PERFORMANCE EXAMINATION

Auditor General

Western Australia

On-line and Length?

Provision and use of learning technologies in Government schools

Report No. 2
May 2001

Auditor General

Western Australia

THE SPEAKER
LEGISLATIVE ASSEMBLY

THE PRESIDENT
LEGISLATIVE COUNCIL

PERFORMANCE EXAMINATION: On-line and Length? Provision and use of learning technologies in Government schools.

This report has been prepared consequent to an examination conducted under section 80 of the *Financial Administration and Audit Act 1985* for submission to Parliament under the provisions of section 95 of the Act.

Performance examinations are an integral part of my overall Performance Auditing program and seek to provide Parliament with assessments of the effectiveness and efficiency of public sector programs and activities thereby identifying opportunities for improved performance.

The information provided through this approach will, I am sure, assist Parliament in better evaluating agency performances and enhance Parliamentary decision-making to the benefit of all Western Australians.

D D R PEARSON
AUDITOR GENERAL

May 23, 2001

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1 Executive summary

Background

A Learning Technologies Project was announced by the Minister for Education on October 28, 1998. Under this project the State Government allocated $80 million to the Education Department of Western Australia (EDWA) to fund the provision of learning technologies for 266 000 students in 770 government schools in Western Australia over four years. The Learning Technologies Project builds upon previous EDWA initiatives to introduce technology into schools and to integrate it into curriculum as a teaching and learning tool.

All funding provided through the Learning Technologies Project grants must go towards improving student access to learning technologies. In keeping with the Government emphasis on increasing computer numbers within schools, the Minister identified computer to student ratios as the key measure of access. Schools were required to achieve a computer to student ratio of 1:5 for secondary students and 1:10 for primary students by 2002.

Actual student access to learning technologies is also dependent upon other factors such as the capacity of schools to install and maintain computer networks and software, and the capacity of teachers to use the equipment for teaching purposes.

EDWA defined six critical success factors as a basis for evaluating implementation of learning technologies in schools including the Learning Technologies Project.

Overall Findings and Conclusions

The critical success factors form a sound basis for implementation, assessment and reporting for the Learning Technologies Project. These are:

- planning;
- hardware;
- electronic educational resources (software);
- connectivity;
- staff capabilities; and
- integration and use.

For each of these factors, a target level is identified and an assessment continuum establishes criteria for low, mid and high levels of implementation. The factors and the associated criteria are set out in Appendix A.

This examination assesses the implementation of the project against these factors. Because the Learning Technologies Project builds on and sits in the context of many previous technology initiatives, the examination also reviews the wider impact of learning technology in schools.

Planning

Planning and monitoring of the Learning Technologies Project has focused on computer to student ratios rather than the achievement of the EDWA critical success factors. However, increased numbers of computers has not always translated to the expected level of student access, use or integration into teaching and learning programs in schools.

EDWA have not determined the full cost of implementation of either the project or the wider learning technologies program. The focus has been on acquittal of project funding and progress towards achieving ratios.

Most schools also spent funds from other sources such as school general-purpose funding on implementation of learning technologies. However, as these expenditures have not been reflected in their Funding Acquittal Statements the full costs of implementation have not been captured.

Of particular concern is that the effectiveness of project implementation and the impact of learning technologies on student learning is not being evaluated.

In addition, insufficient account has been given to infrastructure in the planning process. Infrastructure problems have impacted particularly on older schools and inadequate security in classrooms has affected the deployment and use of computers.

There has been little attempt by EDWA to formally assess the implementation of the project or the wider learning technologies program against the critical success factor framework.

Hardware

Schools are well on track to meet the target computer to student ratios by 2002 with EDWA 2000 census data indicating that 59 per cent of schools already meet these requirements. However, reported computer to student ratios can include computers that are inoperative or not accessible to students.

The majority of schools have opted to purchase rather than lease computers. However, none of the schools reviewed had conducted formal cost-benefit analyses of the purchase versus lease decision.

Inadequate accountability and asset management practices were in place in many of the schools reviewed. Compliance with purchasing requirements which assure value for money could not be demonstrated by 20 per cent of schools.

Frequent information technology (IT) breakdowns and time delays in solving difficulties and repairing faults disrupt lessons and are discouraging teachers from making greater use of learning technologies. Ineffective use is made of professional teaching resources, with many schools relying on teachers, on a time-release and voluntary basis, to provide technical support.

Electronic educational resources (software)

EDWA has negotiated a centralised licensing agreement to provide cost effective access for all schools to a suite of operational software. However, almost 60 per cent of schools had inadequate software management and purchasing processes for other educational software investment. Twenty-nine per cent of schools were experiencing some hardware-software incompatibility problems.

Connectivity

EDWA census data, for 2000, indicates that 68 per cent of classrooms and 77 per cent of school computers are now connected to a network, but the performance and reliability of school networks varied considerably across schools reviewed. A higher proportion of rural schools reported network problems.

All government schools now have the capacity to access the Internet from at least one computer. However, the limited capacity of some schools to implement effective networks has resulted in high costs and limited access for students.

Staff capabilities

EDWA has commenced collection of baseline data on teachers' learning technology skills through a survey of 1500 teachers. Consistent with the results of the EDWA survey, teacher interviews revealed that over 95 per cent have more than a basic level of operational skills, but relatively few reported having trouble-shooting skills.

Over 90 per cent of teachers have undertaken some professional development in learning technologies over the last two years. The bulk of the professional development undertaken has focused on development of computing skills rather than how to integrate learning technologies into a teaching and learning program. As a consequence, the professional development undertaken was considered of marginal or no use in relation to their teaching and learning program for 31 per cent of teachers interviewed.

Peer mentoring was reported as the most effective method to enhance understanding and application to teaching and learning programs for most teachers interviewed. However, access to learning technology mentors was not readily available to 44 per cent of teachers.

Integration and use

Whilst the vast majority of teachers are making some use of learning technology, the degree of use and the level of integration into the curriculum are low. Inadequate access to computers, lack of adequate maintenance, limited or inappropriate professional development and infrastructure problems were identified by teachers as the main factors inhibiting greater use of learning technologies.

The deployment of computers has an impact on use with 49 per cent of teachers reporting having access to only one computer in the classroom. This level of access is significantly less than the reported computer to student ratios and restricts use and integration.

There was substantial variation within and between schools reviewed in the level of use and integration of learning technologies. It ranged from playing games as a reward at the conclusion of lessons, with no integration into the teaching learning program, through to extensive use as a tool to assist students to achieve curriculum outcomes across learning areas. The majority of teachers use learning technology in their classes for research, word processing and document presentation. Teachers will require ongoing support to assist further integration into teaching and learning programs.

Summary of Recommendations

Major recommendations made in the report are that:

EDWA revise project planning by:

- placing greater emphasis on applying learning technologies to the school curriculum rather than simply achieving a target computer to student ratio;

- periodically assessing the implementation of the project and the wider learning technologies program, and evaluating these against the critical success factors; and
- considering the limitations of existing school infrastructure on the installation of computers and computing networks in schools and taking account of them in project planning and funding.

EDWA promote more cost effective implementation in schools through:

- monitoring asset management practices in schools to ensure compliance with EDWA policies and Treasurer's Instructions, including those designed to achieve value for money in purchasing;
- more effective provision of technical support in schools to reduce computer down-time and increase the confidence of teachers to use the technologies with their classes; and
- including in reported ratios only computers that are operating and accessible to students.

EDWA promote effective integration into the curriculum by:

- focusing professional development opportunities on the integration of learning technologies into the curriculum and promoting access to a shared knowledge base of learning technology resources; and
- pursuing strategies to accelerate the integration of learning technologies into the curriculum.

2 Introduction

Background

Governments across Australia have recognised the significance of technologies as a tool for learning …

In April 1999, Commonwealth and State Governments across Australia formally recognised the importance of information and communication technologies in knowledge development and as a tool for learning in the *National Goals for Schooling in the Twenty-First Century*[1]. The Education Department of Western Australia (EDWA) had already identified these technologies as critical in the development of life-long learning skills for students in Western Australia in their *Plan for Government School Education 1998 – 2000.* This commitment to integrate technology into learning and teaching, and improve access to learning technologies for students and teachers, was reiterated in EDWA's *Technology 2000 Draft*[2] *Strategic Plan Overview 1999 – 2001.*

… and $80 million has been allocated for the Learning Technologies Project …

The Learning Technologies Project was announced by the Minister for Education on October 28, 1998. Under this project the State Government allocated $80 million[3] to EDWA to fund the provision of learning technologies for 266 000 students in 770 government schools in Western Australia over four years.

… which builds upon other EDWA technologies initiatives.

The Learning Technologies Project builds upon previous EDWA initiatives to introduce technology into schools and to integrate it into curriculum as a teaching and learning tool. Over the past five years these have included:

- Internet in the Curriculum;
- Technology Focus Schools;
- Innovation in the Classroom;
- Satellite Receivers in Schools;
- EdNet[4]; and
- Computers for Schools.

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[1] *The Adelaide Declaration on National Goals for Schooling in the Twenty-First Century.*

[2] EDWA has not yet ratified the 1999 - 2001 Strategic Plan.

[3] This was part of a $100 million initiative for government and non-government schools funded from the proceeds of the $2.4 billion sale of the Dampier to Bunbury natural gas pipeline.

[4] Over $20 million was provided over three years from 1997-1999 for these programs under the Technology in Schools Program.

All funding provided through the Learning Technologies Project grants must go towards improving student access to learning technologies. In keeping with the Government emphasis on increasing computer numbers within schools, the Minister identified computer to student ratios as the key measure of access. Through the Learning Technologies Project, schools are to achieve by 2002 a computer to student ratio of 1:5 for secondary students and 1:10 for primary students. Computers included in these targets must be no more than four years old or functionally equivalent[5].

However, actual student access to learning technologies is also dependent upon other factors such as:

- the capacity of schools to effectively install and network the computers and software;
- the capacity of schools to maintain the systems to ensure that teachers and students have reliable access to equipment; and
- the capacity of teachers to use the equipment effectively for teaching students.

EDWA defined six critical success factors as a framework for the implementation of learning technologies in schools, including the Learning Technologies Project. For each factor, a target level has been identified and an assessment continuum established that outlines criteria for low, mid and high levels of implementation. The factors and the associated criteria are set out in Appendix A.

Funding must contribute to increased student access to learning technologies …

Schools have been identified as the key point of accountability and delivery for the project. Once schools have demonstrated a capacity, in their school plan, to meet the target computer to student ratios, they have the flexibility to direct any remaining funding to:

- acquisition of additional hardware and software for students;
- development of school connectivity, including establishment of local area networks and Internet access;
- development of teacher competencies in the use of learning technologies and their integration into the curriculum; and
- provision of technical support for the maintenance of the technologies.

… and is based on student numbers.

The allocation of funds to schools has been based on student numbers. This results in $1800 being provided per computer. A further allocation of between $400 and $1900 per computer is provided on the basis of each school's relative socio-economic and geographical disadvantage.

[5] Computers over four years of age that have been upgraded to operate at an equivalent standard.

Funding levels took no account of the existing number of computers in individual schools at the commencement of the project nor the capacity of schools to access alternative funding sources. Distribution of funds commenced in February 1999 and is planned to continue over the four years with $20 million earmarked for each year.

The Learning Technologies Project funding is independent of and additional to existing funding for computers for students from the Computer Repair and Replacement[6] and the Computers for Schools[7] programs.

Examination Focus and Approach

The critical success factors developed by EDWA form a sound basis for assessment and reporting for the Learning Technologies Project. This examination assesses the implementation of the project against these factors which are:

- planning;
- hardware;
- electronic educational resources (software);
- connectivity;
- staff capabilities; and
- integration and use.

Because the Learning Technologies Project builds on and sits in the context of many previous technology initiatives, the examination also reviews the wider impact of technology in schools.

Review of the Learning Technologies Project was undertaken at EDWA central office, district office and school level. A representative sample of 22 schools from three districts was selected for data collection at the school level. Selection was based on strata including: rural and remote/metropolitan; older/new purpose-built, primary/secondary; school size; and progress in implementation of learning technologies. Advice was sought from EDWA central office and district offices as part of the selection process to ensure a valid and representative sample was obtained.

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[6] The Computer Repair and Replacement program which provided the original government funding for computers for students commenced in 1997. It is continuing as an element in the recurrent school grant with $3.2m provided annually. It funds ratios of 1:40 secondary and 1:100 primary.

[7] Funding of $18 million for the Computers for Schools program commenced in 1998 and was distributed through the school grant as a special purpose grant to fund ratios of 1:20 secondary and 1:50 primary.

Documentary evidence was collected from central and district offices. This included the annual census report from all schools.

Data collection within each school included structured interviews with the principal, registrar, information technology (IT) coordinator and technician, where available, and six teachers[8] who represented the full range of use and integration of learning technologies within the school.

Documentary evidence was collected to validate responses provided in interviews. This included school plans, professional development records, asset registers, software registers, logs of IT faults, financial and acquittal reports, invoices and quotations for IT resources, and census returns. Supporting documentation from teachers included booking schedules for learning technology resources, curriculum planning documents, class teaching and learning programs, daily lesson notes and samples of student work. These documents were utilised to confirm levels of use and integration reported by teachers.

[8] A sample of three teachers was interviewed in remote country community schools and class 3 primary schools.

3 Planning

- ***Planning of the Learning Technologies Project has a narrow focus that does not assure the achievement of the critical success factors and has not been integrated with other broader technology initiatives.***
- ***Inefficiencies in the implementation of learning technologies in schools resulted from inadequate aspects of the planning process and school decisions being made based on limited technical expertise.***
- ***Infrastructure problems have impacted particularly on older schools and were frequently not accounted for in planning.***
- ***Project monitoring is limited to acquittal of project funding and progress towards ratios with no evaluation of the effectiveness of implementation or its impact on student learning.***
- ***EDWA have not determined the full cost of either the project or wider learning technologies program implementation.***

EDWA defines the 'Planning' critical success factor as including: "Level of integration of learning technologies in curriculum planning; planning linked to student outcomes; and planning for changing technology".

Planning and Management

The Learning Technologies Project focuses on ratios …

Research indicates that the greatest success in the implementation of learning technologies programs will occur when planning and implementation of programs have a broad focus that takes account of educational outcomes for students, professional development of teachers and provision of adequate technical support[9]. However, for the Learning Technologies Project, planning, implementation and reporting have taken a narrow focus on the acquisition of computers to meet specified ratios.

[9] For example see: Ministerial Advisory Council on the Quality of Teaching, June 1997, *Computer Proficiency for Teachers*, New South Wales Department of Education and Training; Australian Key Centre for Cultural and Media Policy, October 1999, *Real Time, Computers, Change and Schooling*, and Toomey, R. *Classrooms of the Future, Information Technology and Professional Development*.

… and does not reflect the broader direction of the critical success factors …

A broad strategic direction for technology in schools was outlined by EDWA in the *Technology 2000 Draft Strategic Plan Overview 1999-2001*. However, the documentation provided to schools for the implementation of the Learning Technologies Project focuses on target ratios to be achieved, requirements for expending the grant funds and accountability measures. Insufficient emphasis on the defined critical success factors and what is to be achieved by acquisition and access to learning technologies has led to an inconsistent and uncoordinated approach to planning, implementation and use in schools that will impinge on the effectiveness of both the project and the wider learning technologies program.

… or broader technology initiatives in education.

The separation of functions within EDWA for management of current technology programs, and development of long-term plans and directions for learning technologies in schools, contributes to the lack of an educational rationale for the Learning Technologies Project. Within EDWA's organisational structure there is separate and independent responsibility for a variety of technology programs. The current Technology 2000[10] and national initiatives are managed through the Policy and Planning Division, initiatives for laptops for teachers and professional development are managed through the Human Resources Division, and future directions for learning technologies in schools and use of technology for school management are managed through a separate Chief Information Officer in the Business and Resources Division. Development of a comprehensive and integrated learning technology strategy and cohesive management of programs demands high order coordination and provision of consistent direction, advice and support for schools.

School Planning

Aspects of school planning were inadequate …

To access the Learning Technologies Project funds schools are required to submit a 'School Plan' to the District Director to demonstrate how funds will be used. EDWA's *School Guidelines* for the Learning Technologies Project indicate that school planning should provide an overview for achievement of the prescribed targets over the four-year period and also indicate how annual targets for learning technologies will be met. All schools have submitted plans. However, an analysis of plans for schools reviewed revealed:

- learning technology was not classified as a high priority in 18 per cent of schools;
- planning was not linked to the annual budget in 19 per cent of schools;
- planning was not yet linked to student outcomes in 64 per cent of schools;

[10] The Learning Technologies Program is included under this initiative.

- no evidence of forward planning to 2002 in 19 per cent of schools;
- no evidence of forward planning beyond 2002 in 68 per cent of schools; and
- no schools had long-term plans in place beyond 2003 when the current round of funding will have ceased.

To date, this represents a low to mid level of achievement for implementation that is below the target set for 2002 in the critical success factors[11]. Inadequate planning and confinement of planning within the time horizon of the funding period may restrict the ability of schools to maintain the ratios achieved after 2002.

Support for planning

EDWA central office has provided schools with documentation on the requirements of the project and district offices provide feedback to principals on the school plan. However, the level of advice varies across districts depending on the staffing in individual district offices.

Central and district offices provided schools with limited decision-making support …

District offices have the discretion to make their own decisions on staffing within their district. In districts where a curriculum officer with learning technology expertise was not appointed a curriculum officer with no specific expertise in the area was the nominated contact for schools. In each district one person could be responsible for provision of advice for up to 113 schools.

Knowledge within schools and local communities about technology and how to use it for educational purposes varies greatly. Schools reviewed indicated that they needed more advice and assistance than was available. One principal said: *"we put together a committee within the school and pooled our ignorance, we then consulted with other local schools which gave us yet a larger pool of ignorance."* Decision making in schools based on limited technical expertise has resulted in inadequate planning and roll out of learning technologies in schools. This approach to planning is inefficient. More significantly, it puts at risk the long-term effectiveness of the project.

… and some schools lacked the technical expertise required to make informed decisions.

Decisions regarding acquisition, networking and deployment, impact on utilisation by students and the level of integration into the curriculum by teachers. Even where professional advice was sought, it was often of a technical IT nature and the specific educational needs of schools were not addressed. Some schools indicated that, as a consequence of limited technical expertise in decision making, the technology systems in place were not as effective as they could have been. This has led to extensive variation between schools in student access to computers.

[11] Critical success factors and associated targets are attached as Appendix A.

Access to consistent technical advice on procurement and networking that takes account of specific educational needs will assist schools in making effective decisions. Improved decision making in schools would provide efficiencies in procurement and implementation, reduce inequity of access and increase the effectiveness of the project.

Infrastructure

Infrastructure problems were a source of unplanned expenditure for schools. School reviews revealed cases where computers had been purchased but could not be utilised due to infrastructure problems. Examples of infrastructure problems encountered by schools included:

- inadequate power supply to run the network system requiring extensive electrical rewiring.
- inadequate security in classrooms, resulting in schools locating computers elsewhere which impacted on accessibility and use.
- inadequate furniture or space in classrooms to house computers.

Infrastructure problems have impacted particularly on older schools where the original school design did not envisage such requirements. These were frequently not accounted for in planning or in allocation of funding.

Monitoring Progress

Project monitoring is limited …

The critical success factors developed by EDWA central office have been used by 86 per cent of schools to structure annual planning documents. These success factors require that schools continually monitor their plans. However, limited measures outlined in the critical success factors are being utilised by schools, district offices or central office to monitor progress.

Schools account for expenditure of the Learning Technologies Project grant through annual submission of a Funding Acquittal Statement and Expenditure Report to District Directors. In addition, schools are required to complete an annual connectivity census that is collated and monitored by EDWA central office. Census information includes:

- data on the progress of schools in meeting the ratios;
- methods of procurement;
- levels of connectivity via internal networks and to the Internet; and
- means of providing technical support.

The first census was conducted in all schools in December 1998 to provide baseline data. All schools have reported on expenditure of grant funds and submitted the required census data to central office. However, the effectiveness of the project and the efficiency of the procurement and support mechanisms have not been evaluated.

Funding acquittal

…and the designated accounts do not capture the full cost of the Learning Technologies Project.

Funding Acquittal Statements are required to show the level of spending in various areas of learning technology such as hardware, software and networking. Although the Learning Technologies Project grants are determined according to a formula, the full cost of the project and of the wider learning technologies program cannot be determined due to significant shortcomings in the reporting process, including:

- Schools are only required to acquit the funding provided under the Learning Technologies Project. There is no requirement to show expenditure on learning technology that has been funded by other sources, such as school general-purpose funding, Parents and Citizens Association (P & C) funds, and donations. It was evident from an examination of transactions that the expenditure on learning technologies by most schools in 1999 exceeded the learning technology funding provided. Forty-four per cent of schools were required by district offices to amend their 1999 acquittal statements to exclude expenditure in excess of the funding provided under the Learning Technologies Project.
- The salaries and wages of staff involved with learning technologies, such as coordinators and technical support staff (on either a part-time or full-time basis), are not being recorded against the Learning Technologies Project. Other costs such as professional development, infrastructure and furniture required in the use of learning technologies were not always identified or captured for monitoring purposes.
- Seventy-six per cent of principals reported that the limitations on the information captured in acquittal statements meant that it was not useful for school planning.

EDWA has not determined the full cost of implementation of the Learning Technologies Project or the wider learning technologies program.

It is therefore difficult for EDWA to establish the level of ongoing funding that will be required to meet and maintain target computer to student ratios in schools. The use of the existing acquittal process to monitor the project results in the full cost of the project and the wider learning technologies program being significantly understated.

Funding Sources

School revenues comprise of:

- general-purpose funding in the form of an annual school grant;
- specific purpose funding, e.g. the Learning Technologies and Internet in the Curriculum grants;
- P & C contributions;
- school fees; and
- donations from the wider community.

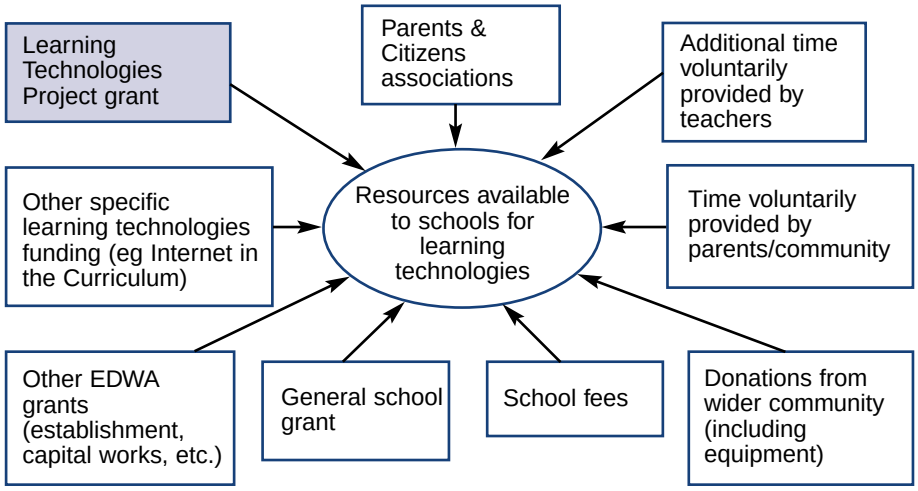

Figure 1: Resources available to schools for learning technologies.

The Learning Technologies Project grant is only one of the resources used by schools for learning technologies.

Source: OAG

There are significant differences in access to sources of funding across schools …

Access to funding sources for learning technologies was not equitable across the schools reviewed. Newer schools and those with increasing enrolments were able to access more EDWA funding. Access to establishment and capital works grants and special funding for Technology Focus schools had enabled some of the schools reviewed to set up fully equipped and networked computer laboratories and classrooms. In contrast, older schools with declining school enrolments, in addition to not having access to establishment grants, have had project-specific funding reduced as it is provided on a pro-rata basis. In the case of one primary school, this has resulted in reliance on alternate funding, of 72 per cent of their learning technology expenditure in 2000, to finance computer lease payments and the school's existing learning technology program.

… and schools have diverted other funds to learning technologies.

Schools have diverted resources from other priorities (such as learning support programs) to pay for technician time and other learning technology support activities. P & C contributions for the procurement of learning technology resources ranged from $2 223 to $9 890 in schools reviewed. Primary schools were more likely to access alternate sources to fund learning technologies.

Many schools do not have contingency plans to cope with a cessation in program funding.

A requirement of the accountability strategy through school planning is that schools ensure they can maintain the ratio requirement once the four-year period of funding has ended. Schools that have entered into leasing arrangements require strategies to continue these arrangements and where computers have been purchased schools require strategies to ensure ongoing maintenance or replacement. The reliance on alternate funding sources and the lack of post 2003 planning in schools indicates that many schools may not be in a position to do this. Further, they will be unable to build on the achievements of the Learning Technologies Project. Forty-five per cent of schools reported that their school had no contingency plan to deal with a cessation of learning technology funding in 2002.

Recommendations

EDWA revise project planning by:

- placing greater emphasis on applying learning technologies to the school curriculum rather than simply achieving a target computer to student ratio;
- improving schools' access to advice and support for the implementation of learning technologies;
- periodically assessing the implementation of the project and the wider learning technologies program, and evaluating these against the critical success factors;
- considering the limitations of existing school infrastructure on the installation of computers and computing networks in schools and taking account of them in project planning and funding; and
- pursuing strategies to ensure that appropriate computer to student ratios are maintained beyond 2002.

4 Hardware

- ***Schools are on track to meet the target computer to student ratios by 2002 with 59 per cent of schools already meeting these requirements.***
- ***Compliance with procurement requirements which ensure value for money could not be demonstrated by 20 per cent of schools.***
- ***Professional teaching resources are being used to provide technical support in many schools with adverse impacts for student learning.***
- ***Frequent IT breakdowns and associated time delays disrupt lessons and discourage teachers from making greater use of learning technologies.***

EDWA defines the 'Hardware' critical success factor as including: "Ratio of computers:student; range of different learning technologies; degree of student access; technical support; and repair and replacement planning".

Procurement of Learning Technology Resources

Under the Learning Technologies Project schools are directly responsible for procuring (purchasing or leasing) computer hardware and related technology products. Centralised procurement on behalf of schools was not adopted by EDWA, however panel contracts have been established by EDWA to allow schools to access approved suppliers without the need for further quotations. A panel contract has also been set up to provide operating lease finance, with an independent Lease Contract Manager available to provide contract advisory and management services.

Compliance with State Supply policies could not be demonstrated by all schools …

Whilst the use of these contracts is not mandatory, any purchasing decisions should comply with State Supply Commission policies. Schools electing to purchase outside EDWA panel contracts are required to access existing whole-of-government panel (common use) contracts that require at least three quotations.[12]

Forty per cent of schools reviewed had elected not to use EDWA panel contracts. Of these, only 50 per cent were able to provide evidence that the requisite number

[12] Whole-of-government common use contracts have been established by the Department of Contract and Management Services.

of quotations had been obtained in the procurement of learning technologies resources. The remaining schools were not able to demonstrate that value for money had been achieved. This finding is consistent with evidence found in the conduct of financial and internal audits.

… and schools have not conducted cost-benefit analyses of the purchase vs lease decision.

The costs and risks of purchase versus lease of equipment in the public sector were covered in the Auditor General's Report No. 3 of 1999 *'Lease now – pay later?'* which recommended that agencies should undertake financial evaluations of procurement options. Six of the schools reviewed had opted to lease rather than purchase computers, with most of these schools located in the one district. None of these schools, however, had conducted formal cost-benefit analyses of the purchase versus lease decision. In some cases, the decision to lease was driven by the goal of providing students with the 1:5 or 1:10 access now rather than at the end of project (in 2002). Thus, schools cannot demonstrate that they have chosen the most cost-effective procurement method.

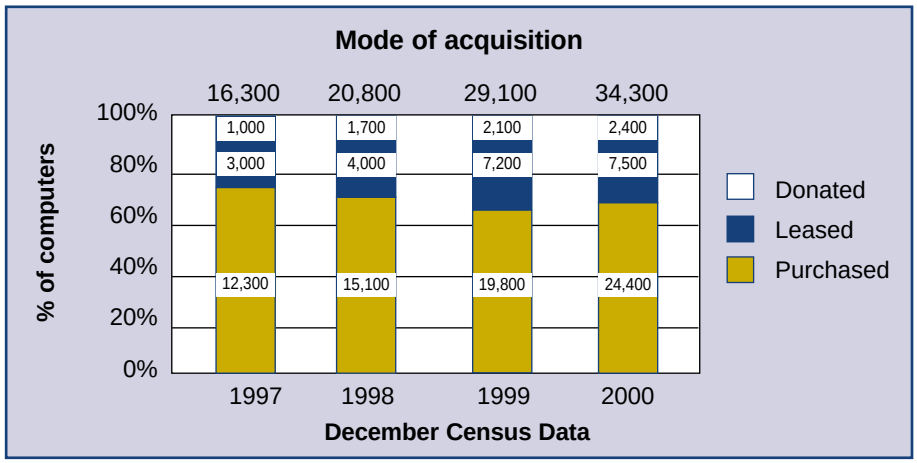

Figure 2: The majority of schools have opted to purchase rather than lease computers.

Source: EDWA 2000 Census

Management of Learning Technology Resources

Inadequate asset management practices were found …

To ensure that assets are adequately safeguarded, schools are required to maintain accurate registers of public property (assets) and conduct annual stocktakes. This is reinforced by Treasurer's Instructions and EDWA policies.

Asset registers at eight of the schools reviewed did not include all computers or had not been updated to reflect changes in the location of computers within

schools. Inaccurate asset registers make it difficult for schools to account for computers purchased under the Learning Technologies Project.

… that could reduce student accessibility to learning technologies.

In ten of the 22 schools reviewed, stocktakes had not been conducted on an annual basis. A further six schools could not demonstrate that their latest stocktakes had been properly conducted. Audit sample testing at four schools identified computers on the register that could not be accounted for.

Achievement of Computer to Student Ratios

Schools are on track to meet 2002 target ratios …

The focus of the Learning Technologies Project is on the acquisition of computers and the achievement of computer to student target ratios of 1:5 for secondary and 1:10 for primary schools. EDWA census data indicates that schools are on track to meet the target computer to student ratios by 2002 with 59 per cent of schools already meeting these requirements. Of the schools reviewed only 14 per cent did not meet the target student to computer ratios for 1999. Each of these schools had a plan to meet the requirements by 2002.

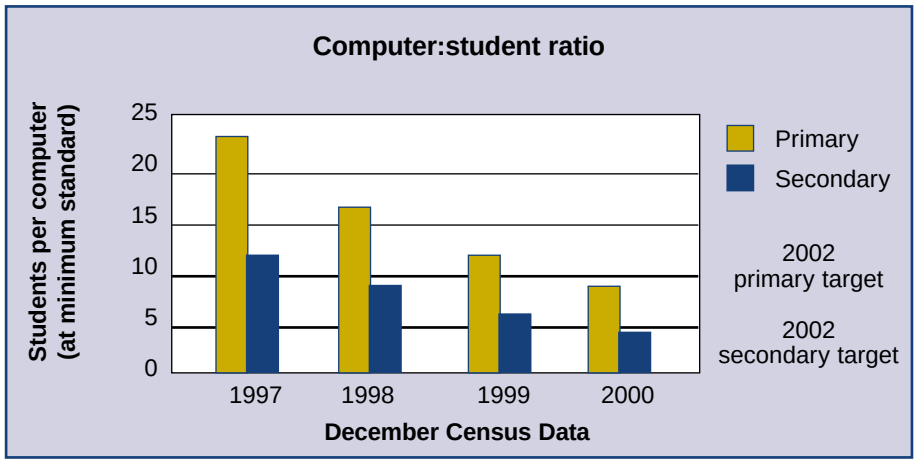

Figure 3: Progress towards the target computer to student ratios.

The census data indicates that schools are on track to meet the target computer to student ratios by 2002.

Source: EDWA 2000 Census

… but 50 per cent of teachers reported limited access to learning technology resources for the purpose of teaching …

Whilst computer to student ratios are a useful yardstick for measuring the progress of schools in relation to the Learning Technologies Project, they do not equate with student access. EDWA documentation indicates that *"Access to learning technologies is not an end in itself – rather, it underpins all of the other key activities and strategies"*.[13]

[13] *Technology 2000 Draft Strategic Plan Overview 1999 - 2001*, Education Department of Western Australia.

Half of the teachers interviewed reported that they had limited access to learning technology resources for the purpose of teaching. Inadequate access was due to insufficient computers in classrooms, inappropriate deployment of computers within schools and timetabling clashes that limited access to laboratories. Comparison against the EDWA critical success factors indicates that this represents a low to mid level of access that is below the prescribed target.

… and reported ratios can be misleading.

Where computers are inaccessible to students it is misleading to count them in computer to student ratios. Examples were found in school visits where faulty and inaccessible computers were counted towards target ratios.

IT Performance and Down-time

Schools with significant down-time had limited access to technician time.

There was wide variation in frequency of IT faults and down-time across schools reviewed. In 2000, the number of faults per semester ranged from 1 to 103 per school, with an average of 49. Teachers in 21 per cent of schools reported that technical problems were a daily occurrence. In most schools these problems were dealt with quickly on the same or following day. However, in 27 per cent of schools, teachers reported that down-time regularly ranged from two days to over a term and 53 per cent of schools reported down-time of over 20 hours access time per semester. None of the schools reporting significant down-time had access to the services of a network manager and the majority did not have access to a technician. The duration of down-time was a particular difficulty in rural schools where computers had to be sent to Perth for repairs.

Down-time has an impact on teaching and learning programs.

Frequent IT breakdowns and time delays in solving difficulties and repairing faults disrupt lessons and are discouraging teachers from making greater use of the learning technologies in their schools. Sixty-five per cent of teachers reported that they had to alter lesson plans due to computer down-time. This impacted on the willingness of 28 per cent of teachers to use learning technologies in their lessons in the future, with teachers reporting that they make minimal use of the learning resources available due to computer unreliability. Teachers need to have confidence that computer hardware will be available if they are to regularly include it in their teaching and learning programs. When planned lessons are disrupted due to technical difficulties, teacher confidence is reduced and the effectiveness of learning technologies as an educational tool is compromised.

Technical Support

Access to technical support is limited …

The frequency of technical difficulties and the impact on teacher use is related to the level of technical support available within schools. Comparison against the EDWA critical success factors indicates that to date, the provision of technical

support is at a low to mid level of achievement for implementation which is below the prescribed target for 2002. Many schools rely on teachers, on either a time-release or voluntary basis, to provide technical support.

Schools reviewed reported the following difficulties in accessing technical support:

- no access to a Help Desk or technical support hotline – 55 per cent (EDWA provides Help Desk support for school administrative networks, but no assistance is provided for school curriculum networks);
- no access to technical support via email or the Internet – 55 per cent;
- no access to hardware/software installation services – 18 per cent;
- no access to replacement computers when existing computers under repair – 91 per cent;
- no access to timely repair and upgrading services – 36 per cent; and
- no access to the services of a technician – 63 per cent.

… and there are impacts on students learning opportunities when teachers undertake technical support duties.

Provision of IT coordination, network administration and technical support by teachers has impacted on student learning opportunities, in relation to increased class sizes and reduction of teacher contact time. Where time is allocated to staff to provide this support it is taken out of the school staffing allocation. This teaching resource is then not available for educational support functions or results in increased class sizes. Where time is not allocated to the teacher, teachers are called out of class to attend to IT problems. Lost teaching time ranged from four minutes to six hours per day, with a mean time cost of two hours per day. Disruptions to classes have implications for both teacher performance and student learning.

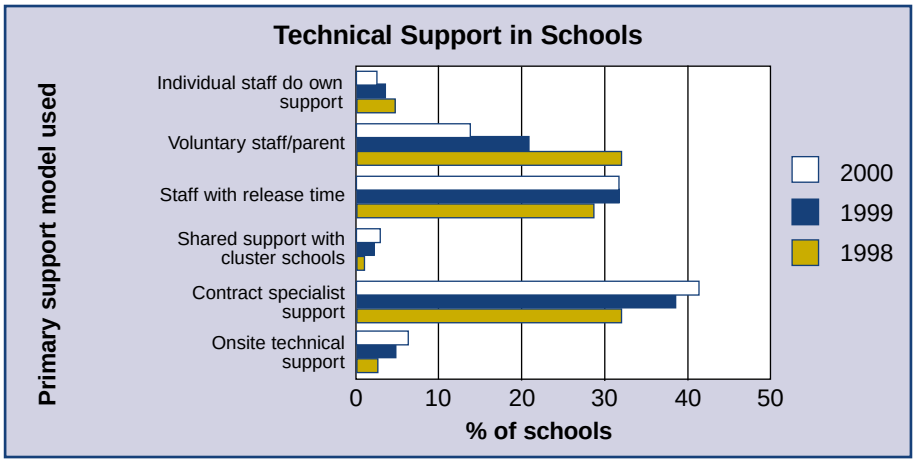

Figure 4: Primary model of technical support used in schools.

Many schools rely on teachers, either on a time-release or voluntary basis, to provide technical support, though use of contracted technicians is increasing.

Source: EDWA 2000 Census

IT coordination in schools

The full cost of technical support is higher than indicated in the financial statements …

Teachers have been appointed as IT coordinators in every school reviewed. The role of IT coordinator provides significant support to other teachers in development of skills, application and integration of learning technologies. However, in 41 per cent of schools reviewed, teachers were not formally allotted time to fulfil this role and no account was taken of the time spent. As this time has not been budgeted for, IT coordinators complete these responsibilities outside school hours or during their DOTT[14] time.

In half the schools reviewed the costs of technical support and professional development were not captured in school financial statements. There is no direct cost to the school where technical support and professional development are being provided voluntarily by teachers. In addition, in many schools IT coordinators have assumed the IT technician and network administrator roles as well. EDWA is unable to monitor the full costs of providing these services.

… and there is significant risk that some schools may not have access to appropriate technical expertise.

Most schools are unable to ensure that they have access to adequate IT expertise as they have limited input into recruitment of teaching staff [15]. There is currently no provision in EDWA staff appointment processes to ensure that schools have teaching staff with the appropriate IT skills and experience to provide the required support. In many schools the knowledge and expertise to administer the network, solve technical problems and maintain the system resided in one person. Instances were noted where schools were without access for days at a time due to the absence of this individual. Implementation and continuity of the Learning Technologies Project are at risk in schools when staff with appropriate IT expertise are unavailable or transferred.

Recommendations

EDWA promote more cost effective implementation in schools through:

- monitoring asset management practices in schools to ensure compliance with EDWA policies and Treasurer's Instructions, including those designed to achieve value for money in purchasing;
- including in reported ratios only computers that are operating and accessible to students; and
- more effective provision of technical support in schools to reduce computer down-time and increase the confidence of teachers to use the technologies with their classes.

[14] Duties other than teaching.

[15] School-based selection rights have been granted to about 120 schools.

5 Electronic educational resources (software)

- ***A licensing agreement for a suite of operational software has been negotiated centrally by EDWA on behalf of all schools at a saving of approximately $1.9m over four years.***
- ***Almost 60 per cent of schools had inadequate educational software management and purchasing processes and 29 per cent were experiencing some incompatibility problems.***

EDWA defines the 'Electronic Educational Resources' critical success factor as including: "Selection and acquisition of electronic educational resources; organisation and management of electronic resources; and teacher use in teaching and learning program".

Software Acquisition

Many schools had inadequate software management and purchasing processes …

Almost 60 per cent of schools reported having no procedures in place to manage educational software investment. Lack of appropriate software procurement and management practices leads to inefficient purchasing decisions and introduces the risk of incompatibility. Twenty-nine per cent of schools reviewed reported the existence of hardware-software incompatibility problems that resulted in available software being inaccessible to teachers and students.

… and were experiencing some incompatibility problems.

Comparison against the EDWA critical success factors for 2002 indicate that to date, selection, acquisition, management and use of electronic resources is at a mid to target level of achievement for implementation in most schools.

Negotiation of a central licensing agreement has resulted in cost savings.

In 1999 a licensing agreement was negotiated centrally by EDWA on behalf of all schools. This has allowed cost effective access to a suite of operational software for all computers in all schools and also for teacher use on home computers. According to EDWA, negotiation of this licensing arrangement has resulted in a saving of $1.9m compared with the cost if schools had individually sought licensing arrangements.

In addition to providing significant savings to schools this State-wide licence enables productivity gains through a reduction in the time each school spends in

ordering and managing software licences and significantly reduces the risk of litigation due to breach of copyright by schools. This allows schools to develop standardised operating systems, thereby increasing student and staff access to electronic resources. It also reduces technical support requirements and the learning curve where teachers and students move across the education system.

The funding required for the State-wide licence was subtracted from the school allocations for the Learning Technologies Project in July 1999. As a result, the allocation for each computer funded from the Learning Technologies Project was reduced by $200 for the remainder of the project.

Recommendation

EDWA promote efficient and effective implementation in schools through:

- continuing to provide opportunities for cost-effective provision of software and pursuing strategies to assist schools in cost-effective procurement and connectivity for learning technologies.

6 Connectivity

- ***Sixty-eight per cent of classrooms and 77 per cent of school computers are now connected to a network, but the performance and reliability of school networks varied considerably across schools reviewed with a higher proportion of rural schools reporting network faults.***
- ***All government schools have the capacity to access the Internet from at least one computer, but lack of a coordinated approach State-wide has resulted in higher costs and limited access for students in some schools.***

EDWA defines the 'Connectivity' critical success factor as including: "Process of management of connections; network services available throughout the school; and extent of networking and Internet access".

School Networks

Most schools have networked computers …

Comparison against the EDWA critical success factors for connectivity indicates a range of achievement to date, for implementation in schools from a low level through to the 2002 target. The EDWA census, for 2000, found that 68 per cent of classrooms and 77 per cent of school computers are connected to networks. Connectivity in schools reviewed was high with all but one school at least partially networked.

… but schools have limited access to network administrators …

Most schools reviewed reported inadequate access to technical expertise in the development and maintenance of school networks. Nine per cent of schools had access to a network manager and in every case this was on a part-time basis. In order to limit networking costs the design and installation of local area networks was done by volunteer teachers and parents in some of the schools reviewed. Schools indicated that access to a consistent source of networking advice, that was cognisant of the specialised needs of education and schools, would have been of assistance in making the most appropriate and cost effective decisions.

… and a higher proportion of rural schools reported network faults.

In 68 per cent of schools reviewed, the time taken to log-on to school networks ranged from 5 seconds to 5 minutes. Whilst the performance and reliability of computer networks varied considerably across schools, a higher proportion of rural schools reported network faults. In 23 per cent of schools, access to school networks was consistently delayed by up to 30 minutes due to server problems. Delays in access of this degree significantly impact on lesson time and reduce the effectiveness of the Learning Technologies Project for students.

Teachers do not have remote access to their school networks.

A high level target for connectivity in the EDWA critical success factors is to provide access to on-line services for teachers and students from home and access to shared resources. Teachers were able to remotely access the school network via modem connection in only two of the schools reviewed. This was not a facility available to students. Such remote access to school resources for teachers would increase self-instruction opportunities and their confidence with learning technologies.

None of the schools reviewed had network sharing arrangements in place with either local schools or other community organisations. There is potential for cost savings to flow from such arrangements. In addition to increasing efficiency this would provide an avenue for curriculum sharing to increase the effectiveness of the Learning Technologies Project.

Internet Access

EDWA provides Internet access for school administrations. However, schools are required to make their own arrangements for Internet access for educational purposes. Solutions varied from installation of satellite dishes to use of local Internet Service Providers (ISPs). In some cases, where STD rates applied or when student numbers were high, student access to the Internet had to be limited due to excessive costs. Lack of capacity in schools to select and implement effective Internet access solutions has resulted in inefficient expenditure of school funds. A coordinated approach to the provision of advice and services would assist schools to secure the most appropriate and cost effective Internet access arrangements.

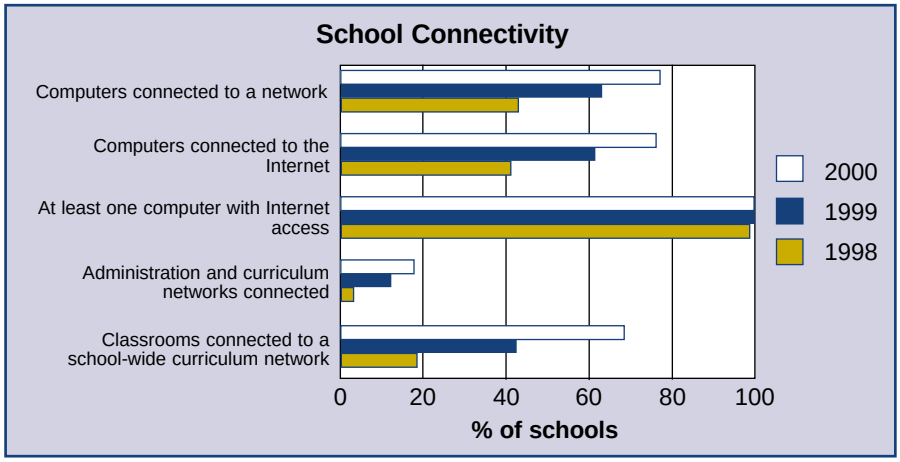

Figure 5: Proportion of schools with local area networks and Internet access.

All government schools now have the capacity to access the Internet from at least one computer, although census data indicates that 14 of the 770 schools experienced difficulty maintaining the connection.

Source: EDWA 1999 and 2000 Census

Recommendation

EDWA promote efficient and effective implementation in schools through:

- developing guidelines for school connectivity and providing advice to schools to support their decision making capacity for network installation and support, and Internet service provision.

7 Staff capabilities

- ***More than 95 per cent of teachers reported having more than a basic level of operational skills but relatively few reported having trouble-shooting skills.***
- ***More than 90 per cent of teachers have undertaken some professional development in learning technologies over the past two years.***
- ***The bulk of the professional development has focused on development of computing skills rather than the integration of learning technologies into teaching and learning programs.***
- ***Informal peer mentoring was considered a valuable form of professional development, but was not readily available to 44 per cent of teachers.***

EDWA defines the 'Staff Capabilities' critical success factor as including: "Learning technology skills; application to teaching and learning; and school planning for professional development in learning technologies".

Staff Learning Technology Skills

EDWA has commenced collection of baseline data on teachers' learning technology skills in 2000, through a survey of 1500 teachers. This survey relied on self-reporting by teachers regarding proficiency and levels of use in the classroom. Self-reporting by teachers provides a useful indicator of teacher confidence to utilise learning technologies in their classes. No minimum levels of competence in learning technologies for teachers have been established.

The vast majority of teachers have basic computing skills …

Consistent with the results of the EDWA survey, virtually all teachers interviewed during school reviews reported having basic operational skills. These were largely self-taught. The vast majority (more than 95 per cent) of teachers also reported having intermediate skills, including file management and creation of complex documents. Relatively few teachers reported having advanced operational and trouble-shooting skills. A significant proportion of teachers reported having no expertise in:

- the use of spreadsheets and databases – 26 per cent;
- basic trouble-shooting – 33 per cent;
- creation of multi-media presentations – 41 per cent; and
- creation of websites – 60 per cent.

The EDWA survey found that teachers were beginning to use learning technology skills in the classroom in a limited way. Interviews confirmed this finding.

… but those lacking trouble-shooting skills were less likely to use available technologies.

Teachers who reported a low level of general computing skills and teachers unable to resolve even the most rudimentary IT faults were less likely to utilise the technologies available. Thirty-five per cent of teachers with basic trouble-shooting skills reported actively integrating learning technologies into the school curriculum, as opposed to 19 per cent of teachers without these skills. The latter reported they lacked confidence in the technology and were reluctant to seek assistance as they were sensitive to the demands on the time of teachers who had taken on the role of IT coordinator or technician. These teachers frequently commented that they would be willing to make greater use of the technology if there was a specialist technician available on-site to provide support.

Professional Development in Learning Technologies

Most teachers have done some school-based professional development …

More than 90 per cent of teachers have undertaken some professional development in learning technologies. Where teachers had identified other priorities through the performance management process, the only learning technology professional development undertaken was as a component of whole of school professional development days. EDWA has provided training for administrative programs and applications[16]. District Offices have provided assistance to schools for administrative, technical and operational training.

… but EDWA does not monitor the extent, nature or cost of learning technologies professional development.

EDWA does not monitor the extent, nature or cost of learning technologies professional development undertaken by teachers, as schools are not required to keep a record of professional development undertaken by staff. However, most schools reviewed did keep a record of staff requests through a performance management or professional development approval process.

Learning technologies professional development for the majority of teachers is provided within their school …

For half of the teachers who had undertaken learning technologies professional development all training had been provided within their school. A minority of staff have undertaken professional development conducted externally to the school. Analysis of the professional development records available for 1999-2000 showed that the learning technologies professional development taken externally was usually by teachers who had taken on the IT coordinator role and school administrative staff.

More than one third of the teachers interviewed reported having a large or very large gap between their existing level of learning technologies expertise and what

[16] Including PeopleSoft, CAS, SIS and MAZE.

they believed they required. Despite this many of these teachers have not been active in seeking professional development opportunities to address identified deficiencies. Forty per cent of teachers who reported a high skills gap and over one third of all teachers interviewed have not requested any learning technologies professional development over the past two years. Factors identified as impacting of the level of professional development undertaken included:

… but learning technologies professional development was not an imperative for teachers.

- forty per cent of teachers reported that learning technologies professional development opportunities were not widely promoted in their school;
- twenty-seven per cent of teachers reported limited access to computers for self-instruction and practice of skills; and
- forty-four per cent of teachers reported that choice of training venue adversely affected their willingness to undertake professional development.

Where professional development was requested it was approved in 93 per cent of cases.

Translation to classroom practice

Professional development frequently was not translated into classroom practice …

A sizable proportion, 31 per cent, reported that the formal professional development they had undertaken was of marginal or no use in relation to their teaching and learning program. Many of these teachers questioned the appropriateness of the learning technologies professional development that was provided. Teachers indicated that they frequently did not translate professional development into the classroom due to lack of access to computers to practice new skills, delay in being able to access the technologies with students and lack of understanding of how to incorporate the use of skills into the curriculum. Comparison against the EDWA critical success factors indicates that to date, this represents a low to mid level of achievement for implementation which is below the 2002 target.

… as its focus was on acquisition of computing skills rather than how to integrate learning technologies into the curriculum.

Educational research suggests that the key requirement for teacher proficiency is knowledge of how to integrate learning technologies rather than acquisition of general computing skills. While computing skills will assist teachers to advise and supervise students, the most important competency associated with integration of computers is the ability to structure classroom learning experiences and to use learning technologies as a tool for student-centred learning.[17] The bulk of the professional development undertaken has focused on development of computing skills rather than how to integrate learning technologies into a teaching and learning program. Only one third of teachers reported having undertaken any

[17] Ministerial Advisory Council on the Quality of Teaching, June 1997, *Computer Proficiency for Teachers,* New South Wales Department of Education and Training.

professional development with a focus on integration in the classroom. Of these teachers, over half reported that this type of training accounted for less than 50 per cent of the learning technologies professional development they had received. The critical success factors indicate that the objective of professional development is to enable staff to apply learning technologies in their teaching and learning programs. To achieve this, the balance of training will need to shift towards integration.

Sharing Knowledge and Expertise

Teachers value peer coaching …

… but there is no access to learning technology mentors in some schools …

The vast majority of teachers (92 per cent) indicated that peer coaching provided by learning technology mentors within the school was as important to them, if not more important, than formal professional development. However, access to learning technology mentors, both formally and informally, has been limited in some schools, with 12 per cent of teachers reporting no access to a learning technology mentor within their school. Of teachers with access to learning technology mentors, 36 per cent described accessibility to the mentors as limited. This was most frequently due to conflicting demands on the mentor teachers.

… and exposure to other teachers' learning technology programs and ideas is limited.

Teachers' access to peer knowledge and expertise externally was also limited with 80 per cent of teachers reporting minimal exposure to other teachers' learning technologies programs and ideas. There are significant time and educational costs associated with each teacher developing strategies for inclusion of learning technology in their teaching and learning program in isolation. The recently developed EDWA Education to Community (e2c) proposal acknowledges these problems and provides IT solutions to enable teachers to share educational resources and develop a learning technologies knowledge base. This would assist teachers to overcome the problem of each having to individually determine how to integrate technology into the curriculum. EDWA has indicated that there are currently no arrangements in place to implement the e2c proposals. A School Information System (SIS) that is being progressively implemented in schools from 1999 to 2003 provides the facility to enable teachers within a school to collaboratively plan curriculum. However, this system does not allow curriculum sharing across schools.

Recommendation

EDWA promote effective integration into the curriculum by:

- focusing professional development opportunities on the integration of learning technologies into the curriculum and promoting access to a shared knowledge base of learning technology resources.

8 Integration and use

- ***Whilst 94 per cent of teachers are making some use of learning technologies, the degree of use and the level of integration into the curriculum are low.***
- ***Deployment of computers impacted on use and 49 per cent of teachers reported having access to only one computer in the classroom.***

EDWA defines the 'Integration and Use' critical success factor as including: "Learning pedagogy *(sic)*; pattern of student use; and extent of use in teaching and learning programs".

Learning Technologies in the Teaching and Learning Program

Most teachers make some use of learning technology resources …

… but the degree of use and the level of integration into the curriculum are low.

Development of teacher competence in the use of IT, levels of confidence and skills to promote its integration in the curriculum of schools, is an ongoing process. Whilst the majority of teachers (94 per cent) are making some use of learning technology, the degree of use and the level of integration into the curriculum are low.

The limited use and integration is represented in the following findings:

- thirty per cent of teachers made limited or no use of computers for the purposes of planning, development of lesson aids or administrative tasks;
- fifty-four per cent had limited or no inclusion of learning technologies in their programs and curriculum plans;
- sixty-three per cent of teachers made limited use of learning technologies in their lessons; and
- forty-five per cent of teachers reported using learning technologies in, at most, 10 per cent of their classes.

Comparison against the EDWA critical success factors indicates that this represents a low to mid level of achievement for implementation which is below the prescribed target.

Inadequate access to learning technology resources, lack of adequate maintenance, limited or inappropriate professional development and

infrastructure problems were identified by teachers as the main factors inhibiting greater use of the learning technologies available within their schools. These problems were of greater significance in rural schools due to increased costs that arise in accessing technical services and professional development opportunities.

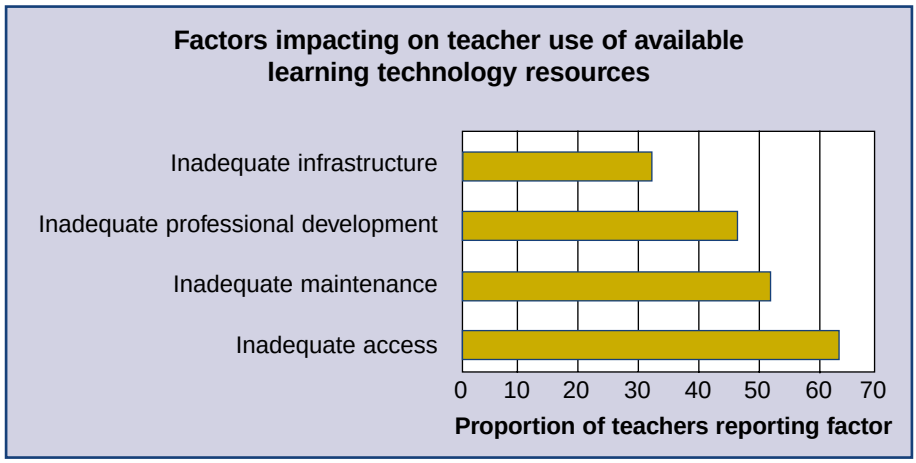

Figure 6: Teachers identified factors that inhibited their making greater use of learning technologies available within their schools.

Notes:

1. *Rural schools and older metropolitan schools identified inadequate infrastructure as a deterrent.*
2. *Inadequate learning technologies professional development was also a greater problem in rural schools. The isolation of these schools limiting the access to affordable professional development.*
3. *Inadequate maintenance assumes greater importance in rural areas where access to vendors is limited. Teachers in every rural school reviewed identified inadequate maintenance as a deterrent to use.*
4. *Inadequate access was due to lack of computers, inappropriate deployment and timetabling clashes that restricted access to laboratories.*

Source: OAG Interviews

Deployment of computers impacted on use …

Deployment of computers impacted on use but there was no consistent view as to whether laboratories or classroom access were more effective on a school wide basis. Inadequate deployment was cited by 24 per cent of teachers as the reason for not using learning technology resources. In schools with laboratories and specialist IT teachers, these teachers commented that it was the role of the IT teacher to teach computing. Some schools restricted access or gave priority to specialised computing classes and this was cited as a limiting factor to use in other curriculum learning areas. Where computers were only available in classrooms, difficulties in classroom management with limited numbers of computers, was cited as the reason for lack of use. In each school there were also teachers who made extensive use of resources available in laboratories and in classrooms.

… and almost 50 per cent of teachers utilise only one computer for their whole class.

Computer use was reported to be most frequent in classrooms. However, this included instances with very low levels of access per student with 49 per cent of teachers reporting access to only one computer in their classroom. This is a level of access well below the target ratios in schools.

Teachers have begun to integrate learning technologies into their teaching and learning programs …

There was substantial variation within and between schools reviewed in the level of use and integration of learning technologies, but 61 per cent of teachers had begun to integrate learning technologies into their teaching and learning programs. Twenty-four per cent of teachers used the learning technologies extensively as one available tool to assist students in achievement of curriculum outcomes. These were commonly characterised by a student-centred approach, with English, Society and Environment and Mathematics the learning areas where they were incorporated most frequently. Thirty-eight per cent made extensive use of computers but with little to no integration; use being limited to word processing, to enhance presentation of completed work, and playing of games at the conclusion of lessons as a reward for finishing work early. The majority of teachers use learning technology in their classes for research, word processing and document presentation. Teachers will require ongoing support by mentors and exposure to exemplars of best practice to assist in further integration into their own teaching and learning programs.

… but require ongoing support by mentors and exposure to exemplars of best practice to assist in this process.

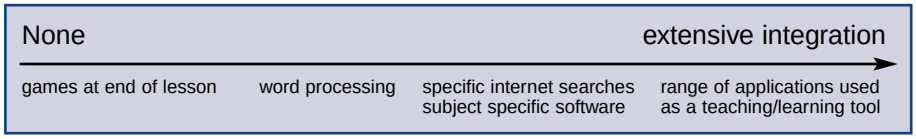

Figure 7: Teachers' programs, lesson plans and samples of student work showed a wide range in the level of integration of learning technologies.

Source: OAG

Student Educational Outcomes

The impact of learning technologies on student outcomes is not yet clear. A means of measuring the effect of learning technologies on student educational outcomes has not yet been developed. Thus, there are no targets for student outcomes included in the critical success factors and no monitoring of the impact of learning technologies on student learning.

Thirty-six per cent of the schools reviewed have begun to link learning technologies to student educational outcomes in planning. In addition, 54 per cent of teachers reported that they had begun to link use of learning technologies to the achievement of student educational outcomes. However, 30 per cent of teachers reported that they were unable to assess, even on an informal basis, the impact of learning technologies on student educational outcomes.

Recommendation

EDWA promote effective integration into the curriculum by:

- pursuing strategies to accelerate the integration of learning technologies into the curriculum.

9 Appendix A A Framework for implementation

LEVEL OF IMPLEMENTATION	PLANNING		INTEGRATION & USE		STAFF CAPABILITIES	
	Integration in school planning		*Learning technologies in the teaching & learning program*		*Staff skills in learning technologies*	
	At a Glance	**Pointers** • Level of integration of learning technologies in curriculum planning. • Planning linked to student outcomes. • Planning for changing technology.	**At a Glance**	**Pointers** • Learning pedagogy. • Pattern of student use. • Extent of use in teaching and learning programs.	**At a Glance**	**Pointers** • Learning technology skills. • Application to teaching and learning. • School planning for professional development in learning technologies.
HIGH	Learning technologies planning is embedded in school curriculum plans, is well monitored and responsive to changing technology and emerging needs within the school.	• Learning technologies planning is integrated in all learning areas and is embedded within curriculum and school planning processes. • Learning technologies planning is embedded in planning to improve student outcomes. • Learning technologies planning is monitored and flexible to take account of changing technology and emerging needs.	A wide range of learning technologies are selected and incorporated into the teaching and learning program.	• Teachers facilitate interactive student-centred learning with emphasis on transforming knowledge using a wide range of learning technologies. • There is regular, individual and group use of learning technologies throughout the curriculum. • Teachers use a wide range of learning technologies in their teaching and learning program.	All staff have capabilities to use a wide range of appropriate learning technologies as an integral part of the teaching and learning program.	• Teachers are capable of confidently using a wide range of learning technologies and assist each other in developing their skills. • Teachers are innovative and able to identify enhanced ways of using learning technologies to their full potential in the teaching and learning program. • Staff professional development for learning technologies is an integral part of curriculum development and school planning.
TARGET 2002	Learning technologies planning exists within school curriculum plans.	• Learning technologies planning is integrated in most curriculum plans. • Learning technologies planning takes account of, and is responsive to, student outcomes. • Learning technologies planning is developing to take account of changing technology.	Learning programs regularly incorporate learning technologies across most learning areas.	• Teachers facilitate student-centred learning approaches. • There is individual and group student access, and use of appropriate learning technologies throughout the curriculum is emerging. • Teachers regularly use appropriate learning technologies across most learning areas.	Most staff regularly use a range of learning technologies and are integrating these into the teaching and learning program.	• Staff are capable and confidently use a range of learning technologies. • Teachers are skilled in creating a classroom environment where learning technologies are regularly incorporated in all learning areas. • The school has a process in place for meeting the learning technologies professional development needs of staff, with emerging links to curriculum.
MID	Learning technologies planning is developing and links to learning areas are emerging.	• Learning technologies planning is either a separate plan or integrated within curriculum plans. • Learning technologies planning has some links to student outcomes. • Planning is according to the principles in the Learning Technologies Planning Guide.	Learning programs incorporate learning technologies on a limited basis.	• Learning experiences are mostly teacher directed. • There is regular individual and group use of learning technologies as directed by the teacher with some access for most students. • Teachers occasionally incorporate learning technologies into their teaching and learning program with patterns of appropriate use beginning.	Most staff have basic learning technologies operational skills and are beginning to apply these to the teaching and learning program.	• Staff have skills to use a limited range of learning technologies. • Teachers are implementing a limited range of technology in the curriculum. • Provision for training of staff in learning technologies is being addressed.
LOW	Learning technologies planning is in its initial stages.	• Most probably a separate plan with few links to student outcomes in curriculum plans. • Linking of learning technologies planning and improvement in student outcomes is yet to occur. • Learning technologies planning in its initial stages within the context of the Learning Technologies Planning Guide.	Teachers accept that learning technologies can improve student outcomes but are yet to implement them in the teaching and learning program.	• Learning experience is mostly teacher centred. • There is limited access to learning technologies by individuals or small groups of students. • There is limited use of learning technologies by teachers and use is not linked to the teaching and learning program.	Staff developing minimal basic learning technologies skills on an individual basis. Development of these skills is largely unplanned.	• Staff are acquiring basic operational skills in the use of learning technologies. • Teachers are becoming aware of possible applications of learning technologies to the teaching and learning program. • There is no systematic plan to skill staff in learning technologies. Some learning technologies training is taking place for a limited number of staff.

# of learning technologies in WA Government schools.

Source: EDWA

ELECTRONIC EDUCATIONAL RESOURCES		HARDWARE		CONNECTIVITY	
Review and management of software resources including Internet sites		*Provision and management of hardware resources*		*Internet & network connections*	
At a Glance	**Pointers**	**At a Glance**	**Pointers**	**At a Glance**	**Pointers**
	• Selection and acquisition of electronic educational resources. • Organisation and management of electronic resources. • Teacher use in teaching and learning program.		• Ratio of computers:student. • Range of different learning technologies. • Degree of student access. • Technical support. • Repair and replacement planning.		• Process of management of connections. • Network services available throughout the school. • Extent of networking and Internet access.
Planned approach to management and use of electronic educational resources appropriate to the teaching and learning program.	• Selection of electronic resources is coordinated throughout the school and strongly linked to the curriculum needs of students and staff for all learning areas. • There is management and coordination of all electronic resources across all learning areas. • All staff are confident in their selection and appraisal of electronic resources for the teaching and learning program.	The school has excellent facilities which allow for varied modes of usage to maximise improvement in student learning. Effective policies and procedures for the management of hardware resources are evident.	• Computer to student ratio: primary 1:1 secondary 1:1. • Extensive variety of learning technologies for different curriculum needs in all learning areas. • Students have unlimited access to select and use learning technologies. • Technical support and maintenance is well managed by skilled experts from a technical support contract or school appointed technician. • A planned and dynamic learning technologies repair and replacement program is in place.	High standard connections and integrated use within the curriculum.	• School has clearly articulated and well coordinated management plan for the operation of learning technologies networks across the school. • Extensive range of online services available throughout the school. (eg: e-mail, access from home, shared curriculum resources, intranet, video conferencing facilities). • A school wide network that includes curriculum and administration with excellent Internet access.
Planned approach to management of electronic educational resources. Use of electronic educational resources is appropriate to the teaching and learning program.	• There is some coordination in the selection of electronic resources which links to the teaching and learning program. • Management of electronic resources is becoming established and coordination of most resources is occurring. • Teachers confidently make use of a variety of electronic resources that have been selected to support the teaching and learning program.	Provision of learning technologies is adequate to facilitate daily use by all students in most learning areas. There is a planned approach to future hardware requirements.	• Computer to student ratio: primary 1:10 secondary 1:5. • Reasonable variety of learning technologies for different curriculum needs. • Students have regular access to learning technologies. • Appropriate and adequate technical support is available as required using a range of sources. • There is a planned approach to technologies repair and replacement.	Connections adequate to curriculum demands.	• A management plan for the operation of learning technologies networks across the school is being developed. • Reasonable range of online services available throughout the school (eg: Internet access, within school e-mailing and shared curriculum resources). • A curriculum LAN connecting most teaching and learning areas in the school providing adequate access to the Internet.
A planned approach to management and use of electronic educational resources is developing with emerging links to the teaching and learning program.	• Most electronic resources are selected based on relevance in the curriculum but there is little coordination in the school. • There is some organisation of electronic resource collections within the school. • Teachers are becoming conversant with various electronic resources and beginning to review them for appropriateness to the teaching and learning program.	Level of hardware provision allows for increased flexibility and use of learning technologies. Planning and management for learning technologies is emerging.	• Computer to student ratio: primary 1:50 secondary 1:20. • Limited range of learning technologies available in the school. • Students have some access to learning technologies on an inconsistent basis. • School provides time and/or funding for staff or contractors for minimal technical support. • School has some procedures for repair and replacement of learning technologies.	Connectivity has expanded to meet limited curriculum demands.	• Minimal organisation for the operation of the learning technologies networks across the school. • Range of online services available within the school limited to Internet access and e-mail. • A number of different networks in different teaching areas and several Internet access points in the school.
No planned approach to electronic educational resources management.	• Selection of electronic resources may not always be appropriate to the teaching and learning program. • There is little organisation of electronic resources within the school. • Teachers are unaware of the kinds of, and potential of, electronic resources for use in the teaching and learning program.	Level of hardware provides limited usage and flexibility. Procedures for management for learning technologies resources are ad hoc and inconsistent.	• Computer to student ratio: primary 1:100 secondary 1:40. • Minimal range of learning technologies available for student use. • Students have little access to learning technologies. • School relies on interested staff or community member for technical support and maintenance. • Procedures for repair and replacement of learning technologies are inconsistent and ad hoc.	Connectivity is limited with minimal use in the teaching and learning program.	• No perceived need for a learning technology network across the school. • Range of online services available within the school limited to Internet access and e-mail. • No networks in the teaching and learning areas in the school and Internet access is limited to a single dial-up connection.

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