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ABSTRACT

Enhanced student learning is the primary objective of integrating technology into classrooms. In order to realize this objective, several critical success factors must be addressed: Access to Technology, Administrative Services, Professional Development, and Curriculum Integration. In this Technology Plan, recommendations are made for action at the state and local levels, for each of the four critical success factors. Equity, hardware and software acquisition, connectivity, technical and instructional support, and funding are specifically addressed under the first factor, Access to Technology. For Administrative Services, recommendations are given for electronic sharing of data, management of human and financial resources, student information systems, and community information systems. (AEF)

North Dakota State Education Technology Plan

1998-1999

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North Dakota State Education Technology Plan

Jane is a 5th grade student with an assignment to research and report on the extinction of dinosaurs. Her teacher suggests that a multimedia presentation would be a fun and effective way to do the project. Jane is excited at the prospect of using the computer for the assignment. She decides to begin in the library, where the media specialist suggests a couple of sites on the Internet to begin her research. Over the next few days, she accesses various paleontology sites on the Internet, gathering information and downloading graphics for her presentation. She emails the authors of each website to get their opinions on why the dinosaurs became extinct. Jane then takes the information she has gathered and begins to outline her multimedia presentation using a word processor and brainstorming software. Within a week she receives email responses from the paleontology experts and integrates their ideas into her outline. With the initial research and planning complete, Jane begins to create her multimedia presentation. She cuts and pastes information from her outline and inserts the graphics she has downloaded into her presentation. A few days later she presents the finished product to her teacher and class. That night, Jane's parents ask what she learned in school that day. Jane excitedly explains, "did you know that some scientists think a giant meteor crashed into the earth millions of years ago and killed all of the dinosaurs?"

Preface

Educational technology encompasses the use of tools to enhance and support teaching and learning. It involves developing and expanding higher order thinking skills, cognitive ability, and the synthesis of information. Technology expands the walls of the classroom to give students experiences that are not normally available in our schools. Technology allows field trips without leaving the classroom, the modeling of complex scientific experiments, and the ability to communicate with people around the world.

Technology that is integrated into existing curriculum provides authentic experiences that expand higher order thinking skills and teach computer literacy simultaneously. For example, a student who uses a word processor as a writing process tool also learns how to operate a word processor. The difference lies in the goal of the technology experience. The primary goal is teaching the writing process and the secondary goal is learning to use the word processor. If using the word processor (computer literacy) were the primary goal, then technology would be an extra area that had to be taught during an already busy school day.

Enhanced student learning is the primary objective of integrating technology in our classrooms. In order to realize this objective several critical success factors must be addressed:

- Access to Technology
- Administrative Services
- Professional Development
- Curriculum Integration

Throughout this document recommendations are made for action at the state and local levels. Initiatives at the state level should encompass these four critical success factors. Local school districts should include all four critical success factors when creating and implementing their technology plans.

Access to Technology

Access refers to the general infrastructure necessary to provide and maintain effective and efficient computer hardware, software, and connectivity on an equitable basis. This section addresses equity, acquisition, connectivity, support, and funding.

Equity:

Technology is having a profound effect on education. However, the benefits of technology on the educational mission and administrative functions of schools throughout North Dakota vary widely. They depend not only on the local availability and commitment of financial and human resources, but also on the receptivity to change within each community. As access to educational resources increases through the use of technology, it is critical that all students in North Dakota have an equal opportunity to participate in technology-enhanced learning. Otherwise, North Dakota risks failure to serve the learners at greatest risk: those with special needs; the very young; older adults; those with limited English proficiency. Also at risk of being left behind are those scoring poorly on standardized tests; those from low socio-economic backgrounds; those for whom a historic technology bias exists; and those living in remote areas that lack access to a full spectrum of curriculum choices and informational resources.

State Recommendation:

- The Department of Public Instruction, working in conjunction with the Governor's Office, the North Dakota Legislature and broad educational interests in the state, should examine issues regarding access to technology-delivered learning opportunities and resources for all students, then develop and support policies which promote and improve equity.

Local Recommendation:

- Local schools and districts should provide all students and educators with access to network ready multimedia capable computers.

- Local schools and districts should provide after hours access to school technology for students and community members who may need access.

Hardware and Software Acquisition:

Hardware and software acquisition refers to the systematic decision making involved in the selection, upgrading, and placement of school technology. If planned and coordinated decisions are not made, schools will be plagued with hardware and software that does not meet the needs of students and educators.

Local Recommendation:

- Schools should provide network ready multimedia computers in all classrooms for instruction, research, and communication. The computers need to be connected to local area networks, wide area networks, and the Internet and be available throughout the instructional day.

- Schools should plan for a ratio of 5:1 students to network ready multimedia computers.

- Technology resources should be matched with the applications required of the instructional goal. Instructional applications such as word processing, spreadsheet, database, graphing and publishing can be accomplished using older computer models and can transition into higher level courseware, multimedia applications and Internet, as machines are upgraded and fully connected.

- Local schools and districts should have a plan for updating, refurbishing, and/or replacing hardware and software resources on an annual basis. Existing and emerging technologies should be investigated on an on-going basis.

Connectivity:

Connectivity addresses access to information and communication resources within the building, the district, the community, and the world. Outdated buildings, obsolete hardware/software and the lack of well planned and managed networks make the issue of connectivity difficult and create inequities for students.

Local Recommendation:

- School buildings should have the necessary wiring and cabling needed for new technologies.

- All computers (classroom and administrative) should be connected to a Local Area Network.

- All buildings within a district should be connected to a high-speed district Wide Area Network with Internet access.

Technical and Instructional Support:

There are two types of support staff: personnel who provide technical support for the equipment such as file servers, workstations and other network components and personnel who provide instructional support for software applications and curriculum integration. The number of support personnel necessary is a function of many variables, including the size of the network, its complexity, and the level of support desired for users.

Finding qualified personnel with the necessary skills is a difficult task. Districts have traditionally relied on the famous last line in employee contracts, "other duties as assigned" to assign technical responsibilities to a willing teacher or administrator. A point is reached where the skills become too specialized, or time demands too great, to continue with a part-time or untrained person. The use of part-time staff or teachers who have classroom responsibilities also means response time is constrained. Those who cannot receive immediate assistance will be angry and frustrated. On the other hand, current market demand for trained technology specialists is very high, and the pay is frequently outside the range of what schools are accustomed to paying classified staff.

Local Recommendation:

- The size of the technical and instructional support staff must be consistent with the size and complexity of the environment. For example, networks in which all computers are the same are easier to support than networks in which significant differences exist in age and configuration.
- Provide effective, on-going training for technical or current staff assigned these duties.
- Local districts should adopt standards so that they are supporting a minimum number of hardware and software configurations.
- Continue to cooperate to aggregate resources such as participation in the ND School Net Cooperative.

Funding:

Funding is essential to successful integration of technology in schools. Consistent and comprehensive funding for technology systems is difficult due to the common practice of funding the purchase of technology through the use of grants. This type of funding typically is good for one-time expenditures, but is inadequate as a funding mechanism for on-going cost such as training of teachers, necessary support staff and equipment replacement.

State Recommendation:

- It is recommended that state funding based on enrollment be provided for technology on an ongoing basis.

Local Recommendation:

- School districts should use local mills as the foundation of a consistent and ongoing technology budget.
- School districts should tap into a variety of other funding sources for technology.
- Schools are encouraged to participate in group purchase programs with other districts or consortiums.
- Schools should evaluate all options for acquiring technology including leasing.
- If schools receive discounts for telecommunications services they should budget equivalent local funds for ongoing technology needs.

Administrative Services

Administrative services encompass the technology infrastructure needed to support the daily operations of a school or school district. Administrative services include electronic data sharing, human and financial resource management, and student and community information systems. Student information

systems ultimately provide the performance data that indicates how students are progressing and whether educational objectives are being met.

Financial and human resource systems measure the cost of providing the service. Community information systems share this information with parents, taxpayers, government agencies and others who have a direct interest in the educational objectives and their cost. Technology can be used to gather, analyze, store, and share data to make this process as efficient as possible. Data must be readily accessible, current, and secure. Administrative systems must be well managed. Routine maintenance, back-up, and disaster recovery systems are necessary to ensure system availability. The implementation of security measures is critical to prevent unauthorized access to confidential data. Year 2000 planning and compliance checking will reduce the risk of related disasters as we approach the next millennium.

Administrators, teachers, and staff need access to data from each building, classroom, or office. They must have the skills necessary to use this technology. The administrative office should provide a model to educators and their students on the application of technology to solve day to day business issues. Teachers must have the ability to update attendance, grades, and other student records information from their classrooms, offices or even their homes. Administrators and staff need access to budgets, financial and human resource records to efficiently manage the business side of the operation. Redundant tasks, such as those found in libraries and food service, are made more efficient and effective through automation.

Federal and state government agencies as well as local school boards require accountability reports based on student and financial data. Reducing the burden of accountability reporting requires that the data be consistent, available in a number of formats, and easily generated. Data need not be reentered into multiple systems or transcribed onto various forms, but rather it should be entered once and then queried and formatted by the computer into the format needed.

Electronic Sharing of Data:

Electronic sharing of data is essential for efficient and accountable school management. The many stakeholders, who fund education programs, including the state and federal government, each have unique reporting requirements. There is also a need to share transcripts with peer institutions and higher education institutions. Paper based reporting must be eliminated as much as possible to ensure the data is accurately transmitted and data entry is minimized.

Currently many schools do not have automated systems at the local level and must generate the reports manually. Others lack the capability to transmit the data over the Internet and must rely on the cumbersome process of transferring diskettes through the mail.

State Recommendation:

- The Department of Public Instruction should provide the infrastructure and applications that will allow the electronic transfer of required reports within web-based environments.

- The state should determine/develop data collection requirements differentiated by the needs at the state level, local school district level as well as vocational education and higher education.

Local Recommendation:

- Schools should put systems in place to be able to transfer data electronically.

Management of Human & Financial Resources:

Technology should be used by school administrators to efficiently process and manage financial and human resources. Accounting, payroll, and food service systems should be automated so that data can be analyzed and reported.

State and federal program providers and local constituents are requiring greater accountability, much of which can be provided through the use of technology. Performance indicators from student information systems can be merged with financial information to determine program costs and numbers of students who benefited. Systems should have the ability to do "what if" analysis so that administrators and board members can explore options when making decisions about budgets or contract negotiations.

Technology can be used to streamline administrative functions so that resources can be focused on the core responsibilities of teaching and learning. Payroll can be automated to the point where employees' pay is automatically deposited in their bank accounts without the time and expense required to issue paper checks. Food service accounts can be updated at the point of sale to increase the accuracy and timeliness of the information. Facility scheduling can be made available online so that the schedule is always up-to-date and rooms can be scheduled from more than one location.

Education as a whole has been much slower to adopt technology to streamline its business processes than other industries. In many cases, those that have implemented administrative systems are not using the data to analyze performance.

State Recommendation:

Professional development programs should provide experiences in using administrative technology and analyzing data to evaluate performance at the program, school and district level.

Local Recommendation:

- Financial, payroll, asset control, purchasing, and food service records should be automated.
- Administrators need to be aware of technological tools available to them and be able to use such tools to analyze data.
- Processes should be in place to allow administrators and staffs ready access to appropriate financial data.

Student Information Systems:

School administrators and staff should use technology to efficiently access, process, and manage student information. For example, student registration, class schedules, grading, individual education plans, and evaluations.

Data should be entered only once. A student's registration information, along with teacher and classroom information can be used to automatically generate class schedules for students and rosters for teachers. Teachers must be able to create grades and attendance records without reentering the students' names. Likewise, grade and attendance reports submitted by the teacher are not reentered at the administrative office. Counselors, teachers, parents and administrators should be able to access the entire student record online to form a more complete picture of the student. Administrators should be able to generate mailing lists to students and parents from the data.

Once student information is gathered it can be aggregated for evaluation of programs and methods. Information about cohort groups can be analyzed to determine the effectiveness of individual programs or teachers. Critical success factors to student achievement can be identified through analysis of the data. School improvement programs will be able to set specific targets and identify progress toward those objectives by measuring changes in the data across the student body.

While most large schools have automated student record systems, many smaller schools do not. In schools that do have automated systems, the primary use is to streamline administrative tasks such as registration and scheduling. Few schools or districts use the data for evaluation of the educational system as a whole.

State Recommendation:

Professional development programs should provide experiences using administrative technology and analyzing data to evaluate performance at the program, school and district level.

Local Recommendation:

- Districts need to build capacity so that they can utilize the technology and data available.
- Student records and related information (i.e. classes offered, teacher assignments) should be automated.
- Administrators need to be aware of technological tools available to them and be able to use such tools to analyze data.
- Processes should be in place to allow administrators and staff-ready access to appropriate student record data.

Community Information Systems:

The community must have access to school information. Schedules for extracurricular activities, curriculum standards, policies, the school calendar, lunch menus, graduation requirements, student recognition items and bond issue information are among the many topics that should be available to the public. The district's web site should be updated regularly to provide this information. Voice response

systems are another option for providing information on demand. Technology can also be used to publish newsletters to parents or the community. Word processing software and desktop publishing software can produce professional camera-ready copy. Labels can be produced instantly by selecting the target group from a database.

Electronic messaging systems can be used to forge closer links among all participants. It is essential that teachers and administrators have e-mail or voice mail so that they can receive messages when they are in the classroom or busy and respond during a free moment. Homework assignments should be available from home and educational resources should be available on the school's web site. In the future, it will be possible for students and parents to have secure access to the student's record online via the Internet so that they can track progress on a regular basis.

State Recommendation:

- State agencies, professional organizations and services providers should maintain web sites with up-to-date information about programs provided and resources available.

Local Recommendation:

- Schools should use technology such as World Wide Web and voice response systems to communicate with community members twenty-four hours per day. For example board policies, extra-curricular activities schedules, and other relevant information.

Professional Development

The challenge of professional development is to train teachers to seamlessly integrate technology into the curriculum to improve teaching and learning. The integration of technology into the curriculum should be viewed as a process - not an event. Professional development activities for inservice teachers are currently available through a variety of sources: local school districts, vendors, colleges and universities, and regional and statewide educational agencies. Professional development activities are available as

- continuing education at local level,
- undergraduate or graduate workshop credit through colleges and universities,
- part of undergraduate and graduate programs at colleges and universities,
- web based workshops, and
- individualized instruction at the local level or by contract.

Professional development in the area of technology integration must include everyone involved in education including teachers, administrators, library media specialists, and others. Professional development in the area of instructional technology implementation poses several problems. One problem is that veteran teachers have typically received very little or no training in instructional technology during pre-service experiences. In-service opportunities are often short one-time sessions with little follow-up or ongoing support. In many cases professional development is the responsibility of individual teachers based on voluntary participation rather than planned and implemented at the building or district level. This approached has resulted in a small number of teachers progressing in the area of technology integration while others fall further and further behind. Very few financial incentives exist as motivators for teachers to invest the large amount of time and energy necessary to integrate technology as a tool for teaching and learning.

State Recommendation:

- State government departments such as the Department of Public Instruction and the State Board for Vocational and Technical Education and other state-level entities should continue to seek out and participate in federally sponsored or other state-level programs and funding opportunities.

- Although there are currently no requirements in the North Dakota teacher certification process for demonstrating the appropriate use of technology, a credential should be created that would provide teachers, schools of education and school districts with a process for meeting and verifying nationally recognized technology integration competencies.

- Certification requirements for teachers in the state of North Dakota should assure school districts that certified teachers have the ability to integrate technology into their curriculum.

- Technology integration should be incorporated into preservice education classes.

- The university system has a key role in preservice education and should take on the responsibility of providing professional development to teachers in technology integration.

Local Recommendation:

- Districts should strive to dedicate 25% of their technology budget for professional development.

- Districts should continue to seek out and participate in state and other funding opportunities.

- Technology integration skills should be evaluated as a component of the annual teacher evaluation process.

- Professional development activities should include requirements that teachers produce materials that document how technology is being used in student learning activities.

- Technology integration skills should be included as part of the teacher job description.

- Professional development activities should be focused on methods and strategies to integrate technology into all curricular areas and instructional settings.

- District technology plans should provide for on-going professional development for all staff.

- Local school districts should insure that professional development activities are designed to meet or exceed the most current instructional technology standards by organizations such as National Center for Accreditation of Teacher Education and International Society for Technology in Education.

- Educators should be able to use educational technology tools to acquire educational materials in electronic forms.

- Educators should be able to use educational technology tools to develop lesson plans incorporating material electronically retrieved.

- Educators should be able to use educational technology tools and to adapt them to the teaching and learning processes.

- Educators should be able to use educational technology tools to communicate with parents, students, peers, and content experts.

Curriculum Integration

The implementation of technology in North Dakota schools has the potential to enhance, expand, and transform curricula by providing technology rich experiences for our students. Technology can be used to teach basic computer skills, give students repetitive practice experiences, or it can be integrated into the existing curriculum.

Each of these technology-teaching strategies has merit, however integrated technology can provide authentic learning experiences for student. This model of learning is centered on learners having experiences that provide useful personal knowledge. The learner then takes these authentic and useful experiences and assembles them in a way that makes sense to the learner.

Technology also has the potential to transform curriculum and teaching methods. The traditional textbook, pencil and paper are giving way to CD-ROM based curriculum and laptop computers. As the delivery methods change, there is an opportunity to evaluate and modify teaching strategy and pedagogy. Instant access to vast amounts of information will allow teachers to help students learn to evaluate, synthesize, and communicate information effectively.

North Dakota teachers need opportunities to learn more about integrated technology experiences and how authentic learning experiences can enhance education.

State Recommendation:

- The state should continue to fund statewide technology service providers who offer instruction to school districts and individual teachers regarding the curriculum integration of technology.

- As state curriculum standards are rewritten, the state should ensure that technology based resources and activities are included.

Local Recommendation:

- School districts should provide training experiences for teachers regarding curriculum integration of technology. Emphasis should be placed on creating technology rich, authentic learning experiences for students that enhance and expand the existing curriculum.

- School districts should provide appropriate technology based learning experiences at all grade levels to ensure consistent progress toward technology proficiency for all graduating students.

- Schools should use the national and state curriculum standards to develop technology integration curriculum activities and implement them in every classroom.

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