Evaluation of the ‘New Initiatives’ in ‘Interactive Education: An Information and Communication Technology (ICT) Strategy for Schools’

What Makes for Effective Teacher Professional Development in ICT?

An Evaluation of the 23 ICTPD School Clusters Programme 1999-2001

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Abstract

This research report is the third of three submitted to the Ministry of Education as part of the Christchurch College of Education's evaluation of three "New Initiatives" announced in the 1998 document *Interactive Education: An Information and Communication Technologies Strategy for Schools.* (Ministry of Education 1998).

The particular ‘New Initiative’ addressed in the report is the so called ‘23 ICTPD School Clusters’ programme of teacher professional development in information and communication technology (ICT). Under this Initiative, 23 clusters of schools from around the country proposed, and were selected to deliver, a programme of teacher development for up to three years in their cluster schools. These ‘ICTPD’ programmes were aimed at increasing teachers’ ICT skills and knowledge, increasing their usage of ICTs for professional and administrative tasks in schools, supporting school policy and planning initiatives related to ICTs, and at increasing the frequency and quality of the classroom usage of ICTs to support teaching and learning.

While operating within a common ‘model’ of directly funding a cluster of schools to collaboratively provide teacher professional development, the 23 ICTPD clusters nevertheless varied considerably in the ways in which they operationalised and conducted their professional development programmes, and indeed in the particular goals and outcomes they each emphasised in their implementation.

Overall, the cluster models were found to be effective in achieving their stated goals, especially those which related to increasing teachers’ administrative and general professional use of ICTs, to increasing teachers’ competence and confidence as users of a range of ICTs and, where it had been a focus of the programme’s implementation, to increasing their understandings about the place and role of ICTs in teaching and learning. For most of the participating teachers, especially those who were actively engaged in the professional development programmes for an extended period of time, ICTs become a regular part of their pool of teaching/learning strategies and a reasonably frequent aspect of their classroom routines.

At the end of the project many teachers were still concerned that the need for continued professional development was likely to be ongoing, well beyond the programme itself, and many were still coming to grips with a number of issues related to the educational quality or worth of their students’ use of ICTs for learning, and to the complex pedagogical process of turning quantitatively ‘greater’ use also into qualitatively ‘better’ use.
1. Executive Summary

This research report is the third of three submitted to the Ministry of Education as part of an evaluation of the so-called 'New Initiatives' announced in the 1998 document *Interactive Education: A National Strategy for Information and Communication Technologies in Schools* (Ministry of Education 1998). The 'New Initiatives' were:

1. The Principals First: First Principles programme of professional development in ICT for school principals.
2. The Online Resource Centre, subsequently entitled Te Kete Ipurangi (TKI).
3. The 23 ICTPD School Clusters programme of professional development for teachers in ICT.

The purpose of the study reported here was to evaluate the 23 ICTPD School Clusters programme of professional development (PD) for teachers in ICT, as implemented in the period from mid 1999 to the end of 2001. More specifically, the research questions guiding the evaluation were:

1. What were the most effective operational characteristics of the various ‘school cluster’ PD models in meeting stakeholder and participant goals?
2. How effective were the ICTPD cluster programmes in terms of promoting administrative efficiency, policy development and strategic planning for ICT in participating schools?
3. How effective were the ICTPD cluster programmes in increasing teachers’ skills and knowledge related to the educational applications of ICTs, and in increasing classroom usage of ICTs?
4. What has been the educational worth or value to students of the ICT-based learning activities implemented by participating teachers in their classrooms during the course of the ICTPD programme?

The main findings of the study with regard to these questions are:

1. Effective school cluster models for professional development in ICT

- Within broadly similar parameters, the goals and objectives pursued by particular clusters, and by particular participants groups within the clusters, were quite varied, as were the modes of operation by which particular clusters and cluster facilitators implemented their professional development programmes.

- Principals and teachers both tended to concentrate on goals related to increasing teachers’ ICT skills and increasing their use of ICTs with students in classrooms. Facilitators were as a group more focussed on objectives related to increasing teachers’ pedagogical understandings and the effective practice of classroom teaching and learning.
Overall, participants reported very high levels of goal achievement as a result of the ICTPD programmes, although there were some role and sector based differences in the extent to which participant groups felt they had achieved particular goals or groups of goals. The particular benefits of the professional development programmes highlighted by teachers were the sharing of professional expertise, increased confidence in relation to ICTs, and developing understandings about both the practice of, and the professional rationale for, teaching and learning with ICTs.

The basic concept of school clustering for the provision of professional development through devolved funding was widely seen as having been very successful. Where difficulties were experienced they were seen more as the result of practical implementation difficulties, often related to the organisational or political dynamics of a cluster than to the concept of clustering in itself.

While there was no single, replicable recipe for teacher professional development that showed itself to be more effective in meeting stakeholder goals than others, there was a fair consensus as to what the ingredients in such a recipe might be. The main factors affecting the extent to which clusters’ PD programmes met stakeholder goals and objectives were:

- The organisational form of the cluster. The sector composition of clusters, the geographical spread of the cluster, the number of schools, or more importantly the number of teachers, involved in the programme, the frequency and timing of professional development events, and the length of time an individual teacher was actively involved in a programme were the most important organisational factors affecting cluster performance.

- Programme content. Programmes which focussed on all three of personal skill development, practical classroom ideas for the use of ICTs, and the development of sound pedagogical or theoretical rationales for the use of ICTs in teaching and learning had more wide ranging, and possibly more long-term, effects than those which focussed more narrowly.

- Professional development strategies. Teachers valued most those professional development strategies which maximised the time available to them to come to grips with ICT skills and uses, and which combined substantial ‘time out’ on the one hand with ongoing access to collegial support on the other. ‘Trickle down’ models appear to have been more successful in relation to the development of skills in schools than in the development of ICT-related pedagogical understandings and professional rationales.

- Social, interpersonal and political dynamics. The extent to which programmes acknowledged and addressed the affective domain needs of teachers in relation to ICT, the terms of employment of the facilitators, and even more importantly, the professional abilities of the facilitators in a teacher-educator role and the extent of commitment, collaboration and understanding shown by senior management in participating schools, all had a significant impact on the operation and effectiveness of the programmes.
Sponsorship and national coordination. Several clusters made effective use of supplementary external sponsorships of various kinds to the benefit of their programmes. The regional and national meetings, workshops and conferences organised and run by the National Coordinator were particularly influential in building the expertise, competence and collegial networks of the cluster facilitators.

2. **ICT uptake in cluster schools: policy, planning and administration**

- There was a marked increase in most participants’ use of ICTs for certain aspects of administration and most aspects of lesson preparation over the period of the ICTPD programme, although this was in many cases only the indirect or partial result of the operation of the ICTPD programmes themselves.

- The extent of increased ICT usage for administrative and lesson preparation purposes tended to be exaggerated in the minds of principals and facilitators, compared to the perception of the teachers themselves.
- Increases in teachers’ use of ICTs for administrative purposes across the clusters were greatest with regard to writing reports for parents, using spreadsheets or databases for assessment and assessment records, and emailing colleagues on administrative matters.

- Increases in teachers’ use of ICTs for lesson preparation across the clusters were greatest with regard to using DTP or word processing packages for the preparation of lesson resources and using the internet to search for lesson ideas and resources.

- While the principals of the participating schools and the programme facilitators both hoped to increase the incidence of policy and planning development on ICT in schools through the ICTPD programmes, these goals were seldom shared by participating teachers, whose focus was clearly on technical upskilling and techniques for the use of ICTs for teaching and learning in classrooms.

- By the end of the project all participating cluster schools had developed strategic plans or policies for ICT, though in relatively few clusters was this the direct or exclusive result of the ICTPD programme operating in the cluster. Primary school principals appear to have been more satisfied with the policy and planning outcomes of the ICTPD programmes than secondary principals.

3. ICT uptake in cluster schools: teachers’ skills, knowledge, attitudes and classroom usage

- As a result of their participation in the ICTPD programme, teachers made significant gains with regard to their understandings of the roles of ICTs in teaching and learning, their personal competence with ICTs, and their confidence about using ICTs with students.

- The ICTPD School Clusters programme directly and positively impacted on the general teaching practices of most of the participating teachers. The great majority of participating teachers reported that the ICTPD programme had increased their effectiveness as teachers, had increased their enthusiasm for teaching, both generally and for using ICTs in particular, and had helped them to offer more varied, motivating and creative teaching/learning activities in their classrooms.

- The main perceived effects on teaching of introducing ICT-based activities into classroom learning programmes were to make teaching more learner centred and more interesting, and to increase teacher stress and workload. Teachers were divided on whether or not incorporating ICT activities made it easier or more difficult to teach their class as a whole, or easier or more difficult to individualise lessons.

- The main concerns participants had at the end of the project about ICTs in teaching and learning were: a continuing frustration with equipment failure and, especially in isolated areas, an unreliable infrastructure, a lack of access to ICTs on the part of their students, a heightened awareness that the need for professional development in the area was likely to continue after the end of the project, and a lack of time in which to undertake such development.
Significant gains in participants’ ICT competence were found across a range of ICT skills and software applications. The greatest gains occurred in relation to the basic operations of computers, graphics applications and the use of the internet. The relatively high rates of no change in relation to teachers’ skills with spreadsheets and databases are probably attributable to the fact that these applications were not emphasised in the content of many PD programmes.

Teachers gained in competence through the ICTPD programmes, but it was probably associated affective domain gains in confidence and the connection of ICT use with their understandings about teaching and learning that primarily determined whether or not such personal competence translated into increased use with students in classes.

Both the confidence and competence gains made as a result of the ICTPD programme were more marked among primary teachers than among secondary teachers, and more marked among female teachers than male teachers.

There was a substantial increase over the period of the contract in the frequency of usage of ICTs in the classrooms of teachers in the ICTPD programmes, but rather less growth in the range of ICTs individual teachers used with classes.

At the beginning of the ICTPD programme almost a third of participants had not used ICTs with classes at all, and just under half had used ICTs with classes ‘only once or twice’. By the end of the PD programme approximately 70% of participating teachers were using ICTs routinely with their classes.

The increase in the frequency of teachers’ use of ICTs for teaching and learning in classrooms was significantly greater for participating primary teachers than for participating secondary teachers. Primary teachers were also more likely than secondary teachers to incorporate a broad range of ICTs in their classroom teaching.

In terms of the Essential Learning Areas, ICTs were used most often in cluster classrooms to support objectives in the Language Learning Area, and least often to support The Arts, Technology and PE/Health. Moreover, in all Learning Areas a core group of generic ICTs were used more often than subject specific or content based ICTs.

By far the most frequently reported and observed usage of ICTs in participating teachers’ classrooms was as a tool or medium for the presentation of work or for information gathering through the Internet. Presentations were sometimes in the form of authored multimedia productions but were mostly in static print form. Other curriculum uses made of ICTs, in order of frequency, were:
- using CD-ROM based references or the Web for information gathering.
- using software such as simulations, spreadsheets, or databases as tools for curriculum related problem solving.
- using content specific programmes for subject specific skill practice or knowledge recall.

As a general rule, the length of time teachers were involved in an ICTPD cluster programme did not significantly affect their growth in terms of acquiring personal ICT skills and competencies. However, the length of time teachers were actively
participating in the ICTPD programmes did significantly affect their level of confidence about using ICTs with classes, and the frequency with which they actually used ICTs with classes.

- A minimum of six months active involvement in an ICTPD programme was apparently necessary in order for an individual teacher to significantly increase the frequency of their classroom use of particular ICTs.

- Teachers who were involved in the ICTPD programmes for the full three years were significantly more confident about classroom use of ICTs, and significantly more likely to increase the frequency of their use of ICTs with classes, compared with those who participated for shorter periods.
4. The educational value of students’ use of ICTs in cluster schools

- For teachers, the main perceived effects on student learning of introducing ICT-based activities into classroom learning programmes were to make learning activities more varied, to increase the range of skills and abilities demonstrated by students, and to increase students’ motivation.

- The great majority of teachers did not believe that ICTs in themselves had led to increased student achievement as measured by formal testing, although almost half of the primary teachers did express the view that incorporating ICT-based activities had increased the amount of higher order thinking demonstrated by children in their classes.

- Teachers tended to judge the value of ICT-based classroom activities in terms of curriculum relevance, cognitive gain, inter-student collaboration, student-centredness, and, especially, student interest/motivation, derived either inherently from the use of ICTs as such, or from an increased variety and range in the skills and abilities exercised. Many also justified such use wholly or partly in its own terms. That is, it was seen as important for students to learn ICT skills for their own sake as well as to use them to support their cognitive and social learning in specific curriculum areas.

- The research team assessed the quality of ICT-based teaching and student learning in the participant teachers’ classrooms in terms of the following indicators:
  - The range of ICTs students used and the extent to which ICT-based learning activities related to particular Curriculum Objectives.
  - The levels of technical (ICT) capability required of, and demonstrated by, students in their use of ICTs.
  - The range of Essential Skills intended and applied in the students’ use of ICTs.
  - The levels of cognitive or creative ability required of, and demonstrated by, students in their use of ICTs.
  - The effectiveness of student collaborations when using ICTs.

- The great majority of ICT-based classroom activities clearly related to curriculum objectives. Most observed and reported activities related the Language Essential Learning Area, followed by Technology, Science, Social Sciences. Maths, Health & PE, and the Arts.

- The technical ICT abilities and operational knowledge of the students observed were generally very high, except in terms of on-screen multi-tasking and more complex transformations of data. However, there was a tendency for students either to know how to operate aspects of a piece of software, or not to know. Few chose to problem solve their way out of technical or operational difficulties, preferring to seek help from the teacher or another, ‘expert’, student.

- In terms of the Essential Skills there was an emphasis on the middle and lower order elements of Communication Skills, Information Skills and Problem Solving Skills in students’ classroom use of ICTs.

- The thinking levels required by, and demonstrated during, ICT-based activities were mostly at the Knowledge, Comprehension and Application levels on Blooms’
Taxonomy of Thinking Skills. Activities at the Application level were as often related to the application of ICT knowledge and skills as to the application of curriculum based principles or skills.

- Generally, student collaborations around the classroom computer were effective, both in terms of task completion and learning benefit. Teachers often had pragmatic (access) reasons for setting up collaborations as well as curriculum reasons. There was also a high proportion of unplanned and informal student collaborations around computers, often focused on aspects of the technical operation of the software.
There was a significant amount of ‘sharing of ignorance’ among students with regard to technical skills, especially in lower primary classes (NE-J2), where student ‘experts’ were often not as ‘expert’ as the teacher expected them to be.

Most of the teachers on the ICTPD programmes had used ICTs little with classes before the programme. Taken as a group, by the end of it they had achieved relatively high levels of ‘incorporation’ of some ICTs into their teaching programmes, but only moderate levels of ‘integration’, if the latter is taken to mean the routine, ubiquitous, authentic, transparent and monitored use of a wide variety of ICTs in contexts which optimise the educative ‘value’ and ‘quality’ of the experience for students.
2. Introduction

The 23 ICTPD School Clusters in the National Strategy for ICT in Schools

Since 1991, successive Governments and many schools in New Zealand have invested large amounts of money on new computer based information and communications technologies (ICTs). Inspiring this investment seem to have been a widely held public perception that developing technological competence has become an essential component of schooling in the ‘information age’, and a widely held professional perception that such new technologies have an important role to play as tools for teaching and learning across most aspects of the school curriculum. Proponents of both imperatives, and not least teachers themselves, have also tended to see the professional development of teachers as a vital factor in achieving such goals, and for the decade after 1991 it has been the policy of successive New Zealand Governments to commit public funds extensively to the provision of professional development programmes for teachers in this area.

For most of that decade the commitment took the form of centrally funding both private and public providers who in turn offered Ministry sanctioned modes of professional development to the schools and teachers in their regions. Through the 1990’s a series of government contracts were let for more extensive and structured programmes. The programmes sponsored were based mostly on an ‘expert consultant’ or ‘advisory’ models of delivery, and were contracted to full time facilitators or consultants in IT, often based in Colleges of Education or Universities, but in a number of instances the contracts were given to commercial PD providers. The basic forms of the programmes were centrally dictated, usually involving support for a teacher or group of teachers over time periods of up to six months, and increasingly with a requirement to concentrate on whole-school or whole department development. These ‘Ministry Contract’ programmes as they became known, were granted on a regional basis for year long programmes, aimed at a systematic coverage of all regions and school levels over time.

These ‘Ministry Contract’ programmes were not the only form of PD available to schools or teachers, however, and nor were they the only source of government funding for such PD. The Ministry continued, for example, to fund Advisory Services around the country to employ IT Advisors whose services were made available to schools at no cost. There was also a notable growth of teacher enrolments in formal papers and courses in educational computing and IT leading to Diplomas and Degrees from Universities and Colleges of Education. Similarly several private sector initiatives were established in which individual schools were resourced to employ full time Resource Teachers to coordinate the IT facilities of the school and to deliver an extensive school-based teacher development programme.

Moreover, in the mid 1990’s the Ministry itself, urged strongly by influential business-based lobby groups, also began looking at both greater direct school ‘ownership’ of their teacher development programmes and the delivery of much more in-service ‘over the Internet’, as potentially more effective ways of funding professional development in IT than the regional advisory programme model which had dominated so far (ITAG, 1998). In 1996, for example, a system of contestable professional development funding was established, known as ‘ITPD’ funding. Schools were encouraged to bid for such funding in groups or as individual schools, although most of them in fact bid as individual schools. In 1997, too, the Ministry
began sponsoring the development of extensive ‘professional development’ websites for various curriculum subjects.

In 1998, however, most of these various initiatives were given some coherence in the announcement of a new national ‘ICT Strategy for Schools’. In terms of its provision for centralised support of teacher professional development in ICT, the new ‘national’ system of funded professional development school cluster announced in the July 1998 budget, and which became the 23 ICTPD School Clusters project in the Strategy, represented a significant departure from the policies and practices of the previous decade. First, the funding was to be devolved directly to schools as both ‘producers and consumers’ of their own PD programmes, rather than being open to tenders from traditional ‘providers’ such as the Colleges of Education Advisory Services who then invited schools or teachers to participate. Secondly, the programmes were only available to groups of schools, which had committed to a ‘clustered’ model of professional development for the benefit of teachers in all the participating schools. Thirdly, the programmes were to be funded over three years for programmes that were to last for three years, much longer than the one year that had been the custom in the past. And fourthly, no particular delivery model was mandated in the contracts themselves. Applicants for ICTPD Cluster funds were expected to develop and propose their own models of delivery, rather than to implement a variation on a predetermined, ministry-approved model as had tended to be the case in the past.

Late in 1998 applications were invited from schools around the country to cluster together to provide these programmes of professional development for teachers. The programmes were to focus on the integration of ICTs into a variety of teachers’ professional practices. The basic structure of the ‘ICTPD Cluster’ programmes was centrally prescribed. A ‘Lead School’, often, but not necessarily, one with a reputation for best practice in the area of ICT use, would form a collaborative partnership with other schools for the provision of up to three years of teacher professional development in those schools. Each cluster was to receive $100,000 per annum in central funding. The funds had to be spent on teacher professional development, and could not be used to defray schools’ hardware, software or infrastructure costs. Beyond that common brief, however, schools were free to group themselves as they wished, and were encouraged to develop and propose their own models and modes of delivering their programmes. Early in 1999, 23 such ‘ICTPD School Clusters’ in various parts of the country were selected under the scheme. The clusters began implementing their programmes in Term 2, 1999.

The aims of the evaluation

This report outlines the findings of an ongoing three year study of the 23 ICTPD School Cluster programmes in action. In doing so it addresses several questions related to the ‘effects’ and ‘effectiveness’ of such collaborative models of professional development in ICT for schools, for participating teachers and for students in classrooms.

It should be noted that the purpose of the evaluation was to outline the effects of the ICTPD cluster initiative as a whole, and not to evaluate specific, individual cluster programmes. The 23 ICTPD School Clusters professional development programmes established in 1999 collectively constitute one ‘New Initiative’ announced in the 1998 National Strategy document. It is true that, within their overarching and shared general purpose of increasing the effective usage of ICTs in teachers’ professional practices, the 23 professional development programmes were in practice very different in the emphasis each gave to
specific goals and objectives, and even more varied in their modes and models of delivery. And with this variance in mind, some of the cluster programmes conducted rigorous self-evaluation and self-monitoring in terms of their own specific objectives and processes. One or two even commissioned outside researchers to conduct a formal evaluation of their particular cluster programme. But this evaluation was not intended to duplicate such studies of the particular effects or effectiveness of particular programmes. Rather it investigated the effectiveness of the cluster initiative in general. How well, and in what ways, did the ‘ICTPD school clusters’ initiative as a whole meet stakeholder and participant objectives? What have been the effects of the initiative as a whole on New Zealand teachers’ understandings of ICT in education, and on teachers’ usage of ICTs in their professional lives? And what has been the quality of teaching and learning with ICTs that has resulted for students in cluster classrooms?
3. Methodology

3.1 Objectives of the Evaluation

The Ministry’s objectives for the national ICT Strategy were stated as being to:

“1. Improve student learning outcomes through the use of ICT.
2. Increase efficiency and effectiveness of teachers and schools by using ICT to enhance curriculum delivery and reduce time spent on administration.
3. Improve the quality of teaching in and leadership of schools through the identification of ICT needs and development of skills.
4. Increase opportunities for schools and businesses to work together in developing a technologically-literate work force. (Ministry of Education, 1998)

As stated in their contracts with the Ministry of Education, the major objectives common to all the ICTPD cluster programmes were to:

“• Provide professional development for teachers in participating schools on the use of ICT for teaching and learning and administration;
• Trial and develop activities that integrate ICT into the teaching and learning process and meet important learning outcomes of the New Zealand Curriculum;
• Explore innovative ways of using ICT in the provision of educational activities for students, teachers and their communities;
• Develop printed and digital resources for dissemination that reflect good practice in the use of ICT in teaching and learning;
• Utilise ICTs to meet a variety of administrative needs;
• Develop systems and strategies for technical support of ICTs;
• Develop integrated policies and sustainable development plans for ICT.” (Cluster Contracts, Schedule A, p1)

As stated in the evaluation contract with the Ministry, the overarching purpose of the evaluation of the ‘23 ICTPD School Clusters’ initiative was “to evaluate how well, and in what ways, the various professional development programmes of the 23 ICTPD school clusters meet the objectives of stakeholders and participants.” In achieving this purpose the evaluators were asked to investigate three core elements with respect to the various professional development programmes in the study. These were:

“1. The effectiveness of the various models of professional development in terms of administrative efficiency, successful policy development and strategic planning for ICT in participating schools.
2. The effects of the various models of professional development employed in the clusters on classroom teaching in participating schools.
3. The effectiveness of ICT-based learning activities developed as a result of the various professional development programmes in helping students achieve the curriculum objectives identified by teachers for the learning activity.”

Research Questions
The study addressed the following core research questions in relation to the ICTPD cluster programmes:
1. What were the most effective operational characteristics of the various ‘school cluster’ PD models in meeting stakeholder and participant goals?

2. How effective were the ICTPD cluster programmes in terms of promoting administrative efficiency, policy development and strategic planning for ICT in participating schools?

3. How effective were the ICTPD cluster programmes in increasing teachers’ skills and knowledge related to the educational applications of ICTs, and in increasing classroom use of ICTs?

4. What has been the educational worth or value to students of the ICT-based learning activities implemented by participating teachers in their classrooms during the course of the ICTPD programme?

3.2 Research Strategy and Data Collection

The general strategy used for the evaluation was a mixed method investigation of the operational nature and in-school effectiveness of the professional development programmes offered in the 23 school clusters over the three years, 1999-2001.

Certain data were gathered from all of the 23 clusters. These included pre- and post surveys of participants, interviews with key stakeholders, participants and Ministry officials, and various official documents such as cluster Proposals and Milestone Reports. The great bulk of operational data on the PD events, and on teachers’ and students’ subsequent use of ICTs in schools and classrooms, however, came from a series of regular interview and observation visits made by the members of the research team to several schools in each of 10 selected ‘case study’ clusters.

Because the evaluation was not commissioned until mid 1999, data collection was focussed on tracing both PD events and school/classroom usage of ICTs from the beginning of Term 4 (October) 1999 through the next two academic years to the end of Term 4 (December) 2001. The researcher observations in the first few terms concentrated on the dynamics of the PD programmes themselves, but from then on observations increasingly focussed on the use of ICTs by students in the classrooms of some of the teachers who were undertaking the PD. As can be seen in Table 1, this aspect of the evaluation involved some 225 stakeholder/participant interviews, observations of 74 professional development sessions and direct observation of 415 ICT-based classroom activities in the 10 selected clusters spread over this two and a half year period.

| Table 1 Number and Chronological Distribution of Interviews and Observations Conducted in Case Study Clusters, 1999-2001 |
|---|---|---|---|---|---|---|---|---|---|
|  | Term 4 | Term 1 | Term 2 | Term 3 | Term 4 | Term 1 | Term 2 | Term 3 | Term 4 | Tot. |
| Stakeholder Interviews | 44 | 21 | 7 | 6 | 12 | 0 | 56 | 40 | 39 | 225 |
| Observations of PD Events | 29 | 19 | 9 | 5 | 3 | 0 | 1 | 7 | 1 | 74 |
| Observations of Classroom Use of ICTs | 0 | 55 | 56 | 134 | 88 | 19 | 29 | 31 | 3 | 415 |
In assessing the relative effectiveness of the various elements of clusters’ PD models we investigated the organisational forms, content and social/instructional dynamics of the PD models and events in the selected ICTPD clusters, focussing on the extent to which those forms, content and social interactions variously reflected (or otherwise) the stated and evolving goals of three main participant/stakeholder groups: the principals in participating schools, the ICT facilitators and programme managers who delivered the professional development, and the teachers who took part.

Data on the effective elements of the cluster ICTPD models were drawn from various cluster documents outlining the aims and progress of the programmes, from a series of interviews in 1999 (and informal discussions frequently thereafter) with the facilitators and managers of all of the 23 clusters, from direct observation of PD events in the 10 case study clusters (mostly in the first 18 months of the programmes), from regular (termly) interviews with managers, facilitators and teachers from the case study clusters, and from retrospective written questionnaires sent to all principals, facilitators and teachers in all clusters at the end of the project.

In assessing the downstream effects of the PD models on teachers and teaching we looked for evidence of change in four primary indicators of uptake and implementation:
- increased teacher understandings of the role of ICTs in teaching and learning.
- improved teacher competence with ICTs.
- increased teacher confidence regarding their professional use of ICTs.
- increased professional and classroom usage of ICTs

Data on uptake and implementation were drawn from the extensive pre- and post-programme surveys of all participants from all the clusters, triangulated against the transcripts of regular (termly) interviews with a sample of 180 teachers, facilitators and managers from the 10 ‘case study’ clusters, completed observation schedules from the research team’s regular (termly) observations in the classrooms of those teachers, and the clusters’ own Proposals and Milestone Reports to the Ministry of Education.

In assessing the quality of concurrent or subsequent ICT-based teaching and student learning in the participant teachers’ classrooms we looked at six core indicators of value:
- The range and Curriculum relevance of the ICT-based learning activities undertaken by students.
- The levels of technical (ICT) capability required of, and demonstrated by, students in their use of ICTs.
- The range of Essential Skills intended and applied in the students’ use of ICTs.
- The levels of cognitive or creative ability required of, and demonstrated by, students in their use of ICTs.
- The effectiveness of student collaboration in their use of ICTs.
- The extent to which the use of ICTs was ‘integrated’ into classroom programmes and practices.

Most of the data relating to indicators of educational value in students’ use of ICTs came from direct observation by the research team of 415 ICT-based activities undertaken by students in the classrooms of 150 teachers in the 10 ‘case study’ clusters over the school years 2000 and 2001. Additional, triangulating, data on ‘value’ came from the transcripts of the termly interviews with teachers in the 10 ‘case study’ clusters whose students were
observed, and from responses to specific items in the pre- and post-project surveys of teachers, principals and facilitators in all 23 clusters.

Observation instruments and interview schedules for the study were developed and piloted in the latter half of 1999. An Observation Schedule used for the observation of ICT-based teaching/learning activities in classrooms is attached as Appendix 1.

Selection of the ‘case study’ clusters

The 10 ‘case study’ clusters were selected to represent both comparable and contrasting delivery models for professional development in ICT from among the 23 programmes in the project. The ‘cases’ were selected to provide coverage of all key operational features of the various models of professional development being used in the various ICTPD clusters, and to maximise opportunities for cross-case comparisons among models and participant roles in analysis.

Certain elements of the PD models were mandated by the Ministry. These included the basic concept of one or two 'Lead Schools' coordinating a cluster of other schools for development, and the inclusion of curriculum, administrative and policy goals. Beyond that, however, there were a number of potentially significant variations in the operational models proposed by the different clusters which determined their suitability as 'cases'. An analysis of the Proposals and first Milestone Reports from each of the 23 clusters led to the identification of eleven key characteristics which seemed to vary widely among the clusters’ various professional development ‘models’. Clusters were selected to ensure that at least two examples of both comparable and contrasting cases in each varying characteristic were evaluated.

Characteristics of the cluster PD programmes that varied from cluster to cluster:

1. Whether full time or part time facilitators were employed, and whether these were ‘internal’ appointments (teachers currently on the staff of participating schools), or 'external' appointments of teachers or ICT Advisors from outside the cluster personnel.
2. The extent to which modelling, expertise, and leadership was 'centralised' on the designated 'lead school' or 'distributed' among the participant schools.
3. The extent to which the PD model anticipated a high or low 'trickle-down' effect (eg. from Lead Teacher to teacher, from teacher to teacher, or from school to school) over the period of the project.
4. The amount of fluidity in the composition of the cluster expected over the period of the project. Clusters were characterised as 'enclosed' if they only aimed to provide PD for a fixed number of schools or teachers for the duration of the project, or 'organic' if they proposed to change the school or teacher cohorts as the project progressed.
5. The sector composition of the school groupings established, especially the types of school (Primary, Intermediate, Secondary) in the cluster. ‘Vertical’ clusters included secondary, primary and intermediate schools, and 'horizontal' clusters were comprised of just primary schools, or just secondary schools.
6. The cluster’s geographical catchment. Schools were sometimes drawn from a restricted 'local' geographical area such as a specific town or even suburb, or they might be selected from a larger group of schools spread over a wider region.
7. The number of schools/teachers in the cluster programme.
8. The rural-urban mix of schools in the cluster.
9. The level of expectation on teachers to participate. In some cases whole staffs were required to take part, in others teachers joined on a voluntary basis.
10. The balance of emphasis in PD events within each programme among the development of ICT skills of teachers, the integration of ICT into classroom teaching programmes, the improvement of administrative efficiency, and the development of policy planning strategies for schools.
11. The particular strategies, techniques and processes used to provide support and guidance for teachers. This included the amount of teacher release time or withdrawal given for PD events, the use of sites within the school or outside the schools for PD events, the androgogical techniques or approach of the facilitator within PD events, the timing and duration of PD events, the amount and nature of the in-class support provided, and so on.

In addition, some clusters offered unique features or objectives that were not apparent in other clusters. Examples of such clusters include the Te Ara Rima focus on Maori immersion programmes, the Cantatech focus on distance delivery for rural secondary students, and the special ‘research project’ on an electronic reporting system in the Porirua school cluster. Only the Maori immersion schools cluster was felt to justify its selection as a case predominantly on the basis of providing a ‘unique’ feature. As the cluster schools were all Maori Immersion, some special considerations were necessary in setting up the research project, especially in terms of communication and information gathering. The researcher conducting the data gathering in this cluster was fluent in Reo and came from the area. All research meetings, observations and interviews operated under the mantle of tikanga Maori. This means karakia, mihimihi, whakawhanaungatanga and so forth were always observed. Tangihanga, whanaungatanga, lack of relievers, and the specialist nature of the curriculum, all served at times to test the organisation of the timetable of researcher observations and school visits in this cluster. Since there was only one cluster of Kura among the 23 clusters, a major point of comparison for this cluster will be a second case study cluster of Kura Kaupapa Maori drawn from the group of 28 clusters which was established in 2001. A separate evaluation report comparing the experiences of these two clusters will be written at the conclusion of the programme of this second cluster in 2003.

With the exception of the Kura cluster, the selection of cases was thus made so as to ensure that at least two comparable and contrasting cases were selected with regard to each of the characteristics above. The Lead Schools in the 10 clusters selected for classroom visits and observations were:
Te Ara Rima (Waikato), St George (Southland), St Albans (Christchurch), Tahatai Coast (Tauranga), Kaitao Intermediate (Rotorua), Fendalton (Christchurch), Karori West (Wellington), Papatoetoe Central (Auckland), Pakuranga College/Farm Cove Intermediate (Auckland), and Paihia (Northland).

Sampling for School Visits and Observations

Within each ‘case study’ cluster the research concentrated on at least three schools, one of which was the designated ‘Lead School’ for that cluster, giving a total of at least 30 schools which were visited on a regular basis. Each ‘case study’ school was visited by a researcher from the evaluation team over the entire 2.5 year period of the project, with each school visit taking at least one full working day. During these visits researchers interviewed...
participating teachers, facilitators and principals, observed professional development events and observed ICT-based teaching/learning activities in classrooms.

The core cohort of teachers in the case studies was comprised of those who began their substantive participation in a professional development programme late in 1999 or early 2000. Some of these teachers from each of 3-4 schools in the cluster were then followed over approximately a two to two and a half year period. This allowed observations of classroom effects for teachers to occur over the ‘natural cycle’ of a complete academic year with one group of learners, as well as longer term follow-up on many of the same teachers with a different group of learners up to a year later. The evaluation plan was to follow at least 6 teachers from the schools in each case study cluster (ie: a minimum of 2-3 teachers per school, giving a total of around 60-80 teachers). In the event it was not practicable to always revisit and observe the same teachers’ classrooms every term, as some moved schools, were absent, were not using ICTs at the time of our visit, and so on. The actual number of teachers whose classrooms were observed, therefore, was rather more than anticipated, at 150. Repeated classroom visits to, and interviews with, about 40 individual teachers were conducted over the course of the project and thus provided field based data on change over time. If a school was only part of the ICTPD programme for the duration of the academic year 2000, our classroom visits still continued in that school during 2001, even though the programme of PD may have formally ended for those teachers or schools.

Teachers taking part in a cluster’s professional development programme had their classroom ICT activities observed and/or were interviewed up to six times from Term 1 2000 to Term 4 2001. The actual timing of visits varied a little depending on the particular exigencies of each cluster, but the typical pattern was for classroom visits to be termly from Term 1 2000 to Term 4 2000, with two further visits, at least one term apart, in the middle or latter parts of 2001 (See Table 1).

Observation instruments and interview schedules used during school visits and the observation of student learning activities were developed and piloted during Terms 3 and 4 of 1999. A copy of this Observation Schedule is attached as Appendix 1.
The ‘Victoria Survey’ and the ‘End-of-Project Surveys’

The pre- and post-project surveys of participants consisted of four surveys conducted in all 23 clusters. Baseline data on teachers’ skills and classroom use of ICTs on entering the programme came from the results of a survey which the clusters themselves conducted early in 1999, prior to the research project being established. The instrument for this was a diagnostic teacher skills and usage questionnaire previously used in Victoria, Australia, which hence became known as the ‘Victoria survey’. Fifteen of the clusters subsequently made the results of their Victoria surveys available to the research team. For its end-of-project data, the research team developed a new questionnaire which expanded many of the items in Victoria survey and added new items from a diagnostic questionnaire developed for the Pakuranga/Farm Cove cluster. This more comprehensive ‘End of Project’ survey of teachers was distributed to all teachers in all clusters in November-December 2001.

Most of the Victoria survey question topics were repeated in the End of Project survey, although as a result of feedback from the clusters the 3-point scale used in the skills section of the Victoria survey was expanded and clearer descriptors of the scales were added. A number of additional items were also included on issues which were not covered by the original survey, but which were felt to be important issues arising from the case study visits over the first year of the project. In order to increase the points of comparison, the End of Project survey asked participants to identify both their pre- and post-project skill levels and classroom ICT experiences, so that these could then be compared with and triangulated against parallel questions in the Victoria survey where such parallels existed and where data were available from the same clusters or teachers.

Table 2 Responses to Victoria and End of Project (EoP) Surveys of Teachers, 1999-2001, by Cluster, by School Sector, by Teaching Experience and by Gender

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<td>26-30yrs</td>
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In all, 1,416 responses from teachers from 15 of the 23 clusters were made available to the research team from the Victoria surveys of 1999. 1,072 responses to the End of Project survey
were received from teachers from all 23 clusters. Because demographic data were not gathered by the Victoria Survey, the End of Project surveys are the data source for all demographic comparisons made in this report. The distribution and basic demographics of teachers responding to the Victoria and End of Project surveys are outlined in Table 2.
As can be seen in Table 2, there was a possible tendency for teachers in the very latter part of their careers, and for males in secondary schools not to respond to the End of Project survey. However, it is very likely that these distributions reflect the demographics of those teachers who took part in the PD programmes rather than any distortion in the distribution of survey respondents compared to the surveyed population. In all important respects it appears that the demographic distribution of the respondent group was similar to that of the teacher population in the PD programmes.

At the end of the project the two other participant groups (school principals and cluster facilitators) were also surveyed for their retrospective views on the ICTPD cluster programmes. Responses were received from 158 principals (141 primary and 17 secondary) in schools from all of the clusters, and from 22 facilitators from 20 of the clusters. This represents just under three quarters of the principals in participating primary and intermediate schools, just over three quarters of principals from participating secondary schools, and over three quarters of the cluster facilitators. Copies of the four survey questionnaires are attached as Appendix 2.
4. The Various 'Models' of Professional Development Operating in the 10 'Case Study' Clusters, 1999-2001

This section outlines the various operational characteristics of the 10 case study cluster programmes as they were implemented over the 2.5 years of the project. The summary below outlines the main variable characteristics of the professional development 'models' in the 10 selected clusters as those models were proposed to the Ministry in 1999. The descriptions that follow provide a general map of the variations that existed in practice in the clusters' organisational structures, goal priorities, androgological strategies employed and content emphases, and any substantial changes that occurred in those operational characteristics over time.

Summary of the Key Operational Characteristics of the 10 'Case Study' Clusters' Professional Development Models as Proposed to the Ministry in 1999.

Cluster A. Horizontal (all primary) clustering of 5 urban schools; organic growth proposed; high external and high internal part time facilitation; distributed leadership through a Key Teacher system; moderate trickle-down (buddy schools); whole staffs involved; high in-class and in-school support, medium withdrawal for PD events; very high curriculum, medium administration, medium policy focus in content.

Cluster B. Horizontal clustering of 4 non-local primary schools (3 urban, 1 rural); high external full time facilitation; distributed leadership; low trickle-down; whole staffs involved; high in-class, high withdrawal (extended 'practicums') components for PD events; very high curriculum and reflective practice, low policy and administration focus in content.

Cluster C. Vertical clustering of 20 small rural schools with low decile ratings and high Maori populations scattered over a wide regional area; high external facilitation by facilitators from Lead School plus one other; high trickle-down through KICTs in an enclosed but large system; centralised leadership; volunteer schools and teachers; very high in-school development component in PD events; high policy, high curriculum and low administration focus in content.

Cluster D. Horizontal primary clustering of 5 local urban schools; high external part time facilitation; centralised leadership; medium-high trickle-down; very high in-school/in-class and medium withdrawal component for PD events; high in-school component in year three; very high curriculum focus (including Bilingual) in content.

Cluster E. Vertical clustering of 6 local suburban schools; high internal part time facilitation; leadership centralised on two Lead Schools; low trickle-down; whole staffs; high in-school, across school (for resource teachers) and withdrawal components in PD events, using a wide variety of strategies; high curriculum, high skills and high policy focus in content.

Cluster F. Horizontal, non-local cluster of 9 primary Maori Immersion schools with an urban-rural mix; full time external facilitation; distributed leadership through Lead Teachers; whole staffs involved on voluntary basis; high in-school, in-class and medium withdrawal focus in PD events; high skills, curriculum (especially language) and administration focus in content.
Cluster G. Horizontal clustering of c.20 regional schools, mostly urban with some rural; high external and internal part time facilitation; leadership centralised on Lead School; low trickle-down; whole staff for lead school only, others voluntary; very high withdrawal, medium in-class balance; high skills, moderate curriculum and administration focus in content.

Cluster H. Horizontal clustering of up to 45 regional primary-intermediate schools with an urban-rural mix; centralised administration based on Lead School; very high internal facilitation leading to high external through development of regional pool of experts; small number of leader schools with very high trickle-down (school & teacher); whole staff in lead schools only; high in-school, low withdrawal components for PD events; high skills and curriculum, medium policy focus in content.

Cluster I. Horizontal clustering of non-local primary schools with an urban-rural mix; very high internal facilitation based on part time facilitators from key schools; high modelling centred on Lead School; organic system of 11 schools per year; moderate to high trickle-down for teachers; proportion of teachers involved was by school decision; very high withdrawal, medium-low in-class components in PD events for key teachers, but the reverse for teachers within each school; high curriculum and moderate skills focus in content.

Cluster J. Horizontal (became vertical) organic clustering of (initially) 9 local suburban schools; high internal part time facilitation based in Lead School; high lead school modelling; whole staffs through moderate trickle down from groups of Lead Teachers; high withdrawal and across-school components in PD events for Lead Teachers, high in-school/in-class support for teachers; high policy, moderate curriculum, low skills focus in content.

The 'Models' in Action

Cluster A

Composition and personnel

The schools in this small metropolitan primary school cluster drew from a wide range of multicultural and socio-economic groups of students. The cluster provided professional development for 70 teachers across 5 schools.

Key Personnel for the cluster included a Project Leader and Project Advisors from a commercial provider who led the cluster through years one and two. Two Facilitators from the Lead School worked together for the first part of year one, after which one left and the other assumed the role of sole facilitator. PD was also provided by two or three Key Teachers from each of four of the five schools who received the bulk of the PD in the first year. The facilitator also acted as Key Teacher for two of the smaller schools. During the three years of the contract, four teachers left Key Teacher positions, one from each of the schools, and all of the three people who wrote and submitted the initial proposal also all moved on to other positions in the first year.

Programme goals
The initial structure for the ICT contract for the cluster was in two parts that would run concurrently: Management/Administration, and Teaching/Learning. This dual focus continued throughout the three years of the programme.

Early in the contract the facilitator and key teachers jointly developed the following vision and belief statement for themselves:

“ICT Team Vision
ICT will be a creative, challenging and integral part of the whole school community.

PD Facilitators Beliefs
• We recognise that teachers have huge commitments apart from ICT. We need to make sure they don’t feel their loads are being added to without seeing the benefits ICT can offer their students.
• We want teachers to take risks, feel confident enough to try new things, to be able to make mistakes and learn from them together.
• We want to encourage the WOW factor by supporting teachers from wherever they are at and celebrating all achievements.
• All users of ICT are learners.
• We will talk about people working smarter not harder, and emphasise the need to set ourselves, teachers, and children up for success.
• We want teachers to understand that using ICT in new creative ways does not have to mean big and flashy, but often small and simple is best. It does not matter what you are using, it is how you use it that counts.
• We believe that effective communication; talking, listening and keeping each other informed is really important. We want to establish an open and collaborative working environment.
• We recognise that when new teachers come into our school we will need to check that they know the systems and procedures in place and that we may need to provide extra support initially.
• We want teachers to have fun!”

Modes of delivery

Professional development in the cluster was implemented on several levels. ‘Key teachers’ were given 7 days release a year to attend meetings with the facilitator, with one extra release day to spend however they liked back in their schools. There were full staff ICT meetings, usually twice a term. The principal of the Lead School, who was also the manager of the cluster programme, met once a term with all the principals. Within each school, the teachers received training from outside people hired to come and deliver short sessions – usually half days – for which teachers were released. This occurred during years one and two of the contract. In 2001 the key teachers took this role on within a buddy system that was put in place within their schools. The format of this buddy system differed from school to school but usually comprised of one key teacher plus between two and four other teachers operating in a syndicate. The facilitator of the cluster, acted as key teacher for the two smaller schools and spent 5 days each term in each of these schools.

Professional development for key teachers initially took place in a commercial company’s ICT training room in the central city, and then in a room in a facility next door to the Lead School. Professional development also took place in the Lead School’s computer suites. In year one, specialists were brought in and teachers were released to take part in this training. A local branch of commercial ICT professional development advisors also offered supplementary skills workshops.
Schools also focused on getting the administration side up and running since this was the other strand of the contract. At one school a key teacher took on the MUSAC system. She was released by the facilitator, who worked with her students on developing a class intranet site, and she worked toward getting test scores into the computer in a way that could be assessed and useful to teachers and administration.

A monthly online e-newsletter was also started and was sent to all teachers so that teaching ideas could be shared. It included website addresses and short descriptions, PowerPoint slide shows that showed the development of entire units, suggestions for people to contact to get lessons on particular subjects, and ICT tips. Practical classroom ideas were also shared informally by staff, in buddy training sessions and in formal ICT staff meetings.

**Programme content**

Reflecting the results of a needs analysis survey conducted in the first Term of the programme there was quite a focus on skill development over the 3 years of the contract. There were in-school sessions on subjects such as PowerPoint, Kidpix and HyperStudio. Outside experts were brought in to give small group sessions to teachers (for example, on file handling basics, e-mail, Internet, Kidpix, Clarisworks, Excel, graphs, editing pictures, and internet searches), and through the buddy system teachers were also able to get additional school-based skills training. The facilitator was also available to all schools, except one which conducted its own PD on skills, to give technical assistance when necessary.

After a focus in year one on teacher skills and on the key teachers, the emphasis of the programme changed to include a greater emphasis on classroom usage and ideas, and then in year three on student learning. A statement clearly showed the programme’s changing emphasis on the infrastructure - skills - pedagogy continuum.

“To date the emphasis has been on developing the technical skills and exploring some successful strategies that support ICT enhanced learning. The focus for 2001 then will be to focus on the communication aspect of ICT. This will incorporate the development of intranets and extranets in providing “scaffolding” for teaching and learning as well as flexible communication within the school community.

Pedagogical Support. We are now at the stage in our development where strategies for successful integration of the ICT can become a focus. By emphasising the creation of effective learning environments and focusing on how our students are learning the ICT will contribute to enhance that learning. The emphasis will gradually move away from the physical hardware and onto how it is being used to support the metacognitive processing for learning to occur.” (Memo to Boards of Trustees, 2000)

The cluster facilitators had a fairly low key approach to pedagogical theory in relation to ICT in their PD programme. Teachers were given some readings for discussion in staff meetings. For example, in Term 4 of the first year a talk was given by the facilitator and a key teacher using resources from Jamie McKenzie’s website From Now On. At another school PD meeting teachers read and discussed a review of research on multimedia. Less formally, the facilitator often modelled lessons for the teachers and included in subsequent discussion issues of underlying pedagogical theory. The Key Teacher meetings were basically planning/strategy meetings but they did include some skill and concept
development. One, for example, was a general sharing session in the morning including planning for the development of resources for the TKI website, and in the afternoon there were two talks: one on action research and the other on web design. Although learning theory/pedagogy was not a particular or overtly structured focus for the cluster, teachers at the end of the programme seemed to be including this in their discourse and planning with ICTs. For example, when teachers talked about ICT in end of project interviews they also mentioned things like “just in time learning”, “inquiry approaches”, “multiple intelligences” and “learning styles.”

Cluster B

Composition and personnel

Cluster B was comprised of four schools in one of the main cities: three medium to large urban schools and one smaller school in a rural area just beyond the urban fringe. These schools represented a range of decile ratings, ethnicity groupings and geographical situations. The Lead School was a decile 10 school with 500 students and an established reputation for ICT innovation and leadership. Another was a decile 9 school 33 km north of the city with a roll of 165 children, serving mostly white, middle class rural families. The third school had a roll of 230 and serves a mainly middle class urban community, including children from a number of ethnic backgrounds. The fourth school was an award winning school with a roll of 220 children in a lower socio-economic area of the city.

The working structure of the cluster included a Director, Advisory Committee, Management Committee, Lead Teachers and a full time Facilitator. The director was ex-officio the principal of the Lead School and the Advisory Committee was comprised of Principals, Board of Trustee members, an academic representative, a business partner representative, a teacher and a representative from the ICT industry. The Management Committee included Principals, Lead Teachers, the Facilitator and the Director. Lead Teachers were nominated from each school. They participated as a group in the first practicum, and were expected thereafter to take a mentor role for future practicum participants as well as a leadership role in ICT within their individual schools. The facilitator’s role, described as “a teacher with ICT skills as well as knowledge about teaching and learning” (Facilitator interview, 1999), was a full time position filled by an external advisor until June, 2001, and by a Lead Teacher from the Lead School thereafter.

As the practicum structure became more known and the knowledge was dispersed within the four schools, the control and initiative shifted due to teachers knowing what to expect and what would be expected from them. At the end of the second year the facilitator left the cluster to go overseas. He was replaced by a Lead Teacher from the Lead School and over the final year of the project a greater emphasis was placed on the Key Teachers in the delivery of the programme. A major focus during year three of the project was ensuring the ongoing sustainability of the PD programme, and maintaining the clustering of the four schools beyond the period of the project itself.

Programme goals

The ‘key beliefs’ held among the cluster designers and participants about ICT in learning included:

• The use of ICT can help students learn in new ways
• Constant change is to be expected in a technological world and has implications for teaching and learning
• Reflection is an integral part of understanding and functioning in a changing environment
• Teachers need to become ICT literate."

(Cluster handout)

The professional development model in the cluster was influenced by the Apple Classroom of Tomorrow (ACOT) research. Using the ACOT progression of ICT understanding and involvement (entry, adoption, adaptation, appropriation and innovation), and other theoretical models as a conceptual guide, the facilitators tried to offer different types of support at different stages in their teachers’ development.

Modes of delivery

Practicum sessions ran for 2 terms and teachers met for nine full day sessions, seven of which were in term time. Teacher release was provided to attend these sessions. The other two days of the practicum were held in school holiday periods. Each Practicum group consisted of approximately 10 teachers drawn from all of the four schools. During the practicum teachers also had the facilitator coming into their classrooms and working with them and their students on site, and extra computers were placed for that time in the teachers’ classrooms. Practicums began with Days 1 and 2 at the Lead School and at least one other day at each of the other 3 schools, giving teachers a chance to visit other classrooms.

Independent of the practicum programme, development in ICT skills was also available through periodic workshops which any teacher in the four schools could sign up for at any time. These skills workshops were held at a city independent secondary school. Some were run by the facilitator, some by the Lead Teachers and some by outside advisors. Skills workshops were also held after school at the Lead School, and run by Lead Teachers in their schools.

Programme content

In its operation the professional development programme was heavily focussed on a reflective practitioner approach, and on getting teachers thinking, writing and talking about their teaching and learning experiences in using ICTs. The model used an intensive two week practicum approach to develop effective teaching ICT strategies, followed up by in-school visits and support from assigned Lead Teachers in each school. The practicums had a focus on improving practice through “intensive, well-supported training and implementation based within a philosophical framework where participants examine their values, beliefs, and practices about education.” (Facilitator interview, 1999)

Within each practicum there was time set aside for a discussion and sharing of practical ideas and development of resources. There was an expectation that teachers would generate these resources and bring them back to the group. Participants had to commit to “sharing, challenging, changing & having fun”, examining professional readings to gain more knowledge, visiting classrooms to observe identified aspects of good teaching and learning in action, and using reflective journals as a tool to examine their teaching effectiveness and professional understandings.
At the end of each Practicum there was a ‘Celebration of Learning’ where participants of the previous practicum shared classroom projects and participants of the just-completed practicum shared a bit of their journey and experiences with ICTs. Teachers were expected to be present at two Celebrations of Learning and to make presentations at both. The first was after the completion of their practicum where their contribution was about their experiences and growth. The second, 2 terms after their practicum, was expected to be a demonstration of an ICT supported classroom activity.

Sharing of ideas and resources also occurred in informal situations and in more structured formats within the schools. One staff meeting observed, for example, saw the facilitators conducting a variety of bus stop activities, brainstorm, Thinking Hats stations, and so on, the general theme of developing a vision and setting goals for ICT in the school.

Practicums all had the same theoretical foci: Interactive Learning (Essential Questions, change theory, Bloom’s Taxonomy, Questioning Tool kit – Jamie McKenzie); How the Brain/Mind works (Brain based learning, Caine and Caine, Julia Atkin); thinking strategies and reflection (Caine and Caine, John Holt’s 4 worlds, Herrmann’s Whole Brain Model, Understanding How We Learn, Julia Atkin, de Bono’s Six Thinking Hats, Cort and DATT thinking programmes); multiple intelligences (David Lazear, Howard Gardner, Brooks and Brooks); and quality learning and ICT (Deming and Feuerstein). Reflection on both the readings and their ICT experiences was a major focus in this model and teachers were expected to send reflections to the facilitator on a regular basis.

Cluster C

Composition and personnel

Schools in this geographically widespread and predominantly rural cluster had high proportions of Maori students, and most were small, low decile schools. The cluster started with 15 schools in the region. They were a mixture of primary, intermediate, secondary, and area schools, as well as one Kura Kaupapa Maori school.

There were three part time facilitators in the cluster, two working with KICTs in each of two sub-regions, and one working with the principals throughout the main region. The wide geographical spread of the cluster and the isolation of many of the schools, meant that the facilitators worked very largely with individuals in their own schools.

Programme goals

The vision of the model was “to support change in pedagogical practice in schools, and to provide schools with the skills and knowledge necessary to do it” (Facilitator interview, 1999).
Modes of delivery

A two-strand approach was implemented in the cluster: 

**Strand 1** targeted principals and Boards, developing their school’s infrastructures and improving their ICT capabilities. Principals received help with their school’s ICT policy development as well as individual ICT skills. This strand also made provision for ongoing technical support. One of the facilitators, himself the Principal of the Lead School, worked directly with the other principals.

**Strand 2** provided direct and indirect support to teachers in the classroom through the establishment of Key Information and Communication Teachers (KICTs). The major focus of the PD programme involved providing the KICTs with regular, intensive PD in the use and application in ICT. They also received further in-school support to implement innovations, as well as technical support. KICTs provided ongoing peer support to their teacher colleagues in between facilitator visits.

During the first year agreements with principals to undertake personal professional development were signed and the Key Teachers from each school were identified. During this time, principals also identified their personal needs for PD, and negotiated the way in which technical support for schools was to work. In the first year schools received about 6 visits each, largely focussed on this needs analysis process.

During 2000 the facilitators in one sub-region of the cluster decided to tailor the particular modes of delivery more to the individual needs of the schools. In one school, for example, the facilitator worked with the KICT to train student tutors from the senior school. The KICT and student teachers then worked with junior school students and teachers on the same skill. The third step was for the KICT to work with remaining senior school students and teachers. In both the last steps the facilitator was present for support.

The professional development sessions in this model were thus multi faceted. Because of the distances between schools, the PD sessions for teachers and principals alike usually took place at the different schools and involved a substantial amount of travel for the facilitators. Individual schools received timetabled visits by facilitators at least once or twice per term throughout the project, and on other occasions by negotiation. Sometimes sessions were arranged during school time and sometimes after school.

Types of workshops differed from school to school. In a few instances a whole staff was involved in a workshop, and for relatively local schools this happened at the Lead School. Most of the PD observed, however, consisted of sessions with one or two principals or staff members. Some teacher PD involved the facilitator modelling either skills or classroom strategies with students, followed by time for teachers to practice. The facilitators also worked in classes with students, especially where the teacher was comparatively inexperienced in ICT related classroom and task management.

In this part of the country, technical support is expensive and thinly spread. The contract therefore also provided all schools with a basic level of support for their ICT equipment on the understanding that the school would have to fund any further costs. This support meant minor problems could be fixed within a short time frame and classroom computers could be operational again.
Programme content

In four of the schools in one sub-region, the KICT and the facilitator each developed after-school sessions covering skills such as e-mail, internet skills, and curriculum usage. Teachers then planned classroom activities using these skills with support and advice from the KICT. A third variation used in three of the schools involved a whole staff approach to develop ‘a school-wide ICT pedagogy’. The content for this PD was a mixture of skills and the understanding of the use of ICTs as tools for teaching and learning.
The teacher professional development provided by the facilitator in the other district was also a mixture of modes and content determined by the needs of each school or teacher, but here the facilitator tended to work directly with individual teachers in developing their skills. The facilitator focussed particularly on desktop publishing skills to create worksheets, keep records and publish newsletters. He also spent a lot of time encouraging teachers to use ‘student-friendly’ creative/editing/presentation software such as KidPix, teaching them File and Folder management, and generally “getting teachers and students away from [just] word processing.”

Cluster D

Composition and personnel

This cluster comprised of 5 urban primary schools with a wide variety of decile ratings and communities in one of the main cities. The principal of the Lead School acted as the cluster coordinator, and three facilitators, each working a percentage of a fulltime position, were responsible for the professional development programme.

The five schools were chosen largely on the basis of existing connections and relationships with the principal of the Lead School. The Lead Teachers were selected by the individual principals based on their interest in teaching/learning with ICTs and a willingness to commit the necessary time and energy to the professional development responsibilities. The model called for the Lead Teachers to continue into the subsequent years of the contract. The group of Lead Teachers changed somewhat in size and composition since its beginning and all schools except one lost and replaced at least one Lead Teacher. Two additional Lead Teachers were added from the Lead School during the project, bringing the total to 20. About half of the Lead Teachers who began the PD in year one were still involved at the end. Some Lead Teachers came on board in year two and some were added in year three.

Programme goals

The model’s Action Plan described six key areas for teacher development:
1. Skills, knowledge and attitudes
2. ICT in the curriculum
3. ICT & teaching and learning styles
4. ICT in administration
5. Community involvement
6. Technical support

In addition, the Plan identified two other specific areas of importance that needed targeting:
1. Bilingual units. This really began to develop in year three of the contract due to the two Lead Teachers involved in the programme beginning to integrate ICTs.
2. Children with Special Educational needs.

Modes of delivery

The cluster began its professional development in year one focussing on the development of 19 Lead Teachers, chosen by the individual principals of the schools. The Lead Teachers took part in 8 days of professional development during the first two years, scattered through
the period. The teachers were released on half or whole days to average out to about 2 days per term. Full day sessions normally met from 9:00 till 3:30. In the second year most sessions were full day, with a few sessions that began in the afternoon and lasted into the evening. In year three the Lead Teachers conducted professional development within their own schools, with the teachers being provided release time, or meeting with Lead Teachers after school. The Lead Teachers in the third year also met as a group with the three facilitators, though less frequently than in years one and two. These 1-2 hour sessions took place after school and focussed on discussing Lead Teachers’ progress with their teacher colleagues. Facilitators also visited schools and occasionally had PD sessions with teachers during year three. All of the facilitators took PD sessions in the schools – often on a weekly basis but in different forms to meet the needs of the school.

Much of the professional development for Lead Teachers took place in the computer suite of the Lead School, but it also consisted of visits to other non-cluster schools with reputations for effective ICT use, and ‘workplace’ visits to other institutions about the city which made extensive use of ICTs.

Each school conducted a sharing staff meeting, in some cases once a term, in other cases less frequently depending on the school. These sessions allowed the staff (both Lead Teachers and non-Lead Teachers) to share ideas about ICT. These sessions often followed the PMI (Plus, Minus, Interesting) format.

During the second year “team groups” were begun. These groups, comprised of Lead Teachers and groups of non-Lead Teachers from their individual schools, were instituted to provide a vehicle for the Lead Teachers to disseminate some of the professional development back into their schools. Lead teachers were expected to take charge of the training sessions for these teachers. In the third year, in keeping with the facilitators’ idea that they needed to make themselves redundant, much of the control devolved to the Lead Teachers in their individual schools.

During year two, also, an e-mail list was established to allow teachers to share ideas for classroom activities with ICTs and to keep in touch with one another between PD sessions. This mailing list began slowly, being used mostly by the facilitators to send things to the teachers. In the middle of year two Lead Teachers were asked to post at least two messages per term: one telling about their ICT work for the term and the second a response to someone else’s message.

Programme content

Staff development in pedagogical theory for the Lead Teachers focused on readings written by high-profile authors in the field (e.g. Julia Atkin, Jamie McKenzie, De Bono, Lane Clark) and articles about learning strategies (e.g. inquiry learning, quality learning, learning styles). During the first year teachers visited several local schools with prominent reputations for effective and innovative ICT use. Other professional development opportunities included a visit to Science Alive and a number of guest speakers providing seminars.

The facilitators and the project coordinator believed strongly that the theory was important and should be the basis for ICT in the classroom. The facilitators’ list of key topics included: values and beliefs, thinking skills, Bloom’s Taxonomy, information literacy, inquiry learning, Questioning Toolkit, learning styles, reflection, curriculum integration, classroom
management, creativity and ICT, communication and ICT, policy and planning, professional development, ICT skills, visits to other schools, sharing ideas, ICT and the community.

During the second year of the contract the focus was on The Essential Skills and how they related to technology. Also during this year they developed and put into place the CLAR (Challenge, Learn, Action, Reflect) process to promote greater reflection among Lead Teachers on the rationales for ICT usage in schools. One of the facilitators explained that this model was put into place when the three facilitators realised that “all 19 people had a different idea of what we are about.” (Facilitator interview, 2001)

PD sessions for Lead Teachers often contained time for sharing ideas and resources. These sessions included descriptions of classroom activities that teachers had put into practice in their classrooms (slideshows, digital camera, word processing, desktop publishing, e-mail projects, spreadsheets, webpage graphic organisers, Internet), impressions from teachers about the use of ICTs in the classroom (surprise at creativity of children, surprise at how fast the children pick up the skills, mindshift for teachers, good reports from parents, children not always knowing the most effective way to use computer, frustrations with technology, time) and some mention of theoretical underpinnings (just-in-time learning, inquiry approach, critical thinking, problem solving).

Practical sessions for Lead Teachers included working with KidPix, HyperStudio, Powerpoint, Photoshop, Front Page, databases, spreadsheets, graphs, digital cameras, scanning, Internet searching, evaluation of websites, programs for maths, using e-mail and mailing lists, and evaluating software (MS Word, Publisher, Excel, Kid Pix, HyperStudio, PowerPoint, Appleworks database, MS Paint and Inspiration) according to the Tutor/Tool/Tutee/Communication model.

Two of the schools reported that the PD for teachers in their schools in year three was oriented towards skill development. One school removed the computers from the classrooms and formed a suite in order to increase teacher usage. These computers were also used for staff development.

**Cluster E**

**Composition and personnel**

The model started as a vertical cluster of six schools in one suburb of a large city. The cluster consisted of a secondary school, its main feeder intermediate school and the local contributing primary schools. The high school and the local intermediate school were joint Lead Schools, and the cluster was managed and facilitated by two teachers from the two Lead Schools. One facilitator had a .5 appointment in one of the lead schools and .5 on the cluster programme, the other had .5 on the cluster programme and a .5 commitment outside the cluster.

**Programme goals**

Cluster documentation describes the main aim of the model as being “to influence the learning culture within the cluster schools”. The professional development sessions also had a strong focus on developing teachers’ and students’ ‘information literacy’ as part of the ‘culture’ the facilitators were aiming to create.
Modes of delivery

The model offered a wide of variety professional development opportunities, both within school time and out of school time. The facilitators describe it as a “multifaceted approach”, and PD events took the forms of after school workshops, school intensive training, seminars and professional readings.

Each term the facilitators arranged a day where they met with all the Cluster Resource Teachers and planned a timetable for workshops for the following term. Often Resource Teachers suggested topics that they would like to develop into workshops and trial with cluster staff although many of the topics were based on the results of a needs analysis survey completed by all cluster teachers at the start of 1999.

Once the Resource Teachers had decided which topics they would like to develop further, they wrote up a presentation and handout notes according to templates provided by the facilitators. The facilitators also developed workshop templates that emphasised how teachers could use the particular ICT in the classroom with students. The termly timetables were circulated to the schools and teachers registered to participate in workshops of their interest.

‘Intensive Training’ of staff at a specific school took place in two ways: the training of a department or syndicate, or the training of whole staff during teacher only days. Schools were offered a selection of eight training modules. Each module was run as a small group workshop for 3-5 people, focusing on both the development of teachers’ own skills in using ICT tools and the implementation of ICT tools to support learning outcomes in the classroom. One training module entitled ‘An Introduction to the internet for new users’, for example, covered the essential skills involved in utilising the World Wide Web, internet jargon and domain names, navigating the web, effective use of search engines, explorations of educational websites, and issues relating to using the Internet in the classroom. Another entitled ‘Curriculum Website Tour’ had less of a focus on specific Internet skills, and was mostly a guided tour of recommended New Zealand and overseas websites.

The Middle School intensive programme was a PD module which ran for a term. It consisted of a mix of full day and half day workshops, release for resource development, independent study and school visits by the facilitators. The 6 teachers in this syndicate had the goal of developing an inquiry learning research unit which made use of many ICT tools.

The programme fostered a ‘project’ approach to group PD in ICT. In this a number of individuals or groups of teachers in the schools undertook a project related top some aspect of ICT in schools, the results of which were then shared with the rest of the cluster. Contract facilitators worked with each school to clarify the focus and scope of the projects. Professional development to support the implementation for the project was an integral part of each plan. Funding was provided as a self-managed grant to each school, paid out when the project outline and aims were submitted to the contract directors. In Term 4, 1999, 3 cluster schools embarked on projects and the other 3 schools commenced their projects in 2000.

A series of workshops for principals and senior school managers was also established during Term 3, 1999, which were specifically targeted at the needs of this group in terms of
whole school planning and administrative skills. In 2000 the contract paid for all 6 principals to attend the Compaq Conference, provided they paid for one of their staff members to go as well.

The organisation continued throughout to involve a mix of different types of PD activities each of which provided varied opportunities for dealing with the spectrum of skills, pedagogy and curriculum integration. However, the programme for the final year had a slight change in emphasis, in that, in order to prepare participating schools for independence beyond the term of the contract, the focus went onto individual schools rather than the cluster as a whole. To this end intensives were held for the group of Resource Teachers to help them “increase the depth of ICT leadership within their own schools by extending the size of their resource teams.” The cluster-wide programme of after-school workshops, was replaced by in-house workshop schedules, in which schools used their own equipment and met for their own specific needs. In year three, too, the facilitators devoted more of their energies to the two Lead Schools, and links with the local College of Education as a professional development provider were strengthened by running the Infolink programme and by providing the opportunity for teachers to obtain formal accreditation for professional development undertaken in the cluster ICTPD programme. Schools were also encouraged to use and contribute to a cluster webpage.

**Programme Content**

In one of the 'projects' a syndicate in the Middle School developed and trialled a Space Unit incorporating ICT usage. The professional development to support the planning process focussed on: exploring the rationale for a changing model of education, examining models of inquiry learning such as Big Six, (Mike Eisenberg, US), Action Learning (Gwen Gawith), becoming familiar with the hierarchy of thinking levels, identifying the characteristics of engaged learners and technology-enhanced student-centred classrooms (Gardner), as well as developing confidence in the use of new ICT tools. Other projects involved setting up mail serving software so that each teacher could have an individual email address and to set up an electronic notice board to replace the daily photocopied sheet; developing a series of templates for curriculum planning and an on-line procedure for the recording and sharing of meeting minutes and producing a school website.

The cluster held regular seminars for all staff at the 6 cluster schools, inviting a range of speakers and commentators on ICT in education to speak to cluster staff. The theoretical aspects of integrating ICTs in classrooms were also addressed through a programme of professional readings. Staff at the cluster schools regularly received topical readings providing information about events, developments and debates about the ICT world in general and in the education sector in particular. When they started distributing readings early in 1999, the facilitators included response forms and hoped that staff would read the articles, discuss them and respond accordingly. While the cluster schools found the readings valuable, they were not as highly valued as other aspects of the contract model.

After-school workshops were largely skills based and covered a wide variety of ICTs (digital camera operation, webpage designers, desktop publishing, graphics packages, email and the internet, spreadsheets and databases, etc.), as well as some classroom teaching ideas, such as sessions on ‘using ICTs in your learning centre’ and ‘using ICTs in a mathematics programme’. ‘School Intensive training’ sessions were also held with each school having its own priority for this. The intensive programmes focused on pedagogy and depicting a
vision for education in the 21st century. Content included: inquiry based learning, exploring the rationale for a changing model of education, thinking skills, developing students’ questioning skills, and identifying characteristics of engaged learners. Sessions focussed on administration were also held in schools according to their interests or needs. These included workshops on developing a school website, setting up mail serving software for the school, and training staff in using Classroom Manager. Seminars and professional readings tended to focus on theories of teaching and learning and were aimed at getting teachers to think critically about the use of ICT in education.

**Cluster F**

**Composition and personnel**

This was a cluster of six Kura Kaupapa Maori (Maori Immersion) primary schools in the middle of the North Island. Three of the schools had their own computer laboratories, each containing 21, 25 and 8 computers respectively. In two of the schools, including the Lead School, each teacher was responsible for teaching their own class with ICTs, while one of the schools had a designated kaiako hangarau (technology teacher). The cluster employed one full-time facilitator who circulated around the schools supporting the professional development of all the teachers in those schools.

**Programme goals**

As the cluster schools were all Maori Immersion, the programmes taught are completely Maori in nature, design, delivery and evaluation. This implied some special considerations for the professional development programme, and likewise the research project, especially in terms of communication and information gathering.

Special needs and conditions were apparent in the Kura. These situations are endemic in Kura Kaupapa Maori, inasmuch as the Kura felt essentially under-resourced and over-stretched. This in turn meant that any professional development programme was immediately snapped up by whomever happened to be available at the time and not too busy. This meant that although an emphasis was on teaching practices, essentially the PD programme made its initial impact in terms of how much it could support the teaching of Maori in particular.

**Modes of delivery**

The workshops that were run in the schools were mostly run in te reo Maori, although some sessions were bilingual as the level of Maori held by teachers was varied and the facilitator was concerned that the teachers might “not only feel uncomfortable with the technology but also with the new Maori language jargon for hangarau.” Maximising the use of reo in professional development events where appropriate, along with the facility of the facilitator with reo and his background in the community, were seen as a significant factors in the perceived success of the professional development programme, in that all participants had to understand, support and be seen to enact the cultural norms appropriate to working in this environment.

There were two main strands to the programme. One was one-on-one work with teachers. The other was a programme of upskilling Lead Teachers so that they could take over after
the contract finished. A programme of waananga was organised in which selected kaiako would attend training in the computer laboratory at the Lead School. These workshops occurred five times during each year and were followed up by a visit to each of the kura in turn by the full time facilitator. In the first two years of the programme each kaiako received set tasks to perform in order to practice the skills and implement the ideas emphasised during the professional development sessions. A series of workshops and other professional development on the school management package 3D Achieve was also conducted for the cluster schools.

**Programme content**

Each kura had very different technologies from each other and very different levels of expertise. Therefore, there was an emphasis in the programme to give each teacher maximum individual attention when rostering the professional development visit, after the collective events had taken place. Each teacher received individual, school-based training from the facilitator, addressing their own particular needs. This meant that the teachers were working with a wide range of technologies based on a rather broad definition of ICTs. This included phone, fax, OHPs as well as computers, digital cameras, the internet and intranets.

In this latter school the ICTPD programme took on a rather different form to that in the others as the Kaiako hangerau has the responsibility of teaching all ICT to classes, for the whole school. While he took these classes with the students, the teacher was freed up to undertake PD events with the facilitator. The programme in this school was geared to a general upskilling with a focus on the managerial aspects of their jobs. A highlight for many in this regard was the use of 3D Achieve software for lesson planning. The focus on this one administration package was in turn aimed at giving rise to greater confidence to individuals, getting them to a point of feeling more at ease with technology in general and empowered to begin enhancing their teaching practice with the broader range of ICT tools. The whanau aspect was strong in this school in that it involved the widest possible range of participants, including cleaning staff, whanau and kaumatua.

**Cluster G**

**Composition and personnel**

The principal and deputy principal of the Lead School developed the proposal on behalf of the local Principals’ Association and all the primary and intermediate schools in the district. The money from the successful ICTPD bid, which provided three years of PD for the 28 schools in the district, contributed to a larger overall project that also included additional funding over two years from a local charitable Trust for technical support to schools, a strategic alliance with a major computer dealer to provide a computer suite located at the Lead School to be used for the training of teachers, and a further strategic alliance with the developers of a school management software package to introduce and trial this software at the Lead School with a view to future development of an area-wide administrative network for all schools.

Using money from the various funding sources, four full time staff were employed by the cluster: an ICT education coordinator responsible for managing the day to day running of the project, the PD requirements of the Lead School staff, and organising/running of PD events in the computer suite for staff from other schools; an ICT education facilitator...
responsible for providing support in schools, working with whole staff development and with principals’ and ICT leaders’ development; a technical support person responsible for establishing and maintaining a level of ICT support for schools which included an 0800 help line as well as practical installation and implementation advice; and an administrative assistant.

Programme goals

The PD model embraced a range of different objectives, only some of which were directly funded from the ICTPD cluster contract. The intended outcomes stated in the original documentation for the project were:

- improved skills and confidence of teachers in using ICTs
- increased use of ICTs in teaching programmes
- increased administrative efficiencies
- appropriate policies and long term plans developed for each participating school
- appropriate advice, professional development and support provided to other schools
- a number of resources made available for National dissemination
- development of J1-F7 ICT curriculum statement for local schools

The facilitators highlighted two key areas that they were addressing in their work with schools:

- a change to the culture in schools (eg a move towards a ‘paperless’ environment, with increased use of the technology to manipulate, distribute and store information) and
- addressing the emotional needs of teachers – assisting them past the barriers they face in terms of both increasing their personal ICT competence and their ability to integrate ICT use into their teaching programmes.

Modes of delivery

In action, the ICTPD model consisted of three complementary strands: in-school PD based on goals established by individual schools and provided by a specialist facilitator; skills-based training provided in a specialist training centre, and provision of a specialist 0800 technical help-desk, funding for which was provided by the Charitable Trust.

The model involved 28 primary and intermediate schools, split into three groups proceeding through a two level process. Level 1 schools, in which PD was provided for teachers in the schools directly, and Level 2 schools, where the focus was on supporting in-school mentors or Lead ICT Teachers who would continue the provision of PD to their colleagues beyond the Level 1 programme. The first group of schools began their Level 1 programme in mid-1999 and continued until September 2000, with the second group starting in September 2000 and continuing until September 2001, when the third group began at Level 1. When each of these groups completed their time as Level 1 schools they were classified as Level 2 schools for the following twelve months.

In the Level 1 programme for the first group of schools the process began with visits to each school to assist principals and ICT leaders to develop their school ICT plan, including increasing teachers’ use of ICTs in classrooms. This was followed by visits by the ICT facilitator to assist teachers with the implementation of the plan, particularly through direct work with children in classrooms where the modelling of appropriate approaches could be provided. A parallel programme of skill sessions was carried out in the sponsored computer
suite established at the Lead School. These were run after school, and provided as a 'smorgasbord' from which teachers could choose what they enrolled in and attended.

The ‘Level 1’ training for the second group of schools was provided at a series of one day sessions held at intervals over a period of two terms. Two teachers from each of the schools attended these sessions. In these sessions the major focus was on pedagogical approaches using ICTs, and developing the skills of facilitation among “mentor teachers”. This programme aimed to establish a workable approach to ‘infecting’ the largest number of staff possible and avoiding the issue of ‘burnout’ by the one facilitator involved. In Terms 3 & 4 of 2000 these sessions were held on a Friday during school time. In 2001 the sessions were held after school. The facilitator continued to have some contact with schools and classes, usually responding to personal approaches.

The third group of Level 1 schools beginning September 2001 continued the “mentor teacher” approach but with a change of emphasis from providing a predetermined programme based in the Lead School to a programme based on identified needs working with the mentor teachers in their own schools.

The 0800 number put callers in touch with a technical help person based at the Lead School. Much of the technical advice was given over the phone, with increasing use made of help sheets and handouts to address common problems. In addition, the technical support person spent much of her time visiting schools helping sort out bigger issues, and providing advice on networking solutions and other technical matters.

The establishment of the sponsored ICT Lab was a high profile part of the cluster of particular benefit to the staff of the Lead School. Scheduled PD classes for teachers from all the schools were held there after school for teachers from the first group of Level 1 schools, but with the second group of Level 1 schools it was used for full days during the week.

**Programme content**

The emphasis on teaching and learning theory and strategies was a significant feature of the latter parts of the implementation of this model, especially after the second group of Level 1 schools joined the project in mid 2000. Where, in the initial stages, the focus was on getting the ICT strategic plans in place, with an emphasis on technical infrastructure and skill development, the emphasis in the second phase moved markedly towards promoting classroom usage and developing classroom strategies for ICT. Regular readings were provided and many references to “experts” were made as part of the PD presentations.

The cluster was also very proactive in producing supporting materials and ideas for teachers in the cluster schools. All of the training sessions were accompanied by extensive resource sheets and instructional materials, and the cluster established a web site as a repository of resources, ideas and tips for teachers.

**Cluster H**

**Composition and personnel**

A total of 45 schools were referred to in the original tender document as potential participants in this large and scattered cluster. An original group of 4 schools (the Lead
School plus three ‘facilitator schools’) started the project, working with 12 schools in Terms 1 and 2, 1999, and a further 29 in Terms 3 and 4, 1999. Each facilitator school had responsibility for a cluster of schools, and each of these, in turn, was responsible for two or three others. At the beginning of 2000, 10 schools were “dropped off” through failure to participate, and resources and effort put into the remaining 35.

The facilitation team was comprised of the Principal of the Lead School whose main task was to create a database for all schools to access support, coordinate communications and set up and manage technical support networks; a commercial technical advisor whose task was to provide technical support, both off and on site, including an 0800 help line; three ‘coordinators’ from the facilitator schools who were to facilitate development within clusters of schools and to support these schools as they become facilitators of others, and ‘professional leaders’, who were individual teachers identified within participating schools whose role was to lead the development of ICT within their schools utilising support and expertise from within the cluster networks and other schools as necessary.

Programme goals

The original proposal was written up by a group of local principals on behalf of the local Primary School Principals’ Association. This group believed strongly that the programme they developed should meet the needs of as many schools as possible. They also intended to foster and use as much local and distributed expertise as possible. “Teachers helping teachers” became something of a cluster slogan. In part this was due to the issues they faced with isolation, and the costs and difficulties in bringing in ‘outside’ expertise, but it also stemmed from the beliefs outlined in the original project proposal, which included the following statements:

- “All teachers need to have skills in ICT, it is not just the domain of a few select teachers or classes
- we have the skill base and personnel here in [the district]
- teachers who use computers for planning, recording, research and personal work use them far more effectively in the classroom
- there is no one solution for schools and their ICT development
- we can support schools in developing a path to follow for their development
- there are ways around all the barriers that have led to schools being hesitant with their ICT development
- sound information leads to sound decisions
- we can provide instant online help effectively and cheaply
- to make changes will require a commitment from schools”

The stated outcomes for this model were:

“1. Barriers to ICT implementation within schools would be identified and strategies to overcome these would be documented and implemented (as evidenced by the development of school ICT implementation plans)
2. All staff in the leader schools would be using ICT personally
3. Systems in place for effective flow of information from the contractor through coordinator schools to the cluster schools
4. Establishing support networks between schools
5. Developing a database of expertise within our schools that can be utilised by others
6. All participating schools can demonstrate that their staff and children are familiar and comfortable using ICT
7. Regular contributions made to online resources centre

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8. Schools become self-supporting in using ICT and can confidently access relevant support when required.”

Modes of delivery

This cluster developed a ‘trickle down’ or ‘pyramid’ model, emphasising a ‘response to request’ approach. All PD was carried out on a ‘needs-determined’ basis, with sessions being undertaken in response to requests from teachers. No formal programme structure was envisaged or provided, except that the cluster also sponsored many teachers’ attendance at the annual TUANZ conferences, a one-day seminar presented by a prominent ICT commentator, a one day ICT ‘expo’ of teachers’ and students’ work from the schools held at a sports Stadium in the district, and a ‘focus on TKI’ day, run with the assistance of a facilitator from TKI

The proposal involved the development of a large database of teacher expertise within the cluster, which could then be shared via the web or other wide area network with all the participating schools. Teachers needing PD in particular areas could access the database to see what expertise was available and the contract would provide assistance with linking the two together. The database was built during year two of the project but was not widely available to the schools until well into the third year. For the first two years teachers’ PD requests were filtered through the cluster manager made direct to the designated school ‘coordinators’.

Initially, all PD was conducted in schools where the requesting teacher was from. From the beginning of 2001 coordinator-initiated visits to schools were also made at least once a term.

In addition, a local technical advisor was also employed for 2 extra days per week in 2001 charged with the task of visiting schools in the cluster at least once a term providing technical support. He made a formal request of schools for a written plan outlining their needs for PD. Later in the project there were also some attempts to coordinate groups of teachers who were seeking assistance in similar areas to attend sessions together.

Programme content

In the first stage of the project (1999) a teacher at the Lead School was given some release time to compile a booklet containing the names and descriptions of a range of software titles available in the school, and a suggestion about how they might be used by children. This booklet was then published by the school with a view to making it available to other schools in the cluster in the hope that teachers might find it helpful when making decisions about software to use.

Similar efforts to create resources to support the ICTPD were evident in other schools observed. At one school the ICT Professional Leader spent a lot of time photocopying pages from a commercial production, laminating them and assembling a set of each for each classroom in the school in an effort to provide ‘on hand’ support for teachers. These resources consisted mostly of ‘how to’ sheets about word processing, as well as simple tasks and activities that introduced particular skills at the computer using familiar software.

Many of the instances where teachers responded to requests for help focused on passing on ideas that can be used in the classroom, although often there was a need for teaching skills to equip the teacher to be able to implement the programme idea. (eg how to use KidPix
slide show in order to be able to work with children to prepare a slide show as part of unit work).

**Cluster I**

**Composition and personnel**

The Lead School in this cluster was a relatively new school in a small North Island city. The school had a well established national and international reputation for effective practice in the integration of ICTs into its teaching/learning programme.

Originally the cluster was geographically widespread, involving schools from a major city some two-three hours drive away from the Lead School, some small rural schools a similar distance ‘up the coast’, and a nest of schools in the greater urban area around the Lead School. From the second year, however, the focus narrowed for pragmatic reasons to the province in which the Lead School was situated.

The cluster facilitator, who was a teacher in the Lead School, was employed .8 on the ICTPD programme and .2 for PD and other activities within the Lead School. At the end of the second year the original cluster facilitator gained the position of Deputy Principal (and later Principal) of the Lead School and her place was taken in year three by another teacher from the Lead School.
Programme goals

The main goals of the programme as stated in the documentation sent to participating schools, and as articulated by the facilitator and managers, was very much focussed on teaching and learning. “The principal aim behind this is to reculture schools to provide greater understanding and implementation of ICT throughout the learning environment” (Programme Proposal, p3) “We want to make a difference; to make schools more self-sufficient, and to have everyone with understanding and a passion for ICT” (Facilitator interview, 1999).

Modes of delivery

Ten schools (9 primary and one secondary) began the project in 1999, with the intention of bringing in another 10 each year for the next two years. Each school sent a designated ‘facilitator’ to some extended workshop/seminar days (a 3 day immersion conference initially and then whole day or half day ‘work shadowing’ visits to the schools consisting of programme planning, in-class modelling and general support. The school facilitators were expected to provide ongoing leadership and PD support for the teachers in their own schools during and after their time in the PD programme.

In the event the plan to bring on 10 new schools each year was not implemented, Instead, largely because of pressure from the first cohort of schools themselves, the second and third year of the project focussed on schools in the Lead School’s own district, and in the third year the number of schools was reduced to 5. As a result many of the original cohort of schools remained in the programme for the full three years.

The facilitator had a role in organising and conducting day-long visits and ‘tours’ of the Lead School for the staffs of participant schools. This was part of their already existing programme of hosting visitors from throughout the country and overseas. In these school visits, the teaching and learning philosophy of the school and how ICT fitted into that philosophy featured extensively, along with modelling of ‘effective practice’ with students in classrooms.

Other PD strategies used in the programme included a two-day regional ‘ICT Conference’ in 2000 in which Lead Teachers and others presented and attended workshops and presentations based on their classroom experiences; other whole day or half day workshops and seminars, such as a Change Management day for principals and Lead Teachers, Lead Teacher skill workshop days, and celebrations of teacher/student work days. The cluster facilitator provided direct PD to the designated school ‘facilitators’, but out of school hours meetings were also held with school principals, for example to plan ICT developments for their schools, and the facilitator was available on request for out of hours ‘techie-breckies’ or ‘classroom ideas’ workshops for teachers in the schools. In the third year much of the facilitator’s job was taken up with in-school visits and workshops of this latter sort.

Programme content

A given school’s programme included whole staff meetings, readings and discussions, formal Conferences, visits to the Lead School, and “techie in class support”. Packages covered in ‘techie-breckies’ and skills Focus Days included Hyperstudio, Clarisworks, webpage design packages, and Photoshop. Other Focus Days were held on teaching and
learning theory topics such as EQ, Multiple Intelligences and Learning Styles. There were also a number of sessions on reflective practice, developing a school vision for ICT and the use of ICTs in particular curriculum areas.
Cluster J

Composition and personnel

This cluster consisted of a primary Lead School with a considerable reputation for effective whole school development in the use of ICTs, about 10 other primary schools and one local secondary school. The cluster was roughly grouped within a single suburb of a large city.

The professional development programme was conducted in the first year by a facilitator who was also on the staff of the Lead School employed on a half time basis. At the end of the first year this facilitator left the school and was replaced by another Lead School teacher on a similar part time basis. The focus of the programme in its first two years was on whole-school teacher development. In the third year of the programme the facilitation was offered by the senior management team from the Lead School and was focused more on principal development.

Programme goals

The philosophical emphasis of the programme was very much on how schools as a whole could initiate whole school development in ICT for better student learning, with a focus on management strategies, planning and rationales rather than on skill development. As described in the information sent to the principals of participating schools,

“It is important to note that this professional development programme in ICT is about whole school development, and not just the development of a few teachers. While a focus will be on the development of competence and confidence with the teachers, the main thrust will be the establishment of teaching and learning with ICT in a coordinated and consistent basis throughout your school. We will be discussing the issues of why ICT is considered important and to be “taught” at your school (establishing a pedagogy for ICT), what elements of ICT need to be identified as student learning outcomes and infrastructural support, and finally how you and your team can go about the process to ensure success for all throughout your school.” (Milestone Report I 1999, Appendix)

Modes of delivery

Each participating school selected six teachers to participate in the programme, largely on the basis of their desire or ability to take a leadership role in ICT with colleagues back in their schools during and after the PD programme. Half of these teachers grouped with half of the teachers from another cluster school to undertake the PD, which was mostly conducted in release time at the Lead School. These groups of six teachers from two schools attended two block courses, each of four consecutive days, two terms apart. The facilitator also visited each school for a half day or day as a follow up to the block courses to support the teachers in their classrooms and to discuss their progress with whole-school/whole-department development. Principals were also invited to a seminar day with a follow-up half day later in the year.

The secondary school in this cluster supplemented the ICTPD programme with a series of weekly after-school skills sessions provided by a local tertiary institution. These sessions were attended by staff, department by department, and were timed to coincide with that department’s period on the ICTPD programme.
The duration of the programme was originally designed to last a year for each school, and for each set of teachers, but in the event most of the first year schools expressed a strong desire to continue in the programme for longer and their participation was extended for a second, and, for some, though in a different form, a third year.
Programme content

There were some skill development activities and practical ‘workshops’ built into the PD events - two of the block days observed, for example had teachers spending much of the afternoon session investigating educational websites with classroom ideas for units of work. But the main components of the block courses involved readings and discussion of topics such as school-wide planning, assessment of student ICT skills and reporting, technical (infrastructure) issues, a rationale for the use of ICTs in schools, successful PD strategies, teaching strategies with ICTs and small groups, and action planning. These latter issues were also the focus of the day long or half day seminars for principals.

At the first block course sessions action plans for in-school development were established for each school and followed up during in-school facilitator visits and review sessions in the second block course.

For the third year of the programme the focus changed. The Lead School still worked with roughly the same group of schools, and some teacher development opportunities in the form of after-school ‘presentation, practice and pizza’ workshops were held in each school. However, the main focus was on the principals and the ICT Lead Teachers and their development as leaders of change in their schools. The programme consisted of a full day seminar for each school principal and their ICT Lead Teachers, at which action plans for individual school development were written, and a series of half day sessions over the year to monitor progress. Days were also set aside for the principals to meet, and the facilitators were also available to present sessions for Boards of Trustees on request. The content of the programme focussed on various aspects of leadership in an ICT context, and ERO’s newly announced criteria for the evaluation of ICT in schools.
5. ‘Effective’ School Cluster Models For Professional Development in ICT: Ingredients but No Recipe

It is clear from the descriptions of the cluster programmes in the previous section that, under the broad umbrella of clustering schools together for the provision of a professional development programme, the individual modes and models of delivery varied considerably among the clusters, as did the particular objectives and performance targets from the contract documents that were emphasised in that delivery. It would seem too, that the emphasis on particular goals and outcomes not only differed within generally similar parameters from cluster to cluster. They also varied from participant group to participant group within clusters.

This section of the report addresses three core questions in relation to the goals and objectives of the various stakeholder and participant groups in the clusters.
1. What were the commonalities and differences among the goals and objectives of the main stakeholder groups?
2. To what extent did they feel at the end that these goals had been met, or not met, and their objectives achieved or not achieved?
3. To which particular aspects of the ICTPD programmes did they tend to attribute that achievement, or lack of achievement?

5.1 Stakeholder and Participant Goals for the ICTPD Programme

There were three main groups of ‘stakeholders’ whose perspectives on the progress of the ICTPD clusters were sought during the project: the principals of the schools which were members of a cluster, the facilitators who conducted the PD programmes, and the teachers who undertook the PD.

As can be seen in Table 3, principals, facilitators and teachers had many objectives in common, reflecting most of the goals articulated in the ICT Strategy and Ministry contract documents. These included increased use of ICTs for administration in schools, strategic planning and policy development in ICT, greater and more effective classroom use of ICTs by students, improved school infrastructures, increased inter-school and inter-teacher collaboration, and, of course, increased technical competence for teachers. Within that broad consensus, however, the cluster stakeholder groups differed somewhat from each other as to their primary goals and objectives for the ICTPD programme, both when the programmes began and as they developed over time.

<table>
<thead>
<tr>
<th>Focus of ICTPD Goals</th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
<th>% of Goals (Teachers)</th>
<th>% of Goals (Principals)</th>
<th>% of Goals (Facilitators)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use for Administration</td>
<td>269</td>
<td>38</td>
<td>7</td>
<td>11.17%</td>
<td>8.32%</td>
<td>8.75%</td>
</tr>
<tr>
<td>Better Teaching and Learning</td>
<td>132</td>
<td>41</td>
<td>22</td>
<td>5.48%</td>
<td>8.97%</td>
<td>27.50%</td>
</tr>
<tr>
<td>Increased Classroom Use</td>
<td>573</td>
<td>122</td>
<td>11</td>
<td>23.80%</td>
<td>26.70%</td>
<td>13.75%</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>126</td>
<td>49</td>
<td>6</td>
<td>5.23%</td>
<td>10.72%</td>
<td>7.50%</td>
</tr>
<tr>
<td>School-wide Policy &amp; Planning</td>
<td>16</td>
<td>30</td>
<td>15</td>
<td>0.66%</td>
<td>6.56%</td>
<td>18.75%</td>
</tr>
<tr>
<td>School/Teacher Collaboration</td>
<td>93</td>
<td>25</td>
<td>11</td>
<td>3.86%</td>
<td>5.47%</td>
<td>13.75%</td>
</tr>
<tr>
<td>Technical ICT Skills</td>
<td>1199</td>
<td>152</td>
<td>8</td>
<td>49.79%</td>
<td>33.26%</td>
<td>10.00%</td>
</tr>
<tr>
<td>Total Goals Stated</td>
<td>2408</td>
<td>457</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 Teachers’, Principals’ and Facilitators’ Goals for the ICTPD Programmes as Stated in the End-of-Project Surveys (Open ended questions)
Table 4 Teachers’ Priorities for Professional Development in ICT (Teaching and Learning) as Stated in the Victoria Survey, 1999 (Closed questions)

<table>
<thead>
<tr>
<th>Teaching &amp; Learning Goals</th>
<th>No.</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.02 Understanding the social and ethical impact of ICT on our lives</td>
<td>16</td>
<td>1.2%</td>
</tr>
<tr>
<td>1.03 Social and ethical considerations associated with responsible use</td>
<td>20</td>
<td>1.4%</td>
</tr>
<tr>
<td>1.04 Using a range of T&amp;L approaches that enable effective classroom use</td>
<td>293</td>
<td>21.1%</td>
</tr>
<tr>
<td>1.06 Evaluating critically the educational value and classroom applications</td>
<td>68</td>
<td>4.9%</td>
</tr>
<tr>
<td>1.07 Continually developing skills, knowledge and understanding of ICT</td>
<td>206</td>
<td>14.8%</td>
</tr>
<tr>
<td>1.08 Understanding classroom management structures for effective use</td>
<td>199</td>
<td>14.3%</td>
</tr>
<tr>
<td>1.09 Creating a classroom environment where ICT is an integral component</td>
<td>384</td>
<td>27.6%</td>
</tr>
<tr>
<td>1.10 Providing opportunities for students to engage in activities enhanced by ICTs which were essentially self-evaluating, cooperative and collaborative</td>
<td>312</td>
<td>22.5%</td>
</tr>
<tr>
<td>1.11 Solving common software, hardware and network technical problems</td>
<td>306</td>
<td>22.0%</td>
</tr>
<tr>
<td>1.12 Designing, planning and using curriculum programs to effectively incorporate ICTs to improve student learning</td>
<td>497</td>
<td>35.8%</td>
</tr>
<tr>
<td>1.13 Selecting, using and evaluating ICTs appropriate to the curriculum</td>
<td>192</td>
<td>13.8%</td>
</tr>
<tr>
<td>1.14 Using computer applications for record keeping and reporting</td>
<td>403</td>
<td>29.0%</td>
</tr>
<tr>
<td>1.15 Evaluating and reporting students learning achievements when using ICTs</td>
<td>252</td>
<td>18.1%</td>
</tr>
<tr>
<td>1.16 Using school level computer applications</td>
<td>184</td>
<td>13.2%</td>
</tr>
</tbody>
</table>

Table 5 Teachers’ Priorities for Professional Development in ICT (ICT Skills) as Stated in the Victoria Survey, 1999 (Closed questions)

<table>
<thead>
<tr>
<th>Specific Skills and Capabilities</th>
<th>No. Times in Top 3</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.01 Operating video camera</td>
<td>57</td>
<td>4.1%</td>
</tr>
<tr>
<td>3.02 Operating scanner</td>
<td>140</td>
<td>10.1%</td>
</tr>
<tr>
<td>3.03 Operating digital camera</td>
<td>107</td>
<td>7.7%</td>
</tr>
<tr>
<td>3.04 Using computer operating systems eg MacOS, Windows</td>
<td>122</td>
<td>8.8%</td>
</tr>
<tr>
<td>3.05 Operating printers</td>
<td>21</td>
<td>1.5%</td>
</tr>
<tr>
<td>3.06 Managing computer files and folders</td>
<td>141</td>
<td>10.2%</td>
</tr>
<tr>
<td>3.07 Using the computer network</td>
<td>171</td>
<td>12.3%</td>
</tr>
<tr>
<td>3.08 Word processing</td>
<td>140</td>
<td>10.1%</td>
</tr>
<tr>
<td>3.09 Spreadsheets</td>
<td>260</td>
<td>18.7%</td>
</tr>
<tr>
<td>3.10 Database</td>
<td>211</td>
<td>15.2%</td>
</tr>
<tr>
<td>3.11 Graphics</td>
<td>187</td>
<td>13.5%</td>
</tr>
<tr>
<td>3.12 Developing a desktop published document</td>
<td>201</td>
<td>14.5%</td>
</tr>
<tr>
<td>3.13 Developing a presentation</td>
<td>165</td>
<td>11.9%</td>
</tr>
<tr>
<td>3.14 Delivering a presentation</td>
<td>82</td>
<td>5.9%</td>
</tr>
<tr>
<td>3.15 Interactive multimedia programs</td>
<td>220</td>
<td>15.8%</td>
</tr>
<tr>
<td>3.16 Information resources</td>
<td>108</td>
<td>7.8%</td>
</tr>
<tr>
<td>3.17 Authoring programs</td>
<td>50</td>
<td>3.6%</td>
</tr>
<tr>
<td>3.18 Email</td>
<td>351</td>
<td>25.3%</td>
</tr>
<tr>
<td>3.19 WWW browser</td>
<td>281</td>
<td>20.2%</td>
</tr>
<tr>
<td>3.20 File transfer</td>
<td>78</td>
<td>5.6%</td>
</tr>
<tr>
<td>3.21 Webauthoring</td>
<td>122</td>
<td>8.8%</td>
</tr>
<tr>
<td>3.22 Discussion groups</td>
<td>38</td>
<td>2.7%</td>
</tr>
<tr>
<td>3.23 Intranet</td>
<td>150</td>
<td>10.8%</td>
</tr>
<tr>
<td>3.24 Electronic conferencing</td>
<td>86</td>
<td>6.2%</td>
</tr>
<tr>
<td>3.25 Collaborative projects</td>
<td>54</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

Broadly speaking, teachers and principals wanted most to see increases in teacher ICT skills and increased use of ICTs with classes. Within the group of principals, primary principals were more likely to have had ‘better learning’ and ‘technical skills’ goals than secondary principals. For secondary principals, greater classroom usage of ICTs was the most frequently identified goal. Teachers, for their part, wanted technical skills, particularly with email, web browsers and multimedia packages and the like, and they wanted help with designing programmes of classroom work which incorporated the use of ICTs. They also wanted to use computer applications for certain administrative tasks (Tables 4 & 5).
Facilitators, on the other hand, were as a group more focussed on the better teaching and learning they hoped to foster, beyond developing those preparatory skills and classroom ideas. In the surveys and interviews alike, facilitators were most likely to articulate goals for the programme as being better teaching and learning, with little or no mention of ICTs per se. For most facilitators, personal skills with particular ICTs were a necessary starting point, but they were not generally seen as the most important part of their job description. These major purposes were more often than not expressed in terms of capturing teachers’ hearts and minds; developing teachers’ confidence first, and then developing their deeper pedagogical understandings about the use of ICTs as educational tools.

The importance of a perceived role as builders of teachers’ confidence, self-esteem, and enthusiasm through a process of sharing was obvious in facilitators’ discourse on their goals. Facilitators spoke of their task as “getting people ready to ‘fly’…”, getting them to “collaborate and support each other”, “building greater confidence and understanding”, “being an enthusiastic and caring facilitator”, “to be able to enthuse people to be able to say ‘I can do that’”, “develop[ing] a positive attitude to ICT”, and so on.

Perhaps most of all, they also regarded as a major goal building the teachers’ deeper cognitive understandings of the role of ICT in teaching, and the connections to be made between the use of ICTs and improving students’ learning. To this end many of the cluster programmes had a strong element of professional reading and discussions of ICT in relation to a number of theories of teaching or learning. One teacher jokingly characterised this emphasis as “f.....g with my mind”, although the facilitators tended to articulate it more politely in terms such as developing “an ongoing awareness of the possibilities of ICTs for enhancing children’s learning”, helping staff “see the importance of the development of information literacy frameworks along with ICT development”, “develop[ing] colleagues’ understandings of why ICT is so important to our children” and so on. One facilitator expressed the main goals of her programme early in the project:

“The emphasis is on the Why, not just How…. What I’m seeing is ‘bells and whistles’. ‘Let’s get kids doing this and this’. An add-on; not a whole classroom programme. [We] tend not to look at why. I want to go further…. Teachers want recipes; and judge [PD] by being able to take a good idea and do it - [but there’s] no long term changes unless we look at the why, getting people challenging their own practices. Teachers want skills. To come out with ‘this’ and ‘this’. Teachers want recipes. They get what they want, [but] I have to bring in the other stuff by the back door so they don’t notice it. I’m trying to get them to be more considered and not just ‘because that’s how you do it’…. There’s never enough reflection time, discussion time, intensity.” (Facilitator Interview, 18/10/99)

5.2 To What Extent Were Participants’ Professional Development Goals Felt to Have Been Met by the ICTPD Programmes?

In the End of Project surveys teachers and principals were asked to list the goals or objectives they had originally had for the programme, and to state the extent to which they now felt those objectives had been achieved.

There were some role-based and sector-based differences in levels of goal achievement reported, though these were often dependent on the particular type of goal. Overall, principals were more likely to report that the programme’s goals were achieved than
teachers, and to report that different goals were achieved. Principals, for example, tended to report greater levels of achievement of teaching and learning goals than teachers, while teachers tended to report higher achievement rates than principals for goals related to administrative and classroom usage.

Within the role-based figures outlined in Table 6, primary teachers were significantly more likely to report that they had achieved their goals than secondary teachers. But secondary principals were generally more likely to report that their goals were achieved than primary principals, especially goals related to infrastructure, technical skills, and administrative use. The exception was policy goals, where primary principals reported higher levels of achievement than secondary.

### Table 6 Percentages of Goals Achieved by Participant Role, as Reported in the End of Project Surveys

<table>
<thead>
<tr>
<th>Focus of ICTPD Goals</th>
<th>% Goals 'not achieved' Teachers</th>
<th>% Goals 'not achieved' Principals</th>
<th>% Goals 'partly achieved' Teachers</th>
<th>% Goals 'partly achieved' Principals</th>
<th>% Goals 'fully achieved' Teachers</th>
<th>% Goals 'fully achieved' Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use for Administration</td>
<td>5.20%</td>
<td>13.51%</td>
<td>40.15%</td>
<td>43.75%</td>
<td>54.65%</td>
<td>40.62%</td>
</tr>
<tr>
<td>Better Teaching and Learning</td>
<td>7.50%</td>
<td>32.43%</td>
<td>48.17%</td>
<td>59.62%</td>
<td>44.33%</td>
<td>28.85%</td>
</tr>
<tr>
<td>Increased Classroom Use</td>
<td>11.90%</td>
<td>13.51%</td>
<td>39.68%</td>
<td>36.59%</td>
<td>48.41%</td>
<td>51.22%</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>0.00%</td>
<td>10.81%</td>
<td>31.25%</td>
<td>25.00%</td>
<td>68.75%</td>
<td>65.91%</td>
</tr>
<tr>
<td>School-wide Policy &amp; Planning</td>
<td>5.50%</td>
<td>27.03%</td>
<td>40.95%</td>
<td>44.20%</td>
<td>53.54%</td>
<td>48.55%</td>
</tr>
</tbody>
</table>

In interviews towards the end of the project teachers confirmed the survey findings that some of the main benefits of the programme for them had been in personal skill development and increased classroom use of ICTs. But they also very often made reference to other benefits that they had not anticipated at the beginning of the project or had not listed as objectives in the surveys. Many of these unanticipated or emerging benefits related to the facilitators’ three primary concerns of establishing collaborative networks among teachers, of building teacher confidence and self-esteem, and of developing their understandings about teaching and learning with ICT. The following selection of statements from the interviews and open ended survey questions indicates the range of benefits teachers and facilitators reported as coming from the programme.

**Benefits as mentioned by Facilitators:**

“Networking - meeting lots of people, getting new ideas, seeing the success of the participants and sharing the excitement of learners”

“Working with other schools and sharing ideas and expertise in a group”

“Knowledge of IT integration in classrooms”

“Exposure to the ‘Big Thinkers’”

“The conferences were great and the network of like minded individuals. Working with primary schools and being able to see teachers gain confidence and seeing direct spin off for students.”

“Another positive aspect was the opportunity to work collaboratively with two other [facilitators] but vastly different personality types. What powerful learning happened between us in our debates!”

“Working with people who were enthusiastic about possibilities, and open to new ideas and ways of increasing their teaching effectiveness.”

“Increased ICT software/hardware knowledge. Professional development at conferences. Gaining an insight into the culture of other schools.”

“Personal growth in skills and knowledge... and in my knowledge of the application of ICT to learning and teaching.”
“[We’ve] developed a positive attitude to ICT in cluster schools. There was a bit of resistance from a few [but] most cluster schools have their strategic plans in place and a clear direction of where they are going. Significant increases in skills and more importantly confidence to use ICT for some teachers.”

“To have teachers gain competence and confidence in their use of various ICTs for the benefit of their children and to support their own workload. To have ICT incorporated in the planning stage of all curriculum preparation - schools have really moved a long way in this commitment over the past three years.”

Benefits as mentioned by teachers:

“It has given me more ideas as to what the students could learn and do to make art using IT... at the moment if they need digital video and editing I have to do it for them.”

“I’m more committed to a constructivist style of teaching.”

“Before this I had no contact with primary or intermediate teachers. I have found talking with the teachers from nearby schools valuable, giving me an appreciation of the skills that many students are starting secondary with - more than I realised - and also the great enthusiasm of teachers and students for integrating ICT projects”

“It has supported my ongoing acquisition of skills, helped me develop resources”

“It has enabled me to produce posters, lists, and set up and update the accession registers [in the library] very easily. I have more confidence when dealing with students’ queries about the internet or CDROMs”

“Learning to use the computer has taken so much time away from other teaching/professional tasks, but as I become more skilled this hopefully will lessen”

“I’ve enjoyed] not reinventing the wheel - being more current with educational viewpoints. Being able to email, receive emails is lessening the geographical isolation I sense at times. Internet has been a big plus personally - having it in the class I find a very [useful?] tool.”

“Higher levels of work presentation, greater access to information. I’m busier, spend a lot of my own time searching for web sites and activities. But pleased to have the opportunity for upskilling.”

“I’m more confident and keen to learn more. Though I still get frustrated when the system’s down”

“Access to progressive learning theories has inspired my passion for children and education and provided a credible backdrop for my teaching programme”

“Added confidence. I feel valued when able to answer questions and solve problems. I’m more aware of resources available on the internet ot help teaching practices.”

“I enjoyed it, picked up a number of useful ideas and enjoyed the networking.”

“I have developed systems to reduce the paperwork and have gained the confidence to let the children have a greater use of the computers.”

“I’m more frustrated and incapable than ever, as I now realise it’s going to be ongoing to keep up with developments. [It needs] access - practice -confidence - use [gesture-->] efficient tool”

“Not only my knowledge of ICT, but my knowledge of how children learn has increased.”

“It’s made me realise I’m new to all this and need more hours in the day to be able to practicum all we have been shown and taught. Over time it will become clearer”

“A rejuvenation, modernisation, awareness of different pedagogies.”
“The programme has made me more confident as a teacher. It has added enthusiasm to the many areas of the curriculum and encouraged a positive attitude amongst students.”

“...feeling ‘with it’, being able to discuss and share ideas with others. The computer is something children love, and love sharing it with their parents, who are always impressed.”

“I have a deeper background knowledge of computer/ICT use, and learning theory. But I find it difficult to assess the impact it has had on my teaching.”

“I used to try and ‘force it’, the use of the computer. But the more I’ve used it myself, the more I’ve seen the opportunities for it to be used [in classrooms].... I guess I use a lot more ‘stationy’ things in my room now. There are different things going on all around the room. The computer is one of them. I’m just ‘facilitating’ around.”

5.3 Perspectives on ‘Effective’ Cluster Models of Professional Development for ICT

There was considerable consensus amongst all parties that the basic concept of schools clustering for professional development in ICT was an effective general strategy. Insofar as there was dissensus or disagreement among participant and stakeholder groups about what was or was not effective in the PD models, the subjects of such dissensus were usually things like the particular forms the programme adopted, the criteria used for the selection of participants, the balance of content of the programme, the particular andragogical techniques facilitators used, or the inter-school or interpersonal dynamics and politics operating in a given cluster, rather than the concept of school clustering itself.
Among the most prominent positive effects of clustering observed and reported by principals were a growing sense of purpose and self worth as a school, the opportunity to share expertise and funding that would not otherwise be accessible, the creation of robust inter-school networks and collaboration which in several cases went beyond the issue of ICT, and the leverage membership of the clusters could often provide for further funding with BOTs and local communities. End of Project Survey comments from principals on these include:

“It has been a real plus to use the fact that we have been a lead school as a focus for the school, its public relations, the opportunity to get Compaq sponsorship and simply to encourage the BOT that we must be on the right track and therefore to give them confidence to keep spending in the fields of ICT.”

“During the last 3 years we have invested large sums in both staff development and the purchase of hardware/software, and now feel that we are not [just] heading in the right direction, but very much at the cutting edge”

“The cluster development has been awesome as it has enabled quite different schools to come together and develop professional relationships-not just in ICT.”

“I have grown a lot professionally through this cluster approach. It has provided an additional motivation to participate in further tertiary study and this has been passed on to staff, board and students.”

“This model is in my view the most cost effective, as well as providing (sic.) quality PD for a large group of teachers [and] therefore having (sic.) a positive impact on student learning outcomes.”

“It has been very effective in areas other than ICT. The principals and BOTs are very keen to develop ICT use across the cluster.”

“There has been a wonderful cross-pollination (resulting of course in hybrid vigour) across schools involved. The sharing of ideas has been a central feature. Inter school sharing has made intra-school sharing extremely strong.”

“I am totally enthusiastic about the self-managing funded PD. “

It was not the purpose of the evaluation to rank the various clusters in any way, or to isolate one or more particular cluster programmes as being the ‘best’ or ‘most effective’ models. Nor was it to provide separate evaluations of the individual case study clusters. The focus of this Report is to look at the generality of the experiences of the cluster participants, and to highlight those elements of cluster operations that were felt to have contributed more or less to their effectiveness as professional development processes. Accordingly, we do not isolate a single, preferred cluster whose ‘model’ could be recommended as ‘the most effective’, or as an exemplary case suitable for universal adoption or replication in future ICTPD clusters. Nor do we think it would be productive, or even possible, to outline a single, replicable ‘model’ for effective professional development clustering, assembled by cobbled together the ‘best’ or ‘most effective’ components of individual cluster models. As has been found in similar studies of many other PD programmes in contexts other than ICT, the relative effectiveness or ineffectiveness of a particular programme was an intensely situated and contextualised phenomenon, unique to each cluster. Certain features worked very well in some clusters and less well in others; certain objectives were more strongly pressed in some clusters than in others, and so on.

Thus no single, replicable ‘recipe’ for successful ICTPD clustering came out of the 23 clusters experience. But the lack of a ‘recipe’ does not mean that the study has not provided some fairly clear indicators, and, what is more, relative consensus among participants and
stakeholders, as to what should be on the list of ingredients. How clusters selected, measured out and combined these ingredients, and how influential each of them was subsequently felt to have been in the overall taste of the meal, varied according to clusters’, schools’ or teacher’s unique needs and situations. But there was relative consensus as to what those core ingredients were. The particular operational characteristics of the cluster programmes most reported to have influenced their effectiveness were:
Organisational Forms and Structures
• The sector composition of a cluster
• The geographical spread of schools in a cluster
• The size of the cluster
• Time and timing issues

Programme Content
• The relative emphasis put on technical skills, classroom ideas and pedagogical rationales or theories of teaching/learning in the content of the programmes.

Professional Development Strategies
• The types and range of particular professional development strategies used in the programmes.
• The extent of ‘trickle down’ expected in the programme.

Social, Interpersonal and Political Dynamics
• The extent to which programmes acknowledged and addressed the affective domain needs of teachers in relation to ICT
• The abilities of the facilitators in a collegial development role
• The terms of employment of the facilitators
• The extent of commitment, cooperation and understanding shown by management, especially the principals, in participating schools

Sponsorship and National Coordination
• The extent and nature of external sponsorship available to individual clusters
• Ongoing support of facilitators through a series of regional and national meetings, workshops and conferences.

5.3.1 Organisational Forms and Structures - Which Schools, Where and When?

In evaluating the organisational forms and structures making for effective professional development, the various clusters’ stakeholders tended to highlight issues related to which schools were selected to join the cluster, the geographic spread of the cluster schools, cluster size, and the timing or duration of teachers’ involvement as key factors.

Vertical -vs- Horizontal clusters: The Secondary-Primary Issue

“The mix of intermediate, primary and secondary is very important, all parts of the compulsory school sector need to understand what is happening at other levels. This has become very clear through our cluster.” (Principal survey comment 2001)

“Secondary schools are not good leaders for primary schools. [It was] OK once it concentrated on what secondaries need and got away from ICT skills. 2000 was a disaster with the mix of secondary and primary. 2001 has been much better with primary people being together.” (Principal survey comment 2001)

The great majority of the 23 cluster schools were primary schools. There were 12 ‘horizontal’ clusters consisting of all primary schools, one ‘horizontal’ cluster of all secondary/area schools, and 10 ‘vertical’ clusters with a mixture of primary and secondary schools. In the vertical clusters usually one secondary school was clustered with several primary schools.
The only cluster with several secondary schools in it was the Cantatech cluster which included 6 Area Schools and 4 rural secondary schools. In 7 of the vertical clusters the secondary school was the Lead School or joint Lead School, and provided one or more cluster facilitators. Three vertical clusters with primary or intermediate schools as Lead Schools included a local high school as a participant school and in all these cases the facilitator came from a primary school teaching background.
Most vertical cluster participants, even those who considered their cluster to have been generally effective and successful, isolated the secondary-primary mix as being to some extent problematic, and in a few cases it was seen as extremely problematic.

In the latter cases, perceived economies of scale and a strongly expressed belief that secondary schools and teachers had fundamentally different needs or structures to those of primary teaching meant that on reflection they would have preferred to have either ‘gone it alone’, or to have combined with only other secondary or other primary schools. In at least three of the clusters this sense of sector-based difference was so strong within the cluster that it led after the first year to a form of operational apartheid in which two effectively parallel but separate ICTPD programmes were running: within the participant secondary school on the one hand, and across the remaining group of primary schools on the other. In some cases the extent of this separation was such that little or no formal or functional contact occurred between the secondary school concerned and the ‘clustered’ primary schools during the second and third years, different programmes of events with different content emphases operated for each sector, and even different facilitators and funding regimes were employed for each sector.

In at least as many other clusters, though, the mixture of secondary and primary schools was seen as not only manageable in an organisational sense, but on the whole positively beneficial to all concerned. Several secondary schools involved in vertical clusters seem to have taken the line that the programme was an important opportunity to foster a greater sense of community with its contributing schools. For at least 2 of the secondary schools taking part in clusters with local primary schools as Lead Schools, this collaboration also derived from a sense that students were arriving at the secondary schools with considerable ICT skills and abilities which the secondary schools had both a chance and a responsibility to tap into in their own programmes.

Evidence from the surveys suggest that overall levels of satisfaction with the ICTPD programmes were somewhat higher among secondary than primary principals, but very similar for teachers from either sector. Nor does the extensive reorganisation of a few of the vertical cluster programmes on sector lines during the project seem to have affected the overall levels of satisfaction of the principals and teachers involved in those clusters compared to the other clusters.

The extent to which individual facilitators had credibility among teachers from a different sector to their own, or were able to build such credibility over time, along with a differential organisation of PD programmes in secondary schools along departmental lines, seem to have been key sector-related factors in the perceived success of the vertical clusters.

**Geographical Spread**

There was considerable consensus among stakeholders with regard to the importance of clustering by geographical locality. In some measure this relates to a concept of ‘natural clustering’, in that schools which were close to each other were often seen as having a natural commonality of interest. This common interest came by virtue of serving the same or bordering communities in the large cities, or the entire local community in the case of smaller centres and towns, or the local cultural community in the case of the Kura.
Largely, however, the advantages of localised clustering were based in the pragmatics of providing professional development services. If not inherently making the PD programme ‘better’, there was a clear feeling among participants that it at least made it more manageable. Facilitators in particular, felt that they were more accessible to geographically grouped schools, spent much less time and money travelling, could more easily arrange combined-school workshops and practicums, and spent more time in individual schools. These were valued not just in themselves but as they were felt to allow facilitators to build an ongoing personal and professional relationship with both school leaders and especially individual teachers.
In several of the clusters the selection of schools became more and more consciously focussed on the local area close to the Lead School over the period of the programme, and even in those clusters which of necessity dealt with schools spread over a wide area, the fact of that spread was consistently reported in evaluation interviews and surveys as a limitation on the most effective operation of the cluster which was overcome only by dint of extra workload on the part of the facilitators and/or by reducing the number of schools or teachers that could effectively be supported in the time given.

**Cluster Size**

The number of schools, and the number of teachers involved in the cluster programmes varied considerably. The smallest clusters provided ICTPD programmes to between 4 and 7 schools, and some 50-70 teachers. The largest clusters sought to serve up to 45 schools and a potential teacher population of several hundred. The Milestone Reports provided by the clusters at these extremes, as well as the reports of the National Coordinator of the programme make it clear that while ‘small’ did not automatically mean ‘more effective,’ ‘too large’ did tend to mean ‘less effective’. The guidelines given to the next group of applicants for cluster programmes in 2000 and 2001 suggested that the experience of the 23 Clusters shows that, within the existing budget and time constraints of $300,000 per cluster over three years, an optimum cluster size could be anywhere between 5 and 25 schools, but, more importantly, would involve a maximum of not much more than a hundred teachers.

The main perceived advantages of the smaller clusters were the greater opportunity to build a sense of cluster community, a greater ability to involve the ‘whole school’ and thus for the programme to affect school culture and not just individual classroom cultures, and increased time for facilitators to provide regular and ongoing support to individual teachers and establish sustainable relationships with them.

**Time and Timing**

Further ‘ingredients’ in successful ICTPD as reported by the participants related to issues of time and timing. In particular, it was felt to be important for facilitators to have regular contact with participating teachers over the longest possible period of time. For facilitators especially, the importance of regular contact was important, while for teachers the main issue was increasing the amount of time they had to devote to ICT issues. For both groups the ongoing nature of the contact, expressed as the length of time they were actively involved in the PD programmes, was also important.

It is important to note here that the key duration factor was probably not so much the length of time a given school was involved in the programme, but the length of time an individual teacher was involved. This period differed considerably from cluster to cluster. Some of the models, for example, were for full ‘three year’ programmes, with the same group of schools being involved over all three years of funding. However, since whole staffs could not take part all at once, there was, even in these clusters, an inevitable staggering of the length of time any individual teachers would be actively engaged in the PD programme over those three years. Some other clusters, on the other hand, originally had individual schools or individual teachers take part in the programme for up to one year only, and then replaced those schools with a different set of participants each year thereafter. In effect, therefore, the latter model was to run one-year programmes three times for different sets of participants, rather than a ‘three year model’ with the same group of participants. In such programmes
an individual teacher could possibly be actively involved in a programme of PD for periods of only a few weeks or months.

Over the clusters as a whole, individual teachers took an active part in professional development off and on for anywhere between 3 months and 3 years. About a quarter of teachers, many of them Lead Teachers for their schools, took part for the full three academic years. Another quarter took part for around two school years, and a third for up to one school year. Primary teachers were engaged in the programmes for significantly longer terms than secondary teachers, possibly because of a tendency in secondary schools to rotate teachers through the ICTPD programmes department by department (Table 7).

It is interesting to note that in all of the case study clusters where annual rotations of schools or teachers were planned, the one year involvement was amended at the end of the first year and further provision was made for many or all of the participating schools to extend their time in the programme. The pressure for this came predominantly from the schools and teachers themselves, and especially from those who were taking on a Lead Teacher role, who often felt strongly that a single year of participation was insufficient to achieve the objectives set for the programmes.

Table 7 The Duration of Individual Primary and Secondary Teachers’ Active Involvement in the ICTPD Programmes

<table>
<thead>
<tr>
<th>Duration of ICTPD (Months)</th>
<th>End of Project Primary</th>
<th>End of Project Secondary</th>
<th>Total</th>
<th>End of Project Primary</th>
<th>End of Project Secondary</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6 months</td>
<td>40</td>
<td>28</td>
<td>68</td>
<td>5.57%</td>
<td>17.95%</td>
<td>7.78%</td>
</tr>
<tr>
<td>7-12 months</td>
<td>135</td>
<td>31</td>
<td>166</td>
<td>18.80%</td>
<td>19.87%</td>
<td>18.99%</td>
</tr>
<tr>
<td>13-18 months</td>
<td>98</td>
<td>26</td>
<td>124</td>
<td>13.65%</td>
<td>16.67%</td>
<td>14.19%</td>
</tr>
<tr>
<td>19-24 months</td>
<td>169</td>
<td>25</td>
<td>194</td>
<td>23.54%</td>
<td>16.03%</td>
<td>22.20%</td>
</tr>
<tr>
<td>25-30 months</td>
<td>74</td>
<td>13</td>
<td>87</td>
<td>10.31%</td>
<td>8.33%</td>
<td>9.95%</td>
</tr>
<tr>
<td>31-36 months</td>
<td>202</td>
<td>33</td>
<td>235</td>
<td>28.13%</td>
<td>21.15%</td>
<td>26.89%</td>
</tr>
<tr>
<td>N</td>
<td>718</td>
<td>156</td>
<td>874</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Perhaps the second most important timing factor, especially from the teachers’ perspective, was the amount of release time available to them to attend PD events. Clusters varied in the amount of release time given to individual teachers for PD. In some clusters an entitlement was built into the cluster model, in others it was expected that teacher release was a contribution made by the schools, in others no release time was given but the schools or the ICTPD contract arranged an extensive programme of before school or after school workshops, ‘techie breckies’, and so on.

Teachers in particular were very clear in their evaluations that the *amount* of time made available to attend such events was a key factor for them. In the case study clusters teachers willingly took up the opportunities offered in pre- and post-school hours sessions, but it is clear from the evaluations that they valued even more any extended periods of release from classroom duties to attend workshops, seminars, conferences and the like. In teachers’ written evaluations lack of time was seen as the most significant constraint on their further development with ICTs. Over 32% of teachers felt that time remained a ‘concern’, and 56% felt it to be ‘a significant concern’ at the end of the project. Similarly, over 80% of teachers and facilitators alike regarded Release Time as one of the most useful PD strategies employed by the clusters.
The flow-on effects of these timing and duration factors on teachers’ levels of confidence with ICTs, and on their subsequent use of ICTs in classrooms, are dealt with in detail in later sections. Suffice it to note here, that teachers, facilitators and principals alike identified several issues of time and timing as important factors in determining the perceived effectiveness of the ICTPD programmes. On the whole, the more successful programmes were seen to be those which maximised the amount of teacher release available to participants and those which involved teachers in ongoing PD support over an extended period of time measured in years rather than in months or school terms.

5.3.2 Programme Content - What?

In terms of programme content the major issue seemed to concern the balance of emphasis given between personal skills and pedagogical theory.

The balance of focus on teaching and learning in programmes’ content, compared to policy development or administration, does not seem to have been a critical factor in perceived cluster effectiveness. Levels of participant satisfaction with the PD programmes were very similar no matter whether the major focus of the PD programme was on ICT in classroom teaching and learning, or on ICT policy development and administrative applications. What does seem to have been important, however, was the balance struck by each programme within their focus on teaching and learning among three key content elements:

- **Technical Skills & Competencies.** The focus of these sessions was on how to operate various ICTs. The aim was to develop teachers’ personal or operational skills and knowledge in relation to operating a range of ICTs that might help them in their administrative roles or, more often, that students might use in classrooms.

- **Classroom Strategies.** The focus of these sessions was on ‘how’ and ‘when’ student use of ICTs might be integrated into classroom programmes. The aim was to develop practical classroom strategies for the incorporation of ICTs. This included discussion of classroom organisation techniques as well as ideas for topics and themes that particular ICTs might be used within.

- **Pedagogical Rationales.** The focus of these sessions was on the ‘why’ of ICT usage in classrooms. The aim was to develop teachers’ broader understandings of the links and connections that might be made between ICT use on the one hand and various pedagogical or learning theories on the other.

Although the action plans of almost all clusters gave similar weights in emphasis to all three of these content elements, it was clear from the observations and the surveys that not all participants gave them similar weighting in terms of their individual goals and priorities, and nor did all clusters give them similar emphasis in the daily practice of delivering the PD programmes.

It is apparent, for example, that facilitators differed as a group from the teachers in terms of the focus of their goals. Whereas teachers tended to be focussed on pragmatic issues related to personal skills and the practicalities of classroom use, the facilitators were often more focussed on pedagogical issues. It would not be too much of an exaggeration to characterise the difference, at least at the beginning of the programmes, as being that the teachers wanted to know ‘how’ but most of the facilitators wanted them to explore ‘why’.

In many clusters theories of learning and teaching were prominent among the readings and activities, and in these clusters the journey for the teachers was often a shift in emphasis.
through the ‘how’ towards the ‘why’. Professional readings which were used to some extent in most of the cluster programmes, generated quite a few negative comments from teachers in the early stages of the programmes, and this strategy was not rated highly by them in the survey. But the totality of evidence from the clusters would suggest that this aspect of the delivery, insofar as it represents or exemplifies a cluster’s emphasis on pedagogical theory and the connections of ICT usage to pedagogical theories, was nevertheless effective in generating teacher awareness of these issues.

Whether they had ‘enjoyed’ such sessions or not, by the end of the programmes many teachers had absorbed such concepts and ideas into their discourse, and in the final interviews were speaking much more favourably of the impact such sessions had had overall. As one teacher expressed this somewhat ambivalent reaction to the theoretical component of her programme:

“Whereas I thought for a start skill based learning is what I need. [And] I do, I do, I do, you know. And I thought, OK, yes, yes, the theorists, yes, we’re going a bit too much into that. But no, when I look back it was actually quite a really good balance.” (Teacher interview 2001)

Our conclusion is that the teachers took from the various cluster programmes according to the emphasis given. Where a strong emphasis was put on theoretical or philosophical perspectives, this often became, over time, and not without some resistance from the participants, part of the teachers’ conceptual frameworks, and it often formed part of their discourse when reflecting on the effectiveness of the programmes. Where the programme was focussed primarily or exclusively on more practical issues, the simple achievement of these practical goals was the main component of teachers’ reflections. Both groups, therefore, emerged from the experience relatively content that their goals had been met, but the range of ICT related issues that had been covered, and, one suspects, the depth of understandings about ICT’s role in teaching and learning achieved, was rather different for the two groups. To this extent, the clusters which had a comprehensive programme which either overtly or in more subtle ways emphasised the development of participants as reflective practitioners seem to have had a particularly strong and possibly broader impact.

5.3.3 Professional Development Strategies - How?

If what facilitators ‘delivered’ in their professional development programmes seemed to have had an effect on the goals achieved, so too did the ways they delivered it.

Professional Development ‘Events’

A question in the End of Project surveys addressed participants’ retrospective views on the particular modes or forms that professional development took in their clusters. Taken alongside the interview data in which participants in the case study clusters were asked more open-ended questions on the subject, these provide interesting indications of which particular strategies the various groups found to be most effective as professional development ‘events’.

It is clear from Table 8 that participants had some clear preferences in terms of the formats that their PD took, and that, while there was agreement among the participant groups about many of these formats, there were nevertheless a few interesting role-based differences in the value put on some particular modes of operation.
Teachers, facilitators and principals alike, for example, tended to rate quite highly Teacher Release time, Technology Mentors, On the spot support, and to a lesser extent Workshops/Seminars as ‘effective’ modes of professional development delivery used in the clusters. All three groups also tended to rate more lowly Workplace Visits and Listserves where they had experienced them. On one or two delivery modes there were significant differences among the participant groups. Principals and facilitators, for example, were much more likely to rate formal Conferences highly than were teachers, principals were more likely to rate School Visits highly than either teachers or facilitators, and facilitators tended to see Professional Readings more favourably, or should we say, less unfavourably, than teachers or principals.

The most highly rated modes of delivery for the three groups were:

<table>
<thead>
<tr>
<th>Teachers</th>
<th>Facilitators</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release time (80%)</td>
<td>Conferences (90%)</td>
<td>Lead Teachers (79%)</td>
</tr>
<tr>
<td>Technology Mentors (75%)</td>
<td>Tutorials (89%)</td>
<td>On the spot support (71%)</td>
</tr>
<tr>
<td>Practicums (71%)</td>
<td>Release time (81%)</td>
<td>Technology Mentors (70%)</td>
</tr>
<tr>
<td>Tutorials (71%)</td>
<td>On the spot support (79%)</td>
<td></td>
</tr>
</tbody>
</table>

(Percentages represent the proportion of that participant group who rated a delivery mode as either ‘largely effective’ or ‘very effective’ in the End-of-Project survey. Definitions of the various strategies are outlined in Q5 of the Teacher End of Project Questionnaire in Appendix 2.)

When these selections from the surveys are put alongside the interview data, it becomes clear that the modes of delivery most positively regarded by participants were those that involved practical and relevant skills and classroom ideas, those which maximised the time available for teachers to come to grips with the content involved, and those which combined this substantial ‘time out’ on the one hand, with ongoing access to facilitators or mentors within their schools or classrooms on the other.
Moreover, within those modes of delivery, teachers also had decided preferences as to how they liked to be grouped. The great majority of teachers found working in one-to-one situations, either with an ICT facilitator or with a colleague, to have been the most effective method for learning new skills. Ninety-four percent and 81% of teachers respectively reported these one-to-one situations as having been either ‘effective’ or ‘very effective’. The great majority (73%) also felt that working in a large group (laboratory) situation had been either ‘not effective’ or only partially effective’ in developing skills. As a group, teachers

<table>
<thead>
<tr>
<th>PD Strategy</th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Study Groups</td>
<td>Professional Reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 not at all effective</td>
<td>8.4%</td>
<td>5.4%</td>
<td>0.0%</td>
<td>21.1%</td>
<td>11.2%</td>
<td>11.1%</td>
</tr>
<tr>
<td>2 partially effective</td>
<td>30.0%</td>
<td>29.7%</td>
<td>50.0%</td>
<td>50.4%</td>
<td>55.1%</td>
<td>38.9%</td>
</tr>
<tr>
<td>3 largely effective</td>
<td>39.3%</td>
<td>44.6%</td>
<td>20.0%</td>
<td>20.3%</td>
<td>20.4%</td>
<td>50.0%</td>
</tr>
<tr>
<td>4 very effective</td>
<td>22.2%</td>
<td>20.3%</td>
<td>30.0%</td>
<td>8.2%</td>
<td>13.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>N</td>
<td>333</td>
<td>74</td>
<td>10</td>
<td>611</td>
<td>98</td>
<td>18</td>
</tr>
</tbody>
</table>

| PD Strategy          | Technology Coaches | On the Spot Support | | | | |
| 1 not at all effective | 5.9% | 8.4% | 0.0% | 7.2% | 4.2% | 0.0% |
| 2 partially effective | 34.0% | 32.7% | 46.7% | 23.5% | 25.2% | 21.1% |
| 3 largely effective   | 36.9% | 42.1% | 46.7% | 36.7% | 37.0% | 21.1% |
| 4 very effective      | 23.2% | 16.8% | 6.7% | 32.7% | 33.6% | 57.9% |
| N                     | 474     | 107        | 15           | 597      | 119        | 18          |

| PD Strategy          | Technology Mentors | Listserves | | | | |
| 1 not at all effective | 4.0% | 3.7% | 5.9% | 29.9% | 15.3% | 30.8% |
| 2 partially effective | 21.3% | 26.2% | 35.3% | 48.6% | 54.2% | 61.5% |
| 3 largely effective   | 42.7% | 39.3% | 41.2% | 16.4% | 23.7% | 7.7% |
| 4 very effective      | 32.1% | 30.8% | 17.6% | 5.1% | 6.8% | 0.0% |
| N                     | 602     | 107        | 15           | 214      | 59         | 13          |

| PD Strategy          | Tutorials | Workshops/Seminars | | | | |
| 1 not at all effective | 3.9% | 4.8% | 0.0% | 8.1% | 5.4% | 0.0% |
| 2 partially effective | 26.2% | 28.8% | 10.5% | 32.9% | 31.8% | 22.7% |
| 3 largely effective   | 38.7% | 44.0% | 42.1% | 35.2% | 39.5% | 36.4% |
| 4 very effective      | 31.2% | 22.4% | 47.4% | 23.9% | 23.3% | 40.9% |
| N                     | 718     | 125        | 19           | 742      | 129        | 22          |

| PD Strategy          | Workplace Visits | School Visits | | | | |
| 1 not at all effective | 15.9% | 13.0% | 0.0% | 12.0% | 1.7% | 11.1% |
| 2 partially effective | 37.4% | 31.5% | 50.0% | 32.9% | 23.3% | 16.7% |
| 3 largely effective   | 26.9% | 35.2% | 16.7% | 33.7% | 45.7% | 33.3% |
| 4 very effective      | 19.8% | 20.4% | 33.3% | 21.4% | 29.3% | 38.9% |
| N                     | 227     | 54         | 6           | 359      | 116        | 18          |

| PD Strategy          | Retreats/Intensive Practicums | Conferences | | | | |
| 1 not at all effective | 4.2% | 4.8% | 0.0% | 10.4% | 1.7% | 5.0% |
| 2 partially effective | 24.5% | 29.0% | 46.2% | 26.8% | 23.3% | 5.0% |
| 3 largely effective   | 30.8% | 45.2% | 23.1% | 31.1% | 45.7% | 35.0% |
| 4 very effective      | 40.5% | 21.0% | 30.8% | 31.6% | 29.3% | 55.0% |
| N                     | 237     | 62         | 13           | 395      | 116        | 20          |

| PD Strategy          | Release Time | Lead Teachers | | | | |
| 1 not at all effective | 2.6% | 3.0% | 4.5% | 7.4% | 0.0% | 4.8% |
| 2 partially effective | 17.7% | 15.2% | 13.6% | 25.0% | 20.7% | 23.8% |
| 3 largely effective   | 37.9% | 45.5% | 27.3% | 39.3% | 41.4% | 42.9% |
| 4 very effective      | 41.9% | 36.4% | 54.5% | 28.4% | 37.8% | 28.6% |
| N                     | 583     | 132        | 22           | 680      | 111        | 21          |

(Percentages represent the proportions of respondent teachers, principals or facilitators who gave each strategy a given rating. Respondents were asked to rate only those strategies which had been used in their particular cluster programme.)
were fairly neutral about working on their own with written support materials for this, although secondary teachers were more likely to report this as being effective than primary teachers.

Most teachers found working in groups with similar skills levels more effective than working in mixed skill level groups. They also reported that working with colleagues from their own school was more effective than working with colleagues from other schools, although this runs counter somewhat to the benefits of cross-school sharing so frequently reported as being a consequence of such inter-school collaboration in responses to other survey questions and in the interviews. Primary teachers tended to be more favourably disposed towards inter-school groups for skill development than secondary teachers.

Teachers felt that working in their own departments or syndicates was a very effective strategy, but a small majority also felt that working across syndicates or departments was also effective. There were no sector differences in these views. Most teachers, however, seem undecided about the relative effectiveness of working across sectors or within their own sector. Fifty-one percent of teachers reported that skill development groups with both secondary and primary teachers in them had been ‘effective’ or ‘very effective’, but 75% of them reported the view that working in single sector groups had been either ‘not effective’ or only ‘partially effective’. Secondary teachers were significantly more likely than primary teachers to report that cross sector groupings for skill development were effective.

**Lead Teacher models and ‘Trickle Down’**

The extent to which the ‘trickle down’ effect implicit in the ‘Lead Teacher’ models adopted by many of the clusters worked in practice has been difficult to assess. This is partly because the Lead Teacher group was not isolated in the demographics of any of the surveys or interview sessions, and few teachers, moreover, commented on it unprompted in interviews. It is also partly because such effects are likely to be more long term than the period of the projects themselves. Moreover, few, if any, of the clusters practised such a model in a pure form, preferring, for example, to supplement the operations of the lead or mentor teachers in their schools in the third year with continued and fairly regular workshops and classroom visiting by the cluster facilitator.

Few if any teachers from high trickle down clusters brought up the issue in their response to open ended survey questions about the structure of their cluster programme, although one or two expressed the opinion in interviews that it had not happened to the extent hoped for in the longer term.

What we can say with more confidence is that the ‘Lead Teachers’ were often at the forefront of pressure to retain their school’s participation in the programmes for as long as possible, and were often quite vocal in their view that one year, or even longer periods, had been insufficient to prepare them for any substantial collegial development role. Nor did the resourcing exist in most cases for this to occur, at least not at the level available to the first generation of facilitators and Lead Teachers themselves.

Certainly, too, one of the facilitators in such a cluster was similarly of the view that it had not succeeded as they had hoped in some important respects. “Our method”, she argued. “became diluted, and few of the teachers outside of our Lead Teacher group had a good grasp of our contract rationale or key features.” (Facilitator interview, 2001) It was her view
that while technical expertise had indeed trickled quite readily from facilitator to Lead Teacher to teachers, the same was not true of the depth of understandings or the processes of reflective practice that the facilitators had managed to pass on to the Lead Teachers.

This was also the experience of one of the observed schools in another cluster, where the Lead Teacher felt that while he himself had gained significant understandings through his participation in practicums, readings and extended withdrawal time, he had not been able to do the same for his colleagues except in relation to passing on ICT skills and some classroom ideas. It is notable in this respect, perhaps, that in none of the Lead Teacher models was the ICTPD contract able to fund the same extent of release for other teachers that had been available to the Lead Teachers, which made it very hard for Lead Teachers to comprehensively ‘reproduce’ their own experience with the cluster facilitator for the benefit of their colleagues, even had they felt as confident and prepared as the cluster facilitator(s) to do so.

The three following extracts from interviews in the two case study clusters that put the most emphasis on trickle down in their model perhaps exemplify some of the issues around trickle down in these clusters.

A  There has been some specific support like [Facilitator] but mainly it has been somebody in the school has learnt to do it and then passed that information to show other people, like [facilitator] showed me how to use the scanner and since then I have had four or five teachers wanting to know how to use it. (Teacher interview, 2001)

B  Teacher: Yes, the contract has certainly zipped up the level of activity in the school, so that it’s a kind of energising place to be in. And I think from the immediate people involved as facilitators and then the Lead Teachers, there’s been considerable flow on effect that affected all staff members including me. And I think it’s probably the energised level that has the most far ranging effects. People are trying to do things and do things differently. And there’s a drive to learn new skills.

Researcher: OK. You said there’s been considerable flow on effects. Can you tell me what some of those specifically might have been?

Teacher: People have observed new skills and different skills that they haven’t used in their own classrooms before. And so instead of just saying, that’s interesting, they’ve just said, how do you do that? And that’s been quite a positive thing, and I’ve had experience of that. I’ve seen some outcomes and I thought, is that hard to do?

Researcher: Right. And where do you see this? You talk about that you’ve – ? You’ve observed it ..?

Teacher: Yes. I’ve observed it from sharing times within syndicate meetings - we’ve discussed what we’ve been doing. Sometimes just in passing through teachers’ classrooms when you’re on duty, or when visiting classrooms I’ve seen that. And I’ve also learnt quite a bit from this whole staff sharing that we have at the end of every term. At first I found that quite onerous. I thought, oh, the end of every term we’re going to have to take a whole staff meeting to do this. ... But when you look back and see what’s come out of it, it’s the only time when all the teachers have had a chance to get together and share about one curriculum area. ... And for me that has been quite a valuable point. Although if I’d looked at it and said four staff meetings in a year just devoted to sharing – what a waste …
Teacher: Yes. And that – it’s a climate of sharing, so it doesn’t mean that you feel guilty if you haven’t done as much as someone. For instance I thought what I had done didn’t look so flamboyant as someone who had produced a video. But other people found value in what I’d done. And I found value in what other some people had done. So there’s a bit of a mix and match and you pick up things from other people that way. (Teacher interview, 2001)

What finally happened is that zoot! We’re all going to do IT. And I’ve found that a little bit haphazard. And I don’t know that it has – as I’ve looked at it more. Tell me how this will advantage the children. How will this help their maths? How will this help their reading, their spelling? What’s this got to do with that. And I don’t see any good answers to those questions … I think I’ve seen as a bit of a block, and all I’ve really wanted to do was say, well I can see that, you know, doing Kidpix is great but what are they learning? And if they’re doing that, does that mean they’re not doing that? Who’s making the value judgement that that’s better than that?... I’d want to look at a sort of underlying philosophy behind the whole IT approach to education and from my possibly quite shallow perception I haven’t ever really seen a good answer about that. ...

Well my experience of Lead Teachers has mostly not been marvellous, because I think too much has been expected, too much has been expected of them - they’re not actually getting paid extra for this. Well I don’t think they are. I don’t know that for sure, perhaps they are. But I think they volunteered to be Lead Teachers without quite understanding what is involved. And I think they’ve discovered that really they’ve been resource people, and so we ought to be able to go to these Lead Teachers and say, help me with such and such…. but once again it’s a wee process step that hasn’t quite been taken. So maybe that’s what will happen next year is that Lead Teachers will be maybe given some release time perhaps … you know, people aren’t yet comfortable going to them and saying, hi, this is me. Give me some ideas for reading for this term please.... And I had rather assumed that with these people coming into the school that that’s what would have happened …. And that’s what happened with the first year, it happened for half the second year, and since then it’s sort of regressed on down really. ... I think that’s the only other thing I’d add, that next year it would be good to see the Lead Teachers perhaps being a bit more proactive with those of us that aren’t naturally, instinctively, just taking this through. Because it just simply is not part of our teaching style.” (Teacher interview 2001)

While we are unable to cite a great weight of evidence for it directly from the participant data, as frequent observers of the clusters we tend to agree with the facilitator quoted above, and conclude that ‘trickle down’ models seem to have worked for two ‘generations’ (from facilitator to Lead Teacher and from Lead Teacher to colleagues) in relation to technical skills and knowledge, and to some extent with regard to the spread of practical classroom ideas, but they did not appear to have been effective for more than one ‘generation’ in developing the deeper understandings of the role of ICTs in teaching and learning, or the processes of professional reflection and self-development that were also part of some of these programmes’ goals.

5.3.4 Social, Interpersonal and Political Dynamics - Who?

“This cluster is strong and the schools mutually supportive. It has been very effective in areas other than ICT. The principals and BOTs are very keen to develop ICT use across the cluster. There are some very able and enthusiastic teachers who are now helping others in the cluster. We have high expectations about future possibilities. The Lead
Teacher for the ICT cluster has been a strong leader with vision and innovative flair.”  
(Principal survey comment, 2001)

“The most globally important thing in my estimation is the ability of the cluster to instigate change from the individual principals within it. You know, to start their change process, to assist them in understanding what it means for their school, and to then foster their ongoing development in that regard and make a big difference for them so that they then are, they have the tools in their toolkit to get out there and make a difference for their school. Because this particular area, the ICT area, impinges on absolutely everything that’s important in the school.... How principals could imagine that they could be divorced from that by delegation, or divorced from it by inaction... defies logic really.”  
(National Coordinator interview, 2002)

Some recent research indicates that the things most valued by New Zealand teachers in professional development are as much, if not more to do with the professional and personal qualities of the person delivering it as with the message he/she is delivering. Davey (2000) concludes from her national survey of English teachers’ views on effective professional development, for example, that a human, social, or interpersonal component was “crucial in most teachers’ descriptions and conceptions of ‘effective professional development” (Davey 2000, p23-4). High quality presenters/facilitators, who were experienced, enthusiastic, highly skilled, empowering, stimulating or motivating in their facilitation and able to generate a strong sense of “professional fellowship” were described as central to such conceptions. Our experience with the ICTPD clusters would tend to support these conclusions.

If the organisational aspects of how the PD programme was delivered were important, even more so seemed to be the interpersonal and socio-political aspects of the operation of the cluster. Affective words such as ‘enthusiasm’ ‘ownership’, ‘energy’, ‘innovation’, ‘flair’ and ‘commitment’ were a very noticeable aspect of the discourse of the teachers, and even more so the facilitators, and highlight the importance, in participants’ eyes, of PD as series of socio-professional interactions, and not merely as an organisational mechanism or system for information delivery. In such situations an individual facilitator’s or principal’s experience, professional credibility, leadership abilities, and personal mana all become important factors in determining the effectiveness of the programme. ‘Who’ was conducting, monitoring or managing a programme, their relative positions in the formal and informal professional hierarchies operating in the clusters, and their levels of personal commitment to it, seem to have been as important in determining the overall impact of a programme as ‘what’ was covered in it or ‘how’ it was organised.

All of the principals and many of the teachers interviewed at the end of the project mentioned the quality of their facilitator as a key factor in determining what worked and what did not in their cluster programme. Indeed, from some we got the impression they felt the combination of a quality facilitator and sufficiently strong leadership and buy-in from the principals could overcome most other limitations that might be present in the structure, content or mechanisms of a PD programme. The desirable qualities most valued in facilitators reflected those emerging from the study cited above: experience and sector-credibility, organisational skills, subject knowledge, enthusiasm, flair and emotional supportiveness. Comments along these lines included:

“Facilitators were supportive and caring.”
“High quality information.”

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“Excellent organisation.”
“Good flow of information.”
“The superb organisation of the project coordinators. They have put in place systems and structures which have led to accountability, have encouraged and enthused the staff participating. They have had the required expertise and have dealt professionally and encouragingly with staff to reach outcomes.”
“The expertise and enthusiasm of the facilitator has been instrumental in our developments.”
“The Lead Teacher for the ICT cluster has been a strong leader with vision and innovative flair.”
“A tremendous set of leaders who were inspiring and encouraging.”

As for the facilitators themselves, heavy workloads and very high self-expectation seemed to be a feature of the facilitator role, and all of the facilitators put a great deal of energy into coming to grips with what was for many of them an unaccustomed role and job description. One potentially critical factor in terms of their sense of their own effectiveness seems to have been whether or not they were full time or part time in the role. The End of Project survey and interviews with facilitators indicate that part time facilitators tended to be less convinced about their own effectiveness, or at least feel that they had additional difficulty in being effective, than full time facilitators. This seems to have been especially the case where a part time facilitator was employed for the other part of their job as the ICT coordinator/teacher in the Lead School, which was often the case in secondary schools. The conflicting demands made on their time by the delivery of the ICTPD programme on the one hand and the requirement to be available for technical support or teaching within their own schools was mentioned to some degree or another by all of the facilitators who were in this situation. As one put it: “.5 isn’t really .5 - it’s a lot more. So both .5 positions taken together come to equal more than full time employment.... being part time is too frenetic, especially given the pay.” All four of the full time facilitators who responded to the End of Project evaluation said that their overall expectations of the programme had been ‘fully met’ or ‘exceeded’. Ten out of the 18 part time facilitators who responded expressed the same view.

If the credibility, knowledge, personality and leadership skills of the facilitators were important to the effective running of the clusters, so too was the extent of active leadership, support and commitment shown by the principals and senior managers of the participating schools. While often not participants in the professional events themselves, their active support of the cluster concept, of the particular programme of PD in place and of the facilitator as the central figure in the process, was nevertheless seen as an extremely influential factor.

Facilitators in particular, spoke of the importance of promoting “greater understanding by people at management team level” in the ICTPD programmes, of having principals “accepting responsibility to drive IT”, of “targeting principals as the key players”, and of generally building a culture of “valuing, rather than jockeying for position” among cluster school leaders. They spoke too, of the effectiveness of “regular get-togethers for all cluster principals”, of appointing the school principals to any cluster management team, and of sharing funds transparently and equitably among participating schools, as mechanisms for generating commitment and ‘buy-in’ from the principals. There was an implicit, and sometimes explicit, assumption in the interviews, too, that to be really effective such support had to be active rather than passive, or delegated.
5.3.5 ‘Sponsorship’ and National Coordination

The final two influential ingredients in the success of the cluster programmes were the supplementary sponsorships involved in several of the programmes, and the impact, especially on the facilitators, of the regular regional and national conferences run by the National Coordinator.

Supplementary sponsorships undertaken by individual clusters took a variety of forms. In some cases it took the form of self-sponsorship by individual schools or teachers for supplementary initiatives, on top of the ICTPD programme but designed to mesh in with the goals and operation of the ICTPD programme. Examples of such self-sponsorship were the several clusters in which schools funded additional regular skills sessions, or made arrangements with local ICT companies to provide them as part of a formal or informal partnership deal. In other cases, the sponsorship of commercial ICT companies took the form of the provision of equipment for no cost or at highly reduced rates, the provision of a computer suite for one cluster’s programme being but one example.

The most extensive sponsorship, however, took the form of the provision of funds from local or regional education Trusts to support the ICTPD programmes directly or through complementary initiatives that took place alongside the ICTPD programme. Cluster G in the case study clusters described in section 4, above, provides a good example of such arrangements, and the level of such support that one or two of the clusters were able to draw upon.

Additional sponsorship, moreover, did not just take the form of external provisions of funding, ICT products, and free, or cheap ‘IT training’ services. A further type of sponsorship came in the guise of the provision in some clusters of formal (degree or diploma level) qualifications credit for participating teachers, organised through the education department of a college of education, university or other tertiary provider. The most extensive example of this, perhaps, was the cluster which had the provision of Diploma in ICT in Education courses from one of the Colleges of Education as the basic part of its programme model. Teachers in several other clusters also had the opportunity to gain formal qualifications credits as a result of their participation in the ICTPD programme, though on a less comprehensive and integrated basis.

In all, about half of the clusters supplemented their ICTPD programme with some level of additional sponsorship of these sorts, and in all these cases, the existence of such support was seen as being an important factor in the overall effectiveness of the ICTPD programme in the cluster.

Finally, we must mention as an ingredient in the progress of the cluster PD programmes, the impact of the active programme of inter-cluster collaboration initiated and organised by the National Co-coordinator. These collaborations took the form of regular regional and national conferences for cluster facilitators and cluster managers. Much of the National Co-coordinator’s job was to travel the country chairing regular regional meetings at which the facilitators and managers of several clusters joined to share their experiences and review the operation of the group of clusters as a whole. In addition, the National Coordination team organised major national conferences in both 2000 and 2001 showcasing cluster developments and providing further PD opportunities for facilitators and teachers alike. The impact of these
meetings and conferences was particularly strong on the group of facilitators, who otherwise might have been left somewhat isolated in their clusters. There was as a result of these meetings an element of constructive cross-cluster fertilisation of skills, classroom ideas, PD strategies and philosophies, especially among the facilitators, which is perhaps reflected in the very high ratings given to conferences as a PD format by facilitators in their End of Project evaluations.

**Summary**

- Within broadly similar parameters, the goals and objectives pursued by particular clusters, and by particular participant groups within the clusters, were quite varied, as were the modes of operation by which particular clusters and cluster facilitators implemented their professional development programmes.

- Principals and teachers both tended to concentrate on goals related to increasing teachers’ ICT skills and increasing their use of ICTs with students in classrooms. Facilitators were as a group more focussed on objectives related to increasing teachers’ pedagogical understandings and the effective practice of classroom teaching and learning.

- Overall, participants reported very high levels of goal achievement as a result of the ICTPD programmes, although there were some role and sector based differences in the extent to which participant groups felt they had achieved particular goals or groups of goals. The particular benefits of the professional development programmes highlighted by teachers were the sharing of professional expertise, increased confidence in relation to ICTs, and developing understandings about both the practice of, and the professional rationale for, teaching and learning with ICTs.

- The basic concept of school clustering for the provision of professional development through devolved funding was widely seen as having been very successful. Where difficulties were experienced they were seen more as the result of practical implementation difficulties, often related to the organisational or political dynamics of a cluster than to the concept of clustering in itself.

- While there was no single, replicable model of teacher professional development that showed itself to be more ‘effective’ than others, there was a fair consensus as to what the ingredients in such a recipe might be. The main factors affecting the impact of clusters’ PD programmes were:

  The organisational form of the cluster. The sector composition of clusters, the geographical spread of the cluster, the number of schools, or more importantly the number of teachers, involved in the programme, the frequency and timing of professional development events, and the length of time an individual teacher was actively involved in a programme were the most important organisational factors.
Programme content. Programmes which focussed on all three of personal skill development, practical classroom ideas for the use of ICTs, and the development of sound pedagogical or theoretical rationales for the use of ICTs in teaching and learning had more wide ranging, and possibly more long term, effects than those which focussed more narrowly.

Professional development strategies. Teachers valued most those professional development strategies which maximised the time available to them to come to grips with ICT skills and uses, and which combined substantial ‘time out’ on the one hand with ongoing access to collegial support on the other. ‘Trickle down’ models appear to have been more successful in relation to the development of skills than in the development of ICT related pedagogical understandings and professional rationales.

Social, interpersonal and political dynamics. The extent to which programmes acknowledged and addressed the affective domain needs of teachers in relation to ICT, the terms of employment of the facilitators, and even more importantly, the professional abilities of the facilitators in a teacher-educator role and the extent of commitment, collaboration and understanding shown by senior management in participating schools, all had a significant impact on the operation and effectiveness of the programmes.

Sponsorship and national coordination. Several clusters made effective use of supplementary external sponsorships of various kinds to the benefit of their programmes. The regional and national meetings, workshops and conferences organised and run by the National Coordinator were particularly influential in building the expertise, competence and collegial networks of the cluster facilitators.
The focus of the previous two sections of the report has been to address the question of what the most effective operational characteristics of the ‘school cluster’ PD models were in meeting stakeholder and participant goals. However, the ultimate test of the effectiveness of the ICTPD programme overall lies less in how participants perceived the value of the PD in itself, or indeed what aspects of it they particularly valued, than it does in what skills and understandings they took away from those events, in what they and their students actually did with ICTs as a consequence back in their individual schools and classrooms, and, perhaps most of all, in what was to be the educational value of that usage. The rest of this report addresses these other issues in turn.
6. School Effects

The Ministry’s contracts with the clusters stated the general purpose of the cluster programmes as being to: “...provide, during the 1999 - 2000 school years, professional and school development programmes in the use of Information & Communication Technologies (ICT) in teaching, learning and administration.” [Our emphasis] More specifically, the 23 contracts stated that, among other things, the cluster programmes were to:

- Provide professional development for teachers in participating schools on the use of ICT for teaching and learning and administration...
- Utilise ICTs to meet a variety of administrative needs, ...
- Develop integrated policies and sustainable development plans for ICT

In about three of the clusters a very high profile for administrative use of ICTs was retained in the cluster action plans. In about six others there was less of a focus on administration per se, and more on the development of whole school ICT planning or policy initiatives. In the great majority of clusters, however, goals relating to both administration and policy development were present, but took a back seat to professional development on ICT in relation to classroom teaching and learning.

6.1 Teachers’ Use of ICTs for School Administration and Lesson Preparation

If the increase of administrative use of computers was not the primary focus for many of the PD programmes, it was nevertheless a secondary goal for many stakeholders and participants, and especially the principals of the participating schools. Moreover, whether administrative use was a primary focus or not, most participating teachers seem to have increased their use of ICTs for various ‘administrative’ purposes over the period of the project, especially their use of ICTs in the process of planning and preparing lessons.

For convenience, we have defined the general notion of ‘administration’ to include all teachers’ use of ICTs for professional purposes outside the classroom, and as distinct from either their own use of ICTs as a teacher within a classroom (for example for demonstration purposes) or the use ICTs in classrooms by students for learning. As such, we include both data on teachers’ use of ICTs for bureaucratic or ‘school administration’ tasks such as maintaining student records, calculating assessment marks, recording absences and so on, as well as data on teachers’ usage of ICTs for ‘lesson administration’, which we will refer to as ‘lesson preparation’, which includes tasks such as producing tests or task sheets, researching lesson ideas, professional reading and so on.

Teachers’ Use of ICTs for ‘School Administration’

In specifying their goals for the ICTPD programmes just under a third of principals’ and facilitators’ stated goals related to administration, policy development or the instillation of ICT infrastructure, with most of these goals relating to the latter two categories. Both principals and facilitators on the whole felt that what administration goals they had were achieved during the project, with over 80% of principals reporting that their administration goals had been ‘partially’ or ‘fully’ achieved. Secondary principals, moreover, reported significantly higher rates of administration goals ‘fully achieved’ than primary principals. Over 80% of the secondary principals surveyed in 2001, for example, felt that their
administration goals for the project had been ‘fully achieved’, compared with 40% of primary principals.

Evidence from the teachers themselves supports the principals’ conclusion that teachers’ use of ICTs in administration did indeed increase in many respects over the project, but it also suggests that principals and facilitators may have an exaggerated sense of the extent of such increases.
Table 9 Increases in ICT Use for Administration over the Period of the ICTPD Programme as Reported by Teachers, Principals and Facilitators.

<table>
<thead>
<tr>
<th></th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease</td>
<td>16</td>
<td>4</td>
<td>0</td>
<td>0.33%</td>
<td>0.47%</td>
<td>0.00%</td>
</tr>
<tr>
<td>No change</td>
<td>2670</td>
<td>283</td>
<td>0</td>
<td>54.58%</td>
<td>33.14%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Some increase</td>
<td>567</td>
<td>239</td>
<td>5</td>
<td>11.59%</td>
<td>27.99%</td>
<td>23.81%</td>
</tr>
<tr>
<td>Substantial increase</td>
<td>1639</td>
<td>328</td>
<td>16</td>
<td>33.50%</td>
<td>38.41%</td>
<td>76.19%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4892</td>
<td>854</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$x^2=19.86$, df=6, p=.0029

Table 10 The Extent to which Increases in ICT Use for Administration were Attributed to the ICTPD Programme by Teachers, Principals and Facilitators

<table>
<thead>
<tr>
<th></th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completely attributable</td>
<td>107</td>
<td>22</td>
<td>4</td>
<td>11.10%</td>
<td>14.67%</td>
<td>19.05%</td>
</tr>
<tr>
<td>Largely attributable</td>
<td>332</td>
<td>65</td>
<td>11</td>
<td>34.44%</td>
<td>43.33%</td>
<td>52.38%</td>
</tr>
<tr>
<td>Partly attributable</td>
<td>425</td>
<td>57</td>
<td>6</td>
<td>44.09%</td>
<td>38.00%</td>
<td>28.57%</td>
</tr>
<tr>
<td>Not at all attributable</td>
<td>100</td>
<td>6</td>
<td>0</td>
<td>10.37%</td>
<td>4.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>964</td>
<td>150</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$x^2=16.65$, df=6, p=.0107

As can be seen in Table 9, there was clearly an increase in most teachers’ use of ICTs in the cluster schools for school administration over the period of the ICTPD programme. But there was also a statistically significant difference between the teachers on the one hand and principals and facilitators on the other about the extent of the increase and the extent to which the increase was attributable to the ICTPD programme. Teachers were much less likely to report that their usage of ICTs for school administration had increased over the period of the ICTPD programme than either principals or facilitators, and teachers were also rather less likely than either principals or facilitators to attribute their increased usage of ICTs for school administration to the ICTPD programme (Table 10).

Table 11 Teachers’ Reported Use of ICTs for Aspects of School Administration

<table>
<thead>
<tr>
<th></th>
<th>Assessment</th>
<th>Running Records</th>
<th>Staff Notices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
<td>Before</td>
</tr>
<tr>
<td>Never used</td>
<td>60.70%</td>
<td>24.33%</td>
<td>74.19%</td>
</tr>
<tr>
<td>Rarely used</td>
<td>16.02%</td>
<td>10.88%</td>
<td>8.53%</td>
</tr>
<tr>
<td>Sometimes used</td>
<td>11.58%</td>
<td>19.88%</td>
<td>5.65%</td>
</tr>
<tr>
<td>Often used</td>
<td>7.25%</td>
<td>24.44%</td>
<td>3.57%</td>
</tr>
<tr>
<td>Always used</td>
<td>4.56%</td>
<td>20.58%</td>
<td>3.00%</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>855</td>
<td>855</td>
<td>868</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Email colleagues</th>
<th>Reports for parents</th>
<th>Absences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never used</td>
<td>72.26%</td>
<td>62.71%</td>
<td>92.89%</td>
</tr>
<tr>
<td>Rarely used</td>
<td>14.23%</td>
<td>8.80%</td>
<td>3.67%</td>
</tr>
<tr>
<td>Sometimes used</td>
<td>8.69%</td>
<td>7.21%</td>
<td>6.11%</td>
</tr>
<tr>
<td>Often used</td>
<td>4.10%</td>
<td>7.09%</td>
<td>13.45%</td>
</tr>
<tr>
<td>Always used</td>
<td>2.90%</td>
<td>16.63%</td>
<td>55.13%</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>829</td>
<td>818</td>
<td>818</td>
</tr>
</tbody>
</table>

The increases that teachers reported in administrative use were greatest for writing reports for parents, using spreadsheets or databases for assessment and assessment records, emailing colleagues on administrative matters, and accessing staff notices. Reported increases in usage were lowest for using ICTs for student running records and the recording of absences. At the end of the contract about two thirds of teachers in the clusters were ‘often’ or ‘always’ using ICTs for reports to parents, while about 40% were doing so for emailing colleagues and assessment calculations.
Teachers’ Use of ICTs for ‘Lesson Planning and Preparation’

A second arguably ‘administrative’, use of ICTs by teachers is the process of lesson planning and preparation. The range of observed and reported uses here covered such things as searching the internet for lesson ideas, producing task sheets or tests using word processors or DTP packages, recording lesson or unit plans in packages such as 3D Achieve, and so on.

Table 12 Increases in Teachers’ Use of ICT for Lesson Preparation over the Period of the ICTPD Programme, as Reported by Teachers, Principals and Facilitators

(Frequencies of Teacher responses were calculated from before and after responses to Q7 in the Teacher End of Project survey. Negative differences in frequency of use before and after the project were taken as ‘decreases’, positive differences of 1 or 2 were taken as ‘some increase’, and positive differences of 3 or 4 were taken as ‘significant increases’. Responses were then totalled and averaged across the 7 aspects of lesson planning and preparation in the question. Principals and facilitators were given the scale as presented in the Table)

<table>
<thead>
<tr>
<th></th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>0.74%</td>
<td>0.66%</td>
<td>0.00%</td>
</tr>
<tr>
<td>No change</td>
<td>286</td>
<td>2</td>
<td>0</td>
<td>35.35%</td>
<td>1.32%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Some increase</td>
<td>203</td>
<td>31</td>
<td>3</td>
<td>25.09%</td>
<td>20.53%</td>
<td>13.64%</td>
</tr>
<tr>
<td>Significant increase</td>
<td>314</td>
<td>117</td>
<td>19</td>
<td>38.81%</td>
<td>77.48%</td>
<td>86.36%</td>
</tr>
<tr>
<td>Total</td>
<td>809</td>
<td>151</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Some two thirds of teachers reported either some increase or a significant increase in their use of ICTs for various aspects of lesson planning or preparation over the period of the project (Table 12). The increase in teachers’ use of ICTs for lesson planning and preparation was greatest with regard to using the internet to get lesson plans and ideas, using DTP or Word processing for producing classroom resources such as task sheets, tests, and handouts, and using digital cameras, scanners and other image production technologies to produce lesson resources. Rather lower increases were reported for accessing the internet for assessment tasks or official documents from the Ministry. The lowest increases were reported in downloading lesson resources or content from CDROMs and using the internet for professional readings, subject association newsletters and the like (Table 13).

At the end of the project by far the most frequent use of ICTs for lesson preparation in the clusters schools was using DTP or word processing packages for the preparation of lesson resources. 76% of teachers in the clusters were routinely using ICTs for this purpose at the end of the contract, and about 40% were also routinely using the web to search for lesson ideas. Use for all other lesson planning and preparation purposes also increased over the time of the project but such usage remained proportionally lower than for these two.
Table 13 Teachers’ Use of ICTs for Various Aspects of Lesson Preparation Before and After the ICTPD Programme

<table>
<thead>
<tr>
<th></th>
<th>DTP for Resources</th>
<th>WWW for Lesson Ideas</th>
<th>WWW for Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before (%)</td>
<td>After (%)</td>
<td>Before (%)</td>
</tr>
<tr>
<td>Never used</td>
<td>16.89%</td>
<td>3.63%</td>
<td>48.67%</td>
</tr>
<tr>
<td>Rarely used</td>
<td>24.07%</td>
<td>4.00%</td>
<td>27.48%</td>
</tr>
<tr>
<td>Sometimes used</td>
<td>27.78%</td>
<td>18.52%</td>
<td>17.19%</td>
</tr>
<tr>
<td>Often used</td>
<td>20.48%</td>
<td>38.62%</td>
<td>8.23%</td>
</tr>
<tr>
<td>Always used</td>
<td>13.17%</td>
<td>38.74%</td>
<td>3.51%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Official Documents</th>
<th>CDROMs for Lesson Content</th>
<th>Digicams etc for Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never used</td>
<td>68.52%</td>
<td>58.07%</td>
<td>73.90%</td>
</tr>
<tr>
<td>Rarely used</td>
<td>17.49%</td>
<td>21.39%</td>
<td>14.95%</td>
</tr>
<tr>
<td>Sometimes used</td>
<td>8.81%</td>
<td>13.81%</td>
<td>7.48%</td>
</tr>
<tr>
<td>Often used</td>
<td>3.26%</td>
<td>4.40%</td>
<td>2.45%</td>
</tr>
<tr>
<td>Always used</td>
<td>1.93%</td>
<td>2.32%</td>
<td>1.23%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>WWW for Professional Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never used</td>
<td>70.60%</td>
</tr>
<tr>
<td>Rarely used</td>
<td>16.63%</td>
</tr>
<tr>
<td>Sometimes used</td>
<td>8.81%</td>
</tr>
<tr>
<td>Often used</td>
<td>2.61%</td>
</tr>
<tr>
<td>Always used</td>
<td>1.36%</td>
</tr>
</tbody>
</table>

**N** 855 855 868 835 826 826

As was the case for ‘school administration’ tasks, teachers’ reported increases in the use of ICTs for lesson preparation were much lower than those reported on their behalf by principals and facilitators. Teachers were also rather less likely than either principals or facilitators to attribute their increased use of ICTs for lesson preparation to the ICTPD programme (Table 14).

Table 14 The Extent to which Increases in ICT Use for Lesson Preparation were Attributed to the ICTPD Programme by Teachers, Principals and Facilitators

<table>
<thead>
<tr>
<th></th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
<th>Teachers</th>
<th>Principals</th>
<th>Facilitators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completely attributable</td>
<td>107</td>
<td>27</td>
<td>3</td>
<td>11.10%</td>
<td>17.88%</td>
<td>13.64%</td>
</tr>
<tr>
<td>Largely attributable</td>
<td>332</td>
<td>74</td>
<td>13</td>
<td>34.44%</td>
<td>49.01%</td>
<td>59.09%</td>
</tr>
<tr>
<td>Partly attributable</td>
<td>425</td>
<td>44</td>
<td>6</td>
<td>44.09%</td>
<td>29.14%</td>
<td>27.27%</td>
</tr>
<tr>
<td>Not at all attributable</td>
<td>100</td>
<td>6</td>
<td>0</td>
<td>10.37%</td>
<td>3.97%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

**Total** 964 151 22

x²=31.52, df=6, p<.0001

Finally, comparing teachers use of ICTs for school administration with their use of ICTs for lesson preparation, it would seem that the increases in the latter were rather greater, and certainly less variable, than in the former. For example, a fairly consistent proportion of between 35% (using DTP packages for lesson resources) and 50% (obtaining lesson resources from CDROM) of teachers reported no change in the various forms of lesson preparation use of ICTs over the period of the programme, while the proportions who reported no change in the various forms of administrative use varied widely from 36% (emailing colleagues on administrative matters) to 90% (recording absences).

The overall conclusion to be drawn, is that over the period of the contract teachers significantly increased their use of ICTs for certain aspects of school administration and for most aspects of lesson planning and preparation. By the end of the project they achieved this to the point where at least the use of desktop publishing for the production of lesson resources, the use of the world wide web as a source of lesson ideas, the use of computer
software for assessment recording or calculation of marks and grades, and the use of computer-based systems for reporting to parents, had all become a matter of accepted routine for the majority of teachers in the cluster schools.
The Role of the ICTPD Programmes in Increasing Teachers’ Use of ICTs for Administration and Lesson Preparation

That teachers reported significant increases in only certain aspects their use of ICTs for school administration over the period of the projects, but medium level increases across the whole range of activities involved in their use of ICTs for lesson planning and preparation, is not surprising. On the whole this probably reflects higher entry levels of usage of ICTs for the range of latter purposes at the beginning of the programme rather than a difference in the effects of the ICTPD programme between the two categories of use. Evidence from our school visits and the project surveys, strongly suggest that many teachers were already using ICTs for preparation of resources before the ICTPD programme began than were using them for certain school administration tasks like calculating assessments or using computerised reporting systems.

There were no statistically significant differences in the surveys between primary and secondary, or any other subgroups of teachers, with regard to their usage of ICTs for administrative or lesson planning purpose. However, the evidence from some of the case studies suggests that while general usage of ICTs for administration was possibly greater in secondary than in primary schools, the specific attribution of any increases in this area to the ICTPD programmes alone was overall probably lower in secondary than in primaries.

However, it should be noted that the issue of attribution of increases in administrative usage to the ICTPD programme is problematic in several ways. Our observations in the case study clusters would indicate that usually an increase in administrative usage over the period of a cluster programme was due to a combination of circumstances or initiatives, of which the ICTPD programme was only one. In many schools, for example, the period also saw a considerable increase in the purchase of new equipment for teacher use, the establishment of school networks and/or intranets, and other independent management initiatives outside the ICTPD programme aimed at greater administrative use. This injection of equipment, for example, was probably mostly due to the grants for infrastructure made available to the schools at the end of 1999, to the flow-on effects of strategic planning done by principals as a result of the tagging in 1999 of infrastructure funding to the production of strategic plans, and to principals’ own professional development through the ‘Principals First’ PD programmes, rather than to the direct effects of the ICTPD programmes.

All of these various national and school-based initiatives seemed to mingle in with and complement each other in many of the case study clusters, such that the causative link between the ICTPD programmes and teacher usage is thus less clear cut than it is with regard to teachers’ classroom use of ICTs.

There was probably a direct and possibly exclusive impact in those clusters where training on school administration packages was a core part of the PD programme. However, in other clusters where this was not a major focus the impact of the ICTPD programmes was probably more indirect or even coincidental, and related largely to the programmes’ effect in heightening teachers levels of confidence in using ICTs generally. As some respondents in the surveys put these issues:

- “In some of the schools this shift would have happened [anyway] but the teachers’ ability to cope has been helped by the skills and confidence they have gained through their PD.” (facilitator)
- “Many [schools] have either bought or are buying planning/assessment packages... The contract has drawn awareness to the availability of these pieces of software and their benefits.” (facilitator)
- “The majority have made so much personal confidence through the contract that they may have made the move themselves...” (facilitator)
- “Some schools have also noted that their teachers have developed the necessary skills to make computerised report writing possible, and therefore made this the only option.” (facilitator)
- “The increased number of PCs - around 30-90 over the three years has had an impact.” (principal)
- “Now we have reliable infrastructure and multiple user access for each classroom staff use is extensive.” (principal)
- “We brought in full computerised reporting as a separate issue to this contract.” (principal)
- “Because we have made other money available as well as the ICTPD project money, we cannot say it is all attributable to the ministry project” (principal)
- “Balanced with schools’ own commitment to purchase equipment and provide other PD outside the contract...” (principal)
- “The PD programme has benefited our previous initiative.” (principal)

It was observed in the case study schools, too, that the benefit flow between professional development in administrative use and professional development in classroom use went both ways. In several of the case study cluster schools, for example, separate initiatives in which the use of ICTs for school administration had been made compulsory was reported by the teachers as having a significant impact on their confidence in the general use of ICTs, and in promoting a growing interest in using ICTs with students in their classes. This interest and confidence in administrative use then transferred to their participation in the ICTPD programmes which focussed on skills and techniques appropriate to classroom use. In other instances the dynamic worked in the other direction, with teachers who had grown comfortable, for example, with the use of word processing in classrooms through the ICTPD programme, then becoming more willing to use those or other applications for reports to parents, and so on.

Our estimate is that the ICTPD programme itself lead directly, though not exclusively, to substantially increased administrative/lesson planning use of ICTs for just under half of the participating primary school teachers, and about a third of the participating secondary school teachers, though the figures will vary considerably from cluster to cluster, and from school to school within clusters.

6.2 School Policy Development and Strategic Planning for ICT

For most cluster schools the ICTPD programme was their one major initiative for increasing student use of ICTs, whereas it was but one of several for increasing use of ICTs in school administration or policy development. For this reason, as with school administration issues, the extent to which any reported increases or initiatives related to the development of school policies or strategic plans for ICTs was directly due to the ICTPD programme initiatives is uncertain, and very variable from cluster to cluster, or even school to school.

It appears that all, or very close to all, of the cluster schools had submitted strategic plans for ICT to the Ministry of Education even by the end of 1999. Certainly, all of the respondent
principals from ICTPD cluster schools in the ITAG survey of that year said that they had sent a strategic plan to the Ministry. This was well above the national average of around 78% of principals. Principals in the cluster schools, especially the primary schools, also appeared more likely to have attended the Principals First: First Principles professional development programme, to have amended or established ICT related policies, and to have formed joint ICT committees with other schools, compared to principals in non-cluster schools. They were also much more likely than principals in non-cluster schools to have attended professional development events for teachers aimed at helping them integrate the use of ICTs into classroom practice in the previous twelve months (Table 15) (ITAG 2000, The Learning Centre Trust 2001).
Table 15 Percentages of Principals in ICTPD Cluster Schools Taking Actions Related to Strategic Planning and Policy Development in ICT Compared to the National Average

<table>
<thead>
<tr>
<th>ICT Related Policy/Planning Actions</th>
<th>Prim.</th>
<th>Sec.</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended PFFP programmes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICTPD School Principals</td>
<td>81.94%</td>
<td>75.00%</td>
<td>80.43%</td>
</tr>
<tr>
<td>National Average</td>
<td>47.00%</td>
<td>61.00%</td>
<td>54.00%</td>
</tr>
<tr>
<td>Wrote a Strategic Plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICTPD School Principals</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>National</td>
<td>86.00%</td>
<td>75.00%</td>
<td>79.00%</td>
</tr>
<tr>
<td>Formed inter-school ICT committee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICTPD School Principals</td>
<td>50.00%</td>
<td>20.00%</td>
<td>35.00%</td>
</tr>
<tr>
<td>National</td>
<td>16.00%</td>
<td>12.00%</td>
<td>14.00%</td>
</tr>
<tr>
<td>Wrote a new ICT related policy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICTPD School Principals</td>
<td>68.00%</td>
<td>55.00%</td>
<td>61.50%</td>
</tr>
<tr>
<td>National Average</td>
<td>58.00%</td>
<td>59.00%</td>
<td>58.50%</td>
</tr>
<tr>
<td>Amended current ICT related policies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICTPD School Principals</td>
<td>47.00%</td>
<td>45.00%</td>
<td>46.00%</td>
</tr>
<tr>
<td>National Average</td>
<td>30.00%</td>
<td>30.00%</td>
<td>30.00%</td>
</tr>
<tr>
<td>Established ICT-specific PD policies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICTPD School Principals</td>
<td>42.00%</td>
<td>25.00%</td>
<td>33.50%</td>
</tr>
<tr>
<td>National Average</td>
<td>51.00%</td>
<td>59.00%</td>
<td>55.00%</td>
</tr>
<tr>
<td>Contracted additional technical support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICTPD School Principals</td>
<td>41.00%</td>
<td>50.00%</td>
<td>45.50%</td>
</tr>
<tr>
<td>National Average</td>
<td>53.00%</td>
<td>43.00%</td>
<td>48.00%</td>
</tr>
<tr>
<td>Attendance at PD events on teaching and learning with ICTs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICTPD School Principals</td>
<td>79.00%</td>
<td>55.00%</td>
<td>67.00%</td>
</tr>
<tr>
<td>National Average</td>
<td>64.00%</td>
<td>38.00%</td>
<td>51.00%</td>
</tr>
</tbody>
</table>


Some 60% of responding principals in the End-of-Project survey, mostly from primary schools, considered that their policy and planning goals had been fully achieved during the project, while 27% considered that they had been ‘partially achieved’. There were more secondary principals who reported that their policy goals were ‘not achieved’ than reported that they were ‘fully achieved’, while the great bulk of secondary principals considered their policy goals to have been ‘partially achieved’ during the programmes.

In terms of the development of strategic plans, the most important stimulus for this came from outside the cluster programmes in the form of an announcement from the Ministry in late 1999 that supplementary one-off infrastructure grants of funding for all schools were conditional upon the development or production of a Strategic Plan for ICT from each school. Similarly, the Principals First: First Principles Programme of professional development for principals conducted in the latter terms of 1999 and into 2000 and 2001 also played a major role in heightening principals’ awareness of ICT issues and promoting policy development in cluster schools just as in others (Ham & Kachelhoffer 2002). In some clusters these external initiatives were the major stimuli for policy and planning development and the ICTPD programme played little part. In others these external factors combined with a focus on policy and planning already in the cluster programme to jointly promote change in the area.

Summary

- There was a marked increase in most participants’ use of ICTs for certain aspects of administration and most aspects of lesson preparation over the period of the ICTPD programme, although this was in many cases only the indirect or partial result of the operation of the ICTPD programmes themselves.
The extent of increased ICT usage for administrative and lesson preparation purposes tended to be exaggerated in the minds of principals and facilitators, compared to the perception of the teachers themselves.
- Increases in teachers’ use of ICTs for administrative purposes across the clusters were greatest with regard to writing reports for parents, using spreadsheets or databases for assessment and assessment records, and emailing colleagues on administrative matters.

- Increases in teachers’ use of ICTs for lesson preparation across the clusters were greatest with regard to using DTP or word processing packages for the preparation of lesson resources and using the internet to search for lesson ideas and resources.

- While the principals of the participating schools and the programme facilitators both hoped to increase the incidence of policy and planning development on ICT in schools through the ICTPD programmes, these goals were seldom shared by participating teachers, whose focus was clearly on technical upskilling and techniques for the use of ICTs for teaching and learning in classrooms.

- By the end of the project all participating cluster schools had developed strategic plans or policies for ICT, though in relatively few clusters was this the direct or exclusive result of the ICTPD programme operating in the cluster. Primary school principals appear to have been more satisfied with the policy and planning outcomes of the ICTPD programmes than secondary principals.

7. Teacher Effects

In assessing the effects of the PD models on teachers and teaching we looked for evidence of development in four primary indicators of uptake and implementation:
- changes in teachers’ perceptions and understandings about ICT in education
- improved teacher competence with ICTs
- increased teacher confidence about integrating ICTs into classroom activities
- increased classroom usage of ICTs

The focus of this section is on the those indicators of uptake which together constitute the impact of the programmes on the teachers themselves: their attitudes towards and understandings about ICT in teaching and learning, their practical skills with ICTs, and their levels of confidence about using ICTs in classrooms. The flow-on impact of the ICTPD programmes on the extent of teachers’ and students’ actual ‘usage’ of ICTs in classrooms is dealt with in the next section.

7.1 Teachers’ Beliefs about the Role of ICTs in Teaching and Learning

When teachers in the clusters were asked about the effects of the ICTPD programmes and their subsequent experiences using ICTs in classes on them and their teaching, the responses were mostly positive, and for many of them extremely positive. With very few exceptions, teachers regarded their participation in the programme as having constructively, and in many cases extensively, changed their views on ICTs, and the way they regarded the use of ICTs with students.

In terms of the effects of the ICTPD programmes on themselves as classroom teachers, the most frequently mentioned benefits reflected a view that the programmes had allowed them to introduce greater variety and interest into their classroom programmes, had increased
their own enthusiasm for teaching generally, and had increased their general sense of effectiveness as teachers.

Teachers wrote or spoke often of the programme having developed their understanding of pedagogy in an ICT related context, especially, but not exclusively, those in clusters which had an extensive formal component of professional reading or reflection and a strong focus on teaching and learning theory. Typical comments along these lines would include: “I’m now aware of the need to incorporate ICT, aware of how this can help less able students learn”, “It has changed my views about information accessing / critical thinking skills and how important these are”, “I am more committed to a constructivist style of teaching”, “more interested in student centred learning”, “I’ve changed the range of activities to cater for multi-intelligences”, “I have had to read up to date research. Consequently my personal philosophical base has been firmly established when considering integrating ICT and I have very clear directions of where to lead my students and teachers in my syndicate”, “It has changed my thoughts on learning and how to cater better for individual learning styles”, “it has led to thinking about curriculum delivery and processes of learning and how people need different kinds of thinking/learning skills in the so-called information age”.

Rather more often teachers stated that the ICTPD programmes had fostered or provided a positive attitude towards the use of ICTs, especially in terms of raising their sense of self confidence and self-belief about using it with classes, and in making them feel less out of date or ‘behind’ their colleagues: “It’s exciting - now I am much more confident”, “I feel less like a dinosaur”, “It keeps you up to date, if you had more time you could do it more”, “I’m more confident on the computer and push buttons without fear of ruining anything”, “I have much more confidence in trouble shooting, approaching others about ICT related technologies, and keen to try out programmes in my own time and to see how I might use them with children”, “It’s made me a less frustrated computer user”, “I’m more comfortable in using computers in the classroom”.

Most predominantly, however, teachers valued the PD opportunity for the range and variety of ICTs and the variety of ideas for incorporating ICTs into classroom programme that were offered: “It has given me more ideas as to what the students could learn and do”, “It exposed me to more sources of information. It made teaching much more interesting”, “I am now able to use a wider range of media and software personally and professionally and in the classroom”, “I’ve had access to a large bank of different ideas”, “It has kept me up to date with the world as it is now, enabled me to offer children the opportunities they should have in 2001”, “It has given me more ideas - places to look for ideas, planning, resources. Presenting plans, assessments in a variety of ways”.

In the End of Project surveys less than 2% of teachers reported that their ICTPD programme had been a negative experience overall. Indeed, a solid majority of two thirds, mostly from primary schools, felt that their general effectiveness as teachers had increased during the project. Half of them reported that their enthusiasm for teaching in general had increased as a result of their participation, mostly, it seems, because of a sense that the use of ICTs allowed them to be more creative and innovative in their unit planning. Over 80% of the teachers, for example, reported that they had been able to offer ‘more’ or ‘many more’ creative ways to learn in their classrooms as a result of the ICTPD experience. A similar proportion reported that they had been able to make the learning experiences ‘more’ or ‘much more’ varied for students, and had ‘increased’ or greatly increased’ the range of skills and abilities demonstrated by students in class.
Such positive effects, however, were not always easily or quickly achieved for the teachers. In particular, many pointed out that participation had involved considerable extra time commitment out of normal school hours, and on the whole participation in the programme had increased rather than decreased their professional workload. About a third of the teachers, mostly from secondary schools, felt that the incorporation of ICT-based activities into their teaching programmes had significantly increased the amount of time they now spent planning lessons. About a third also reported that incorporating ICT-based activities had made their job more stressful, though in this case secondary teachers were less likely to report increases in stress than primary teachers. A group of 56 (11%) secondary teachers reported that using ICTs had actually made their teaching less stressful.

Teachers were also divided on whether or not incorporating ICT-based activities had made it easier or more difficult to either teach a class as a whole or to individualise teaching. Reflecting, perhaps, the tendency for secondary students to have access to computers in a laboratory situation and for primary classes to have only one or two computers in a class, secondary teachers were more likely than primary teachers to report that using ICTs made it easier to teach the class as a whole. Thirty-four percent of secondary teachers reported this to be the case, whereas 25% of primary teachers reported that using ICTs made it more difficult to teach the class as a whole. Both sector groups, however, were more ambivalent about the extent to which using ICTs with classes had allowed them to individualise work for students. About half of both secondary and primary teachers reported that using ICTs had made individualising student work ‘easier’ or ‘much easier’. The remainder reported that it had made no difference either way.

*Chart 1 Teachers’ Concerns about Using New Technologies for Teaching and Learning at the End of the Project*
As well as being asked in the interviews and End of Project surveys what they saw as the benefits to them as teachers of using ICTs in the classroom, participant groups were also asked to outline their greatest continuing concerns about the use of new technologies in teaching and learning. Chart 1 shows that many of the teachers were now less anxious about access for themselves but more anxious about access for their students, less concerned about their basic skills but more concerned about the skills they realised they still had to learn, less concerned about about organising classroom uses for ICTs but more concerned about finding the time to keep up with new developments. Above all, perhaps, they still had significant concerns mostly revolving around infrastructural or equipment reliability, and their growing awareness that the need for professional development was likely to be ongoing.

In the interviews and open ended survey responses they spoke of such issues in terms such as: “material is more easily stored and retrieved, as long as the computers don’t ‘die’ (not ‘crash’. ‘Crash’ is OK. ‘Die’ loses all your work!)”, “Poor bandwidth in rural areas”, “lack of equipment and poor [student] access to equipment makes life difficult”, “I now know what I don’t know”, “I feel like a frog landing on more and more rocks that get hotter and hotter”, “[I] have had lots of opportunities to learn new skills, but not enough time to consolidate learning and to make ICT use easy”, or, as one of the facilitators reflected, “there was a feeling that we were just getting started in schools when it was all over.”
7.2 Teacher Competence

In the surveys given to teachers before and after the project, the particular skills or competencies investigated were:

- Basic Computer Operation
- File Management
- Word Processing
- Graphics
- Spreadsheet Skills
- Database Skills
- Internet Use (WWW)
- Email
- Multimedia Presentation Skills

Table 16 Reported Gains in ICTPD Programme Participants' ICT Competence: Entry Skill Level Compared with Exit Skill Level

<table>
<thead>
<tr>
<th>Change in skill level</th>
<th>File Management</th>
<th>Basic Operation</th>
<th>Word Processing</th>
<th>Spreadsheet</th>
<th>Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change (No/Low skills at entry)</td>
<td>26</td>
<td>86</td>
<td>32</td>
<td>178</td>
<td>254</td>
</tr>
<tr>
<td>No change (Mod./High skills at entry)</td>
<td>164</td>
<td>113</td>
<td>197</td>
<td>77</td>
<td>50</td>
</tr>
<tr>
<td>Moderate gain (No/Low entry level)</td>
<td>452</td>
<td>334</td>
<td>404</td>
<td>402</td>
<td>323</td>
</tr>
<tr>
<td>Moderate gain (Mod/High entry level)</td>
<td>101</td>
<td>63</td>
<td>196</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>High gain (No/Low entry level)</td>
<td>55</td>
<td>168</td>
<td>31</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>High gain (Mod/High entry level)</td>
<td>NA</td>
<td>21</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

% No change: 23.81% Graphics: 26.05% Word Processing: 26.63% Spreadsheet: 37.06% Database: 47.28%

% Moderate gain: 69.30% Graphics: 51.96% Word Processing: 69.77% Spreadsheet: 60.17% Database: 52.26%

% High gain: 6.89% Graphics: 21.99% Word Processing: 3.60% Spreadsheet: 2.76% Database: 0.47%

Table 16 describes the gains reported in these skills relative to teachers’ entry skills at the beginning of the programme. A one sample t-test with a hypothesised mean of 0 (no growth) on the reported levels of absolute gains showed that statistically significant rates of growth were reported across all of the skills outlined above (p<.001), with the greatest absolute growth in teachers’ skills reported in relation to graphics, basic computer operations, and use of the internet.

Reported growths in particular ICT teacher skills over the period of the programmes were not apparently determined by, or correlated with, either school sector or gender. Nor, by and large, were they determined by cluster. The only statistically significant effect on skills growth by cluster was in relation to basic computer operations (F=2.31, df=22,757, p=.0006). In terms of this particular set of skills, there were six standout clusters (Fisher’s PLSD Test p<.05 for at least a third of the paired clusters). No cluster stood out as having significantly less impact on teacher skills than the other clusters, either in relation to basic computer operations or any of the others skills developed in the programmes.
Nor were teachers’ reported increases in technical competencies to any great extent
determined by the length of time they were in the PD programme, except, again, in relation
to Basic Computer Operation and File Management (F=3.06, df=5,443, p=.01; F=4.49,
df=5,443, p=.0005). In respect of these two skill sets there was a statistically significant
tendency for teachers who had been in the programme for 31-36 months to report greater
growth than those who had been in it for less than a year. However, no statistical
relationship was found between the length of time teachers were in the PD programmes and
reported growth in any of the other ICT skills investigated.

7.3 Teacher Confidence

It was noted in a previous section that facilitators in particular often emphasised the
importance of the affective domain when evaluating their role in the PD process. In the
surveys and interviews alike, they often highlighted their perception that teachers feel less
comfortable with ‘ICT’ than they do on the more familiar grounds of specific curriculum
areas or even teaching and learning in general. In part this could also explain why teachers’
own objectives for the programmes were dominated by personal skill rather than
pedagogical goals. Adjusting their programmes in many cases to accommodate the teachers’
belief that they had to become users before they could become pushers, facilitators thus
emphasised the importance of increasing teachers’ confidence about ICT, both as users
themselves and as teachers whose job was to promote use by students.

On the whole, the teachers seem to have responded to this emphasis very positively. In the
End-of-Project surveys, for example, teachers in all clusters reported that the ICTPD
programmes had led to a substantial growth in both their professional confidence about,
and their classroom usage of, ICTs. A one sample t-test with a hypothesised mean of 0 (no
growth) on survey questions about the extent of teachers’ growth in confidence and their
growth in classroom use both gave highly significant results (p<.0001). Moreover, there
were also statistically significant correlations between the length of time the teachers were
actively engaged in the PD programmes and their confidence, between the length of time
they were engaged in the PD programme and their classroom usage, and between their
growth in confidence and their growth in classroom use (Fisher’s r to z, p<.0001).

Within this general trend of a longer time in the PD programme leading to greater
confidence and greater use, there are also indications that the third year of the programmes
may have had a particularly strong influence in these respects. Fisher’s PLSD tests for length
of time on the programme (in six months intervals) compared to confidence growth gave
statistically significant results (p<.05) for 6 of the matched pairs of time spans, 5 of which
had 31-36 months as their second comparison item (Table 17). This indicates strongly that
the growth in teachers’ confidence about the use of ICTs in classrooms was significantly
greater among those who were in the programme for the full three years than for those who
were part of it for shorter periods.

The importance of the third year is also apparent in terms of the frequency of teachers’
classroom use of ICTs, if somewhat less dramatically so than in the case of teacher
confidence. Here statistically significant results (p<.05) were found for 9 of the matched
pairs of time spans with a predominance of 1-6 month comparison items at one end of the
scale and a mixture of longer time spans at the other (Table 17). It seems clear from Table 17
that the frequency of reported classroom use was significantly less among teachers who

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were engaged in the programme for 1-6 months than those in the programme for a year or more, and significantly greater for those in the programmes for 30-36 months than almost all other time spans.
Table 17  Confidence Growth and Growth in Usage Compared to Time in Programme

<table>
<thead>
<tr>
<th>Months in Programme</th>
<th>Mean Diff</th>
<th>Crit. Diff</th>
<th>P-value</th>
<th>Signif?</th>
<th>Months in Programme</th>
<th>Mean Diff</th>
<th>Crit. Diff</th>
<th>P-value</th>
<th>Signif?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-6,7-12</td>
<td>0.011</td>
<td>0.200</td>
<td>0.9137</td>
<td></td>
<td>1-6,7-12</td>
<td>0.113</td>
<td>0.229</td>
<td>0.3339</td>
<td></td>
</tr>
<tr>
<td>1-6,13-18</td>
<td>0.190</td>
<td>0.203</td>
<td>0.0675</td>
<td></td>
<td>1-6,13-18</td>
<td>0.244</td>
<td>0.233</td>
<td>0.0398</td>
<td></td>
</tr>
<tr>
<td>1-6,19-24</td>
<td>0.186</td>
<td>0.183</td>
<td>0.0469</td>
<td>Yes</td>
<td>1-6,19-24</td>
<td>0.386</td>
<td>0.210</td>
<td>0.0003</td>
<td>Yes</td>
</tr>
<tr>
<td>1-6,25-30</td>
<td>0.205</td>
<td>0.230</td>
<td>0.0803</td>
<td></td>
<td>1-6,25-30</td>
<td>0.334</td>
<td>0.264</td>
<td>0.0130</td>
<td></td>
</tr>
<tr>
<td>1-6,31-36</td>
<td>0.596</td>
<td>0.171</td>
<td></td>
<td>&lt;.0001</td>
<td>1-6,31-36</td>
<td>0.812</td>
<td>0.195</td>
<td>&lt;.0001</td>
<td>Yes</td>
</tr>
<tr>
<td>1-6,7-12</td>
<td>0.179</td>
<td>0.221</td>
<td>0.1136</td>
<td></td>
<td>1-6,7-12</td>
<td>0.131</td>
<td>0.254</td>
<td>0.3092</td>
<td></td>
</tr>
<tr>
<td>7-12,19-24</td>
<td>0.175</td>
<td>0.203</td>
<td>0.0916</td>
<td></td>
<td>7-12,19-24</td>
<td>0.273</td>
<td>0.232</td>
<td>0.0212</td>
<td>Yes</td>
</tr>
<tr>
<td>7-12,25-30</td>
<td>0.194</td>
<td>0.246</td>
<td>0.1218</td>
<td></td>
<td>7-12,25-30</td>
<td>0.221</td>
<td>0.282</td>
<td>0.1241</td>
<td></td>
</tr>
<tr>
<td>7-12,31-36</td>
<td>0.585</td>
<td>0.192</td>
<td>&lt;.0001</td>
<td>Yes</td>
<td>7-12,31-36</td>
<td>0.699</td>
<td>0.219</td>
<td>&lt;.0001</td>
<td>Yes</td>
</tr>
<tr>
<td>13-18,19-24</td>
<td>-0.004</td>
<td>0.206</td>
<td>0.9686</td>
<td></td>
<td>13-18,19-24</td>
<td>0.142</td>
<td>0.236</td>
<td>0.2391</td>
<td></td>
</tr>
<tr>
<td>13-18,25-30</td>
<td>0.016</td>
<td>0.249</td>
<td>0.9023</td>
<td></td>
<td>13-18,25-30</td>
<td>0.090</td>
<td>0.285</td>
<td>0.5373</td>
<td></td>
</tr>
<tr>
<td>13-18,31-36</td>
<td>0.406</td>
<td>0.195</td>
<td>&lt;.0001</td>
<td>Yes</td>
<td>13-18,31-36</td>
<td>0.567</td>
<td>0.223</td>
<td>&lt;.0001</td>
<td>Yes</td>
</tr>
<tr>
<td>19-24,25-30</td>
<td>0.020</td>
<td>0.232</td>
<td>0.8679</td>
<td></td>
<td>19-24,25-30</td>
<td>-0.052</td>
<td>0.266</td>
<td>0.7015</td>
<td></td>
</tr>
<tr>
<td>19-24,31-36</td>
<td>0.411</td>
<td>0.174</td>
<td>&lt;.0001</td>
<td>Yes</td>
<td>19-24,31-36</td>
<td>0.426</td>
<td>0.199</td>
<td>&lt;.0001</td>
<td>Yes</td>
</tr>
<tr>
<td>25-30,31-36</td>
<td>0.391</td>
<td>0.223</td>
<td>0.0006</td>
<td>Yes</td>
<td>25-30,31-36</td>
<td>0.478</td>
<td>0.255</td>
<td>0.0003</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Overall, therefore, there are strong indications that the longer was the PD: the greater was the growth in teachers’ confidence about classroom use, and that the greater was teachers’ confidence about classroom use: the more often it happened. The latter result is probably to be expected, since logic would suggest a clear connection between growing skill and confidence on the one hand and actual classroom use on the other. But the importance of the ‘confidence’ or ‘attitudinal’ issues among teachers in relation to PD in ICT, and its apparently strong connection to the length of time that teachers had in the PD programmes, is worthy of emphasis.

It should also be noted that the growth in confidence throughout the clusters had both gender and school sector dimensions. Female teachers reported significantly less confidence at the beginning of the programme than male teachers, although there was no significant difference between them at the end of the project. Women, in other words reported greater growth in confidence over the period of the project than did men ($\chi^2$ Before = 25.53, df=4, p<0.0001; $\chi^2$ After = 7.64, df=4, p=.1775; F=14.05, df=1,988, p=.0002). Similarly, the growth in confidence reported by primary teachers was significantly greater than that reported by secondary teachers (F=5.30, df=2,1008, p=.0051).

Summary

- As a result of their participation in the ICTPD programme teachers made significant gains with regard to their understandings of the roles of ICTs in teaching and learning, their personal competence with ICTs, and their confidence about using ICTs with students.

- The ICTPD School Clusters programme directly and positively impacted on the general teaching practices of most of the participating teachers. The great majority of participating teachers reported that the ICTPD programme had increased their effectiveness as teachers, had increased their enthusiasm for teaching, both generally
and for using ICTs in particular, and had helped them to offer more varied, motivating and creative teaching/learning activities in their classrooms.

- The main perceived effects on teaching of introducing ICT-based activities into classroom learning programmes were to make teaching more learner centred and more interesting, and to increase teacher stress and workload. Teachers were divided on whether or not incorporating ICT activities made it easier or more difficult to teach their class as a whole, or or easier or more difficult to individualise lessons.

- The main concerns participants had at the end of the project about ICTs in teaching and learning were: a continuing frustration with equipment failure and, especially in isolated areas, unreliable infrastructure, a lack of access to ICTs on the part of their students, a heightened awareness that the need for professional development in the area was likely to continue after the project, and a lack of time in which to undertake such development.

- Significant gains in participants’ ICT competence were found across a range of ICT skills and software applications. The greatest gains occurred in relation to the basic operations of computers, graphics applications and the use of the internet. The relatively high rates of no change in relation to teachers’ skills with spreadsheets and databases are probably attributable to the fact that these applications were not emphasised in the content of many PD programmes.

- Teachers’ gained in competence through the ICTPD programmes, but it was probably associated affective domain gains in confidence and the connection of ICT use with their understandings about teaching and learning that primarily determined whether or not such personal competence translated into increased use with students in classes.

- Both the confidence and competence gains made as a result of the ICTPD programme were more marked among primary teachers than among secondary teachers, and more marked among female teachers than male teachers.
8. Classroom Effects: Indicators of Uptake

At the beginning of the ICTPD programme 28% of participants had not used ICTs with classes at all, and another 46% had used ICTs with classes ‘only once or twice’. By the end of the PD programme approximately 70% of participating teachers were using ICTs routinely with their classes (i.e. incorporating ICT activities in more than one unit of work per term). This increase in the frequency of classroom use was greater among primary teachers (70% reported a rise in their frequency of use) than among secondary teachers (50%), although it should be noted that about a third of secondary teachers reported being already occasional classroom users even before the programme started. At the end of the programme, about a quarter of primary participants and 16% of secondary participants reported that they routinely incorporated at least one ICT-based activity in ‘most’ or ‘all’ of their teaching units.

These figures, and the results in section 7.2, indicate that there was a significant overall increase in the general frequency of teachers’ use of ICTs across all the clusters over the period of the ICTPD Project. But what was the nature of that usage? Which ICTs were used in classrooms? In what subject areas? For what curriculum purposes? And so on.

8.1 Frequency of Classroom Use of ICTs in Cluster Classrooms

As can be seen in Chart 2, over a quarter of the classroom ICT-based activities reported by cluster teachers were focussed on language activities, with maths, social studies and science accounting for most of the rest. In many cases in primary schools, of course, a given ICT activity could be relevant to two or more Essential Learning Areas.1

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1 The figures were calculated from survey questions asking teachers to isolate the main Learning Area focus of an activity, and where more than one was stated totals were adjusted for all of those mentioned. Activities which were said to be relevant to ‘all’ or ‘every’ subject are not included in the totals.
Table 18 and Chart 3 shows this generally increased classroom usage broken down by specific curriculum purposes and ICT types. They indicate that the predominant uses of ICTs in classrooms at the end of the project were the use of word processing or desktop publishing packages for the presentation of creative writing or project/content based work, and information gathering on the internet. Prominent use was also being made of multimedia packages for on-screen presentation of work, research or information gathering from CDROM based ‘encyclopaedias’ or email contact with other students or adult experts, and skill/knowledge practice using content-specific drills or ‘games’.

Chart 3 Teachers’ Reported use of ICTs for Particular Purposes at the End of the ICTPD Programme

<table>
<thead>
<tr>
<th>Skill/Content Practice</th>
<th>Presentation (Authoring)</th>
<th>Presentation (Static Print)</th>
<th>Information Gathering</th>
<th>Problem Solving</th>
</tr>
</thead>
<tbody>
<tr>
<td>7%</td>
<td>17%</td>
<td>40%</td>
<td>27%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Table 18 Percentages of Teachers’ Reporting Regular Usage of ICTs by Students for Given Curriculum Purposes Before and After the ICTPD Programme

<table>
<thead>
<tr>
<th>Curriculum Purposes</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenting learning in computerised slide shows (text &amp; graphics)</td>
<td>12.4%</td>
<td>42.1%</td>
</tr>
<tr>
<td>Editing and composing multimedia presentations or videos using computer software (ie: including sound and moving images).</td>
<td>6.3%</td>
<td>23.9%</td>
</tr>
<tr>
<td>Writing computer programmes or scripting interactive presentations</td>
<td>3.2%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Designing and/or creating web-pages to present learning</td>
<td>3.3%</td>
<td>18.7%</td>
</tr>
<tr>
<td>Composing, editing and presenting creative work using Word Processors &amp;/or graphics</td>
<td>55.8%</td>
<td>84.0%</td>
</tr>
<tr>
<td>Composing, editing and presenting project or content-based work using Word Processors &amp;/or graphics packages</td>
<td>42.9%</td>
<td>70.2%</td>
</tr>
<tr>
<td>Accessing or searching for information on the internet</td>
<td>28.3%</td>
<td>74.3%</td>
</tr>
<tr>
<td>E-mailing other students or experts about a current topic or problem</td>
<td>18.4%</td>
<td>50.7%</td>
</tr>
<tr>
<td>Accessing or searching for information on electronic encyclopaedias</td>
<td>29.4%</td>
<td>58.5%</td>
</tr>
<tr>
<td>Faxing or phoning other students, experts etc about a current topic</td>
<td>17.4%</td>
<td>38.6%</td>
</tr>
<tr>
<td>Using the electronic catalogue to find appropriate reading in the library</td>
<td>23.6%</td>
<td>47.1%</td>
</tr>
<tr>
<td>Data logging using external monitoring devices connected to a computer</td>
<td>3.2%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Recording, calculating or analysing data using prepared Databases or Spreadsheets.</td>
<td>9.8%</td>
<td>28.5%</td>
</tr>
<tr>
<td>Designing and developing their own databases or spreadsheets to analyse information or solve problems</td>
<td>6.5%</td>
<td>19.0%</td>
</tr>
<tr>
<td>Practising skills or reinforcing knowledge using content specific Drill and Practice programs</td>
<td>37.6%</td>
<td>63.4%</td>
</tr>
<tr>
<td>Learning content or skills from a computer based tutoring programme</td>
<td>12.6%</td>
<td>33.3%</td>
</tr>
</tbody>
</table>

One sample t-tests with a hypothesised mean of 0 (no growth) indicate that a statistically significant growth in teachers’ use of ICTs in classrooms occurred in the 23 clusters for all of the ICTs and purposes listed in Table 18 ($p<.0001$ in all cases). This growth was the greatest
in the use of word processors for creative writing and the presentation of ‘project’ work, the use of the internet for research, and the use of programs such as Kid Pix or Powerpoint for linear slide show presentations. Growth in classroom usage was lowest in relation to using data logging software for data collection and analysis, content or concept- based simulations, and scripting/programming interactive presentations.

There were some important differences among clusters in the extent to which their teachers reported growth in students’ classroom usage of ICTs over the period of the project. Cluster-dependent, statistically significant differences were found in relation to reported growth in the frequencies of using word processing for creative writing (F=2.3, df=22,443, p=.0008), student emailing (F=2.83, df=22,443, p<.0001), slide shows (F=2.78, df=22,443, p<.0001), multimedia production (F=3.38, df=22,443, p<.0001), designing/creating websites (F=2.47, df=22,443, p=.0003), analysing data on pre-prepared spreadsheets or databases (F=2.06, df=22,443, p=.0035), and use of fax/phone by students (F=2.99, df=22,443, p<.0001). Post Hoc analysis (Fisher PLSD) showed that the clusters which reported statistically significant differences in classroom use compared to at least a third of the other clusters with regard to particular types of usage were:

- Slide shows - Cluster A (+19), Cluster B (+16), Cluster C (-10)
- Multimedia presentations - Cluster A (+19), Cluster G (+10)
- Designing and/or creating web-pages - Cluster D (+16), Cluster A (+10), Cluster E (+8), Cluster F (+7)
- Word Processing/DTP for creative writing - Cluster A (+13), Cluster D(+14), Cluster C (-8)
- Accessing or searching for information on the internet - Cluster A (+13)
- E-mailing other students or experts. - Cluster A (+20)
- Faxing or phoning other students, experts etc. - Cluster A (+19), H (+7)
- Using pre-prepared Databases or Spreadsheets. - Cluster I (+20), Cluster A (+16)

(‘+x’ indicates that these clusters’ teachers reported significantly more growth in this aspect of their classroom use of ICTs than in x other clusters, ‘-x’ indicates that the cluster teachers reported significantly less growth in this aspect of classroom usage than in x other clusters. Cluster labels, A, B, C etc , bear no relation to any other alphabetical cluster labelling in this Report)

It should be noted that these differences do not necessarily reflect a particular success, or shortcoming, of individual cluster programmes per se, but are more likely to reflect the varying extents to which individual cluster programmes or facilitators ‘pushed’ particular pieces of software or particular classroom uses in the course of their programmes compared to other clusters.

There were also some statistically significant differences in classroom usage between primary and secondary participants. Overall, for example, primary teachers reported that they incorporated ICTs into a higher proportion of their units of work at the end of the project than secondary teachers (x²=26.72, df=4, p<.0001). Primary teachers were also more likely than secondary teachers to have increased the extent to which their classes were developing slide shows, producing multimedia presentations, or faxing/phoning other students or content experts (F=4.03, df=2,714, p=.0125; F=4.86, df=2,714, p=.0082; F=6.77, df=2,714, p=.0013 respectively), but there were no statistically significant differences between the two sector groups with regard to increases in the frequency of the other classroom uses of ICTs reported in the End of Project survey.
The most significant factor in increasing classroom usage over the period of the programmes seems to have been less the cluster that the teachers were in, or the sector in which they taught, but the length of time that individual teachers were taking part. As indicated in section 7.3, above, there was a strong statistical relationship between the length of time teachers were in the PD programmes and the overall extent of their use of ICTs in their classrooms. This was also reflected in the results of our analysis of time-dependent factors in relation to the 17 specific ICT uses listed in Table 18. Highly significant time-span dependent differences were found in relation to growth in the frequency of classroom use for seven of the seventeen classroom uses investigated, and marginally significant differences were found in relation to three others. Analysis of Variance and Post Hoc analysis (Fisher PLSD) results indicate the following:
Increased classroom use of word processing and fax/phone technologies was significantly less for teachers who were in the PD programme for six months or fewer compared to other periods, though it was only marginally greater for those who were in it for the full three years compared to other periods.

Increased classroom use for accessing information from electronic encyclopaedias was significantly less likely for teachers who were in the PD programmes for six months or less.

Increased student usage of the internet for research and for emailing was significantly less among those who were in the programme for six months or less, but it was also significantly greater amongst those who were part of the programme for the whole three years.

The marginal results, which would have been statistically significant had that been set at the 95% level, related to classroom use of multimedia tools, drill and practice programs, and databases and spreadsheets.

8.2 Range of ICTs Used in Cluster Classrooms

“I had lots of trouble thinking of things to do [with computers]. Then I got my class to do a survey on pets, and created a spreadsheet. We have used this skill three or four times since then.” (Teacher interview, 2001)

“Some of the things I’ve been doing in my classroom with the computer include: searching the ‘Stuff’ website for current events, bookmarking sites for themes we’re doing so that kids can look them up later, using special CDs for reading and maths programme, publishing children’s short stories, rewarding early finishers. A special project has been using email. One of our teachers went overseas for a term and sent regular emails with a ‘guess’ [section] for us to find out where she was. We also exchanged emails with another school at census time.” (Teacher interview, 2001)

The range of information technologies available to teachers is massive, especially if we consider that term to include all the various forms (not brands) of hardware, peripherals and software packages on the market that could potentially be used in classrooms for teaching and learning. A study of teachers’ use of ICTs is a study of use across a range of subjects and objectives of a large and apparently ever expanding range of softwares and hardwares. In a school context this range includes: drill and practice software, interactive tutorials, educational games, interactive simulations (either fictional or modelling ‘real world’ situations), interactive encyclopaedias, computerised library catalogues, data logging software, mind mapping and sequencing software, content-free problem solving packages, administration databases, a wide range of generic software tools such as word processors, databases, spreadsheets, web browsers, email managers, presentation assemblers, multimedia editing and production tools, website development tools, electronic messaging software, as well as hardware peripherals such as digital cameras, digital video, scanners, probes and sensors, palm-tops, LEGO-LOGO models, and so on.

Given such a considerable range of potential ICTs to use with classes it is not surprising that facilitators in their PD programmes and teachers in their classrooms tended to make very
specific choices about which hardware and software tools to focus on in their PD programmes. For many clusters the PD programmes tended to focus on the full and effective use of a few selected ICTs rather than attempt to 'test the field’. As a result there was an understandable tendency for teachers to use in their classrooms those ICTs with which they were either already familiar or those to which they were introduced during the course of the professional development programmes. In one school in a case study cluster, for example, an entire year of one teacher’s classroom use of ICTs, and most of the year’s after-school professional development activities, revolved around the use of two particular software packages - Hyperstudio and Internet Explorer.

Over the clusters as a whole there was a wide range of ICTs used in teachers’ classrooms over the three years of the project. When teachers were asked to specify the particular ICTs (software packages and peripherals such as digital cameras etc but not computers or printers) that they used in particular curriculum areas, over a hundred unique ICTs were mentioned. However, while a fairly wide range of ICTs were clearly being used in classrooms across the clusters as a whole, that does not mean that any given teacher was necessarily using a wide range of ICTs in his or her particular classroom. Indeed, it is our conclusion that for the majority of teachers on the PD programmes, using the same few ICTs often took priority over using more ICTs.

A breakdown of the range of ICTs used by individual cluster teachers shows that about a third of them had used only one or two different ICTs with classes by the end of the three years, just under half had used 3-5 different ICTs, and about 20% of the teachers had used more than 5 different ICTs. In this regard primary teachers were significantly more likely to use a wider range of ICTs with classes than secondary teachers. Over half of the secondary teachers in the clusters reported having used only one or two ICTs with classes at the end of the project (Table 19).

| Table 19 Teachers’ Classroom Usage of ICTs by the Range of ICTs and School Sector |
|---------------------------------|-------------|-------------|-------------|-------------|-------------|
|                                 | 1-2 ICTs    | 3-5 ICTs    | >5 ICTs     | % of Sector 1-2 ICTs | % of Sector 3-5 ICTs | % of Sector >5 ICTs |
| Primary                         | 181         | 285         | 138         | 29.97%       | 47.19%       | 22.85%       |
| Secondary                       | 62          | 44          | 13          | 52.10%       | 36.97%       | 10.92%       |

\[ x^2=20.72, \text{df}=2, p<.0001 \]

It should also be noted that certain ICTs were often used across a variety of Essential Learning Areas, especially generic production packages or tools such as word processors, databases, graphics and presentation tools, and digital cameras. While there was a certain tendency for some particular ICTs to be used in some areas more than others, such as spreadsheets in maths or data logging in science, and so on, this tendency should not be exaggerated. In fact, a general ubiquity of use of the more popular software packages, no matter what the Essential Learning Area, was a feature of the classroom uses reported and observed in the project. Word processing or presentation packages were used extensively for science and social studies, not just language, spreadsheets were used for language classes and not just maths, Draw packages were used for mathematics and not just art, and so on (Table 20).

Table 20 indicates that the proportion of ICT usage for multimedia authoring or screen presentation was very much the same for all curriculum areas except mathematics. Usage of different types of software applications was also quite similar among science, social studies, and technology, with the focus being on information gathering, and static print presentation
technologies in all these cases. The use of problem solving and analysis software, and also content-based curriculum practice software, was rather greater in mathematics than all other Learning Areas, while static print presentation software was more prevalent in the arts and languages compared to other Areas.
Moreover, within each of these categories of software types a relatively small list of specific software applications tended to predominate. If one were to list the specific software programs used most often, and in most Learning Areas, the list would actually be quite small. The web browsers Netscape and Internet Explorer and the word processors within Clarisworks/Appleworks and MS Office themselves account for well over a third of all specific uses of software in ICT-based activities reported by teachers in the surveys. If Kidpix, Hyperstudio and the spreadsheet, database and presentation tool components of the MS Office and Appleworks/Clarisworks suites are added to the list, then those eight software packages alone were used in over two thirds of the ICT-based classroom activities reported or observed during the three years of the ICTPD project.

Thus, the overall picture painted by both the surveys and our observations in the schools, is that by the end of the project there was a large and growing number of ‘focussed adopters’ who used a few core ICTs often, and for a few curriculum purposes, and a rather smaller but also growing number of ‘ubiquitous adopters’ who used a wide range of ICTs, some routinely each day or week, and a number of others occasionally throughout the school year, for a wide range of curriculum purposes.

Summary

- There was a substantial increase over the period of the contract in the frequency of usage of ICTs in the classrooms of teachers in the ICTPD programmes, but rather less growth in the range of ICTs individual teachers used with classes.

- At the beginning of the ICTPD programme almost a third of participants had not used ICTs with classes at all, and just under half had used ICTs with classes ‘only once or...
‘twice’. By the end of the PD programme approximately 70% of participating teachers were using ICTs routinely with their classes.
The increase in the frequency of teachers’ use of ICTs for teaching and learning in classrooms was significantly greater for participating primary teachers than for participating secondary teachers. Primary teachers were also more likely than secondary teachers to incorporate a broad range of ICTs in their classroom teaching.

In terms of the Essential Learning Areas, ICTs were used most often in cluster classrooms to support objectives in the Language Learning Area, and least often to support The Arts, Technology and PE/Health. Moreover, in all Learning Areas a core group of generic ICTs were used more often than subject specific or content based ICTs.

By far the most frequently reported and observed usage of ICTs in participating teachers’ classrooms was as a tool or medium for the presentation of work or for information gathering through the Internet. Presentations were sometimes in the form of authored multimedia productions but were mostly in static print form. Other curriculum uses made of ICTs, in order of frequency, were:
- using CD-ROM based references or the Web for information gathering.
- using software such as simulations, spreadsheets, or databases as tools for curriculum related problem solving.
- using content specific programmes for subject skill practice or knowledge recall.

As a general rule, the length of time teachers were involved in an ICTPD cluster programme did not significantly affect their growth in terms of acquiring personal ICT skills and competencies. However, the length of time teachers were actively participating in the ICTPD programmes did significantly affect their level of confidence about using ICTs with classes, and the frequency with which they actually used ICTs with classes.

A minimum of six months active involvement in an ICTPD programme was apparently necessary in order for an individual teacher to significantly increase the frequency of their classroom use of particular ICTs.

Teachers who were involved in the ICTPD programmes for the full three years were significantly more confident about classroom use of ICTs, and significantly more likely to increase the frequency of their use of ICTs with classes, compared with those who participated for shorter periods.
9. Student Effects: Indicators of Value

“Having the time out to focus was really excellent. And for me the main, the sort of, equally, important thing was looking at philosophies and theories around teaching and learning. ... Because I was incredibly sceptical of the value of ICT for children in primary school, I knew it was inevitable and totally accepted the fact that we live in this technological world, but I had to have some sort of justification.” (Teacher interview, 2001)

“Computing is fun. But [we still] need to ensure real learning is taking place.” (Teacher survey response, 2001)

Few of the participants in the ICTPD programme had been extensive users of ICTs prior to the programme. Accordingly, during their first two years of ICT use most participants seem to have focussed on increasing the range of ICTs their students use and/or maximising the frequency of such use. The ongoing challenge for most of them at the end of the programme, however, was to similarly maximise the educational quality of ICT use in their classrooms through more effective ongoing integration of ICT activities into their teaching programmes.

That more cluster teachers were using more ICTs more often with classes is one measure by which to gauge the effectiveness of the ICTPD programmes. But did greater or more varied use necessarily mean ‘good’, 'better' or educationally ‘worthy’ use? As we have stated elsewhere, “there is a considerable difference, for example, between the quality or value of the learning experiences of one student who may copying out an already drafted story onto a word processor for publishing, and that of another who is composing and editing the audio track of a Hyperstudio presentation on Shakespeare’s imagery. Moreover, the difference does not lie in the use of the word processor in one case and Hyperstudio in the other. The difference lies in the different qualities and worth of the language learning involved, the thinking skills exercised, and so on. These indicators of value, of course, lie less in how often ICTs were used, than in how well? To what curriculum ends? With what learning outcomes? Using what pedagogical processes?” (Ham 2001, p7).

The following summaries of a few ICT-based activities from the case study observations serve to exemplify the range and variety of the ICT-based activities students undertook in the classrooms of the teachers in the ICTPD professional development programmes. More importantly, they outline and exemplify the complexity, from the teacher’s perspective, of the task of ‘integrating’ ICT usage into classroom programmes, and some of the innumerable organisational and pedagogical issues that need to be balanced in so doing. To some extent they also highlight and map the key parameters of what needed to be investigated in the research project with regard to assessing the overall educational worth or value to students’ of their use of ICTs in ICTPD cluster classrooms.

A. A Year 7 class was doing an environmental study over several weeks. The first 15 minutes of the observed lesson consisted of an audioconference with a Dept. of Conservation Ranger in the Nelson Lakes National Park about one of their current projects. The whole class was seated around a Polycom audioconference phone. Students were given a series of questions to ask and answer during the audioconference. After the audioconference the class went back to summarise and discuss their answers to the questions. One group of two boys, who were the school web site ‘editors’ for that class for that week, went to a computer to design a web page and wrote up the audioconference material as their class’s contribution to the current events section of the school website. The two boys spent 30 minutes
more or less equally divided between discussing/designing/editing the visual layout of the web page and typing in the questions and responses from the audioconference. At the end of the lesson about half of the questions and answers had been typed in. The font size, colour, spelling and layout of the webpage’s text had undergone about 30 revisions.

B. As a culminating synthesis activity for a unit on China in a Year 8 class, students were asked – as a class - to construct a mindmap of what they had learned in the unit. One student was asked to type into the Inspiration program on the class computer what the rest of the class called out. A data projector was aimed at the sloped ceiling since the room was all windows and doors and had no vertical projection space. Students called out and discussed suggestions for the various concepts and categories emerging from the brainstorm. The teacher’s role was to coordinate the collection of their ideas. In 15 minutes the students had created a huge concept map of the unit they had just completed. The teacher used this as one means of evaluating how well the students as a group could establish and identify relationships among the ideas learned in the unit.

C. New Entrants were asked to draw a picture and write a sentence underneath it using KidPix as part of a unit on ‘Me’. The students had done this work already in their books. They were to redraw the picture in Kidpix, save it, then switch to Appleworks to write the words, then save the Appleworks file and then cut and paste it back into Kidpix. One child was put in charge as “helper” but he (apparently deliberately) kept doing things to confuse the other children he was supposed to be helping. The teacher was working with other children in another part of the room. Over the 20 minutes of the session she had to intervene many times with the computer group to help them with the technical operation of the software, during which time the helper sat quietly and smiled and nodded.

D. The group of 3 Year 5-6 students in this class were producing small commemorative movies for New Entrants about their first day at school. The students planned the movie, created story boards on paper, contacted the parents for permission, met with the student and parents on their first day, filmed, edited and produced a Quicktime movie, which was then burned on to the CD and given to the child and his parents as a souvenir. Different groups of students from the class were given this task over the year as new pupils came to the school. The learning focus for the older students was on process planning as part of an ongoing Technology unit.

E. This was a lesson using the computer as a medium for an assessment in a unit on Space. The teacher was using a word processor connected to a touch pad which she had programmed with names of the planets listed on it. Students had to touch the names of the planets to order them as to distance from the sun and the list of names would appear on the screen in the order they were touched on the touch pad. The teacher stood by and directed students, occasionally putting her hand over a child’s hand on the mouse to “direct” the students how to operate the program. Students were called to the computer in turn and “talked” through the exercise. If a child forgot a planet he or she had to erase all the planets after it (letter by letter) and then put in the forgotten one and continue with the rest of the list. The children seemed afraid of making mistakes because this was a ‘test’, and tended to sit passively waiting to be told what to do.

F. This lesson was part of a unit in Science on experimental method, with the sub topic: procedures. The class consisted of a combination of Year 3 and 4 students. During the previous lesson, students had been introduced to the concept “procedures” and steps when planning. They found out why it is so important to follow certain procedures when working in a science environment. In the follow up lessons, students had to plan a science game, and work out the procedures planning the development of the game. They used different ICTs as part of the lesson sequence. Students worked in groups, designing their own game. Then they had to write down the steps and procedures used in making the game and fax that to another school and students in a Year 3 and 4 in that school. The planning steps had to be such that the students in the other school could duplicate/reproduce the game. The observed group of students used a word processor to write up the procedures used in producing their game. While working on the computer, they frequently checked back to what they had learned the previous day regarding procedures and step by step planning. After they had typed and printed their planning steps, the group went to the fax machine in the library and faxed the procedures to the neighbouring school. On returning to the class they went back to the computer and started to develop a slideshow, summarising the Planning Process they had used to develop the game. They were going to share this later with the rest of the class as a formal presentation.
This lesson was part of the Social Studies unit involving Year 4 students. The unit topic was Samoa and the lesson content was Coral and Coral Reefs. Students used books and the Internet to find information on coral reefs. In the previous lesson, students had received information about islands, and where one can find Coral Reefs. There were 3 computers in the class. In the lesson observed, the teacher gave the groups on the computers specific information to look for on the Internet. She also provided them with specific URL's to use. She mentioned to the group that those who wanted to could have a look at Encarta but that she thought the information in Encarta would be a bit too overwhelming for them at this stage. While some of the groups were looking up information on the Internet, others used books to get similar information. One of the computer groups clicked on a link to other sites and came to a website with lots of material in written form. The teacher was constantly moving around the class to check on everybody and quickly showed the group another site to use, explaining that they would find all the information a bit hard. Students were asked to write down the most important fact that they could find on each site. At the end of the lesson the facts collected and the reasons for identifying them as important were discussed as a class.

A Year 1 class in which the teacher was teaching an English lesson to the main part of the class. The lesson was about spelling words. The teacher used an hour glass to give students the opportunity to “work” on the computer. Two students were observed during their turns on the computer. The teacher concentrated on teaching the spelling lesson to the main body of the class, while students at the computer worked on some Maths drills. The software was a typical 3 pool drill which keeps a record of student work. When a student completed an exercise, the program recorded how many times the student had tried an answer, how many answers s/he got right and how many wrong. The first student struggled with the reading level of the text and the volume on the sound was turn down which meant he could not hear the spoken instructions. He completed only one or two sums. When his time was up, he quickly left and joined the main body of the class. The second student on the list on the wall came to the computer, immediately realised that he needed the sound turned up and called to the teacher that he could not hear. She came over, turned the sound up and returned to the larger group. At this stage the folder of the previous student was still open as the previous student had not logged out of the program. Student 2, who was much more able than student 1 therefore worked in the other student’s file, and got through quite a few problems before his time expired.

This class was a Year 11 Science class in a computer laboratory using ‘Crocodile Clips’ simulation software to design and make basic electrical circuits. The lesson was part of an electricity unit in which students had previously been introduced to the concept of circuits and the relationships between amps, volts and so on. The aims of the observed lesson were twofold: to get students familiar with the software, and also to reinforce the principle that the more bulbs were placed in series in a circuit, the lower was the current running and the less bright the bulbs would be. Follow-up lessons were planned and booked in the laboratory in which the students would generate and experiment with several kinds of basic circuits on the computers, using the appropriate electrical symbols. The students were talked through the basic operation of the program on two simple tasks involving light bulbs in series or parallel, and were then given some ideas for circuits to develop or alter at their own pace. Students were to write down the amperages for the three series circuits once they had constructed them, and note what changed when parallel circuits were produced. The two observed students constructed the required circuits quickly on screen, but needed instruction to see the importance of the amperage figures that kept changing as they edited the circuit. They did the three required tasks more quickly than the rest of the class. They spent the rest of the time experimenting with the various features of the program, observing what circuits other groups were making, and introducing as many of the electrical components as they could find icons for into the basic circuit they had built to see what effect it might have on the lights.

Reflecting on such experiences in interviews and surveys alike, teachers spoke of the cognitive benefits in terms such as ICTs being “another useable link in helping to reinforce certain concepts”, or by saying that students are “more aware that the teacher is not the only source of knowledge, more aware of how to access knowledge and able to judge their progress, they start to realise that other skills and abilities are important as well as being able to answer questions in textbooks”. Children, according to many of the teachers, “have become more reflective in their learning and are beginning to evaluate their work”, “they work more independently, they think critically and constructively”, the incorporation of
ICTs has “definitely improved work requiring research or comparison of ideas” and “their independence and problem-solving skills improved.”

The great majority (73%) of teachers did not believe that ICTs in themselves had led to increased student achievement as measured by formal testing, although almost half of the primary teachers did express the view that incorporating ICT-based activities had increased the amount of higher order thinking demonstrated by children in their classes.

Teachers also spoke often of the social benefits of using ICTs on classrooms. They spoke of classroom use of ICTs leading to “cooperative learning at their own pace”, to “lots more students helping each other” and “more group work”.

Most of all, though, teachers reported that using ICTs in classrooms had increased students’ self-motivation and levels of interest, largely because of the greater variety and range of activities that students were able to engage in. To cite but a tiny proportion of comments along these lines:

“[ICTs] got the children more excited.”

“It motivates and provides another tool for children to want to learn. It can provide a huge range of activities to support units of learning, thus motivating children at all learning levels.”

“They are more self-motivated. They enjoy showing new skills, are really buzzed when they work something out or master a new skill. Are more focussed on the task in hand. Will read and research with enthusiasm.”

“Motivation, interest, higher order thinking skills.”

“Reluctant writers often produce more.”

“Students are keen to research and use the internet and use CDROMS to find information. They have enjoyed more choices for presenting their work too.”

“The confidence to use tools. [And] not seen before creative skills.”

“Enthusiasm. It can capture unmotivated children.”

“Students enjoy working on the computer. [There’s] more variation and interest in studies. [I’m] providing a range, different activities that support learning, motivate, and use the equipment that the school owns.”

Across the clusters as a whole, two thirds of teachers in the End of Project survey felt that the use of ICTs in classrooms had increased their students’ levels of motivation. Most participants also felt that the use of ICTs had resulted in their programmes being more student-centred (62%) and more varied (89%). Most (87%) felt too, that the use of ICTs had allowed students to demonstrate a wider range of skills and abilities in their classroom work.

The teachers, in other words, tended to judge the value of the ICT activities for the students in terms of cognitive gain, inter-student collaboration, student-centredness and especially interest/motivation, deriving either inherently from the use of ICTs as such, or from increased variety and range in classroom activities.

For its part, the research team assessed the quality of concurrent or subsequent ICT-based teaching and student learning in the participant teachers’ classrooms by analysing 350 separate ICT-based activities observed in classrooms in terms of six core indicators of value:

- The range of ICTs students used and the extent to which ICT-based learning activities related to particular Curriculum Objectives.
- The levels of technical (ICT) capability required of, and demonstrated by, students in their use of ICTs.
- The range of Essential Skills intended and applied in the students’ use of ICTs.
- The levels of cognitive or creative ability required of, and demonstrated by, students in their use of ICTs.
- The effectiveness of student collaborations when using ICTs.
- The extent to which the use of ICTs was ‘integrated’ into the teachers’ general teaching programmes and practices.

The first five of these tests of value relate directly to the benefit or otherwise to students of their use of ICTs. It is these observed ‘student benefits’ that are the subject of this section of the Report. The issue of ‘integration’ is more a question of the value of ICT-based activities taken in the context of both teaching and learning combined. This is dealt with in the next section.

9.1 The Range and Curriculum Relevance of ICT-based Teaching/Learning Activities

To some extent, of course, how often students use ICTs in classrooms to achieve certain, relevant curriculum objectives, and the range of ICTs they use to achieve them, are in themselves a partial measures of the value of ICT usage in classrooms. And in the cluster visits teachers often explained their choice of ICT-based classroom activities in terms of this combination of frequency and variety of use alongside the curriculum relevance of the activity.

On a number of occasions teachers justified the students’ use of ICTs in an activity entirely in its own terms, implying that any activity which built students’ familiarity with the ICTs was seen as a curriculum goal in itself and worthy in its own right. Sometimes the task of becoming familiar with the software, while set initially without other curriculum contexts, was nevertheless preparatory to some future use for a different, curriculum related purpose. On a few occasions it was described as simply a ‘computer’ lesson, or ‘their turn on the computer’, but there were no observed examples of activities where the ICT was being used wholly as a reward, or for frivolous, unmonitored purposes not connected at all to curriculum goals. It was more common for teachers to describe the ICT activity as both meeting certain subject-specific curriculum goals and the perceived ‘technology goal’ of ICT familiarity for its own sake. Most often, however, teachers outlined the purpose of the ICT-based activity simply in terms of general subject-oriented curriculum objectives. Word processing activities, for example, would be described as “part of a Social Studies unit on Maori culture”, or “for creative writing”, or “to finish editing their stories about our trip to the zoo last week”, and so on.

The range of Essential Learning Areas covered in students’ use of ICTs, the range of ICTs used by cluster students, and the general curriculum purposes behind that use as reported by the teachers in the End of Project surveys has been detailed in an earlier section. Below, these figures are compared with those noted by observers during their visits to the cluster schools (see Table 21, Charts 4 & 5).

It would seem from differences between the patterns of curriculum relevance observed by the researchers and those reported by the teachers in the surveys, that the observations
rather underrepresented activities related to Social Studies and Maths, and over-represented activities related to Technology. Much of the latter, however, is possibly explained by the tendency cited above of about 10% of teachers to justify their use of ICTs verbally to the visiting researchers in terms of either or both the inherent value of ICT use in itself and other curriculum objectives. In terms of ‘curriculum purpose’ the two charts are rather more similar, except that the observations seem to have underrepresented the frequency of web-based information gathering activities and somewhat over-represents the proportion of usage for static print presentations. However, the general predominance of those two purposes over all others is suggested by both data sources, even if the exact proportions differ.

Table 21 Observed Activities by Software Type and Essential Learning Area
(N=325 distinct ICT activities (48 Secondary))

<table>
<thead>
<tr>
<th>Software Type</th>
<th>No. Activities</th>
<th>Learning Area</th>
<th>No. Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movie making/editing</td>
<td>1</td>
<td>Language (general)</td>
<td>34</td>
</tr>
<tr>
<td>Musical authoring</td>
<td>1</td>
<td>Reading</td>
<td>5</td>
</tr>
<tr>
<td>Multimedia presentation</td>
<td>13</td>
<td>Writing</td>
<td>28</td>
</tr>
<tr>
<td>Web design/authoring</td>
<td>4</td>
<td>Visual language</td>
<td>8</td>
</tr>
<tr>
<td>Slide Show (DTP)</td>
<td>19</td>
<td>Oral language</td>
<td>2</td>
</tr>
<tr>
<td>Total ‘authoring’</td>
<td>38</td>
<td>ESOL</td>
<td>1</td>
</tr>
<tr>
<td>Scanner/digital camera (DTP)</td>
<td>2/14</td>
<td>Total Language</td>
<td>78</td>
</tr>
<tr>
<td>Graphics</td>
<td>36</td>
<td>Science</td>
<td>27</td>
</tr>
<tr>
<td>DTP</td>
<td>28</td>
<td>Combination Science/Language</td>
<td>13</td>
</tr>
<tr>
<td>WP</td>
<td>45</td>
<td>Total Science</td>
<td>40</td>
</tr>
<tr>
<td>Total static print</td>
<td>125</td>
<td>Maths</td>
<td>19</td>
</tr>
<tr>
<td>Email</td>
<td>5</td>
<td>Total Maths</td>
<td>19</td>
</tr>
<tr>
<td>CD-ROM Reference</td>
<td>6</td>
<td>Social Studies</td>
<td>21</td>
</tr>
<tr>
<td>World Wide Web (research)</td>
<td>36</td>
<td>Total Social Studies</td>
<td>21</td>
</tr>
<tr>
<td>Total information gathering</td>
<td>47</td>
<td>PE/Health</td>
<td>4</td>
</tr>
<tr>
<td>Mind mapping</td>
<td>6</td>
<td>Total PE/Health</td>
<td>4</td>
</tr>
<tr>
<td>Simulation/problem solving</td>
<td>3</td>
<td>Technology (inc. TIM)</td>
<td>15</td>
</tr>
<tr>
<td>Spreadsheet</td>
<td>9</td>
<td>ICT skills</td>
<td>29</td>
</tr>
<tr>
<td>Database</td>
<td>4</td>
<td>Combination Language/ICT</td>
<td>10</td>
</tr>
<tr>
<td>Total problem solving</td>
<td>22</td>
<td>Combination Science/ICT</td>
<td>2</td>
</tr>
<tr>
<td>Curriculum tutorial</td>
<td>6</td>
<td>Total Technology</td>
<td>56</td>
</tr>
<tr>
<td>Drill &amp; Practice</td>
<td>11</td>
<td>Music</td>
<td>2</td>
</tr>
<tr>
<td>Multimedia storybooks</td>
<td>6</td>
<td>Art</td>
<td>1</td>
</tr>
<tr>
<td>Total curriculum practice</td>
<td>23</td>
<td>Total Arts</td>
<td>3</td>
</tr>
</tbody>
</table>
Taking the observed and reported figures together, it is clear that students in the cluster teachers’ classes were indeed using ICTs quite extensively, and that for the most part such ICT use had clear curriculum relevance. The use of ICTs in the clusters appears to have been spread across all of the seven Essential Learning Areas, although the predominant usage was for Language and Maths. Such usage also covered a variety of key curriculum goals, although there was a marked tendency for ICTs to be most used for students’ presentation of their work in static print form and for information gathering via the Internet. As has been noted in a previous chapter, there were sector-based differences in the variety of ICTs students used in classes, but in general they tend to have been frequent users of a few core programs or ICTs rather than frequent users of a wide range of ICTs.
9.2 Students’ Technical (ICT) Capabilities

“Teacher: ...they are all very familiar, they know what they can do and its quicker for them, its just fun.... Putting a slide show together and surprising me... with a Kidpix slide show. The photos that they used were already on the computer but they, there was only a small group of three, but I’ll say one child took the reins and put it all together and I had left him to it thinking I’ll come back and assist but by the time I came back it was finished and he had put sound in it and he had put a transition through it and it was just like “come and see this” and...yeah I was amazed, absolutely amazed. He was six.

Researcher: So had that group had previous experience with building a slide show?

Teacher: One to one, as in just looking at and talking through and as the group just viewing basically, seeing me model it. I didn’t think he was able to do that.”

(Teacher interview, 2001)

A second possible measure of the value of ICT usage in classrooms that was investigated, was the observed technical abilities of the students. To what extent did students learn or demonstrate ‘computer literacy’ or ‘technologically literacy’ in the course of their use of ICTs? This was observed in relation to three main parameters: first, the level of technical ability and operational knowledge required to complete the task they were given, secondly, the students’ demonstrated ability to operate the various information technologies, software applications and so on they had to use, and thirdly, the extent to which they were able to independently problem-solve any technical or operational difficulties they confronted during their use of the ICT in question.

The great majority of tasks observed required a sound knowledge of basic computer operation: facility with the keyboard and/or a mouse, operational knowledge of a menu driven interface, knowing how to open documents from different directory paths, scrolling, searching or moving through existing documents, entering or changing text or graphic information in new or existing documents, logging on to a network, answering on-screen questions or problems, saving documents to specified directory locations, printing documents to paper, and so on. The technical activity most frequently observed once applications were running involved creating or editing text and bit mapped (Paint) or object-oriented (Draw) graphics in a single application. About 15% of observed activities involved the students in more complex technical tasks such as multitasking (moving information from one application to another while both were active in different windows) and 9% involved transforming data from one form to another (eg: graphing tables of data or vice-versa, sorting lists in different ways, real time data logging, morphing etc).

In all except the more complex transformation and multitasking activities, students showed considerable existing facility in operating a wide variety of ICTs, and very easily learned new skills or program features when shown them. Younger children sometimes had problems locating previous drafts of work, especially if the default directory path was not set up with a folder in their name, or was unknowingly changed during the course of the computer session. Younger children also often edited almost exclusively using the delete key or ‘multiple undo’s’, rather than multiple selection methods using click-and-drag
methods. Often they would delete entire pieces of work and start again with a clean ‘page’ rather than edit the small section that needed changing.

New skills or operational knowledge were most often acquired by being shown or told, rather than by ‘working it out’ themselves. Students tended either to know, or to not know, how to operate particular pieces of software or hardware, or the specific features of those programs that might best achieve their purposes. If they already knew the appropriate procedures then they applied them with subconscious ease. However, if they did not solve a particular technical problem within two or three key presses or mouse clicks, then they tended to rely on either their peers or the teacher to solve it for them rather than systematically to problem-solve it themselves. When striking a problem, some students persevered, trying alternate and apparently systematic procedures such as skimming through menu options, reading the prompt lines at the top or bottom of the screen, or retracing their actions as far as they could remember them. Most, however, whether they were new entrant 5 year olds or senior high school students, either gave up and started again or sought help from others if their first one or two efforts did not work.

For the most part, the problems encountered were matters of simple procedure: a step in the process had been missed out, a directory path had changed unobserved, or an on-screen instruction had not been read or understood etc. To this extent any help sought was easily and quickly given and the problem readily solved. It was often noted by the researchers, however, that the advice given by ‘expert’ peers or even the teachers was not necessarily the most efficient method for solving the problem. Sometimes this derived from ignorance of a ‘better way’ on the part of the ‘expert’. More often it resulted from a misdiagnosis of the problem because the ‘expert’ had not always been present during the process and thus did not know what the student had been doing prior to needing help, and thus did not know, and could not at a glance see, what key presses or selections s/he had/had not made that created the problem in the first place.

Finally, it might be noted that the fact of seeking help to solve technical difficulties did not seem to be regarded as especially problematic, or necessarily an indication of failure or inadequacy by students of any age. Rather, it was ‘what you did when you got stuck with computers’. The impression was often given that they asked neighbours or the teacher simply because that was a more effective and efficient solution than wasting time trying to work it out themselves. Perhaps because they knew there was usually some small and simple remedy, there seemed little sense of stigma or failure if a student did not know how to operate an aspect of a program or made a technical mistake, though there did seem to be some sense of status and pride exhibited by those who were able to successfully help.

9.3 Students’ Application of The Essential Skills in their use of ICTs

In describing their project goals and objectives a number of cluster managers and facilitators drew a distinction between fostering students’ ‘technological literacy’, as exemplified in students’ technical facility on the one hand, and their ‘information literacy’ as exemplified by their ability to cognitively process information using ICT tools on the other. For them in particular, a significant measure of the value of students’ use of ICTs in cluster school classrooms was the extent to which activities fostered the development of the ‘Information Skills’ among The Essential Skills.
As promulgated by the Ministry of Education, The Essential Skills consist of eight groups of specific cognitive, social, attitudinal physical and work skills to be fostered in schools. The eight groups of skills are:

- Communication Skills
- Information Skills
- Problem Solving Skills
- Numeracy Skills
- Self-management and Competitive Skills
- Physical Skills
- Social and Cooperative Skills
- Work and Study Skills

The specific sub-skills within these headings which were investigated as part of the research are listed in Question 4 of the Observation Schedule in Appendix 1.
By definition, the great bulk of the ICT-based activities observed saw students exercising those Essential Skills that specifically related to the use of information technologies, namely: the Communication Skill to “become competent in using new ICTs” and the Information Skill to “use a range of information-retrieval and information processing technologies confidently and competently”. Virtually all observed activities therefore exercised those particular skills.

If we look at the rest of the Essential Skills, excluding those two ICT-specific skills, the skills we most frequently observed students applying or developing were Communication Skills and Information skills, followed by Problem Solving Skills and Numeracy Skills (Chart 6).

**Chart 6 Most Frequently Demonstrated Essential Skills by Skills Group**

Given the tendency noted earlier for teachers to focus on the classroom use of ICTs on language activities for paper-based or screen-based presentations of work and for information gathering on the Internet, the predominance and relative parities of these three groups of Essential Skills as exhibited by students is not surprising. However, when the groups of skills are broken down into their constituent sub-skills, it becomes apparent that students tended to exercise certain sub-skills in their work with ICTs rather more than others.

For example, Table 22 indicates that of the Communication Skills listed there was a strong tendency to focus on the skills of ‘communicating confidently’ and ‘conveying and receiving information in a range of contexts’ compared to the arguably higher level cognitive skills of ‘discrimination and critical thinking’ or using ICTs to support ‘arguing a case persuasively’. There was a similar tendency to focus on the lower to medium order skills, or, within a particular skill, on its lower or medium order elements, within the Information Skills. Students were very often observed identifying, locating, gathering, storing and processing information using ICTs. They were often observed organising that information, summarising it, representing it in different forms and presenting to others it in a clear and logical way. There was relatively less observation of students conducting high level evaluation of their information, apart from evaluating for relevance and non-relevance, of students presenting information
from a variety of perspectives, or of students ‘distinguishing fact from opinion’. Similarly, within the most observed Problem Solving sub-skills, students were more likely to be asked to “think reflectively or logically” than they were to think “critically or creatively”.
Table 22 Percentages of Observed ICT-based Activities in which Students Demonstrated Various Sub Skills in The Essential Skills

<table>
<thead>
<tr>
<th>Communication Skills</th>
<th>% of Observed activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicate confidently and competently by listening, reading, speaking &amp; writing and other forms of communication.</td>
<td>45.4%</td>
</tr>
<tr>
<td>Convey &amp; receive information, instruction, ideas &amp; feelings in a range of social and cultural contexts.</td>
<td>16.9%</td>
</tr>
<tr>
<td>Skills of discrimination and critical analysis in relation to the media, and to aural and visual messages from other sources.</td>
<td>12.4%</td>
</tr>
<tr>
<td>Argue a case clearly, logically and convincingly.</td>
<td>1.1%</td>
</tr>
<tr>
<td>Become competent in using new ICTs, including augmenting communication for people with disabilities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Information Skills</th>
<th>% of Observed activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify, locate, gather store, retrieve and process information from a range of sources.</td>
<td>25.1%</td>
</tr>
<tr>
<td>Organise, analyse, synthesise, evaluate &amp; use information.</td>
<td>18.9%</td>
</tr>
<tr>
<td>Present information clearly, logically, concisely and accurately.</td>
<td>14.1%</td>
</tr>
<tr>
<td>Identify, describe, and interpret different points of view, and distinguish fact from opinion.</td>
<td>3.1%</td>
</tr>
<tr>
<td>Use a range of information-retrieval and information processing technologies confidently and competently.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem Solving Skills.</th>
<th>% of Observed activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Think critically, creatively, reflectively and logically.</td>
<td>21.7%</td>
</tr>
<tr>
<td>Exercise imagination, initiative, and flexibility.</td>
<td>12.4%</td>
</tr>
<tr>
<td>Identify, describe, and redefine a problem.</td>
<td>4.8%</td>
</tr>
<tr>
<td>Analyse problems from a variety of different perspectives.</td>
<td>2.5%</td>
</tr>
<tr>
<td>Make connections and establish relationships.</td>
<td>3.9%</td>
</tr>
<tr>
<td>Inquire and research, and explore, generate and develop ideas.</td>
<td>3.1%</td>
</tr>
<tr>
<td>Try out innovative and original ideas.</td>
<td>5.0%</td>
</tr>
<tr>
<td>Design and make.</td>
<td>3.9%</td>
</tr>
<tr>
<td>Test ideas, and solutions, and make decisions on the basis of experience and supporting evidence.</td>
<td>2.3%</td>
</tr>
<tr>
<td>Evaluate processes and solutions.</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Numeracy Skills</th>
<th>% of Observed activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculate accurately.</td>
<td>4.2%</td>
</tr>
<tr>
<td>Estimate proficiently and with confidence.</td>
<td>0.6%</td>
</tr>
<tr>
<td>Use calculators and a range of measuring instruments confidently and competently.</td>
<td>2.9%</td>
</tr>
<tr>
<td>Recognise, understand, analyse, and respond to information which is presented in mathematical ways, for example, in graphs, tables, charts, or percentages.</td>
<td>3.7%</td>
</tr>
<tr>
<td>Organise information to support logic and reasoning.</td>
<td>0.6%</td>
</tr>
<tr>
<td>Recognise and use numerical patterns and relationships.</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

9.4 Students' Demonstrated Cognitive and Creative Capabilities when Using ICTs

The level of cognitive complexity of the tasks set, and the levels of thinking demonstrated by students in the performance of those tasks were assessed in terms of Bloom’s Taxonomy of thinking skills, with the additional category of ‘Creativity’ being included to account for ICT-based activities which were designed consciously to encourage students to try out new ideas, or to be inventive, ingenious, novel or original in some way. The categorisation of the activities was done on the basis of the following broad definitions of Bloom’s levels:

**Knowledge**: Recall of facts, dates, names, definitions.

**Comprehension**: Understanding the meaning of remembered material

**Application**: Using information in a new context to solve a problem or answer a question.

**Analysis**: Breaking a piece of material into its parts and explaining the relationship between the parts.

**Synthesis**: Putting parts together to form a new whole, pattern or structure.

**Evaluation**: Making a judgement based on a set of criteria.

**Creativity**: Trying out new and innovative ideas.

(Additional keywords used to further categorise and characterise the various levels of thinking observed in the setting and performance of the ICT-based tasks are outlined in Question 3 of the Observation Schedule in Appendix 1)
In categorising the observation data the team took some account of the ages and developmental levels of the students involved, and also differentiated as far as possible between the level of thinking implicit in the tasks as set, and the levels of thinking implicit in the behaviours of the students as they performed the tasks. In this latter regard we found that the levels of thinking expected in the task and those demonstrated by the students were generally the same throughout the cluster classroom observations. Students on the whole did indeed achieve the levels of thinking implicit in the various tasks. However, it is perhaps important to note there that teachers were often not themselves in a position to judge the levels of cognitive development, or other aspects of the learning, demonstrated by students during their use of ICTs. In the vast majority of observed sessions, and especially in primary classes where there was only one or two computers for 20 or 30 students, the teachers were able to have only brief and often cursory interactions with the students concerned. While there was much observed individual learning at computers, there was relatively little observed individual teaching.

Overall, we found that the majority of the ICT-based activities observed were set, and performed, at the Knowledge, Comprehension and Application levels on Bloom’s Taxonomy of Thinking Skills. Tasks at these levels account for some 68% of all those observed (Chart 7).

Around 20% of the tasks were set, and performed, at the Knowledge level of Bloom’s Taxonomy of thinking skills. Approximately 25% of the tasks observed were at the Comprehension level, and a further 23% at the Application level, though in a number of cases the ‘application’ concerned involved ‘applying’ ICT knowledge and skills to different ways of presenting their knowledge or comprehension.

At the higher levels of thinking, activities focussed on Synthesis (13%) were more common than than activities focussed on either Analysis (6%) or Evaluation (7%). Approximately 7% of the observed ICT-based activities had Creativity as their major focus.
9.5 The Effectiveness of Student Collaborations when Using ICTs

Students were often encouraged to cooperate when working at the computers, even in large laboratory situations where students had one computer each, and during about half of the classroom visits descriptions and ratings of student collaborations around the computer or ICT were made.

Chart 8 How Cooperative was the Working Relationship of the Groups? (n=153)

When such collaborations were preplanned and formally set up, teachers tended to have a mixture of rationales for establishing them. Primary teachers in particular put students in pairs or trios at the computer and saw this working in groups or collaborating with neighbours as a normal, desirable part of classroom interactions that should be fostered in its own right. They also often explained the collaboration as making the students less dependent on the teacher in terms of operating the programs, as increasing the rate with which students could be cycled through an ICT-based activity, and/or (in the case of secondary students working in a laboratory situation) as enabling them to have access by sharing an activity that they otherwise would not have got in that period.

As can be seen in Charts 8 and 9, the levels of constructive inter-student collaboration as rated by the researchers in our observations of ICT-based activities was very high, and most collaborations, whether formal and planned or informal and unplanned, resulted in successful completion of the tasks set.
In working together at the computer students often took turns to be in control of the mouse, the other student(s) becoming ‘helpers’ either on technical aspects of operating the program or on helping solve the content problem on screen or to contribute to the information processing occurring on screen. We estimate that among the formal preplanned collaborations, which often set up with the pragmatic goals of sharing the computer time or providing a student with operational assistance, there was an almost equal division between purely technical collaborations and collaborations that were substantially or wholly on the curriculum tasks at hand.

We also estimate that in about half of the observed ICT activities involving student-student collaboration, collaboration consisted of interactions that were deliberately set up or formally encouraged or instigated by the teacher. In about a third of the cases we observed informal, unplanned and usually brief collaborations occurred that had not been consciously planned by the teacher. The other 13% were a mixture of the two. In contrast to the preplanned and formal collaborations, the main purpose and content of the majority of such informal or spontaneous collaborations appeared to be technical in nature, with the cooperating student helping the student at the computer with some aspect of operating the programme. Often this was accompanied by casual expressions of praise or criticism of their work, or answering the (content) problem.

We also noted that there seemed to be a lot of ‘sharing of ignorance’ among students with regard to technical skills, especially among younger students in lower primary school classes (NE-J2). Student ‘experts’ were as prone as those they were helping to either know or not to know how to operate features of the programs and were equally likely to try a couple of solutions before asking yet another expert or restarting the program, rather than problem-solve their way out of the difficulty. Because of this, strategies such as ‘teaching one to teach the next one’ often suffered from a dilution effect as the various students in a class worked through a particular programme.
Summary

- For teachers, the main perceived effects on student learning of introducing ICT-based activities into classroom learning programmes were to make learning activities more varied, to increase the range of skills and abilities demonstrated by students, and to increase their motivation.

- The great majority of teachers did not believe that ICTs in themselves had led to increased student achievement as measured by formal testing, although almost half of the primary teachers did express the view that incorporating ICT-based activities had increased the amount of higher order thinking demonstrated by children in their classes.

- For many of the teachers their use of ICTs in the classroom was justified in terms of curriculum and skills relevance. Many also justified such use wholly or partly in its own terms. That is, it was seen as important for students to learn ICT skills for their own sake as well as to use them to support their learning in specific curriculum areas.

- The great majority of ICT-based classroom activities clearly related to curriculum objectives. Most observed and reported activities related the Language Essential Learning Area, followed by Technology, Science, Social Sciences, Maths, Health & PE, and the Arts.

- In terms of the Essential Skills there was an emphasis on the middle and lower order elements of Communication Skills, Information Skills and Problem Solving Skills in students’ classroom use of ICTs.

- The technical ICT abilities and operational knowledge of the students observed were generally very high, except in terms on-screen multi-tasking and more complex transformations of data. However, there was a tendency for students either to know how to operate aspects of a piece of software, or not to know. Few chose to problem solve their way out of technical or operational difficulties, preferring to seek help from the teacher or another, ‘expert’, student.

- The thinking levels required by, and demonstrated during, ICT-based activities were mostly at the Knowledge, Comprehension and Application levels on Blooms’ Taxonomy of Thinking Skills. Activities at the Application level as often related to the application of ICT knowledge and skills as to the application of curriculum based principles or skills.

- Generally, student collaborations around the classroom computer were effective, both in terms of task completion and learning benefit. Teachers often had pragmatic (access) reasons for setting up collaborations as well as curriculum reasons. There was also a high proportion of unplanned and informal student collaborations around computers, often focussed on aspects of the technical operation of the software.

- There was a significant amount of ‘sharing of ignorance’ among students with regard to technical skills, especially in lower primary classes (NE-J2), where student ‘experts’ were often not as ‘expert’ as the teacher expected them to be.
10. A Note on the ‘Integration’ of ICT-based Activities into Classroom Programmes

“Researcher: Right, what criteria do you think you will use in two years time to say that this was successful as professional development?

Teacher 1: Am I still using the computer, are my students using the computer, are they using other vehicles for IT, is it part of what we do everyday in the classroom?

... Teacher 2: It’d be nice to think that in two or three years time that we’re going to see children coming through who have the skills to be computer literate, so that it really is in the true sense a tool, and that we then are focussing on the teaching and learning of this. [With us] just supporting. Where at the moment there’s probably more emphasis put into the skills teaching, that’s what I feel.” (Teacher interview, 2001)

Most ICTPD programmes had as one of their major goals that participants would move towards effectively ‘integrating’ ICT use within their overall teaching programmes, though there was no consistently articulated view among the clusters of what this might mean in practice. Nor in our view has the concept of ICT ‘integration’, or how to evaluate it, been adequately articulated in the research literature. However, our own experience in researching the 23 clusters indicates that it may have something to do with optimising the effectiveness of ICT usage with regard to at least the following parameters:

- **Curricular integration** - ie: the extent to which, and ways in which, an ICT activity relates directly to appropriate curriculum goals, and to the same or complementary curriculum content or skills as other learning activities in a given unit of work or sequence of lessons.

- **Temporal integration** - ie: the extent to which, and ways in which, a given ICT activity relates directly to other prior, concurrent or subsequent learning activities occurring in the classroom.

- **Spatial integration** - ie: the extent to which the use of computers or ICTs is separated in place or location from other learning activities in a unit of work.

- **Pedagogical integration** - ie: the extent to which the choice of particular ICTs, and the ways in which they are used in classes, are consistent with and between the pedagogical philosophies, orientations and intentions of the teacher, and the learning styles, abilities and motivations of the students.

Moreover, laying across all of these four parameters, perhaps, is the further test of ICTs ‘transparency’ or ‘invisibility’, which might be called ‘attitudinal integration’. By this we mean the extent to which teachers and students alike take for granted, regard as routine, and do not see as special or problematic in any way, either the use of any given ICT for any given learning task, or its technical operation.

By the first of such measures the level of ICT integration achieved in the observed classrooms was quite high. As has already been noted in this report, the great bulk of ICT activities observed in cluster classrooms were clearly linked to curriculum goals, were predominantly part of a ‘unit’ of work in which related curriculum goals were addressed, and were usually linked to the exercise of Essential Skills other than ICT skills in themselves
By the latter measures, however, the levels of ‘integration’ achieved for ICT activities in the observed classrooms varied greatly from teacher to teacher, but seem to have been more moderate.

In many respects achieving ‘temporal integration’ was a matter of mid to long term planning, organisation and accessibility, and was especially problematic for primary teachers, who often taught 20 to 30 students in a classroom with one, or occasionally two, computers.

Primary teachers developed a number of techniques for ‘rosters’ and ‘rotations’ in order to cycle their students through an ICT-based activity within a unit of work. Sometimes students were assigned a specific ‘time limit’ with a bell or buzzer indicating that their time on that activity was up. At the other extreme some students were given all the time they needed to do an ICT activity, even if it took all day. Sometimes students worked at an activity for a fixed period of time each day for a week. Sometimes students worked for a fixed period of time on certain days of the week. Sometimes every student in the class was expected to have a ‘turn’ at a given ICT-based activity during the course of a unit of work. Sometimes only some students used ICTs in a given unit of work. The practical variations were almost infinite but all had the common goal of providing what the teacher saw as an equitable opportunity to use ICTs at some points in their classroom programme.

This meant that the students working on the computer were often engaged in activities that bore little relationship to what the rest of the class was doing at the time, but might have a relationship with some whole class activity that had occurred some days, or on occasion weeks, before. Sometimes the activity missed by students while they were using the class computer was caught up at a later time in the day, often it was not (see activities described in the previous section). Some teachers overcame this problem by limiting the use of ICTs to only that number of students who could complete the ICT activity within the period the particular unit to which it related was operating. Others operated much of their classroom programmes on the basis of ‘learning station’ sessions, in which groups of students cycled through a series of different but related activities in a unit, one or two of which involved the use of ICTs, over an extended period of time. The order in which students did the various activities differed among groups, but over the period of the unit all students had completed all activities.

Analysing the ICT-based activities observed in primary classrooms, and coding them according to the extent of close or obvious temporal connection between the ICT activity and other structured activities in a unit of work or sequence of lessons, we estimate that around 18% of the observed activities were not apparently closely connected in either content or skills terms to prior, concurrent or subsequent activities. Many of these were ad hoc program familiarisation sessions. Approximately 28% were not apparently related to concurrent classroom activities, but were part of ‘ongoing’ activities connected to earlier or anticipated work in a unit. Some 5% were related to concurrent activities but were one-off sessions on a particular topic or skill and not part of a regular pattern of sessions. Around 48% of observed ICT activities were clearly related in terms of skills or content to all of prior, concurrent and anticipated classroom work in a given topic or unit.

Secondary teachers also experienced some difficulties in terms of timing their ICT-based activities within their teaching programmes, but in their case these difficulties arose from
issues of location rather than timing per se. If most of the observations of ICT-based activities in primary schools took place alongside the one or two computers in a teacher’s normal classroom, those in secondary schools mostly took the form of observing students working in a dedicated computer laboratory, well away from the class’s ‘normal’ room for that subject. The obvious difficulty that this created was that use of ICTs could only be made when the computer room was available, and teachers of different subjects competed for such laboratory time. The use of ICTs in such situations was therefore seldom spontaneous, or brief, or organised as ‘part of a lesson’. In these cases ICT use by students was organised well in advance. It was for a fixed and limited period of time and it constituted the entire ‘lesson’ for all of the students. Teachers in the case study cluster secondary schools often reported difficulties in getting room bookings for more than one or two of their periods in a row. For them ICT usage was ‘occasional’ in both the sense of being and periodic over several days or weeks, and also in the sense of being an ‘occasion’, something different and non-routine, a change from rather than a continuation of normal subject teaching and learning activities.

All but a very few of the ICT activities observed in secondary schools took place somewhere other than the students’ normal classroom. Mostly they occurred in a computer laboratory or occasionally in the school library.

The general sense of physical separation experienced in secondary schools also existed to some extent in many of the primary school classrooms observed, in that the ‘class computer’ was usually located in a corner of the room, on the back wall, or in many cases in an adjacent storeroom or alcove. Even computers within the main body of classrooms were often separated off from the rest of the room by makeshift partitions of bookcases or other furniture. Such locations all reinforced the idea of the separation of computer activities from the mainstream of teaching and learning, and seemed often to make it difficult for teachers to monitor what was actually happening at the screen. One exception to this noted in one cluster school was a class in which students were using a mobile set of 8 laptops in a particular study. All students were working on the same topic and a general set of common tasks, but by way of a variety of activities. About half of the students chose to use the laptops, either in groups or individually. The various computer users or groups were using different software packages to perform different tasks related to the unit topic. The computer users worked in different parts of the room, some on the floor, some at desks, while the others, also in various parts of the room, some on the floor, some at desks, used books or other resources.

The research team did not actively collect or analyse data on the pedagogical orientations of the teachers, students’ learning styles or many of the other elements of ‘pedagogical integration’. This emerged as a significant component in the ‘integration’ concept only during the latter stages of the research. However, the ‘test’ of pedagogical coherence that it implies in assessing the extent of integration of ICTs and its ‘worthiness’ as an educational enterprise, is something that could usefully be investigated in future studies.

The observations did, however, involve the incidental noting of data about the kinds of other, non-ICT-based, activities that were occurring in the classroom at the time, and more particularly, data on the content and frequency of teachers’ interactions with the students who were using ICTs. In this latter regard it was noted that in the great majority of cases, and especially in primary school classrooms where there was only one or two computers, teachers had relatively infrequent interactions with the students working at computers. In
the main those interactions that did occur consisted of the teacher providing students with task instructions at the beginning of the activity, and, during the activity, conducting cursory checks that the students appeared on task or were not having procedural difficulties, and/or providing largely technical assistance. Where such interactions occurred, they were often initiated by the students. There was relatively little time spent actively ‘teaching’ the students about the substantive content of the activity when the students were using ICTs.

Perhaps the element of integration that was least observed in the observations was attitudinal. For many, if not most, of the participating teachers, their use of ICTs with classes was often perceived and structured as something of ‘an added extra’, rather than routinely and invisibly integrated with other activities on similar curriculum goals or topics etc. This was especially so in the early stages of their involvement in the ICTPD programmes, but for many it was also still an issue at the end. In some ways many of the teachers moved during the programme from a form of blissful ignorance of ICTs to a point where they were much more conscious of the extensive possibilities that they had not yet explored, and this in turn brought with it a less than blissful sense of the ongoing need for even further development in the area.

On the whole, it is our conclusion that over the period of the 23 ICTPD cluster project the great majority of teachers had successfully and frequently ‘incorporated’ some ICT usage as an established part of their classroom programmes, but relatively few had managed to achieve full ‘integration’, in the sense of the transparent and almost subconscious absorption of a variety of ICTs into the accepted and unproblematic routine of daily classroom life. In this regard it should be remembered, of course, that the population of teachers whose ICT usage was studied were those who initially had little or no experience with ICTs and who had undertaken professional development in the area for very varying lengths of time. Given that, it was perhaps not surprising that at the end of the programme many of these teachers reported that while they were now confident about regularly ‘including’ some ICT-based activities into their teaching programmes, achieving fully effective and comprehensive levels integration of all the different potential uses of ICTs they were now aware of was still an important and ongoing professional development goal.
11. Conclusion

"What teachers really need is in-depth, sustained assistance as they work to integrate computer use into the curriculum and confront the tension between traditional methods of instruction and new pedagogic methods that make extensive use of technology.” (CEO Forum, 1999)

There were a number of clear, extensive and positive outcomes of the 23 ICTPD School Clusters project. The basic concept of clustering schools to manage the provision of professional development for teachers in ICT was widely seen as being effective, especially where there was a genuine and prior sense of community of interest and commitment among the participating schools. The experience of the 23 clusters has also highlighted a number of key factors in the organisation and operation of such programmes that should be considered in the planning of any future ICTPD cluster projects.

It is also clear that the programmes contributed indirectly to the development of strategic planning and policy initiatives on ICT in participating schools, and directly to substantial increases in the professional skills and confidence of participating teachers, to substantially increased teacher use of ICTs for administration and lesson preparation, and to substantially increased usage of ICTs by students in those teachers’ classrooms.

At the end of the three years of the project, the predominant impression given by the participants was that it had been a very worthwhile experience, which had for most of them achieved their objectives. However, even given the relatively long duration of the programmes for many of them, it still had not been enough for them. At the end of the project most teachers were less concerned than they had been at the start about their own skill levels with ICTs, less concerned about their ability to incorporate ICTs into classroom programmes and the practicalities of so doing, less concerned about being able to access ICTs for their own professional use, and more assured of the positive impact ICTs could potentially have on their teaching and their students’ learning. They were still, however, much concerned about their ability to keep up to date with new developments in the area and the ever-emerging new technologies that they now knew they did not know. They were concerned too, about the likelihood of ongoing support not being available to them after the project had finished, about a lack of access to equipment for students, about continued equipment failures and out of date or inadequate infrastructure in isolated areas, and most of all, perhaps, about their ongoing sense of “the lack of time to cope with it all”.

In this regard it is important in any study of ICTs in education to highlight the plurality of the term. Although we tend to use the expressions ‘IT’, ‘ICT’, or, even less accurately, ‘computers’ as if we were referring to a single entity, or at best a collection of broadly similar and comparable entities, nothing could be further from the reality of the situation. There is no ‘Information and Communication Technology’, but there are a broad range of ‘Information and Communications Technologies’. One of the major dilemmas facing the teacher in the information age is the fact that in the world of schooling there can be so many different technologies used at many different levels of schools for many different educational purposes. For this reason it is neither appropriate nor useful to talk too generally about the ‘effectiveness of ICT’ in schools or of the ‘effects of ICTs on learning’. Rather it is necessary to look closely at particular ICTs as used by particular teachers in
particular teaching situations to achieve particular curriculum or learning objectives with particular students.

If only because of the ever broadening range of technologies becoming available and the myriad of educational contexts in which they might be used, teacher professional development in this area is likely to continue as a long term and ongoing requirement. In the three years of the 23 clusters ICTPD programmes the great majority of participating teachers were able to significantly increase their own ICT skills and confidence as users, and most also significantly increased the frequency, and to a lesser extent the range, of ICT usage within their classes. Rather fewer, however, were able to achieve to their own satisfaction the complex professional task of fully integrating such ICT use into their total teaching programmes within that time, or to significantly improve over time the educative quality of their students’ use of ICTs as a medium for learning. Relatively few have been able to devise or implement ‘best practice’ in terms of assessing student achievement in the context of any given ICT-based activity. Moreover, if such latter expectations existed they were perhaps unrealistic, given that the teachers involved were for the most part just beginning on their journey as ICT-using educators. Certainly, our findings in this regard are consistent with a number of overseas studies indicating that it takes more than a few months or a few terms for most teachers to have enough experience with enough ICTs in enough classroom contexts for enough curriculum purposes with enough individual students to move beyond an initial focus on ‘skill development’ and quantity of classroom ‘usage’, and to develop the comprehensive, ongoing programmes of work involving ubiquitous, authentic and monitored use of a variety of ICTs that are required in order to maximise the educative ‘value’ and ‘quality’ of the experience for students.

The main continuing need for schools in the clusters would seem to be ongoing efforts to install adequate and robust technical and support infrastructures, especially in rural and isolated areas. The main continuing need for teachers would seem to relate to developing ways of even more fully and appropriately ‘integrating’ ICT use into their existing teaching/learning programmes, and in particular within that, developing ways of optimising the level of cognitive/creative challenge involved in students’ use of ICTs, and devising appropriate and valid methods for assessing or evaluating student achievements as demonstrated during the course of such use.
REFERENCES


