THE USE OF COMPUTERS ON WHEELS (COWS) AT EDGECUMBE COLLEGE, THE EASTERN BAY OF PLENTY

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The aim of the project:

The aim of MOBLAP was twofold. Firstly, it aimed to help remove barriers to ICT access and its integration in low decile and/or rural schools. Secondly, it aimed to increase and improve learning opportunities in a broad range of subjects, using wireless and mobile laptop technologies (Computers on Wheels, or COWs).

The aim of Edgecumbe College was to improve student motivation and performance by changing the teaching and learning process from being teacher-centred to student-centred. To help support the aim, teachers were encouraged to include the COWs as part of their teaching programme, and students were given Individual Learning Plans (ILP) and access to the COWs.

The scope of the project covered the exploration of the use of the COWs over the whole age range and curriculum spectrum of the school. It was hoped that with ready access to the laptops, a wider range of students would be exposed to ICT-enhanced learning. Also students learning in many diverse curriculum areas would use the technology to help make their learning more individual, enjoyable, engaging and beneficial (Bereiter, 2003). It was also hoped that student and teacher confidence and adeptness with ICT would increase through the use of the COWs (Becker & Riel, 2000).

Changes in motivation and performance levels were measured subjectively through observations such as student punctuality, self management, opinions, and rate of progress through topics.

Fig 2: Senior students with the COWs

Located in the Eastern Bay of Plenty between Whakatane and Kawerau, Edgecumbe College is a Year 9 to 13 rural decile two school, with approximately 400 students.

Summary of findings:

Teachers and students consistently reported that the project had been successful for them. The COWs were actively used for the whole of the project across many curriculum areas, age ranges, and staff ICT abilities. Use of the COWs increased once the operating system was changed to one that was familiar to staff and students, and the original trolley was modified to improve the mobility of the COWs. However, with one pod shared between 30 classes, and aged batteries, barriers to using the COWS remained.

Students were motivated to use the technology as they were able to work on group and/or individualised learning activities that they otherwise would not have had access to.

Edgecumbe College's 2005 in-school survey showed confidence in the use of ICT for teaching and learning had improved, with much of the improvement attributed to the COWs, especially where students and teachers had had regular access, and their successes were shared.

Project description:

The supplied laptops were wireless (did not require cabling), and portable. The COWs were transported around the school on a modified trolley. This gave teachers more flexibility about when and how they chose to integrate the COWs into their teaching programmes.

The laptops supplied by ITAS and DigiOps were Asus 1.7GHz with 250kB RAM and 20Gb HDD. These were run from the school administration database server, which is a Pentium IV, 2.4GHz, 1Gb RAM, 40Gb hard drive. Initially the machines were loaded with the SmartTools software from ITAS. The COWs came with their own

wireless connection, network cable, and laptop mains power supplies. The total mass was over 40kg when loaded.

Project participants:

The key participants in the project's development were:

- Digital Opportunities (DigiOps) MOBLAP project supported by the Ministry of Education, ITAS, the eBOP ICT Cluster, and Edgecumbe College, all of whom provided the resources needed for the start-up, support and management of the project.
- The school management and its Principal, who actively promoted the COWs, and used them with his Year 9 social studies class.
- The school's technical ICT leader and his technical support person who administered the hardware, software, and booking system, and made ongoing changes to the operation of the COWs as needed.
- The school's ICT cluster lead teachers supported by the eBOP ICT cluster, which provided training, ongoing support to staff and students, and assisted in the modification of the trolley.
- Various members of the teaching staff who accepted training and then explored and developed the use of the COWs in their classes. The departments that made the most significant use of the COWs were the English, Science, Technology, Social Studies, Physical Education, and Mathematics departments.
- The student users who benefited from the scheme by having ICT access that they would otherwise not have had.

Fig 3: Junior science class co-operative learning activity

Project resourcing and setup:

Hardware used in the delivery of the project was essentially the COWs and its server.

The trolley housed 10 laptops, power supplies and cables, which included mains cables and a network CAT 5 cable. A wireless connection unit was also housed in the trolley.

The COWs and the server were centrally located in the confined space of the technician's room. A building upgrade will see the COWs relocated to a bigger and more accessible space.

The COWs were booked by teachers with access to any networked PC or laptop through the school's KAMAR administration database.

Initial training was for administrators and users and was provided by ITAS and the local eBOP ICT cluster. The training was backed up with professional development opportunities and in-classroom help from our ICT cluster and competent teacher users. Edgecumbe College provided the ongoing administrative and technician support.

Project development:

The project was introduced to staff, and two teachers were selected to be administrators and were trained in SmartTools by ITAS staff. ITAS also provided additional training to key teachers from each of the school's curriculum areas.

Although SmartTools seemed to meet the school's needs, staff preferred the familiar Windows 2000 operating system, which was loaded on the classrooms PCs. With permission from DigiOps the COWs operating system was changed to Windows 2000, which resulted in increased interest in the COWs. Further staff training and workshops were held at ICT cluster teacher-only days, and ongoing help and technical support was provided by the school's ICT lead teachers.

A key development in the use of the COWs was the addition of a pneumatically wheeled 'truck', which was purchased from the local hardware store for $40, and was bolted to the case. The alteration meant the COWs were able to be wheeled around the school and over various surfaces more easily. The COWs were pulled up classroom ramps and small sets of steps by staff and senior students without fear of injury to themselves, or damage to the COWs.

Figure 4: $40 truck from the local hardware store, bolted to the existing cabinet

In an experiment, the school acquired another smaller trolley to see if two pods improved the accessibility and availability of the COWs to more classes. However, for most classroom activities teachers preferred at least seven or eight laptops. After a brief trial the school reverted back to a single trolley.

Impact on Users:

Teachers:

The English department was the biggest and most regular user of the COWs, followed by Science, Technology, PE-Health and Social Studies. Most teachers used the COWs for short intense periods of teaching, as the time spent planning a unit of work was wasted if the COWs were unavailable because of scheduling clashes between teachers.

For teachers who managed to access the COWs, there were several significant consequences relating to management and teaching. Some of these had a negative as well as positive impact.

Use of the COWs varied considerably between teachers. Several teachers made the COWs an integral part of their teaching programmes, while other teachers only needed the COWs occasionally. The unavailability of the COWs frustrated some staff, who were unable to establish regular access and use.

The school's soft technology teacher, Sr. Rosemary Revell, used the COWs with great success in 2004 to aid students' research for their Technology projects. Rosemary archived sites she considered appropriate, which gave her students quick and safe access to the required information by using the COWs. In 2005 however, Rosemary's timetable clashed with another curriculum area that had made frequent use of the COWs. Rosemary's class had to return to occasional visits to the school's computer suite. This meant that two work areas had to be supervised as students often worked on different parts of their projects in class. With the COWs in her classroom, Rosemary was able to supervise and guide all her students effectively, independent of their activities.

A report on the use of the Laptop Pod in soft materials technology – Rosemary Revell, Technology Fabric teacher:

> *"I used the pod (COWs) in the first half of 2004 before I went on a sabbatical for six months. In 2005, I was unable to access them due to the timetable structure.*
>
> *A positive from using the COWs in 2004 was that most of the senior technology fabric class were able to research various topics and access unit standard materials I had posted for them on the school intranet, as web archives. This meant I could be sure they were on safe sites that related to their learning tasks, at all times.*
>
> *The negatives were that some students abused the privilege and headed for music or games when asked to research something outside the archived sites. Also, transporting COWs was a struggle as the trolley was very heavy, and often I was the only person strong enough to manoeuvre the load, which I found 'hernia causing'! There was some difficulty with the wireless reception in some parts of the room, and often the batteries hadn't recharged because of the lack of time between lessons. It was a hassle to collect in all the cords if you had to use the mains plugs. It required a lot of organisation to make things run smoothly, but it was much easier to manage once the COWs were on the same operating system as the school network.*
>
> *I can see the value of the laptops but given the choice for MY convenience, I prefer to be able to walk into a computer lab with a technician on hand to troubleshoot for me and the students, when doing our research."*

The positive impacts on teachers were many, and centred around the flexibility achieved when using portable technology for digital learning.

The addition of the COWs to the school's computing equipment enabled staff to plan lessons for their regular classrooms. Students worked at their own rate on individual tasks they had chosen, with the student's choice often reflecting their own interests and style of learning, (BECTA 1, 2004). Teachers of Technology, English, Physics and Electronics illustrated this with stories.

The individualisation of teaching programmes was much harder to achieve with limited access to computers, or if their location was fixed outside the normal teaching space.

There was a change in the school's pedagogy as teachers' teaching styles became less teacher-centred and more student-centred. Classroom observations saw students occupied individually or cooperatively on their tasks, and teachers spent more time in the body of the classroom and worked with the students rather than at the front, directing the learning, as was traditionally the case.

Students:

Students were able to access computers when it was impossible to timetable a class into one of the school's two computer rooms, or they had insufficient access to networked PCs in their usual classrooms. Classroom PCs were slower when running remote complex software via the network compared to running software installed on a laptop from the COWs. The COWs were easily integrated into a lesson where various activities were happening in the classroom. This gave teachers greater flexibility within the teaching and learning process, and benefited the students.

For example, the physics and electronics classes used Individual Learning Plans (ILPs) (Joyce, 2003) and accessed simulation software and presentations, which at times, placed high demand on the classroom's three networked PCs. Without much extra work, software was locally installed on each of the COWs. This high demand software ran at a good speed on the COWs. A highlight of the project was during the teachers' student-appraisal session, when students in physics and electronics classes asked for more access to the ILPs and COWs. This happened without being prompted to comment in this area, and came from the students' own conversations. Improved punctuality and less need for teacher management of classes were also noted. If continual access to the laptops or similar technology was guaranteed, then ILPs would be used more for teaching and learning in these classes. ILPs and digital learning objects were a better way to teach these students as it better met their needs and learning styles, as compared to traditional teaching practices.

Fig 5: Guidance from teacher on using simulation software.

Two stories from two teaching areas follow. The stories illustrate the impacts on teachers and students described above.

Stories from our teachers:

A report on the classroom use of laptops in English classes - Bill McClure

The laptops in my classroom were used in Year 11 and 12 English for research and the production of creative and formal writing. I have plans to use them in the near future in Level 2 Drama as a tool in the production of 'Front of House' material for the Drama Achievement Standard 90303 – "Perform a substantial acting, technical or production role."

Late in Term 2, I set a challenge for myself and designed and produced three Novel Studies for two Year 10 classes. The aim was to work out links so that the units could be shared with other department members. In terms of student achievement, I designed something that allowed students to:

- Respond to the text in a variety of written forms
- Explore characterisation
- Explore the authors' manipulation of language

- Produce creative writing
- Carry out research leading to an oral presentation that could incorporate IT as well

Activities were created that used the computers as tools, and students were enabled to make choices and exercise control over how, where, and when they progressed as learners. I constructed three units and used PowerPoint as the platform. Choice was built into the programme with a wide variety of activities, and meant students were able to pick and choose what they did. Students were also allowed to tackle the activities in whatever order they wanted - with some direction given to allow for practicalities such as access to resources.

The results varied greatly between the two classes.

Access and attitudes:

The main issue was access. The top stream class embraced the concept behind the unit enthusiastically. The class was informed of the plan to introduce the unit a week prior to it starting, and every student was encouraged to submit a signed cyber safety contract, which entitled them access to the school's intranet (where the units were stored, and where their work was expected to be saved). All students achieved this.

The design of the unit and the variation in students' abilities made up for a lack of computers, as all were not on the same task at any given time. The fastest readers had begun work on the unit while the slower readers were still reading. As the slow readers embarked on the project, the computer proficient students had started work on their research and speech, and required the computers less often.

I managed with the seven laptops from the pod, and five computers in the department – three of which were located in the vacant room next door. Five or six students at any given time were left without a computer. A carefully chosen few were sent with a note to the computer room. This arrangement worked well over a period of about three weeks.

The lower 'stream' class had consistently presented behavioral and management issues for me and other teachers. I was keen to discover whether or not the intensive use of IT-based activities would go some way toward addressing their problems. They were not so enthusiastic about returning the cyber safety contracts, and only 10 of 21 were able or willing to go through the proper channels to access the school's system. The 10 students progressed through the activities much more slowly than the other class, and required more help in navigating the unit. On the whole, the 10 students' reactions were positive, and they were always first to arrive and eager to get on with work.

I felt the remainder of the class had let themselves down badly by failing to embrace the technology. I printed off copies of the PowerPoint presentation as worksheets for them to work through.

Improvements:

Next time, I would like to ensure that every student has access to the technology. With my lower band class, I had to remind, ask, beg, and harangue them to return their cyber safety contracts. I realised I was fighting a losing battle so I changed to the old paper-based strategy with the dozen or so who were reluctant. I hoped to see at least a hint of motivating jealousy once the others in class started to work on the laptops, but it was not to be.

There was not as much interaction or discussion between the students as I expected but that maybe down to the design of my units. I hope for improved the levels of interaction between the students next time.

Conclusion:

Overall, the students' ICT skills were quite high. Students unfamiliar with PowerPoint or the school's intranet were quick to catch on. I was encouraged that the units inspired students to take control of their own learning. They worked at their own pace and only called me over to clarify points or assist them only when necessary. This freed me to play the role of 'guide at the side' much more. Across both classes there was a lot less of the old 'let's see if I can get sir to give me the answer' attitude amongst the students who used the technology.

There was a change in the ‘normal’ classroom chatter and a hint of competition emerged between students. The typical ‘what did you get up to in the weekend?’ was replaced with ‘which one are you up to?’ or ‘what did you put for that question?’

The developments encouraged and convinced me to carry on exploring the possibilities presented by laptops in the classroom.

Individualising teaching programmes with ICT in Physics and Electronics classes – Andrew Collicott

As a teacher, I had wanted to develop the use of digitally supported ILPs after many years of using paper ones. I was delighted to be able to access the COWs for my classes in my usual teaching laboratory. Much of the work in my Physics and Electronics classes was practical and had been simulated using Crocodile Physics software. As students worked individually, the class could not be relocated to the computer room when only some of them wanted to work on the computers. With the COWs in classroom, students were able to continue working individually from the range of activities.

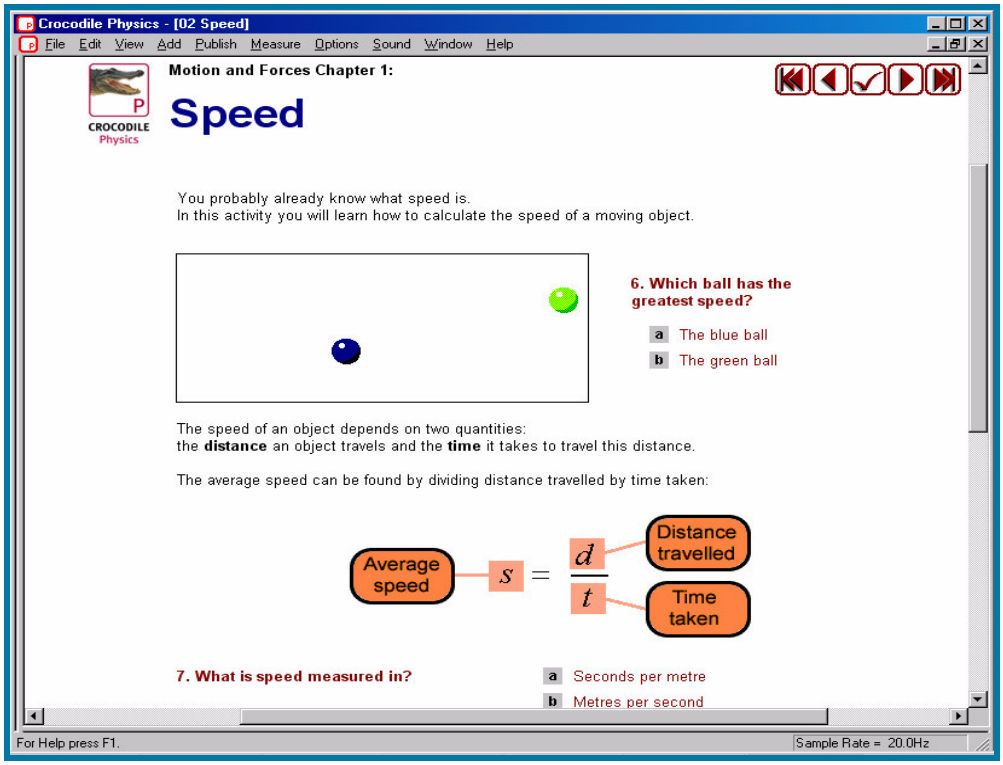

Fig 6: Example of a Crocodile Clip for Physics

Many of the learning activities involved in ILPs would required the use of computers, either totally or in part, such as in this interactive learning tutorial from Crocodile-Clips.

Below is an example of part of a Physics ILP, which the students opened on the laptop and worked by activating the hyperlinks in column three. These led students to many of their instructions and learning activities.

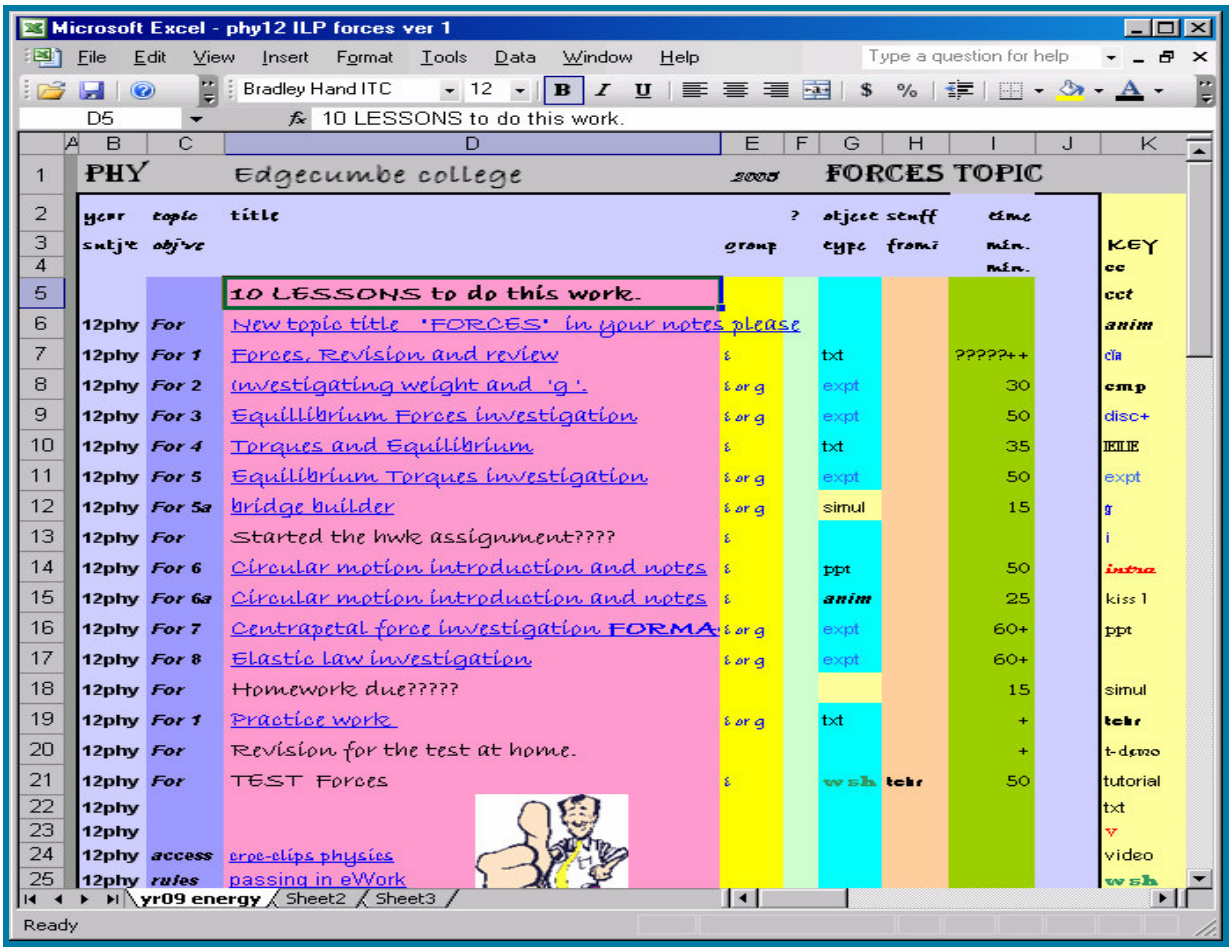

Fig 7: An example of an ILP.

Students made notes, did research, viewed websites and presentations, went on virtual field trips, wrote practical reports, or used a spreadsheet to analyse and graph data.

The two purposes of ILPs were to organise programmes and allow access to digital activities. The teacher was then freed up to teach rather than organise the students in class. An illustration of some of the advantages follows.

Conversation at the start of an electronics technology lesson

The class was using the COWs from the DigiOps project and an ILP, which contained hyperlinks to electronic instruction sheets and activities. This gave choice to the student and allowed them to work at their own pace.

AC - "Hi Peter! You're early!"

Student - "Hi Sir! Did you make that change to the ILP that we talked about last lesson?"

AC - "Yes! I have it here on my laptop and am just popping it onto the I: drive. You are a bit too quick for me this morning!"

Student - "Is there a worksheet, so that I can use the laptop and 'croc-clips' for that sensor circuit?"

AC - "Yes you can, but I think you should consider choosing the hands-on version and build the experiment yourself this time. You've simulated a lot on the laptops lately and have missed out on practicing those

component handling and identification skills. Remember we talked about that last week, when you had difficulties with the pin connections on that transistor."

Student - "Can I pull up the ILP now on this laptop, and have a look?"

AC - "It's ready! Three choices for 18241/1, including a simulation on croc-clips, building the real light sensitive circuit yourself on your breadboard, or waiting for the demo later when the others have caught up. Have you found the hyperlinks and made a choice yet?"

Student - "Yes, I'll build it. I'm ahead of the group on this topic, so there's plenty of time to do the experiment. I really enjoy the laptop simulations though! Next time, maybe?"

Not all my students were as motivated as Peter, but the conversation illustrated the many advantages of the combined use of the COW and ILP, as shown here.

1. The student was early to class, showing his motivation.
2. The student already knew what was going to happen in the lesson, which showed self management of his learning.
3. The teacher updated the ILP showing he was current with the student's needs from last lesson.
4. The student wanted to simulate an experiment using the laptop, showing he was comfortable with eLearning.
5. The teacher was guiding the student's choices, showing that the work was student-centred and met the student's needs.
6. The student made choices using the laptop and ILP under guidance, showing the individualisation of his learning by using a choice of learning activity.
7. The student was ahead of some classmates, showing that the students in the class were working at their own rate.
8. The student reminded the teacher of his learning preferences, showing that he wanted to be involved in his learning choices.

From my teacher-point-of-view, I gained a lot of job satisfaction when students were early to class, motivated, on-task and making real progress in their learning. By using portable computers, ILPs and digital learning objects with my classes, I was more involved with the student's learning than with their management, and felt very satisfied with my work.

Summarising the highlights of the project:

In a strange way, one highlight was actually the problem the school had when many teachers tried using the COWs, and had to compete for its use. Teacher demand, though a problem, was a good sign of the success we were having with the COWs. However, this meant some teachers and students missed out on access for the lessons they had hoped to complete with the COWs.

It was reported by teachers that students showed increased motivation and work output, displayed by improved punctuality and better task completion.

There were also unsolicited student comments where students wrote positively about enjoying their self-directed work with the COWs and ILPs, and wanted more of this type of learning programme.

Teacher satisfaction was high when the teacher felt he /she was doing a better job for harder-working students, by making use of this technology.

Future plans and intentions for the project:

There has been much discussion within the staff involved in the project about how we can make more use of portable computer technology to continue the improvements in teaching and learning that we have already achieved with the COWs.

Teachers hope to be able to access the COWs in the future, though we will need to address the replacement of the old batteries and deal with recharging issues during the working day, as well as the time needed to set-up in each class. Some classrooms also need their power supply circuits upgraded to avoid circuit-breakers tripping when the COWs are plugged in to recharge batteries. It is hoped to find some funds to set up a second set of batteries in a charging unit on the trolley so spent batteries can be replaced easily, without the need to connect the chargers to the 'mains' supply. Similarly we will avoid more cabling off the COWs if we can improve our radio reception around the whole school. It is hoped that these changes may overcome most of the problems our teachers are presently having with managing the existing COWs.

The "digital divide" within the school is a situation we want to address either by longer-term planning by booking the COWs in blocks, or by introducing more portable machines to meet the need of those teachers who are becoming more frequent users.

Having researched and discovered the benefits of portable computer technology (BECTA, 2004), the school is exploring the possibility of making this technology accessible to more, if not all of our students and teachers. We are interested in more affordable portable computers that do not interfere with the way our classes run, and do not effect our existing classrooms. It seems that handheld PCs may well fill this need and we are currently writing a proposal for a national school trial. We are also looking at replacing some of our classroom PCs with reconditioned laptops in the next round of renewals.

Due to an increased awareness of the advantages of digital learning and the expectation of more portable machines being available, the school is currently in the process of changing our school intranet from a file-based to a browser-based system. This will allow each HOD to have better control of their learning area files and take us closer to the next step of taking the school intranet online.

Conclusion:

Edgecumbe College was lucky to be involved in, and has benefited from MOBLAP project.

The benefits were not only improved access to ICT for the students and the positive effects on their learning, but also the opportunity for more professional development for the teachers who were involved in the programme, both in the planning and use of ICT in their teaching.

As this report showed, improved ICT access with the COWs increased student motivation and work output. Use of the COWs also enabled students to make choices about how they worked and what they worked on. The COWs helped to better meet each student's learning needs and requirements.

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