websites] quite often I will go in and find things and I will put them on a computer. I've got folders for everything so I have folders for sharing whole class work ... all the children have their own individual folders as well and there is a class one for photographs, one for things that we've made... it's a very messy sort of storage device...of their learning in a sense."*

S/he described the profound effect a recent server upgrade had had when s/he lost a lot of resources and that even though s/he still had the laptop and smartboard s/he felt a strong sense of loss.

This notion of the laptop as a place for storing material either directly or through the network was frequently mentioned. However, as well as being a storage device, the laptops allowed for retrieval of material in different locations. This was

particularly relevant where classes were working in the media room in some instances and on the CoWs in others, as evidenced in School 800. The laptop often appeared to be the link between different learning locations and the repository of both teacher and student work.

Another example of the capacity of the laptops to sit as an interactive hub was seen at School 800 where the teacher champion showed us how his/her laptop contained everything needed for his/her teaching. All of his/her unit and lesson plans were on the laptop with hyperlinks to other documents and resources. When teaching in the media room this teacher simply plugged the laptop into the network and had the whole lesson ready to screen through the data projector. In this way the laptop provided for preparation and planning, sharing of key lesson resources and the type of delivery notes usually written onto a blackboard.

The laptop was described by a teacher in School 500 as a

> *"very important tool for my teaching and the children's learning more importantly. There's a number of different ICT things that I use, for example, digital cameras, video cameras, just all sorts of different types and that is to sort of gain and get them to learn more about language experiences and then I might take that into their oral language writing programme and even maths and numeracy programmes."*

Also in School 500 another teacher described the use of the smartboard and basically the laptop as the central point of his/her teaching

> *"...like I will talk about writing when we start the lesson off we will do our learning intention, we do our success criteria all together and I've got the note book, the smartboard, I open and make notes together so we have got that information the children and myself to go back and have a look at and then over the week because we don't do writing in isolation it's a plan and works over a week or a week and a half and so that is our base work that we can go back to and see the lesson and revise if we need to."*

This modelling and sharing of learning formed the basis of his/her programme.

When students were researching, working on finding resources, the teacher's laptop often served the function of sharing with everyone a useful website that one of them had found. As explained by a teacher from School 800, *"Often when they are researching I will grab someone else's site and put it up on the data show on my laptop"*.

Leadership

Within each school the senior leadership was highly supportive of their teaching staff and clearly proactive in ensuring the school vision and goals were being met. How this was done and the nature of that leadership did vary but across all was the sense that the key leadership role was seen as facilitating and supporting effective teaching and learning. All three principals were highly approachable and enthusiastic about their school and what was happening in it.

Perhaps the most individual senior leadership was to be seen in School 100. At this school the principal was a visionary educator with strong personal philosophies around teaching and learning. These had come from international research and other literature but were very personally driven within the school. The principal was seen as the source of high level ideas which others then turned into practice. The senior leadership team were highly motivated and supportive of the principal's theories of education as were key members of the staff. One of the teachers described the principal as *"the 'mad genius' at the core of what we do"*.

At School 800 there was a sense that the principal's role was more of facilitator and provider. S/he was the central person through whom decisions were made. S/he was clearly part of the decision-making process but listened to others and was receptive to new ideas. The teacher champion in this school was very strongly supported by the principal.

The School 500 principal was spoken to only briefly but was very knowledgeable of the school, of what was happening within it and of the needs of the students. The impression was that, as with the other principals, s/he was very supportive of what was happening and worked hard to ensure the teachers and students were supported.

Teacher champions

All three schools had very obvious teacher champions who provided models of effective practice for other teachers and who were willing to support their colleagues in their professional practice. Their enthusiasm for the potential of ICT, their understanding of the relative capabilities of their colleagues and their willingness to help others were key features of their leadership, which was both formal (School 500) and informal (Schools 800 and 100).

At School 800 this champion was a classroom teacher who had been specifically employed to lead the ICT integration in the school through modelling and sharing expertise. ICT was fully integrated into her/his own practice to an exceptional level. This was evidenced in her/his use of the laptop as an interactive workbook, which included all her/his planning, resources and delivery notes. What was perhaps the secret to her/his success in motivating others was her/his low key approach and willingness to support in a non-threatening way through the modelling of practice and being a highly skilled communicator. S/he talked of *"taking away the barriers which teachers felt they had"* in terms of using technologies and to set expectations that they could meet. Moreover, s/he considered each teacher's needs and current level in relation to technology use and designed their support accordingly. *"It's about taking a journey to finding out what would be the best way for them"*. In this way s/he was personalising the learning of the teachers to ensure both authenticity and appropriateness.

At School 500 this champion was the ICT coordinator who was also a member of the senior management team. S/he supported teachers both technically and pedagogically and, as with School 800, appeared to work on the belief that you make the small things easy for teachers. An example of making small things easy could be seen in the way s/he took the digital cameras to download pictures for one of the teachers so the lesson could continue in the afternoon. S/he appeared to be readily available for the teachers and able to provide the kind of just-in-time support that is often cited as needed. S/he was also able to extend the teachers and their practice. For example s/he had spoken to one of the teachers about using her video clips of students explaining mathematics as a professional development resource for other teachers. This champion had investigated *"every possible source of funding"* in order to build and maintain resources at the school. Her/his success was evident in the level of infrastructure in the school.

At School 100 there were several champions. These were teachers who were highly motivated and skilled in innovative uses of ICT. They modelled successful practice in their classrooms and were willing to share their knowledge and experience with others. They were fully supported by the senior management team and encouraged to take risks and try things. This latter support is crucial for teacher champions if they are not to feel isolated in their school.

A strong professional learning culture

There was a strong professional learning culture evident in each school. This learning culture was evidenced in the daily conversations of the teachers, in the way they interacted with each other and in the language used when discussing their professional practice. It was also evidenced in the conversations we had with the ICT leaders and the school senior management. In these schools teachers are encouraged to try new things, to take some risks and to learn from each other. The teachers were willing to speak openly about their practice and were not concerned at having observers. In

two cases (School 500 and 100) this was further extended to include an ICTPD contract and *"sharing situations with other schools within our cluster"* was commented on often.

A teacher interviewed at School 100 said that teaching here *"is more like being in a creative industry for me because I don't feel stifled"*. The principal at School 100 also talked of the place of creativity in the school culture describing something akin to a contagion effect. What he described was how *"people did interesting and creative things and people brought in…at this school there is no mandating…it evolves."* A teacher interviewed echoed this, explaining *"like I got onto blogs and wikis really early and I passed that on to S, now S has led pod casting"*.

When we talked to a teacher in School 100 about the potentially overwhelming nature of some of the ideas that the principal (described as the *"creative director"* by one interviewee) might espouse s/he responded that it was *"OK to freak out because there are half of us who are able to help others"*. This school had a formal system of buddy coaches *"that helps to cater for people coming in at different levels"*.

The notion of peer coaches or collegial professional support was also strong in the other schools if not as formalised. At School 800 there was evidence of the modelling of shared learning across the whole school. The teacher leader in ICT explained that

> *"Modelling like; well specifically what was happening is that people would say I really want to do this but I don't know how to do it, so from there it was a journey to find out the best way to do it for them, and generally I'd start that on my own and then pull them in."*

Professional development was also emphasised in these schools. In School 500 one interviewed teacher described all of their staff meetings as professional development and described a notion of internal professional leadership *"…it's not led by management; they tend to be led by people who would be appropriate to lead PD"*. A teacher in School 100 referred to an international conference that s/he attended that had been part of their professional development, saying that the principal *"encourages the right people to go to conferences, rather than just management"*. Learning from this conference had clearly been implemented in this teacher's practice and many of the examples of where the laptop impacts on the teaching and learning experiences of the students in this class could be traced back to this resource.

In all schools there was a sense of both pressure and support for teachers to develop their professional practice and to meet the expectations of the school. The common practices we saw in classrooms, within each school, suggested very clearly expressed expectations about what is taught and how it is taught. They also suggested a sharing of practice across all teachers.

Extending professional practice

In these schools, professional and classroom practice have both been extended through the use of ICT and through the use of the laptops as a hub for other tools as discussed previously. The laptops may have an indirect influence but they are always somewhere in the process of teaching and learning; whether in the planning and preparation of lessons or being utilised as a tool for curriculum delivery in the classroom.

Planning, preparation and delivery

The use of the laptop for planning seemed almost too automatic to warrant mentioning but on questioning it was clear that all teachers used the laptop to plan, some only for longer- term planning and some for day-to-day planning. While the teachers spoken with indicated they used their laptops extensively for planning, several stated that not all teachers in their schools used them to the same degree as they did, but acknowledged that a great deal of progress had been and was continuing to be made.

At School 800, for example, a template, a shell was set up for planning. The teacher leader worked with teachers initially to put their planning onto the laptop "*down to where our literacy and numeracy plans are all on the laptop and you just have to highlight what it is you're teaching now*".

School 500 has an intranet with all the school policies and resources for every single curriculum area where teachers can get activities,

> "*You can get AOs [achievement objectives] just everything you want on all those, the school songs, everything, absolutely everything on there. That's how you can learn it (to use the laptop), just little things like that make a difference…all planning is on there…you can book the computer room…*".

Teachers in School 100 also talked of "having everything at your fingertips…It's all there for you, you know exactly what to do…and it's nice because you can add to lessons every year and make them, better."

Similarly, a teacher at School 500 described how

> "*There are all kinds of teaching examples right throughout the day and for myself I do all my planning on it. I plan everything on it like I use it to hold all my reading planning, writing planning, everything, just everything which is really, really good. At the touch of a key I can see what I've done and what I need to work on it and all those progressions.*"

This teacher used a paper copy when doing group work so that other students could continue to use the laptop and other technology that was attached to it.

Extending and improving practice

Another teacher in School 500 discussed the effect on his/her own practice and how it had been extended through the use of ICT. S/he described her practice as definitely much more interesting for his/her students. S/he had always had a problem with teacher talk and was not aware of how much until s/he "*actually started videotaping and seeing myself butting in and taking over and explaining, explaining and they didn't get it whereas they get a lot when they are watching someone else do it*". This had progressed to where the students themselves were videoed as a pair and then the class listened to it or groups listened to it independently on computers. "*Children are much more interested in listening to themselves or their peers read a story or say what they are learning and what they would see if it was a videotape rather than a teacher*". The further intention was that at some point the children could show their learning through podcasting on the school website and go out into the homes. The students managed this entire process themselves through the teacher's laptop.

Recording observations about students in real time

In both School 800 and 500 we saw examples of teachers recording formative assessments of students in real time. Teachers described how their laptops were on their desks and they recorded observations directly onto them about individual students. It was reported, for example, that during the course of teaching, if a child did not have forward number sequence, the teacher would quickly type this into the maths plan

> "*so the plan just evolves and evolves. Planning becomes much more focused, in fact teaching and learning has because I am able to hone in a lot quicker. …. Whereas in the past, I may have made a mental note of it and maybe remembered next time….*".

At School 500 Year One students spoke into the laptop as they practised positional language. This enabled the teacher to record their oral language as a means of both recording learning and developing an authentic resource to share with

other students. Once the whole class had completed the recording process a PowerPoint was developed that included pictures of each child and them describing where they were (eg, I am under the table).

Enriching and extending learning experiences

In all three schools, ICT was used in diverse and exciting ways to enrich and extend the learning experiences of students. These uses were across the curriculum and ranged from basic numeracy exercises on the Internet through to the use of digital cameras to explain positional language and the use of iPods to access examples of effective speeches. In this section we provide a range of examples of the activities undertaken to highlight the breadth and depth of use of ICT in three different contexts, in three different ways but always to enrich and/or enhance student learning.

Archives of student work

The teacher laptops, along with the school server, served as a repository of student work in all three schools. This repository included electronic portfolios, working documents, and photographic records of activities. Student work was also archived and retained as a resource through the creation of published documents, such as collections of student writing which could be found in the school library or in classrooms.

In School 800 there were examples of students having a permanent record (on CD) of their experiences at camp or of photos sent from a biologist in Antarctica with whom they corresponded when researching Antarctica. They also had very detailed folders containing examples of work completed throughout the year and even very young students displayed a thorough knowledge of what these folders contained and exactly how to retrieve anything contained within them.

In School 100 one teacher discussed the contents and potential use of students' individual blogs. This included students using their blog as a showcase

> *"If they've done a particularly good thing they can direct their next college teachers, employers*
> *to what they were doing when they were eleven…I can use it with my next class and say can we*
> *improve on this. So then again it's the total constructive work and…it's not all my voice".*

Student work is able to be produced professionally and used as a resource through ICT. Teachers talked of the fact "*we had our books*" in the class library. Several across the schools also referred to using work that had been completed either by current students or those from previous years as exemplars for stimulating current work.

At School 500 there were folders of student work on the school intranet. This meant that the teacher could ask Justin, for example, if they could all look at his published piece and it could be used as a reading text. Another classroom teacher in School 500 referred to being able to

> *"store things that the kids can refer to, it is something that we can go back and look at…there*
> *are some things that I know a couple of children are struggling with and so they can go back in*
> *their own time and have a look…but it's all independent".*

In School 100 as much of the students' work was retained on their individual blogs, it could be returned to often by themselves and others, and referred to in different contexts.

In School 800 students had their own multilevel folders, which they could navigate around with ease. These contained a full record of everything that they had used ICT as the medium of delivery for during the year. They also contained work at various stages before final publication that the students could look back to and comment on. The teacher and

students could also use this as a measuring gauge for the progress that had been made in both the use of ICT and academically throughout the year.

Modelling and sharing learning

Laptops and data projectors were often reported as being used to model practice in some way. This could be the teacher modelling how to do something or other students doing so. For example, in one classroom, a new entrant class in School 500, the laptop and data show were used as the teacher modelled sentence structure. A sentence written by a child formed the basis for the teacher's input.

> *"I said to J, can we use your story to all look at it together and so we put J's story up and we read it and see what it says, then we think about what else we could add to it, say to make it a little more interesting…I do try to use it as a way to show them what is expected…"*

Similarly, with older students a teacher at the same school described how s/he copied what students had written into a smart document and then in a workshop was able to use their writing to illustrate ideas, so making it more real for the students. "*They know it (the writing) is going to be shared. It's a bit more personal".*

There were also many examples given to us by both students and teachers of sharing learning, using technology. Year 2 students at School 800, for example, explained how they had to research a planet and indicate what made it possible for people to live there or not. They had to present this as a photo story. A member of the group researching Venus explained how they put pictures from the Magellan space probe into their work. These students were very articulate about what they had learnt despite having no prompts in front of them.

In School 500 the teacher described how she used students to model and share their learning in mathematics. Children who had gained a new concept or worked really well with a particular strategy so that they could explain it clearly, were videotaped doing it. *"The next day for maths the group will watch the video and then hopefully the children can see how we use language to explain what they are learning, what they are doing"*. The benefits are twofold: it increases student confidence, and those children who are struggling with a particular concept in mathematics are seeing it again in 'child-speak' at the same time as they are physically doing it.

In all three schools there were multiple examples of students presenting their work to each other. In many instances different groups covered different topics and then presented their findings to the whole class whether through PowerPoint, booklets or posters. There were also examples of students willingly sharing expertise and skills to support each other.

Anytime resource and support materials for students

Technology in these schools provides students with access to a range of resources and other infrastructural support materials to undertake their class work. The most obvious examples of anytime infrastructural support for students were in School 100 but all three schools had technology highly accessible to students.

In School 100, where the students were of intermediate age, they could use photocopiers, iPods, cameras, editing suites and teacher resources without supervision. Furthermore, they could come into any classroom at any time to work with resources or go to the library when they needed to. We observed more than one student ask a teacher (not their own) if they could use the computers in his/her classroom even when a class was present. We also observed a lesson where students were working in three different locations dependent on the current task.

A different take on the notion of technology providing anytime support described above is that of differentiating and/or personalising learning. All teachers and students interviewed in the case-study schools gave detailed examples of how

the Internet is used in their classrooms to provide material to support teaching and learning. In School 100 students log into an Australian-based maths system (Mathletics) where the classroom teacher sets a course that students can study online at their own level, and at the end of the course they can join a live competition at their own level with students from around the world. Students were asked if they were given the choice of doing that kind of mathematics or having a textbook or worksheet in front of them, which one would they choose? They chose the interactive website stating this was because it involved real people at the same time as learning.

Similarly, at School 800 we observed a Year 3 numeracy lesson where students were working on different online activities dependent on their capability. These activities were graded and students moved through them at the appropriate pace. Of particular note, in this lesson, was the way a student with special needs was able to work alongside the other students but on an activity that catered for her level. This was managed with no apparent difference in the way she was being treated or working.

A teacher in School 100 talked of how students look at the learning intentions for a particular unit or topic then highlight class workshops they need to attend. The teacher timetabled 'workshops' or times with her/him for each learning intention and students chose the ones they needed to be at. "*In any one day there could be ten kids working on completely different learning intentions while I work with a workshop group…. only the kids that need to be there*". One of the examples s/he provided was in the use of iPods to support the teaching of speech making. On the iPods were examples of different kinds of speeches and other resource material for the students. If students felt confident in the work they were doing they could go outside with an iPod and continue working on their speech while other students were in a workshop with the teacher.

A different way of thinking about the use of the web was given by a Year 1 teacher in School 800 who found that accessing material on the internet could provide valuable opportunities for reading mileage and for differentiated activities in terms of this. "*We have found some really good reading Internet sites and they* [the Year 1 students] *just think they are playing computer games and they don't realise what they are doing*". The teacher also mentioned that using different Internet sites for reading enabled her to provide a greater choice of reading activities, appropriate to the level and current needs of the student….. "*Inserting letters into words, alphabet train, word families and blends, talking books*".

Recording experiences

The use of digital cameras to record experiences was seen to promote learning in different ways at the three schools. In writing in School 800, for example, the use of visuals was a memory aid in terms of what actually happened, an aid that helped (in this case Year 1 students) to revisualise the events, placing the students clearly within the context. The use of

> "*real visuals… when the children see themselves in the photo……helps their writing because whilst they've got their memories, if they can physically see the progression [of the Eagle helicopter landing] and the people that spoke to them, it's helping them to process what it is they're actually writing*".

In School 500 a teacher also suggested that the students need visuals to remember experiences.

> "*Last Friday we made muffins and each group had a recipe that they were following. So there were four groups all making a different batch of muffins each and so I gave each group a camera…so they took pictures of the process and then our next step this week is… I will probably work with a group at a time, and we will sequence the pictures and they can highlight, not highlight, write up the key words and that will help them with their next steps in doing procedural writing. They would forget I've given them a little bit of test but basically told them list out what happened, in what order and write out a vocab list*".

Also at School 500 we saw students writing while a PowerPoint was shown through the data projector of their experience. In this instance they had been to the park nearby and "*played*" in the leaves. The students then came back to class and wrote about the experience. The PowerPoint of the actual experience enabled them to be more descriptive and authentic in their writing.

Articulating learning

There are a number of ways in which technology helps to articulate learning in these schools. At the simplest level it captures and supports the reporting of learning. In an integrated studies unit in School 800, Years 7 and 8 students produced posters or brochures on the computers about an environmental issue. However, the medium assumed greater significance because they were reporting in German, a language they were studying that term. The computer medium served as an ideal way to visually capture the information, given the students' level of German. The pictures carried most of the message, supplemented by the core, basic German vocabulary that the students had learnt. With limited linguistic knowledge, they were still able to convey quite sophisticated ideas.

School 500 demonstrated two very different and potentially powerful ways to allow students to both articulate and consolidate learning. The Junior Oral Screening Test (at 5 years 1 month) had consistently shown children entering the school to have an average age, in terms of oral language, of 3 years and 3 months. So, a key goal in the junior school was to raise vocabulary. The new entrant children were working on positional vocabulary as they were known to have difficulty with under, over, on top, in etc. These children had, the previous day, gone into the playground in pairs with a digital camera and taken photos of each other in various stances or positions (largely in, over and under but also upside down!). The camera operator gave instructions about where their partner should be, such as "on top of the monkey bars" or "underneath the tree". They directed their own photo-shoot for five pictures each. When they returned, the teacher connected the camera to her laptop and downloaded the images. The class quickly viewed them and selected the best ones and each selected their favourite one. The next day that photo was available for each child and, in pairs, they talked to each other about it, practising the positional vocabulary. Each had a turn sharing a sentence with the group. Finally, each child recorded the sentence which was then linked to the photo on a PowerPoint so that the whole class could view it and have the positional vocabulary reinforced in a meaningful context. Each slide had the question "Where is….?" and the recorded response was played as if answering. The children were next moving on to writing the sentences.

Experiencing the world outside

Technology allows students to see the world through their own eyes or through the eyes of others. They can view the world as it is through the likes of Google Earth. One teacher at School 500 reported "*rehearsing*" the route of a trip before the children took it so they would be cued as to what they would see on the way to their destination.

Another example of enriching the learning of the students through experiencing the world outside of their usual ambit was in School 500 where news was accessed through Google news pages or the TV1 or TV3 news channels. This was a Years 5 and 6 class. The teacher selected appropriate content to play from the on-demand list. S/he explained that this allowed the children to "see" places and people not part of their own lives. As the teacher further illustrated, one time they were reading about the Golden Gate Bridge and it was "*so easy*" to find a picture of it online to show the students, "*so easy*" to help with "*lots of prior knowledge stuff*". An aim, always in the foreground at this school, was to extend vocabulary and students not only talked about what they were seeing but kept a class book of new words. Different students each day had responsibility for keeping and adding to it and at the end of a week the students worked in the computer lab on some activity planned to incorporate the words encountered that week.

An interesting slant on this notion of seeing the world through your own and others' eyes was observed in School 800. The principal of this school had made contact with a colleague in Sydney and through this initial contact the decision

was made for a class from each school to work together on a project. Digital cameras were used at each school to record the everyday life of a 'kiwi' and swap this with a 'kangaroo' (that was actually a crocodile called Bindi, after Bindi Irwin, the students informed us). The kiwi and the Australian counterpart were stuffed toys. Their experiences were recorded on digital cameras as students took turns to take both camera and toy home. The experiences in the respective contexts (Auckland and Sydney) were filmed and then written about and exchanged electronically (although the kiwi was sent by parcel post to the other school).

Another example from School 800, of using technology to experience the world, was the use of email to talk with an Antarctic biologist as students worked on a research unit on Antarctica. Seemingly they told her what they knew and she commented and added to their knowledge. The children took a printed copy of an email from the biologist to share at home with their parents, furthering the reach of their learning. It was a focus or a talking point to enable them to talk with adults about what they had learnt. When we interviewed the students, one said "*She sent like a seven page email to us…. I've got the email in my bag*". Clearly, the email and the process had impacted on this student.

Students, in a School 100 classroom, also virtually experienced shopping and living on a budget using online sites. This task required them to plan meals for the week, to look up suitable recipes, to buy ingredients and to stay within a budget, a cross-curricular undertaking.

Extending learning

As already alluded to, in School 500 there was a concerted focus on vocabulary building. In a new entrant classroom, the digital camera and laptop were used to extend the practice of oral storytelling. The teacher reported that after the shared book, s/he previously used to get the children to retell the story orally. But now s/he used photographs of people and actions (they had a large props box in the classroom) to record the story. Then the children "*take the pictures, like creating a story board and put it through Photostory and it speeds up and transitions itself into a little movie*". The children then narrated the movie. Oral language is stimulated as they work together and recall the vocabulary to retell. Also, the notion of sequence is developed.

In School 500 the social skills learning for the year had focused on the notion of respect, in particular, respecting learning and learning respect. One case-study teacher asked his/her different writing groups to take digital cameras around the school and take photos of children who were demonstrating respect to each other. They then brought these pictures back to the classroom

> "*And I have trained some of my children to put them onto the laptop or computer and then we show them as a slide show and then from that we went to our computer suite and we all made up PowerPoints and we did writing as a writing experience as well. We did some drafting and publishing and then the best ones were chosen and then we played them in the theatre*".

Another angle on extending learning, or more accurately ensuring learning, was the idea expressed by a School 100 teacher that students were " getting" how they were going a lot quicker and s/he felt that it was because there was a visual and an aural channel a lot of the time…. "*It's visual as well which is what is really good about the smartboard and the iPods compared to when you are just talking*".

The traditional curriculum objective of delivering an oral presentation was considerably extended by a teacher in School 100. S/he described how students began usually by researching using the Internet, a common occurrence currently. The students generally typed into Word although some preferred to write. However, where students needed to "brush up on certain things" they were able to listen to downloaded podcasts of speeches of famous people (using a site called T Talks) that the teacher put on the iPods. S/he also used a new virtual community called iTunes for educators. These students were able to access models of speeches and not necessarily at their desks or in the classroom. The iPod

Touches meant they could access the internet from the playground or field. At times, if working with a bigger group, the smartboard was used to access the Internet and a particular speech.

Cooperative learning

Interacting by reading and commenting on someone else's writing through a blog was a practice seen in School 100. Blogs, however, also served a broader function of coordinating learning. A teacher showed us the blog site s/he had set up where tasks were posted and where sites were suggested as resources. Students posted their responses to the tasks and peers asked questions "*and then it all goes on….. questions to questions and answers to answers, it's more cooperative, more co-constructivist*". This teacher expressed the belief that blogging enhanced the exchange of ideas in class….. "*giving their opinions, interacting, thinking about what other bloggers are saying*". And, as the posts all come past the teacher, there is the facility to review and assess students' ongoing work and perhaps use the content for an individual conference.

Interviews with students in School 100 reinforced the value of having writing posted so that others can read it and give feedback. Although one confessed it was "*a bit nerve wracking really knowing that people can read what you are writing; it's also good to find out what they think, from another person's perspective*". There was a common belief that the use of technology engages students.

> "*My kids, they love coming to school. Their parents say they get up early: they are at school by 8 o'clock – 90% of my class are here. It's great they love coming to school. It's not because of me: it's because they have all these resources to engage with.*"

Perhaps more tellingly, when asked what they might miss if they were to attend another school, students at School 100 talked of "*getting to interact with other people and things.*" The people featured as well as the technology; in fact the technology facilitated the interactions from the way they spoke.

Enhancing student skill

These schools are keen to enhance and build on the skills that they perceive students to already have, thus they are at the core of their learning. One teacher at School 100 described the school as having an

> "*ICT bias in the best way, we want it to be cutting edge, kids they're all on Bebo, they know about setting up their websites, they all know how to blog, it's becoming a fact of life so part of the major way they're going to be writing is online, um, so it fits in with their interests. Of course the tasks are school orientated [but are built around experiences] that students already have in their out of school lives, thus making it more relevant to them*".

A teacher at School 800 commented that although many of the students had the hardware that they were using at school also at home, there is no one there to show them how to use it and how it can be used in a multitude of different ways. Another at the same school also acknowledged that s/he presumed in some cases that her/his students knew more than they did and gave an example of having to retrace her/his steps and '*teach*' how to send an email. So there seems to be a '*fit*' that teachers are trying to make between constructing relevant learning and enhancing what students already know, or do not know.

Involving students

In all of the case-study schools students were very involved in their learning. Both they and their teachers described normal classroom practice as including regular use of a variety of technologies and activities that involved the students as the decision-makers with the teachers as supporters and developers. The use of the laptop and other technologies supported high-level formative practice, while recording the journey for both student and teacher use.

A teacher in School 100 discussed the fact that his/her students acknowledged that they were not learning in the traditional way, and that some had difficulty coming to grips with this.

> *"One of them literally sat here and said (because I asked them how they wanted to learn at the beginning of the year) 'all I want you to do is give me a textbook, tell me what to finish, and I'll have it done'. Now she's the top mathematician, very bright but she was confusing the fact that she'd got that mathematical ability through that style of teaching or learning. And it wasn't necessarily because she's gone up more this year than she ever has, because she's been let off the leash, she's not confined by the text book".*

A common theme was that students valued their own work more and were proud of the high quality of their completed tasks. This was not to say that 'all' of their work was completed to a 'published' quality. In School 800 one class had a series of books that they had 'hand written', although the cover was produced using ICT. These books had been kept throughout the year and were in the library for others to view.

Meeting school-wide goals for learning

Each of the schools had a clearly articulated vision and set of goals for teaching and learning. These were all quite different in some respects but all focused on meeting the needs of the students in the classrooms. They appear to have been based on the context and culture of the school community and ranged from improving oral language through to enriching learning experiences and implementing a notion of invitational learning. The extent to which this vision was innovative varied greatly, but none was static, that is, practice in each school was shifting and changing in some way from what it had been in the past.

In all the schools the use of ICT was directly related to both the clearly articulated student achievement goals and a clearly articulated philosophy of learning.

This was particularly evident in School 100 where there was a complex interweaving of the notion of invitational learning as a core underpinning principle of learning and instruction in the school, and the pervasive use of technology. There was also an understanding that there was a solid theoretical base behind articulated ideas of student learning and that teachers had to work at it to make the theoretical a practical exercise. As one teacher explained, it is up to teachers "*how we are going to teach practically using these ideas and this technology...*".

We did query whether technology had made invitational learning possible or whether invitational learning had provided an appropriate framework within which to utilise the potential of technology. We did not get a clear response to this question but it would seem that the two were being developed in tandem in many ways and that any attempt to define causality would be meaningless.

Further to this notion of linking ICT to a philosophy of learning, it is also used only where appropriate and for specific learning purposes. It is not an "extra" activity outside of teaching and learning. This was articulated in School 800 where it was explained that ICT is only used where there is a need, "*ICT doesn't sit out on its own: it's part and parcel of our learning...some days it sits out here and other days it sits right at the core*". At this school, ICT appeared to be primarily an enrichment tool, a way of extending the learning experiences of students and making them more authentic. A wide range of activities were undertaken using ICT across the curriculum.

In School 500 the ICT coordinator reported that teachers were becoming discerning about what programmes they were using, there was more of the why and how they can be used to support learning, "*yes it is difficult because you see something and you are so enthused about trying to get that, but using that in a way that is purposeful is really quite important now*". In another example of purposeful use a teacher from School 100 referred to finding a website that had

interactive activities to reinforce several maths concepts. However, as s/he only required part of the electronic worksheet s/he used the smartboard software to modify it to meet her/his students' needs.

In School 100 one teacher discussed resources found on the Internet, describing them as

> *"not all very deep, there's a lot of just busy work, and I was very aware…you analyse what was busy and what was productive, and is this actually gaming or is it educational game, and what kind of games are the best and which aren't, so it made me think about it".*

There was a common belief in all of the schools that the use of technology engages students and as such it was seen as a valuable tool. This was clearly articulated by a teacher from School 500 in the quote already given above about her/his kids loving coming to school.

Responding to student need

The examples provided in the previous section highlight the similarities between these three schools in the way they have used ICT to enrich and/or enhance student learning. In all instances the student and their learning needs were at the core of what they were doing. Their contexts, however, meant things had a different focus and/or approach.

At School 800 the emphasis appeared to be on enriching the learning experience through the use of different media and the addition of new dimensions. The push-pull effect was obvious at this school with the "*students pushing and the teachers having to know*". A six- and a seven-year-old interviewed were quite clear that they learnt "*some off the computer and some our teacher has been telling us about*". These youngsters used electronic and print sources of information. One said "*Usually when I go home I go on Kids Astronomy…and I get out books about planets*". They were fired up about astronomy; they were able to tell us a number of things they had learnt about the planets (they could name them in order!) and about why the moon "*goes into a banana shape or is only a half one*" and about the fact that in the Milky Way there are "*lots of millions and zillions of stars that nobody can even count them*". One liked the computer because "*when we want to learn about a planet, we just click on it and we go down and it tells us something that we don't know about space*".

At School 500, as already mentioned, there was a clearly identified oral language problem. In this context, technology was being used very purposefully as part of the solution to this problem. This school was a school that admitted to being initially "*technology driven*" but it had worked to a point where technology was seen as a *"tool to make teaching more powerful*". In all of the examples we saw of technology being used, there was some aspect of oral language, whether it was the Year 1 students practising oral language or the Year 3 students explaining mathematics concepts while being recorded. In this way technology use was closely linked to a targeted area of student achievement. The key philosophy was that teaching is empowered through the learner being more engaged and more independent. There was also a belief that students were more likely to "*complete a technology learning task* [than a traditional paper and pencil one] *because they can view their work, review their work and be more involved in the process*".

School 100 is an intermediate school and as such the students are older. At this school technology was being used to extend the core philosophy of invitational learning. This is learning that is personalised and individualised. The underpinning belief is that "*kids will run to school excited about their learning*". The senior management articulated a philosophy of innovation. "*An innovative paradigm, that's what we are on about here. It's about creating knowledge or using knowledge to create your understanding of the world*". The technology and the systems (or the de-systemising and alternative structures that the senior management talked about to enable flexibility) were designed to support such a view of learning. There seemed to be a complex synergy between their view of learning and technology.

Conclusions

In all three schools there were some strong commonalities despite the differences in approach and focus. These could, perhaps, be described as a recipe for success or at least the building blocks of success.

In all three schools the use of ICT was natural and unforced. It was part of a wide range of media and pedagogies employed, where appropriate, to meet student needs and to enrich their learning experiences. It was also ubiquitous in terms of planning and professional work. Each of the schools had a clearly articulated vision for learning. The laptops were an integral part of this ICT infrastructure. In every example we were given of teaching and learning the laptops had had some part to play. In previous data collection when we had focused on the laptops, this had not been made clear. The laptops are so integrated their use is no longer explicitly acknowledged. They are, to a large extent, an invisible part of these teachers' toolboxes.

The learning culture in all three schools was also very apparent. Each of the teachers was willing to talk to us, to share their classrooms in an open and transparent manner. They readily engaged in professional conversations and talked of the support and expertise of their colleagues. Whether informal or formal, peer modelling and coaching was common. We also noticed how these schools saw the chance to be involved in the evaluation as a learning opportunity.

The role of the formal leadership in these schools cannot be understated. Each of the principals was very different in personality and leadership style. Yet there were similarities in the way they supported the staff and facilitated the implementation of the agreed vision. That there were clearly articulated and implemented teaching and learning goals and strategies is a reflection of the coherence across the schools.

As well as the principal there was at least one teacher champion in each school. In only one instance was this as a formal ICT coordinator role. These champions were in all instances highly skilled and innovative practitioners who modelled both best and next practice to their colleagues. Perhaps more importantly, they were also very aware of the capacity of their colleagues, of the need for small steps at a time and the need for collegial support and pressure.

The extent and nature of the infrastructure in each school was very different. Each had obviously been contextualised to fit the school culture and climate and the needs of the students. While the infrastructure at School 100 was extensive, the other two reflected what can be achieved with a carefully constructed plan and pragmatic decision-making. It should be noted, however, that at all three schools the cost of their infrastructure was highlighted and ways of finding extra money had been necessary.

While two of these schools were in high decile areas the third was not. It is important to note this and to realise what can be achieved at any school where there is sufficient will and desire to do so. A focus on meeting the needs of students, of providing them with a variety of opportunities and ways to learn is perhaps the most important ingredient of all.

8. Snapshots in time – 2005 and 2008

In this chapter the responses of those participants who completed surveys in both November 2005 and November 2008 are considered. Differences in the time periods considered by some of the questions in the two surveys (six months in 2005 and twelve months in 2008), mean it is not always possible to make direct comparisons across the two sets of survey data. However, it is possible to compare the two snapshots of the same teachers at different points in time.

There were only 70 participants who met the criterion of completing surveys in both 2005 and 2008. These 70 represent only 17% of the total number of participants who completed at least one of the four surveys administered during the research. The extent to which they are representative of the teachers in the 13 schools that participated is not known. It must be remembered that as they had had their laptops for at least four years, these represent experienced users.

The three areas considered are computer use, participant readiness and impact of the laptops.

Computer use

Figure 8.1 summarises participant responses regarding their average weekly use of the three different types of computers considered for both 2005 and 2008. As it shows, average laptop use for these teachers increased from 15.4 hours per week in 2005 to 23.6 hours per week in 2008. Conversely, the number of hours of school and home desktop use did not change significantly.

Figure 8.1: Overall use of computers by participants over a typical week (hours)
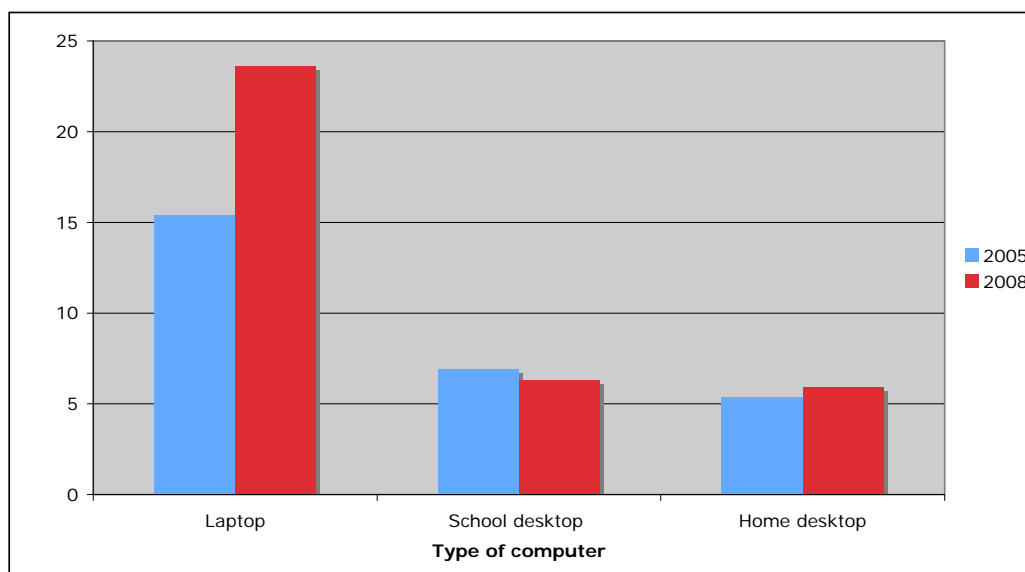
As Figure 8.2 shows, the overall reported use of computers per week for 2008, compared with that reported in 2005, shows an increase across all types of use.

Figure 8.2: Overall levels of use of computers by participants across specific areas of use (hours in a typical week)
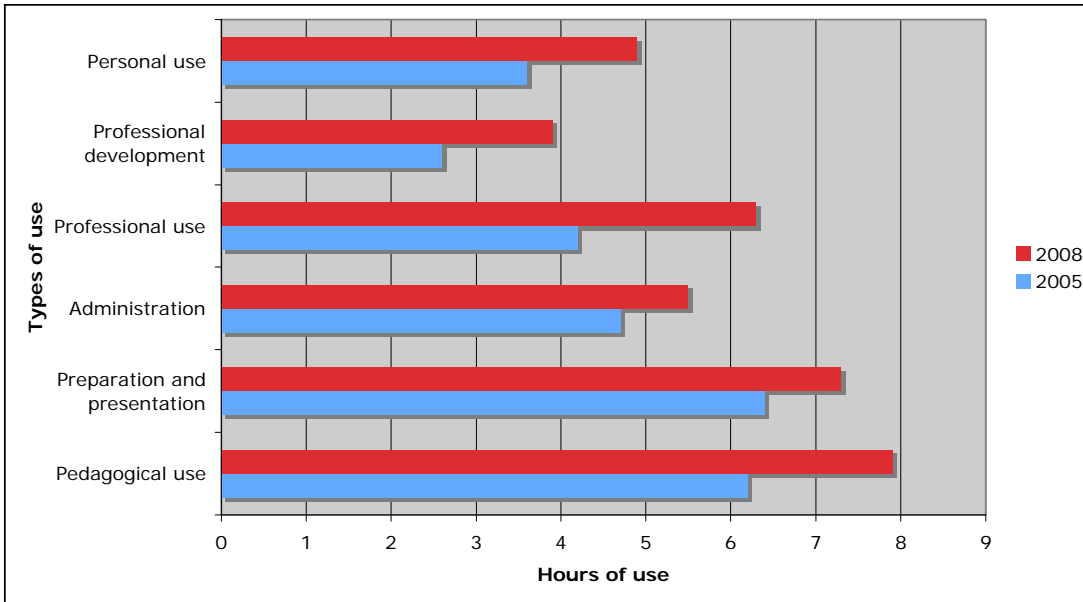

Ongoing learning

In 2008, this group of 70 participants reported that their skills had increased in terms of both range and level over the previous twelve months. These data suggest that the participant teachers had continued to be on a learning curve throughout 2008 building on earlier learnings reported in 2005.

Figure 8.3 highlights that their level of skill improved to a greater extent than their range of skills in 2008. It is likely that by 2008 teachers had largely determined what they wanted to use their laptops for and were becoming more proficient in those chosen usages rather than broadening their skill base. That is, they appear to have been developing deeper rather than wider skills.

Figure 8.3: Reported extent of improvement in both range and level of skill for 2005 and 2008
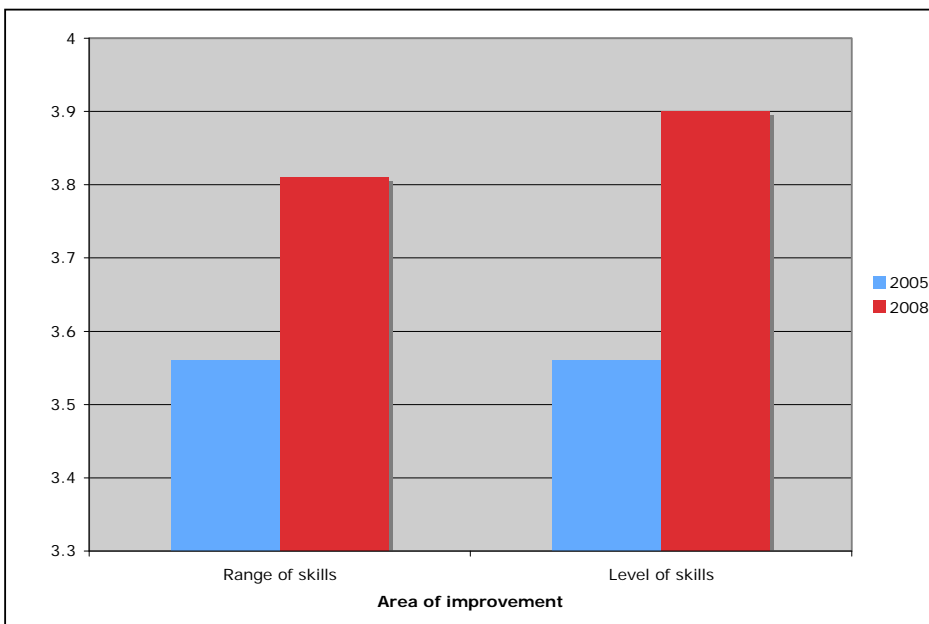
The 2005 and 2008 survey asked participants the extent to which their confidence in using their laptops had increased during the previous six months (2005) or twelve months (2008). In both surveys, participants reported increases in confidence between 3 and 4 (on a six point scale) for all areas except for participating in online professional learning. As with skill, the important implication of these findings is that, in 2008, these teachers were continuing to build on and develop their earlier confidence gains reported in 2005.

Figure 8.4: Extent to which participant confidence increased over the previous year
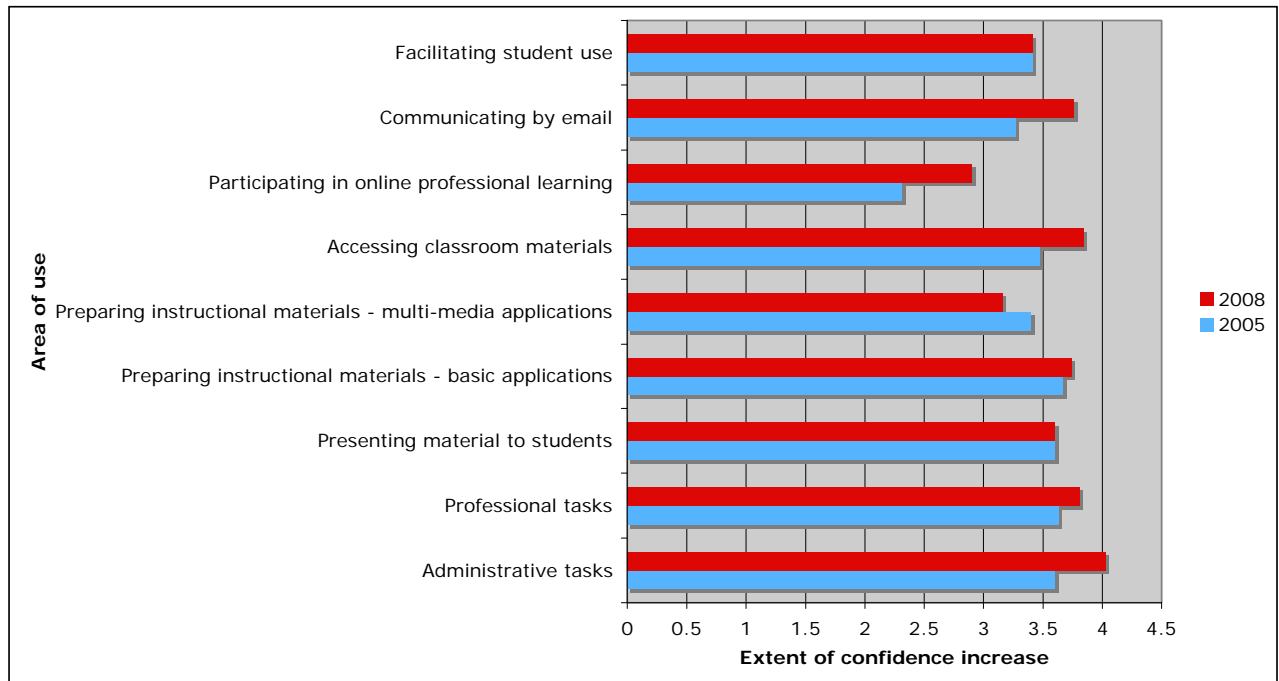
Impact of the laptops

The third area, for which similar snapshots in 2005 and 2008 can be depicted, is the level of reported impact of the laptops on different areas of their professional lives. Figure 8.5 displays the reported levels of impact at each of these time points. At both times the greatest areas of reported impact were resource preparation, administrative work and professional work. Also of interest is that, at both time points, teachers reported only a moderate impact on academic outcomes although there was increased pedagogical use. This is likely to be due to a common definition of academic outcomes as being related to results measured by standardised tests, such as used for numeracy and literacy, rather than the broader learning outcomes generally associated with ICT usage.

Figure 8.5: Level of reported impact on various areas of professional lives of participants
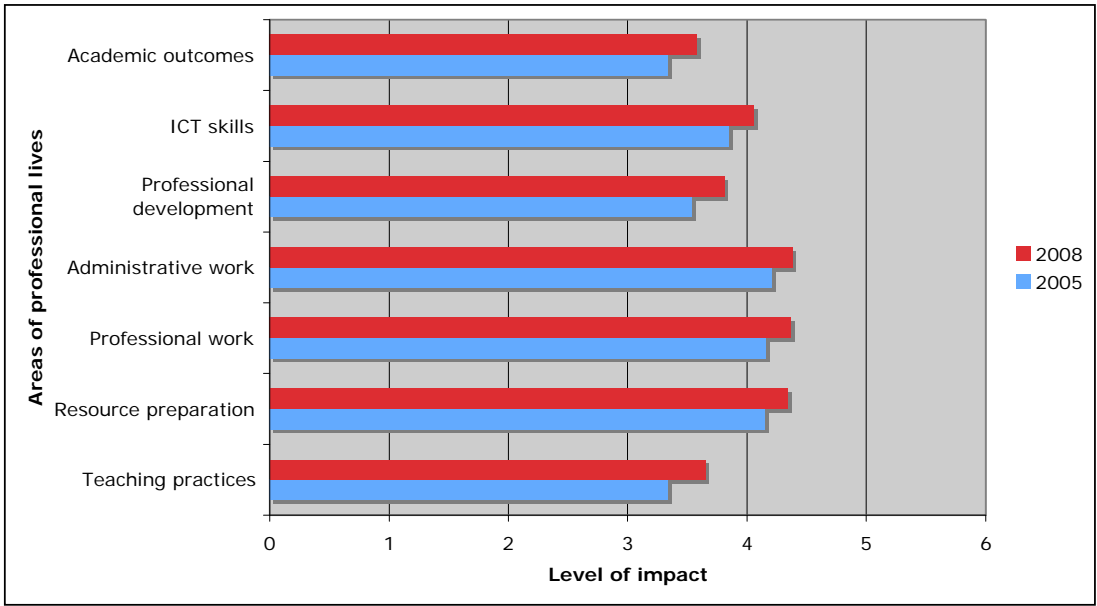
9. Looking Back and Looking Forward

Although this study was focused on the laptops that teachers acquired as part of an operational policy innovation, the report illustrates incidentally a wide range of uses of technology in teaching and learning. What this study showed was that the laptops are critical for the type of innovation and expertise shown in the participating schools, particularly in those that were case studies. The teachers we questioned through surveys and in focus groups and informal interviews expressed the view that they could no longer work without their laptops. We would argue that without them these teachers could not even begin to achieve what they had in terms of the inclusion of ICT in their professional lives and their classrooms. The portability, the access and the links to other resources and infrastructure the laptops have provided has enabled them to extend their professional practice and the learning experiences of their students.

Meeting Ministry goals

The Ministry operational goals for this initiative were clear and very specific. Primarily, the initiative was about raising teacher competency and confidence in using ICT so that greater use was made of ICT across all aspects of teachers' professional lives. Underpinning this were a number of specific goals related to the activities of individual teachers and to school ICT development in general.

Overarching these operational goals are the strategic goals for e-learning related to 21st century learning and the digital age with their strong reform messages (Ward & Parr, 2006).While these goals are not always explicitly stated in operational discourse, they are implicit in such policy and as such can also be seen as drivers for this initiative.

The first operational goal relates to the development of new ICT skills. The teachers reported, in the May 2005 baseline survey, that this was an area where they expected a large amount of impact, suggesting a match with Ministry goals. Findings from the November 2005 survey suggest that, while the impact was not as great as initially expected, there was an overall improvement in teachers' ICT skills over the preceding six months. It would appear that the laptops were offering teachers both more opportunity and more need to develop skills. Laptop portability and increased functionality, compared to other school computers, meant that teachers were using computers more widely than before, particularly in the classroom, and this had meant either the development of new skills or of more advanced skills in other areas. Data from the 2008 survey showed that teachers considered they had made improvements in their skill levels and range of skills in the previous 12 months. Importantly, this continued reported increase in level of skill, suggests that learning was ongoing. While teachers continued to report extending their range of skills, this was not to the same extent as their level of skills, suggesting that they found out early what worked for them and consolidated and enhanced their skill in these areas. The picture that emerges is one of ongoing, cumulative and compounding shifts in teacher skill and use of ICT.

The second goal stated by the Ministry was that teachers would be able to access online professional development and support. The laptops, with their increased portability and the access they afford teachers to such opportunities, certainly had the potential to impact in this area. However, it seems that this was not an area where teachers perceived them as having any great impact. In 2008 the mean level of impact for this area was below 4. This was lower than for the preparation of resources, professional and administrative work or for improving their ICT skills, all of which were above 4. A similar finding was reported in the November 2005 survey. In both instances, 2005 and 2008, the only areas with similar low reported means were classroom teaching practices and academic outcomes for students.

However, these findings have to be interpreted with caution. It may be that teachers struggle to differentiate between their learning and the professional work they do in preparing material for their students. In responding to the professional development question, they may have been thinking of formal professional development, such as distance

learning courses rather than other learning opportunities, such as emails, professional listserves and the Internet where they can access and share ideas and resources with other teachers.

The third goal, relating to teacher capacity, was the creation of, and access to, quality curriculum and assessment resources. Certainly, teachers expected the laptops to have an impact in this area and in November 2005 they reported a relatively large impact. Comments made during the focus groups and reported here suggest that there had been a shift in the type and quality of resource and this had occurred owing, again, to increased functionality and portability.

The second set of Ministry goals were related to the provision of ICT resource for the schools themselves. While neither the baseline nor the follow-up survey dealt with these goals specifically, comments made in the focus group interviews suggested that these goals were also being met in 2005. Teachers spoke of the value of the laptop as an additional resource in their classroom. They also spoke of the value of it for, generally informal, professional learning. For some being able to use their laptop at any time and in any place had motivated them to learn how to do things, in their classroom practice, they had not previously tried. It must be stated though that the majority of teachers already had access to computers and most would have had opportunities to engage with ICT previously. The value the laptops appeared to add in terms of motivation to engage lay in their portability and the additional freedom that such portability provided teachers. This was not about accessing professional development per se but about what they learnt as they "played" on their laptops and discovered new skills, incidentally almost.

Changes in classroom practice

The findings that were, perhaps, the most interesting relate to what appears to have been an unintended, and largely indirect, outcome of the provision of laptops. While the overall Ministry operational objective for the initiative did mention increased use in teaching and learning, the emphasis was apparently more on professional and administrative tasks than pedagogical. However, the findings from both the surveys and the focus groups suggested that the laptops were enabling teachers to change what happens in their classroom and to make greater use of other computers in the school for student learning. In this sense, they were meeting the broader, and more reform-focused, goals of wider strategic policy.

Conclusions

This report has covered a wide range of uses of technology in teaching and learning. The focus of the study was on laptops. What this report has shown is that the Ministry goals for the Laptop Initiative were met. Laptops are critical for the type of innovation and expertise shown in the schools and espoused in strategic discourse related to 21st century and e-learning. In general, teachers felt they could no longer work without their laptops and, arguably, we contend that they could not even begin to achieve what they have without them. The portability, the access and the links to other resources and infrastructure the laptops have provided has enabled them to extend their professional practice and the learning experiences of their students.

However, the extent of growth in skill and use may be bounded. It may be that there was considerable room for improvement initially, although the data looking at the situation before the laptops showed that teachers did report a reasonably high level of use. There may, at various points, be plateaus in utility and, as technology increases in complexity, some teachers who, to date, have made good progress, may flat-line. It may also be that they have satisfied their current needs. Fresh injections of ideas and support may be needed periodically providing a balance between internal, home-grown expertise and injection of specialist skills. An external boost may help to get over the plateau, which may be a function of reaching levels of competence/imagination/risk taking, and it may serve to lessen the effects of innovation weariness. Where there is coherence across pedagogical initiatives and different ICT initiatives like TELA and ICTPD, effects may be strengthened.

References

Becker, H. J. (2001). How Are Teachers Using Computers in Instruction? Paper presented at the 2001 Meeting of the American Educational Research Association.

Cox, M., Abbott, C., Webb, M., Blakeley, B., Beauchamp, T., & Rhodes, V. (2003a). ICT and attainment: A review of the research literature (A report to the DfES No. 17): British Educational Communications and Technology Agency.

Cox, M., Abbott, C., Webb, M., Blakeley, B., Beauchamp, T., & Rhodes, V. (2003b). ICT and pedagogy: A review of the research literature (A report to the DfES No. 18): British Educational Communications and Technology Agency.

Grünbaum, L., Pederson, M., & Nielsen, S. (2004). Study on innovative learning environments in school education. Final report for the European Commission DG Education and Culture: Rambold Management.

Ham, V. (2008). *National trends in the ICTPD school cluster programme 2004 – 2006*. Final report to the Ministry of Education. Christchurch: Core Education.

Hayes, D. N. A. (2007). ICT and Learning: Lessons from Australian Classrooms. Computers and Education, 49, 385-395.

Johnson, M., Kazakov, D., & Svehla, M. (2005). *ICT in schools 2005.* Report prepared for the 2020 Communications Trust. Wellington: BBC Marketing and Social Research.

Lai, K.-W., Pratt, K., & Trewern, A. (2001). Learning with technology: Evaluation of the Otago Secondary Schools Technology Project. Dunedin: The Community Trust of Otago

Loveless, T. (1996). Why aren't computers used more in schools? Educational Policy, 10(4), 448-467.

Ministry of Education. (2006). Enabling the 21st century learner: An e-learning action plan for schools 2006-2010. Wellington: Author.

Ministry of Education, (2005a). TELA Laptops for Teachers Scheme: Information Pack. Wellington: Author.

Ministry of Education. (2005b). Enabling the 21st century learner. Wellington: Author.

Ministry of Education. (2002). Digital Horizons Strategy: Learning through ICT. Wellington: Author.

Ministry of Education. (1998). Interactive Education: An information and communications technologies strategy. Wellington: Author.

Parr, J. & Ward, L. (2005). *Digital opportunities pilot project (2001-2003): Evaluation of the FarNet learning communities in the Far North*. Final report prepared for the Ministry of Education. Wellington: Ministry of Education.

Shakeshaft, C. (1999). Measurement issues with Instructional and Home Learning Technologies. Paper presented at The Secretary's Conference on Educational Technology

Sullivan, C., & Anso, M. (2000). *ICT in Schools 1999*. Report prepared for ITAG (online). Information Technology Advisory Group.

Ward, L. (2006). Putting Policy into Practice: Pedagogical Reform through ICT. Unpublished Doctoral Thesis: University of Auckland

Ward, L., & Parr, J. M. (2006). Using policy as a tool for instructional reform: The case of ICT. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

Ward, L., & Parr, J. M. (2010) Revisiting and reframing use: Implications for the integration of ICT. *Computers and Education.* 59.

Statistics Glossary

Analysis of Variance (ANOVA)	A statistical procedure for deciding if the underlying mean values of several groups are really all the same, or if some are significantly different from others. It uses a calculated value known as an F statistic, which needs to be compared with tabulated 'critical' values.
Significant	The difference between the mean values of two groups is said to be (statistically) significant if the probability of the difference occurring by chance is less than a pre-set value (usually 5%).
Standard deviation	A measure of the variation of a set of numerical values around a central mean value. Usually, about 95% of cases will lie within twice the standard deviation of the mean.
T-test	A statistical procedure for deciding if the underlying mean values of two groups are really the same, or significantly different. It uses a calculated value known as a t statistic, which needs to be compared with tabulated 'critical' values.
Tukey post hoc test	Even if an ANOVA test indicates that group means are not all the same, it does not indicate which ones are different from which others. A 'post hoc' test provides this additional information, and Tukey's test is one of several variants.