

Emerging Technology Project

Focusing on National Standards for Technological Literacy

by

Department of Career and Technical Education

Premise

The present and future workforce demands that students be technologically literate to succeed in a highly competitive and global market. If we, as a state, are going to remain competitive both in the training and education of knowledge based workers, and attracting new and expanding industries that are looking for a well prepared workforce, we need to provide students with a fundamental understanding, through experiential learning, of the technological principles that will prepare them for their future education and careers. These technological competencies are the National Standards for Technological Literacy that have been adopted by the State Board for Career and Technical Education and are implemented into our Technology Education programs across the state.

Background

The Emerging Technology project had its beginnings in the High Tech Initiative in the late 1980's. At that time, the State Board for Career and Technical Education helped establish and provide initial federal funding for consortiums of schools to form "High-Tech Cooperatives" each comprised of 6 to 20 schools that rotated a variety of technology based equipment between members of the consortium. This rotation concept enabled the schools to share the cost of equipment and kept expensive equipment in use as it moved from school to school. The results were that the High Tech equipment was being used by students and teachers. Also with the modules rotating between schools it was being used all the time, in effect wearing out equipment due to use rather than it growing outdated on a shelf when a particular class was finished with it.

The SBCTE provided federal startup funding, some for professional development and a minimal amount of funding to be used to repair and maintain the equipment. The balance of the funding to operate, replace, and repair equipment came from the member schools through membership tuition. Each member school paid a yearly tuition fee to the consortium of \$2,000 to \$5000 depending on the consortium that they are in. There are currently 67 schools in six consortiums. The number of schools currently in a consortium varies from 3 to 20.

While these consortiums initially were able to maintain the equipment that were in the learning modules, the equipment replacement cycle and the high usage of the equipment has outpaced the ability of consortiums to replace outdated or worn out equipment. The equipment that is currently being rotated between schools on a four to six week rotation

is: Robotics, CNC Milling/Lathe, Biotech/Genetics, Lasers, and Hydraulics & Pneumatics, along with some other equipment that individual consortiums have developed for their area. The variety of equipment, along with new equipment to be added to the rotations, will enable the curriculum to align to the standards for technological literacy.

Initiative

This initiative would provide funding to replace and update equipment in existing schools (67) and pilot an additional 29 schools for a total of 96 schools or 8 to 10 consortiums. This represents a little over one half of the current school districts across the state. The creation of a consortium would be left up to the local schools with basic guidelines set by the DCTE through a management team derived from consortium membership, industry, and state staff. Local schools would apply for approval of their consortiums by identifying the size of the consortiums, the equipment they will utilize, the standards that they will follow, the length of rotation, how they will maintain the equipment, how the equipment will be rotated, a professional development plan, a fiscal agent for the consortium, an equipment and operational budget, and a process for identifying students who have participated in the classes. The guidelines are reflected in the remaining sections of this request.

Proposed Budget

The state funding would be used for purchasing new equipment, development of curriculum, and professional development of teachers. The proposed local funding would be used for professional development of teachers, rotation of equipment, technical support, supplies, travel, and equipment repair. Local schools/consortiums will provide funding and/or in kind support for the total cost of operating the consortium. State funding will be on a reimbursement basis. Consortiums will submit requests for approval of specific equipment and/or professional development activities and when approved, can purchase and submit claims for reimbursement to the Department of Career and Technical Education. Total funds allocated to each consortium will be based on the number of schools and whether they are a new or existing participating school. The total budget for the proposed project would be:

67 schools @ \$6,000 per year/\$12,000 biennium	\$804,000
29 new schools @ \$11,000 per year/\$22,000 per biennium	638,000
Total of 96 districts	\$1,442,000
Operation and Administration (Travel, supplies, curriculum development)	58,000
Total state contribution	\$1,500,000

Local school contribution (cash or in-kind)

\$4,000 per year/\$8,000 biennium	768,000	
Total program budget		\$2,268,000

Schools currently operating a consortium would receive less money because they have a base of equipment and will use funds to replace, on a scheduled basis, older equipment with new equipment. New schools would receive a larger amount to be able to “buy in” to an existing consortium to expand current or build new modules to accommodate the additional rotation needs or to form a new consortium to build equipment modules from scratch.

With this budget, a consortium of 12 schools could expect to receive from \$144,000 (12 x 12,000) to \$268,000 (12 x22,000) depending if they were new or established schools.

Sample operating local budget for a 12 school consortium

(This budget is only for illustrative purposes. An individual consortium may provide varying line items in different amounts or as in-kind match, for example in services, training costs, or fiscal management)

Income (12 schools @\$4,000 cash or in-kind)		\$48,000
Equipment repair/maintenance	4,600	
Equipment Transportation Cost	6,000	
Training and Production Supplies	7,000	
Instructor Training	6,000	
Consortium Support Services	22,000	
Fiscal Management	2,400	
	Total Expenses	\$48,000

Administration

The project would be administered by the Department of Career and Technical Education. The DCTE would form an advisory board/management team made up of representatives from the consortiums, state staff, business and industry. It would be the responsibility of the management team to review present and future learning modules, advise on formation of new consortiums, recommend statewide training of teachers, review and recommend curriculum/standards updates. Each consortium will form a local management team that will be responsible for the activities of the consortium; which modules to use, rotation schedule, provide for technical support, rotation schedules, and operational budget.

Consortiums

Consortiums must demonstrate that they are effective and efficient to operate at their membership level. The plan must show the rotation schedule, length of each rotation, how the rotation will be carried out, the modules that it will incorporate, how it will maintain and service equipment, and how it will measure the impact of the program

through such measures as the number of students exposed or career pathway choice through high school and further education.

New consortiums will be approved based on local commitment and lack of regional availability to present consortiums.

Curriculum

The present and future curriculum will be aligned to the “Standards for Technological Literacy”, which have been developed nationally and are the cornerstone of Technology Education programs in North Dakota. These standards identify what students should know and be able to do to become technologically literate. These standards have been formally reviewed by the National Academy of Engineering, the National Research Council, and the technology teaching community. The standards will be consistent across the consortiums, but consortiums may have different modules dependent on the needs of that school and region. The curriculum will also be aligned with the program area that the teacher is certified in. Each of the modules will have a career component integrated into the curriculum to make students aware of the careers that are available in that area.

Modules

New modules will be added and existing modules may be deleted as more effective ways of teaching the Standards for Technological Literacy are examined. This type of equipment has traditionally been high cost, but when it is shared between schools and fully utilized throughout the year it becomes more cost effective.

The cost of setting up a module varies by the type of equipment in that module. For illustration purposes, here is an estimated cost for each of the modules of a six module rotation. A 12 member consortium would require two each of the modules to rotate between schools.

- CNC Milling – \$26,000 - 2 mills, laptops
- Robotics – \$18,000 - 4 robots, laptops, mfg simulation equipment
- Electronics - \$6,000 – Circuit software, laptops, meters, and electronic supplies
- Biotech/Genetics - \$9,000 - Equipment not found in a chemistry lab
- Laser optics - \$9,000 – 4 lasers with receivers and optic cable
- Graphic Productions – \$9,000 Software, laptops, vinyl cutters

Professional Development

There is a need to have all instructors who will be teaching with these modules to be fully trained in how to best integrate the Technological Literacy Standards into instruction. Coordinating professional development activities for instructors will be a responsibility of local consortium and the statewide management team. There will be a minimum level of funding built into the local consortium to update existing instructors and to train new

instructors. The minimum level will be determined by the number of schools within a consortium. State funding for professional development will be available for modules that are introduced enabling statewide initial training to take place.

There is a current policy that all instructors who teach any of the modules must be trained prior to teaching that module. Training will be coordinated with postsecondary institutions which will enable instructors to receive credit.

Accountability

Each consortium will submit student information which will show the students who participated in a module, if any assessment was given, and information to enable follow-up of participants.