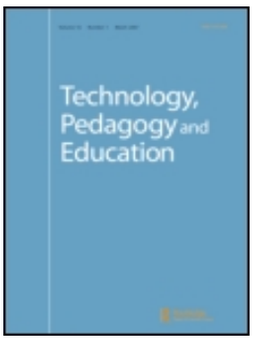

Routledge
Taylor & Francis Group

Technology, Pedagogy and Education

ISSN: 1475-939X (Print) 1747-5139 (Online) Journal homepage: https://www.tandfonline.com/loi/rtpe20

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To cite this article: Niki Davis (2003) Technology in teacher education in the USA: what makes for sustainable good practice?, Technology, Pedagogy and Education, 12:1, 59-84, DOI: 10.1080/14759390300200146

To link to this article: https://doi.org/10.1080/14759390300200146

Technology in Teacher Education in the USA: what makes for sustainable good practice?

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ABSTRACT Good practice with information and communication technologies (ICT) in teacher education is responsive to its society's needs. This article provides a complementary view to those from Europe and elsewhere in the world from the perspective of federal USA, with this nation's localised support for K-12 schools. It is part of the quick-scan study in 2002 led by Paul Kirschner of the Open University of the Netherlands. Five teacher education programmes were selected to illustrate best practice with technology (as ICT is called in the USA) in US teacher education. Although the ICT benchmarks described by Kirschner & Davis (this issue) were present in every case, a better distinguishing factor was that all had a mission to serve their diverse communities. In addition, these programmes provide complementary professional development in the schools in which pre-service students gain internships. The review of best practice comes after 3 years of significant federal funding provided through the Federal Department of Education's initiative: 'Preparing Tomorrow's Teachers to use Technology' (PT3). Strategic planning for this initiative by government agencies and professional organisations is also described. It is noted that there is still much work to be done towards social justice and digital equity within and beyond the USA.

Introduction

Good practice with information and communication technologies (ICT) in teacher education is responsive to its society's needs. Therefore this article starts with a description of the context of teacher education in the USA and its development recently. The article is not designed as a comparative study; instead it draws upon an international framework developed recently for UNESCO (in press) to justify an approach through culture and context for the interpretation of good practice with technology in teacher education. (Davis, 2002, provides a description of the framework in a previous issue of this journal.) This article provides a complementary view to those from

Europe and elsewhere in the world from the perspective of federal USA. It is part of the quick-scan study in 2002 led by Paul Kirschner of the Open University of the Netherlands (Kirschner, this issue). It also attempts to analyse what can make such good practice sustainable, drawing upon recent research in the USA.

Context and Background

Education in the USA is largely controlled by individual states and funding for K-12 (kindergarten to 12th grade schools) is to a large extent dependent on the local community and culture. This reflects the political system, which informs both national and local direction and funding of education. Teacher education is provided through universities and colleges and other agencies, particularly the regional agencies responsible for the management of K-12 schools. However, the latter do not provide pre-service teacher education. Universities may be publicly funded and are required to take all students that achieve their entrance requirements in that state through open enrolment. Alternatively, they may be private universities who accept a selected cross-section of the students who apply. In addition to the dominant US culture of European origin, there are also institutions that have allegiances to minority cultures: Historically Black, Hispanic and Tribal Colleges. Students pay fees, which are usually higher for private universities, to study to become accredited teachers, usually through an undergraduate degree programme that commonly takes 5 years or more. Relative to the United Kingdom (UK), few students are encouraged to take a degree first and then a post-baccalaureate course to become licensed teachers. Students may elect to take some of their courses at a community college (college of further education) and transfer them into their degree programme. Temporary measures to accredit teachers to work in public schools are rising in many states due to the increasing shortage of teachers. This is particularly true of science and math teachers at the secondary level and in poorly resourced communities. Special programmes in inner-city schools are also developing to train assistant teachers already in the classroom.

Table I describes the range of agencies and professional organisations that support and impact on technology in teacher education in the USA, in the opinion of the author. These organisations influence practice by setting standards, which might be called competences or a national curriculum in other countries. Awards for exemplary practice further influence practice because organisations and individuals value them as external indicators of the quality and esteem of their programmes. Quality assurance for teacher education programmes is voluntary, unless mandated by individual states. Standards that have been implemented at national and regional/state levels are helping to motivate and sustain change with ICT in teacher education across the USA. Models of programme evaluation have noted that change

that aligns with mandated standards improves sustainability (see Stake's 1967 evaluation framework, for example).

Agency or organisation	Remit	URL or standards or guidance	Award?
National Council for Accreditation of Teacher Education (NCATE)	One of 2 national quality assurance agencies		None for technology in teacher education
Teacher Education Accreditation Council (TEAC)	One of 2 national quality assurance agencies		None for technology in teacher education
Association of Teacher Education (ATE)	One of two major professional organisations of teacher educators		None for technology in teacher education
American Association of Colleges of Teacher Education (AACTE)	One of two major professional organisations of teacher educators	http://www.aacte.org/Awards/practice_awards.htm	The earliest award for the integration of technology in a programme of teacher education
International Society for Technology in Education (ISTE)	ICT professional society serving the needs of ICT-using teachers and teacher educators	http://cnets.iste.org	ISTE NETS Distinguished Achievement Award
Society for Information Technology and Teacher Education (SITE)	ICT professional society focused on the needs of ICT-using teacher educators	http://www.aace.org/site	Award for digital equity in teacher education
Chief Executive Officers Forum (CEO Forum)	An influential working group of captains of industry set up to inform the development of technology in education	http://www.ceoforum.org	CEO Forum reports provide guidance that mention cases of good practice
Department of Education Initiative Preparing Tomorrow's Teachers to use Technology (PT3)	Federal grant programme to develop ICT in initial teacher education	http://www.pt3.org	Not applicable, selects and manages grants

Table I. Organisations in the USA that promote and sustain ICT in teacher education.

The major ICT standards for ICT in teacher education, NETS, have been developed by the International Society for Technology in Education (ISTE) and adopted by the National Council for Accreditation of Teacher Education (NCATE). These standards align closely with those identified by this study –

they incorporate all six benchmarks in considerable detail except for the final two, that involve assessment paradigms and the policy dimension (as discussed by Kirschner & Davis, this issue). The development of student teacher standards from the detailed standards for K-12 students and the subsequent development of administrator standards have strengthened the coherence of this movement, which also fits with a wider standards movement in education across the USA. However, the level of detail of these technology standards poses problems for their integration with content standards that may be stronger in the long term. In a chapter providing international guidance for UNESCO (in press, see Chapter 5), this author discusses the need to embed ICT standards in the culture and context locally and globally.

ICT in Education and Teacher Education

New technology has been part of US education for many years and is embedded within US culture in many ways (Macionis, 2002). It began with the widescale implementation of teaching machines based upon programmed learning/behaviourism. Seymour Papert's (1980) book *Mindstorms* generated considerable enthusiasm in the 1980s across the USA, as well as in other parts of the world. There have been significant, although patchy, financial investments in new technology across the USA for decades. However, as in other countries, neither the scale of investment nor the results match those in commerce and industry, with the 'Apple Classrooms Of Tomorrow' (ACOT) providing one notable exception (Sandholtz et al, 1997). Both ACOT and Henry Becker's seminal survey published in 1994 showed that such good practice took several years to develop. The lack of good practice across the USA was noted by the US Office of Technology Assessment (OTA) report on technology in teacher education of 1995 and this started calls for action. The NCATE Task Force on Technology (1997) found that teacher educators reported the following problems when using technology: a lack of time to learn about new technologies; a lack of technology and technical support; a limited number of faculty technology training opportunities; and an academic reward system that did not provide incentives for technology innovation. This appears to be the case in other countries such as the Netherlands, as discussed by Kirschner & Wopereis in this issue. Teacher education had been given little support in its efforts to use and integrate technology into its classrooms (OTA, 1995; Willis & Mehlinger, 1996; Panel on Educational Technology, 1997). In 1998, ISTE surveyed schools, colleges, and departments of education to identify how they were preparing new teachers to use technology in classrooms to collect baseline information about the preparation of pre-service teachers to use technology (Milken Exchange on Education Technology, 1999). Findings from the survey indicated that the technology skills of teacher education

faculty were comparable to the technology skills of the students they teach; however, most teacher educators did not model the use of technology in their teaching and most pre-service teachers did not use or integrate technology during their field experiences. One recommendation was to develop models that would identify, study, and disseminate effective uses of technology for both teacher education and K-12 schools. Further research in Henry Becker's 1998 national survey of technology-using teachers and their schools, *Teaching Learning and Computing* (Becker & Riel, 1999), clarified systematic ways in which the development of practice can be encouraged.

This then was the context for the largest initiative in the world to develop ICT in teacher education, which started in 1999. It was called 'PT3: Preparing Tomorrow's Teachers to use Technology'.

PT3: a federal capacity-building approach for the USA

In 1999, educators and policy makers in the United States became aware of the growing crisis in teacher retention and recruitment. Although it was reasoned almost a decade earlier that pre-service teacher education programmes could significantly impact on the future use of computer-related technology in K-12 schools, by effectively preparing teachers who had the knowledge and the ability to use and integrate computer-related technology to enhance teaching and learning (Berney, 1991), this had been slow to develop. Policy makers now accepted that the improvement of pre-service teacher education would be an effective use of resources at a time when schools would be losing a high percentage of teachers within 5 years (over 60% in many regions). A federal programme called Preparing Tomorrow's Teachers to use Technology (2001) was established under the leadership of Tom Carroll, a cultural anthropologist with experience in government agencies, including negotiation of the E-rate to provide more equitable access to the Internet for poorly resourced schools. Carroll brought together an advisory group of leading ICT teacher educators so that he could better understand the context and culture of their work, informed by what became known as the 'SITE Ames White Paper' (Thompson et al, 1999). The group informed a national initiative that would build capacity for ICT teacher education, focusing on pre-service teacher education.

The call for proposals in the 1st year announced three types of grant: capacity building, implementation and catalyst. Capacity-building grants provided funding to plan for change, thus improving the ability of historically poor universities to participate. This category was supported only during the 1st year of the initiative. Implementation grants aimed to implement model practice with technology in all locations of the teacher education programme: colleges of education, other colleges that provided courses to students in teacher education programmes, and in the students' field experience within K-12 schools. A strategy of matched funding required the grantees to gain the support of each organisation's leadership and

complementary funding was provided in many ways, with contributions of time and expertise from within and beyond the universities (partner schools that host practice teaching and the regional agencies for education), and vendors' discounted hardware, software prices and training support.

Catalyst grants developed initiatives that built on existing technology expertise with innovative ways to expand capacity across a large geographic area or to develop resources. Some of the catalyst projects developed high-quality resources to support teacher education, such as multimedia case studies, examples of electronic portfolios and a digital equity toolkit. Many of these can be accessed on the Internet through the PT3 community's web site (http://www.pt3.org). The PT3 catalyst project, the 'National Technology Leadership Initiative', brought teacher education content associations into the national initiative with summit meetings and established ongoing partnerships, including a flagship on-line journal to promote discussion and development of current issues in technology and teacher education (http://www.citejournal.org), with editorial autonomy of sections by content associations. For example, the US Association of Science Teacher Educators edits the section for technology in science teacher education.

The PT3 programme has built regional and national capacity for planning and managing change for ICT in teacher education. Each project was directed to spend at least 20% on evaluation, with an emphasis on evidence to disseminate information on the development of the project and the provision of summative reports, including alignment with government indicators. The PT3 leadership formed a national group of evaluators to analyse the changing national picture and to develop evaluators' appreciation of systemic change in education. An annual conference of the PT3 projects, complemented with strands within the annual conferences of professional societies for ICT (Society for Information Technology and Teacher Education and ISTE), provided an opportunity for all project leaders and evaluators to benefit from ongoing research and evaluation and build networks.

From this description, the reader will understand the relatively rich context from which to pick cases from around 1000 institutions that provide teacher education.

Five US Case Studies of Good Practice

The invitation to collaborate with an international study of initiatives in the field of teacher education across the globe came when the first round of PT3 projects were nearing the end of their 3-year project periods. Three annual competitions have now been held, resulting in 445 grants to teacher education programmes in the USA. Therefore there were many hundreds of examples of good practice in the US from which to choose and the number continues to grow. Two criteria were used to select five cases, but there is

no claim that they represent the range of good practice within the USA. The criteria were: practical access to information within the short time available to obtain information, and external recognition of the exemplary nature of the teacher education programme. The latter was provided through awards discussed earlier in this article including the technology award from the American Association of Colleges of Teacher Education (AACTE) , the ISTE National Educational Technology Standards Distinguished Achievement award, that recognises institutions that have exhibited models of integration of the NETS for teachers into their teacher education programmes (http://cnets.iste.org), and citations of good practice by the CEO Forum. Two out of the five cases had more than one award. The ISU graduate programme that prepares teacher educators did not qualify for these awards, but it is recognised as a leading doctoral programme in Peterson's Guide (2003). That case was added to the survey to establish the need for quality preparation of the next generation of teacher educators, so as to support sustainable reform of technology in teacher education. In addition, all the cases selected followed the three basic principles for ICT in teacher education noted by the Ames White Paper (Thompson et al, 1999), namely:

- ICT should be infused into the entire teacher education programme.
- Technology should be introduced in context.
- Students should experience innovative, technology-supported learning environments in their teacher education programme.

The presentation of the five cases now attempts to uncover key mechanisms for how and why these cases have been able to develop and sustain good practice. They start with the two most easily accessible teacher education programmes to the author, which are both provided through her university Department of Curriculum and Instruction in Iowa State University (ISU) and supported by the educational technology centre that she co-directs.

ISU's Synergy: elementary pre-service and Ph.D. programmes

Elementary pre-service programme. The whole ISU degree programme in elementary education (ages 5-12 years) consists of at least 135.5 semester hours, which are selected by students with help from advisors. A semester hour is roughly 1 hour per week for a 15-week semester, but lab courses usually count 1 semester hour for 2 hours in the lab. The students' programme ends with 16 credits of student teaching in a school, and successful completion is required for licensure. This teacher education programme won the national technology award from AACTE in 2000 before PT3. The most recent developments funded by a PT3 implementation grant for the 'TechCo' project focus on simultaneous renewal across the University and in four K-6 (i.e, elementary) schools (Thompson et al, 2002). The project

has increased the ICT throughout courses in the programme, introducing it in the context of content courses and innovative practice in these four technology-rich schools. Unlike the UK, there are few cohort groups of students who take a series of courses together. TechCo created a cohort of 20 students to work intensively in the four technology-rich schools. One course that introduces every student to educational computing is mandatory and takes place across a semester with 2 hours of lectures and 2 hours of lab work (http://www.educ2.iastate.edu/ ci/classes/201/). Around 700 students take this course each year, including students in the elementary, secondary and tertiary programmes. Labs, open-access facilities and a resource collection in the Center for Technology in Learning and Teaching (CTLT) with student assistants, support the course lecture. The programme also aims to model good practice with technology by those who teach courses within the Department and in other colleges, including sciences and engineering. In addition, students who choose to take a specific set of courses can add technology as a minor subject to complement their major in elementary education. The students who choose a technology minor often become curriculum leaders of technology in the schools in which they teach. Undergraduate students have opportunities for paid work in the CTLT and a lively Educational Computing Club that serves K-12 school needs.

Ph.D. programme. ISU's doctoral degree in Curriculum and Instructional Technology is a leader in technology and teacher education, which is also a signature of this degree programme (under http://www.ctlt.iastate.edu/ see programs and courses). Students study at least 72 semester credit hours, starting with a foundations course in curriculum and instructional technology and ending with a dissertation of original scholarship. Around half the courses develop knowledge of technology in an educational context, including classroom applications and distance education. Most students complete a portfolio to demonstrate their mastery of foundations of curriculum and instructional technology, research and leadership; including an aspect of technology in which they will become an expert teacher and teacher educator. Students have many opportunities for internships as teachers and researchers within their courses and in paid assistantships. This is seen as an important part of preparation for careers in education, especially teacher education.

The underlying strength and sustainability of ISU's teacher education programmes is in the acknowledgement of the importance of a community to support the ongoing growth of pedagogical and technical knowledge that can be found in the CTLT (http://www.ctlt.iastate.edu). It is grounded in synergy between the pre-service and graduate programmes of teacher education. For example, the need for teachers of labs for technology in the pre-service programme provides opportunities for graduate assistantships; and graduate students take a course that reciprocally mentors faculty into

better use of technology and the students into an understanding of university teaching. Over a decade ago, the course 'Technology and Teacher Education' was established by Ann Thompson to provide graduate students with an internship experience. Many of these students became teacher educators who are experts in ICT. These students mentored teacher educators in ICT skills and, in return, the teacher educators mentored the students in their profession. The graduate students' adviser, who strategically selected or negotiated the participation of teacher educators, facilitated and planned the interaction. Over the years, the balance has moved from encouragement of reluctant teacher educators to participate, to the strategic choice from a long list of volunteers. Each student meets with his or her teacher educator mentee weekly and responds to their needs at an appropriate pace. During weekly meetings of the class, the graduate students learn about mentoring and a variety of approaches to infusing technology in education. These meetings foster collaboration and networking among the graduate students, lend moral support, provide opportunities for the development of technical skills, and engage students with relevant literature. The graduate students' adviser insists that mentoring graduate students assist the teacher educator to engage with ICT, rather than allow the teacher educator to delegate the ICT tasks to the student mentor. The mentor pairs are expected to engage in many rich conversations as they work together, covering diverse themes and competencies, including social issues with ICT and discipline-specific topics. Toward the end of the semester, the teacher educators join the mentors' class for a celebration of their collaborative professional and course development. At this time all participants reflect on a wide range of ICT applications, cultures and contexts. The graduate student adviser also reflects on the programme's success in reaching department and university goals and gains new ideas for future planning. This model has been extremely successful, as measured by increased faculty competence in the use of technology and by the attitudes of graduate students and faculty (Thompson & Chaung, in press). ISU graduate students have cascaded the reciprocal mentoring approach from ISU to other universities and colleges during and after their studies.

University of Virginia – a focus on content

The University of Virginia, in common with ISU and the University of Texas at Austin, has a strong centre that supports technology in its School of Education. The faculty and graduate fellows of the Center for Technology and Teacher Education design, implement and assess curricula that integrate technologies into K-12 schools and their own teacher education programme (see http://www.teacherlink.org/). A major focus is the ways in which technology can be used to teach content areas including math, science, social studies and language arts more effectively; that is to

introduce innovative ICT in context. This is done in collaboration with local school districts. The richest symbiotic example is the 'Technology Infusion Project', which works with Albermarle schools to pair pre-service students with a practising teacher to identify and implement technology in appropriate ways into a classroom, with support from graduate students. Both AACTE and ISTE have made awards to the University of Virginia programme.

University of Texas at Austin: UTeach and recruit

The final two cases are responsive to the growing number of US learners whose first language is not English. Both have received ISTE NETS awards. They arise in states with particularly high densities of Hispanic and other cultural groups and provide valuable guidance to programmes that are only just beginning to address this issue.

At a time when the nation is beginning to recognise major shortages in the recruitment of science and math teachers, this example from the University of Texas illustrates a way to engage students' interest in education while they are studying for their first degree. The 'Uteach' partnership between two university colleges and a school district successfully combines active recruitment and support for natural science undergraduates with tuition reimbursement, small cohort groups of students and guidance by master teachers in Austin's schools (see http://www.uteach.utexas.edu/technology/). The related PT3 project successfully revised and streamlined the professional education sequence of courses, with early and ongoing field experiences that capture the imagination of pre-service teachers and provide a foundation for more advanced pedagogical courses. Integrated pre-service and content experiences prepare students to teach all levels of material to students of diverse cultural and socio-economic backgrounds – from the core curriculum to early university courses that integrate technology into math and science education. This includes optional service learning field experiences with Native American schools. The programme's flexibility also permits multiple entry points (from freshman to graduate) with proficiency-based assessment, including the development of an individual portfolio. UTeach won the ISTE NETS award in February 2002.

Arizona West – community service

Arizona State University West works with and for its local communities to provide an outstanding community service while also educating the next generation of teachers for kindergartens and elementary schools in the region (http://westcgi.west.asu.edu/pt3). The full description provided by its coordinator Helen Padgett using the format of this international study is

given in Appendix A to this article. The two most striking features of the programme, developed with PT3 funding, introduce technology in context and support innovation as recommended by the Ames White Paper (Thompson et al, 1999). The programme has also been organised to infuse ICT as appropriate:

> 'Students Teacher Plus' involves teams of a student teacher and a cooperating teacher attending workshops prior to and during the student teaching semester to support their joint development of units integrating technology into K-4 classes [ages 4-9 years], which are piloted by the student teachers acting as classroom teachers.
>
> Arizona Classrooms of Tomorrow Today – 40 model technology-rich classrooms in which interns, student teachers and teachers can observe technology being used effectively (informed by the famous Apple Classrooms of Tomorrow [Sandholz et al, 1997]).

This early childhood teacher education programme has been redesigned to embed technology and prepare students for professional roles concerned with the development and educational needs of children from birth to 8 years old. This takes three forms: modelling by faulty as they teach; technology-rich assignments for student teachers; and curricular units for the K-4 curriculum with instructional methodologies which are culturally and linguistically sensitive and developmentally appropriate for meeting the needs of a diverse population enrolled in urban, rural and very rural schools. English as a second language and adaptation for children with special needs are also integrated by complementing the expertise of student teachers with ASU West's specialist programmes.

The faulty work hard to achieve a range of standards including National Association for the Education of Young Children, ISTE NETS*T and NETS*S, and also full regional accreditation – a well-deserved winner of ISTE's award in February 2002.

Sustaining Good Practice

This article has attempted to draw out aspects that have the potential to sustain best practice with ICT in teacher education. At a national level there have been standards, awards and a federal funding initiative. As discussed earlier, standards set by ISTE have helped to spread good practice and to sustain it, especially when adopted by NCATE, the larger national accrediting agency for teacher education, because this brings ICT into the mainstream for programme requirements (see Stake, 1967, for example). The design of the Federal Department of Education's PT3 initiative is sustaining innovation by building capacity to change regionally and nationally as well as locally. Capacity building and catalyst projects have been particularly important to build a reservoir of expertise, resources and

support networks complemented by the ongoing collaboration with leading teacher educators and their professional organisations.

At the more local level, programme action to sustain good practice with ICT in teacher education is a complex process that needs to respond to ongoing changes in education and technology. Therefore it is linked to coherent planning across the participating organisations (Davis, 2002, provides a discussion of the characteristics of complex systems and models of change with ICT in teacher education). Teacher education programmes that develop mechanisms for continuing faculty, teacher and organisational development become better able to sustain good practice. The 'CREATER' model of educational change emphasises the need for a change agent working in complex systems to create a shared agenda for change built on complementary individual cares and concerns (Ellsworth, 2000; see Davis, 2002 for guidance on its use). Each of the cases selected illustrates this key strategy for sustainability, in which they engage partners in the provision of pre-service teacher education plus professional and organisational development in K-12 schools:

- Iowa State University's approach to simultaneous renewal has built complementary partnerships and courses that result in ongoing professional development for faculty and teachers plus mentoring for future faculty and pre-service teachers.
- The University of Virginia approach exploits its research Center for Technology and Teacher Education to develop ICT applications to serve discipline-specific needs. It implements these innovative processes in K-12 classrooms as part of the pre-service programme.
- The University of Texas UTeach recruitment for math and science teachers is in partnership with a local district and with university faculty to respond to local shortages of teachers.
- Arizona State University West's Students Teacher Plus teams pre-service students with practising teachers working together on a complementary agenda to improve practice in K-4 schools as well as teacher education.

Summary and New Challenges

This article has described the recent development of technology in teacher education in the USA and illustrated sustainable good practice with five case studies. The cases have included teacher preparation from early years to high-school advanced courses. It is notable that all cases come from well-resourced public universities that have a mission to serve their communities. This article recognises that they are doing an outstanding job in partnership with some of the schools that provide field experience. Many more universities also do this. ISTE's NETS standards for teachers are widely implemented across the USA, so the benchmarks identified by Kirschner & Davis (this issue) are indeed prevalent in the USA.

However, there is little room for complacency. Much yet remains to be done to spread the good practice and to keep abreast of technology development. In addition, historically under-resourced programmes of teacher education continue to have more difficulties in renewing their programmes to integrate technology to serve their communities. Approaches suited to the dominant European culture in the US need to be complemented with approaches suited to the populations that Historically Black, Hispanic and Tribal Colleges serve. Programme-wide portfolio assessment and learning communities would appear to be culturally appropriate, but these have yet to be well developed and researched, and challenges include these colleges' lower access to technology. Meantime the Government has changed in the US from a Democratic to a Republican Administration and priorities for funding are moving towards teacher quality with legislation that increases assessment for both students and teachers. Increased pressure for accountability is reducing opportunity for K-12 schools to manoeuvre with the result that some withdraw from partnerships in teacher education. It is to be hoped that evidence from the PT3 initiative of the value of technology partnerships for simultaneous renewal of education and teacher quality may help to stem this withdrawal.

Finally, as we look to the future, distance education is making its presence felt in K-12 schools and teacher education. The number of Virtual High Schools is increasing rapidly (Joiner, 2002). Maybe it is time to consider preparing tomorrow's teachers to support distance education (Davis & Nilakanta, in press). It should also be noted that an increasing proportion of K-12 teacher preparation is also taking place through distance learning, including a successful programme of teacher education provided through the University of Phoenix. In the future we will hopefully be able to identify good practice for a programme of teacher education led from a distance, aligned possibly with the standards developed by the National Staff Development Council (2001), and with support from the PT3 programme.

Acknowledgements

Thanks for the Dutch Government for initiating and supporting this study and to Paul Kirschner for his strong leadership. Also many thanks to the programmes described in the case studies, especially Helen Padgett of ASU West for her detailed analysis within the Dutch study's format of the outstanding programme she coordinates, and my colleagues in ISU.

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APPENDIX A. ASU West Early Childhood Teacher Preparation Programme Description for the Dutch study: checklist and evaluation

Please see Kirschner & Davis (this issue) to interpret the layout of the forms used to collect this data.

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Evaluation form

Evaluator	Niki Davis
Date	28/3/02 and 29/3/02

1. General information

Name of programme	Arizona State University West Early Childhood Teacher Preparation Program
Country of origin	USA
Countries of use	USA
Creator	Dr. Keith Wetzel and Dr. Michael Kelley
Publisher / Distributor	Arizona State University West
Sources for background information (i.e. internet, publications)	http://www.west.asu.edu/pt3/awards/netsaward.htm http://www.west.asu.edu/pt3/awards/documents/ECNETS.pdf http://www.west.asu.edu/pt3/

Comments:

Goal: Beginning teachers will be prepared to integrate technology into their classroom teaching.

Winner of ISTE Nets Distinguished Achievement Award Feb 2002.

- Comprehensive staff development and support for university faculty to learn and model technology integration in their curricula.

- Student teacher and their K-12 cooperating teacher have an opportunity to attend a Student Teaching PLUS course just prior to and during the student teaching experience.

- University/K-12 partnership designed technology-rich K-12 Arizona Classrooms of Tomorrow Today (AZCOTT) to serve as models for university practicum students.

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2. Content

Synopsis of the programme (max. 500 words)

Over the past five years, Arizona State University West (ASUW) has developed an Early Childhood program that features a curriculum based on the NETS-T, NETS-S, and the Arizona Teaching Standards. Support for change has been provided through 1) faculty development, 2) curriculum revision, and 3) technology friendly field placements. This support for change has led to an Early Childhood program in which 100% of the faculty integrate technology into their teaching and graduates are better prepared to use technology in their future classrooms.

The technology integration is embedded in an Early Childhood Program that prepares students to enact professional roles that will be concerned with the development and educational needs of the children from birth through eight years of age. Child centered in its approach, it offers professional education in:
1.the design of environments that are intellectually stimulating and challenging to young children, and that promote curiosity and resourcefulness;
2.modes of relating to young children that are nurturant and supportive of their well being, and that promote social competence; and,
3.curriculum and instructional methodologies that are culturally and linguistically sensitive and appropriate for meeting the language, learning, and affective needs of a diverse population enrolled in urban and rural schools.

This program remains true to the Early Childhood Philosophy while integrating technology in ways consistent with developmentally appropriate practices. The faculty work hard at supporting the programmatic standards of the National Association for the Education of Young Children.

Target group	Pre-service ☒ and/or in-service ☐ Pedagogic subject matter Elementary Education Program with an emphasis in Early Childhood Teacher level (primary ☒, secondary ☐, tertiary ☐)
Main goals(s)/ objective(s)	Provides new opportunities for the following groups to become proficient and confident users of technology in their classrooms: 100% of early childhood university faculty and 100% of early childhood teacher education students.
Specialisation (content / domain)	Programs in the ASUW College of Education are fully accredited by the North Central Association of Colleges and Schools (most recent accreditation was received in Spring, 2000). Graduates from the ASUW Elementary Education with an emphasis in Early Childhood Professional Teacher Preparation Program (PTPP) receive K-8 certification through the Arizona Department of Education (http://www.ade.state.az.us/certification).
Study aspects	Full-time ☒ and/or part-time ☐ Length of study (in semesters) UG around 4 semesters Prescribed / normative study burden (hours per week) 40

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Comments:
Professional Development Activities for Faculty
First ASUW faculty have learned to use technology in their disciplines. Second, Early Childhood (EC) faculty met regularly to develop a detailed curriculum plan for the systematic teaching of technology objectives that are sequenced and seamless throughout each program. As a result faculty modified their courses to integrate technology into a) instructor activities, b) the student objectives, and c) student assignments.

Professional development workshops for faculty offered a variety of technology training, ranging from Desktop Basics and MS Office to Web-Page Development and content specific software or technology based learning strategies. During each workshop, appropriate technical skills were presented and faculty explored and practiced implementation strategies. All EC faculty participated in technology integration workshops during the past three summers. One-on-one follow up support was provided to facilitate implementation.

EC faculty evaluated the technology components present in their courses. The program outcomes were aligned to state teaching standards, NETS-T, and NETS-S. EC faculty created a matrix that defines the evidence that students need to demonstrate proficiency in standards competencies.

As a result of these efforts, technology integration has taken on three forms among ASUW EC faculty. First, faculty use technology for instructor activities such as PowerPoint and on-line discussion groups. This serves as a model for preservice students in the course. Second, faculty have included technology-rich assignments in their courses, requiring students to create electronic presentations, incorporate digital still images, use software applications, and produce digital video. Third, faculty require students to create curricular units that incorporate K-3 student use of technology to accomplish lesson objectives. During field experiences students implement the created curricular units.

3. Pedagogical aspects

Epistemology	Objectivism	☐	☐	☒	☐	☐	Constructivism
Pedagogical philosophy	Instructivist	☐	☐	☒	☐	☐	Constructivist
Underlying psychology	Behavioural	☐	☐	☒	☐	☐	Cognitive
Goal orientation	Sharply-focused	☐	☒	☐	☐	☐	Unfocused
Experiential validity	Abstract	☐	☐	☐	☒	☐	Concrete
Contextual validity	Contextualised[1]	☐	☒	☐	☐	☐	Decontextualised[2]
Flexibility	Teacher-proof	☐	☐	☒	☐	☐	Easily modifiable
Accommodation of individual differences	Non-existent	☐	☐	☐	☒	☐	Multi-faceted
Learner control	Non-existent	☐	☐	☒	☐	☐	Unrestricted
User activity	Mathemagenic	☐	☐	☐	☒	☐	Generative
Co-operative learning	Unsupported	☐	☐	☐	☒	☐	Integral

[1] I can use what I learn / make 'immediately'
[2] Learn now, use later

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Cultural sensitivity	Non-existent ☐ ☐ ☐ ☒ ☐ Integral

Comments:
The open nature of the learning is mainly through authentic learning, often in K-6 schools with support from a master teacher.

Student Teaching PLUS Course
Arizona State University West Early Childhood teacher education students complete a practicum experience in a K-3 classroom each semester. A unique aspect of the PT3 project is that ASUW students and their mentor or cooperating K-3 teachers have an opportunity to attend a Student Teaching PLUS course together. They attend the course prior to and during the student teaching semester and create a standards-based technology-integrated curriculum unit using the framework called a Unit of Practice. As they implement the unit, they share their implementation experiences and evaluate the unit. Both the ASUW student and the K-3 mentor teacher receive graduate credit hours for participating in the Student Teaching PLUS course.
Often the Arizona State University West student is strong in technology and the K-3 mentor teacher is strong in content. This provides a close partnership in integrating technology into the curriculum through reciprocal mentoring.

The Unit of Practice has seven components including:
– Standards (content, technology, & TESOL) -- What is to be learned?
– Invitation/Essential Question -- The curriculum question and project overview that the students will be addressing. What are students being invited to learn and do?
– Situations/Learning Environments -- Where, when, and for how long each task will take place in the learning environment.
– Interactions -- The way the students will work, the ways the teacher will work with the students, and the ways the students will interact with others.
– Tasks/Activities with adaptations for differentiated instruction -- The actions that the students will be asked to undertake. What will students do?
– Tools and Resources -- All materials, specific software and web sites that the students will use to accomplish their tasks.
– Assessment -- How students will show they have met all standards through their completed tasks.

4. Technical and organisational aspects

Form of study (1)	contiguous ☒ vs. distance ☐
Form of study (2)	paper based ☒ vs. stand alone electronic ☒
Educational materials (media used)	Many and varied, including computers, software, Internet URLs, books, standards-based technology-integrated curriculum units, and the creation of electronic portfolios.
Critical support for use of media	Online mentoring is used in addition to class time
Technical preconditions (operating system, etc.)	The ASUW PT3 Project created K-12 Arizona Classrooms of Tomorrow Today (AZCOTT) that provide a variety of models of classrooms of the future. Each AZCOTT classroom has five or more multimedia computers, a projection system, and Internet connections. The AZCOTT program is a partnership between ASUW College of

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	Education and K-12 School District Partners. ASUW provides the professional development for the K-12 teachers and the school districts provide the technology and the support for the technology. ASUW interns and school district teachers visit and participate in these model classrooms. There are currently 40 AZCOTT classrooms as part of this project.
Institutional costs (how much? / for what? - in US$)	fixed not known, but the PT3 grant was awarded a U.S Department of Education grant of $1.1 million over three years (1999-2002) variable (telephone/cable, printing, etc.) not known
User costs (how much? and for what? in US$)	fixed per semester hour as is normal in the USA, around $130 each semester hour or for Arizona residents $1,254 per semester for seven or more credits variable (telephone/cable, printing, etc.) Computer fees are normally not charged in addtion for use of the labs etc in the university

Comments:
Five years ago ASUW established a COE Technology Committee and began to require all students at orientation to sign up for and learn to use university email and First Class conferences for threaded discussions. Since 1999, a Preparing Tomorrows Teachers to Use Technology (PT3) grant has provided the resources to enable the COE to implement a well-planned and cohesive effort to ensure that students experience good models of technology-infused teaching in a) their COE classes and b) their field placements. These efforts have changed the COE curriculum and the way COE faculty teach and have assisted ASUW school district partners in the creation of model K-12 technology-infused classrooms.

These technology initiatives within the COE have been supported by aggressive implementation of the campus-wide Information Technology Strategic Plan. Currently, there are 523-networked computers available on campus and two airport wireless areas to support student use; 85% of all computers, multimedia projectors and software licenses are less than 3 years old. Approximately 70% of all classrooms have presentation computing stations installed with the goal to equip all classrooms within the next 2 years. Virtually 100% of the campus classrooms have Internet and video (TV/Satellite) connections. Teaching facilities include: 3 mobile computing carts each with 15 wireless laptops available for classroom use, three Windows labs and two Macintosh labs that COE share with other colleges, two teaching classrooms with seven computer group stations around the perimeter of the room, and three early childhood teaching spaces have 3-6 computers to simulate the elementary classrooms graduates will see in local schools. Finally, the campus has established technical support for faculty coordinated through a campus-wide HELP desk and 6 computing support personnel housed in the academic units. Technology support and access for students is available through Technopolis, a computing commons.

The COE has, within its strategic plan, a goal to move toward full technology integration within its curricula and classrooms. All faculty and staff have multimedia computers with Internet access in their offices. All COE dedicated classrooms have computing presentation stations fully wired with Internet and TV/Satellite connections. There is sustained and ongoing faculty training in technology integration. Since 100% of our students have computers at home and approximately 65% have Internet access, the COE faculty have greatly expanded the use of email and electronic online class discussions using the Blackboard software through the MyASU portal. All

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COE students receive free email and training in using the portal during the first week of their first semester in our Professional Teacher Preparation Program.

Factors that insure sustainability include the hiring of a technology integration specialist, the establishment of a technology budget, and a 3-year cycle of hardware and software replacement for all faculty. Finally, all new COE faculty hires must have, as part of the desired job qualifications, technology integration knowledge and skills.

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Checklist - Standards for the choice of a programme for inclusion as good/best practice

Evaluator	Niki Davis
Programme	Arizona State University West Early Childhood Teacher Preparation Program

The chosen programme for initial teacher training attempts/is designed to allow the aspirant teacher to:

1. Become a competent personal user of ICT (i.e., ICT as a personal tool)[1]	☒
2. Competently make use of ICT as a tool for teaching (i.e., using ICT for better teaching)	☒
3. Competently make use of ICT as a mind tool (i.e., using ICT as a motor for new forms of teaching and learning)	☒
4. Command/master a range of educational/pedagogical paradigms which make use of ICT	☒
5. Command/master a range of assessment paradigms which make use of ICT	☒
6. Understand the policy dimension of the use of ICT for teaching/learning (i.e., that ICT implementation at the classroom (micro) level requires policy at the school (meso) and district/national (macro) level	☒
7. Other (often social) aspects of ICT use in education	☒

Comments:

100% of Arizona State University West Early Childhood faculty integrate technology in teaching and students feel well prepared to integrate educational technology in the grade or subject they will teach. This is important because students participate in many classrooms in which technology is used uniquely. For example, in classroom organization, students use a computer program to design the layout of their future classroom, and in the curriculum course, Early Childhood majors communicate with Special Education majors using threaded discussions (Blackboard) to discuss and plan adaptations for children with special needs.

1 In the Netherlands this is referred to "receiving a digital driver's license".

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Checklist - Explication of the standards

Ad 1. Become a competent personal user of ICT

- Office applications (word processing , spreadsheets, databases, drawing, web page editor)	☒
- Resource tool (CD-ROM, Internet, Portals, Search machines)	☒
- Communication tool (email, video conferencing, listserv, chat, ICQ)	☒
- Work tool (project environments, CSCL)	☐
- Communication between and within student groups	☒
- Communication between and with teachers	☒
- Communication between school, parents, local community and society	☒
- Administration (maintaining records, MLEs, registration, time tabling, reporting)	☒
- Continuing education / life long learning for the teacher	☒

Comments:
All ASUW student curriculum units become CD-ROM based. ASUW students use Adobe Acrobat Writer to create a mini portfolio. Each student in the class leaves with a CD-ROM containing all of the lessons created by the class. Each lesson includes technology-enriched activities for K-3 children.

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Ad 2. Competently make use of ICT as a tool for teaching

- Adapting technologies TO good/better teaching such that the leaching/learning CAN change for the better (be more effective/more efficient, achieve ends that were heretofore impossible)	☒
- Planning for individual, group and whole class activity	☒
- Learning material preparation and production (paper based, multimedia, web based)	☒
- Instructional design of course materials (Designer's Edge, Simquest, etc.)	☐

- Considering the possibilities / consequences of using ICT such as
  - Multimedia (animation, 3D, graphics, video, sound)
  - Networking / Collaboration / Co-operation
  - Simulations / Modelling
  - Audio and video on demand (synchronous / asynchronous)
	☒

- Selecting resources such as
  - Learning environments (WebCT, Learning Space, Blackboard, etc.)
  - Project environments (Projectplace, E-Project, etc.)
  - Collaborative environments (CSILE, Belvédère, KIE, etc.)
  - Software
  - Software support
	☒

- Teaching at a distance (non-contiguous, distributed, often asynchronous)	☐
- Team teaching in situ or at a distance	☐
- Mediating between students and technology - questioning, focusing, assessing, monitoring	☒
- Differences between learning with, learning through and learning about ICT	☒
- Managing teaching (communication) both in blended learning and at a distance	☐
- Manage learning	☒
- Implications of different machines and platforms (laptops, PDA, desktops, etc.)	☒
- IP telephony, video conferencing at desktop or whole group	☐

Comments:
ASUW students take a technology literacy course that provides exposure to current technology resources and provides hands-on opportunities to utilize a variety of hardware and software in curriculum planning and implementation.

Ad 3. Competently make use of ICT as a mind tool

- Collaboration on pedagogical projects (with other teachers, experts, designers, etc.)	☒
- Co-operation between teachers, teacher educators, and student teachers	☒
- Teacher as member of a professional team	☒

Comments:
ASUW preservice students have an opportunity to participate in a course with their practicum mentors. Student Teaching PLUS assisted K-3 teachers in learning to use technology in their classrooms. Preservice students and

their mentor teachers attend classes prior to and during the student teaching semester that assists them in the development of curriculum units integrating technology. The preservice students, with the collaboration of their mentor teachers, then implement these technology-rich units during their practicum experience.

Ad 4. Command/master a range of educational/pedagogical paradigms which make use of ICT

- Collaboration / co-operation
  - asynchronous (email, discussion lists, web based forums, listservs)
  - synchronous (video, audio, chat, whiteboard, file sharing)
	☒

- Resource based learning (informing, asking questions, evaluating, comparing)	☒
- Effect on teacher role	☒
- Effect on school culture	☒
- Effect on students with respect to autonomy, authentic activity, learning styles, situated learning, motivation, disenfranchising	☒

Comments: ASUW students collaborate with K-3 teachers on curriculum units that when completed are published on a website. Many online resources are shared that will support the ASUW students when they begin teaching.

Ad 5. Command/master a range of assessment paradigms which make use of ICT

- Assessing using ICT tools (limitation and affordances)	☒

- Assessing learning in new ways
  - Self assessment (e-portfolios, learning diaries, notes)
  - Peer assessment
  - New forms of (authentic) assessment (e.g. through multimedia, group assessment)
  - Formative and summative assessment
	☒

-	☐

Comments: ASUW students learn to create and apply rubrics for specific learning experiences using online resources. Early Childhood students create an electronic portfolio that demonstrates their ability to build a standards-based technology-integrated curriculum unit.

Ad 6. Understand the policy dimension of the use of ICT for teaching/learning

- ??	☐
- ??	☐

Comments:

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Ad 7. Other (often social) aspects of ICT use in education

- Teaching and learning specialist subject(s) with ICT	☐
- Teacher as member of a school community (school newspaper, school Website)	☒
- Support for personal ICT development	☒
- Assessment of trainees own learning using ICT	☒
- Modelling of good ICT practice by HE tutors	☒
- Implications of the Information Age on schools and schooling	☒
- Impact of ICT on society	☒

Comments:
In January 2001 the core Early Childhood faculty implemented the NETS-T standards. It should be noted that the implementation is a recursive cycle, i.e., faculty are continuing to further their knowledge of technology and instruction and are adding new and more sophisticated uses of technology each term.