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Developing Maryland's Technology Education Leaders for the 21st Century: Technology Education Leadership Project (TELP)

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Through the competitive proposal process, the University of Maryland Eastern Shore (UMES) received a three-year Teacher Enhancement Grant from the National Science Foundation (NSF) in March 1998. The Maryland State Department of Education provided additional funds for the grant. The purpose of the grant was to administer the Technology Education Leadership Project (TELP), a statewide project designed to enable technology education teachers to more effectively deliver instruction that results in students achieving the technology outcomes identified by the State of Maryland. TELP addressed a long-term goal of Maryland educators to enhance technology literacy for all students by integrating the study of mathematics, science, and technology as a required component of the educational program.

Background

In 1992, the Maryland State Board of Education passed new Public High School Graduation Requirements mandating that all students earn one credit in technology education. The new requirements affected students entering the ninth grade in the fall of 1993. Students not pursuing a Career and Technology Education program or an academic program that includes two years of foreign language were required to earn two additional credits in advanced technology education. Because of this policy, all Maryland schools have developed new technology education courses to meet the graduation requirement. These courses reflect considerable change in technology education at the middle and high school levels. Career and Technology Education administrators, professional organizations, colleges, the Maryland State Department of Education, and teachers made extraordinary efforts to create and implement new courses, new instructional materials, and professional training for teachers to achieve the goals of technology education.

Need for Professional Development

The approved changes in technology education course offerings at the middle school and high school level created the need to provide professional development experiences for technology education teachers. Many teachers were working with limited or outdated knowledge and had not been exposed to new and innovative approaches to assist students in learning about technology.

Each year from 1993 to 1997, the Maryland State Department of Education surveyed administrators of technology education to determine professional development needs. The results of those surveys consistently indicated:

1. A need for technology teachers to improve their knowledge of technical areas and their understanding of the building blocks of technology systems identified in the State curricular guidelines as the "Core Technologies."
2. A need for teachers to improve their skills in directing problem-solving activities that enable students to apply mathematics and science concepts to real-world problems.
3. A need for teachers to use educational technology effectively.
4. A need for teachers to utilize performance assessment in evaluating students.

Although attempts at meeting professional development needs were planned and implemented at the local level, a more intensive, focused, and long-term effort was needed to make substantial progress.

The Technology Education Leadership Project (TELP)

During the initial phase of project planning in the summer of 1998, the TELP Advisory Panel was notified of project funding and the group's first meeting was scheduled for September in preparation for project implementation. The advisory group, composed of local and national leaders including teachers and business professionals, planned to meet semi-annually to provide guidance to the project team regarding content and best practices. One of the primary objectives of TELP was to provide in-service professional training and teacher enhancement for more than 400 Maryland technology education teachers. Areas of instructional focus included the Core Technologies, teaching/learning strategies, and leadership. Ninety technology education teachers were selected from school districts across Maryland to become Teacher Leaders. The Teacher Leaders received intensive training and would later deliver local in-service to other teachers. The project involved five components: (a) summer institutes, (b) local planning teams, (c) weekend institutes, (d) local in-service training, and (e) evaluation and follow-up (see Figure 1). Over a three-year period, Teacher Leaders participated in four weeks of summer institutes and twelve weekend leadership sessions during each school year. During year three, Teacher Leaders, with the assistance of administrators, planned and delivered ten days of in-service training for teachers in their school systems.

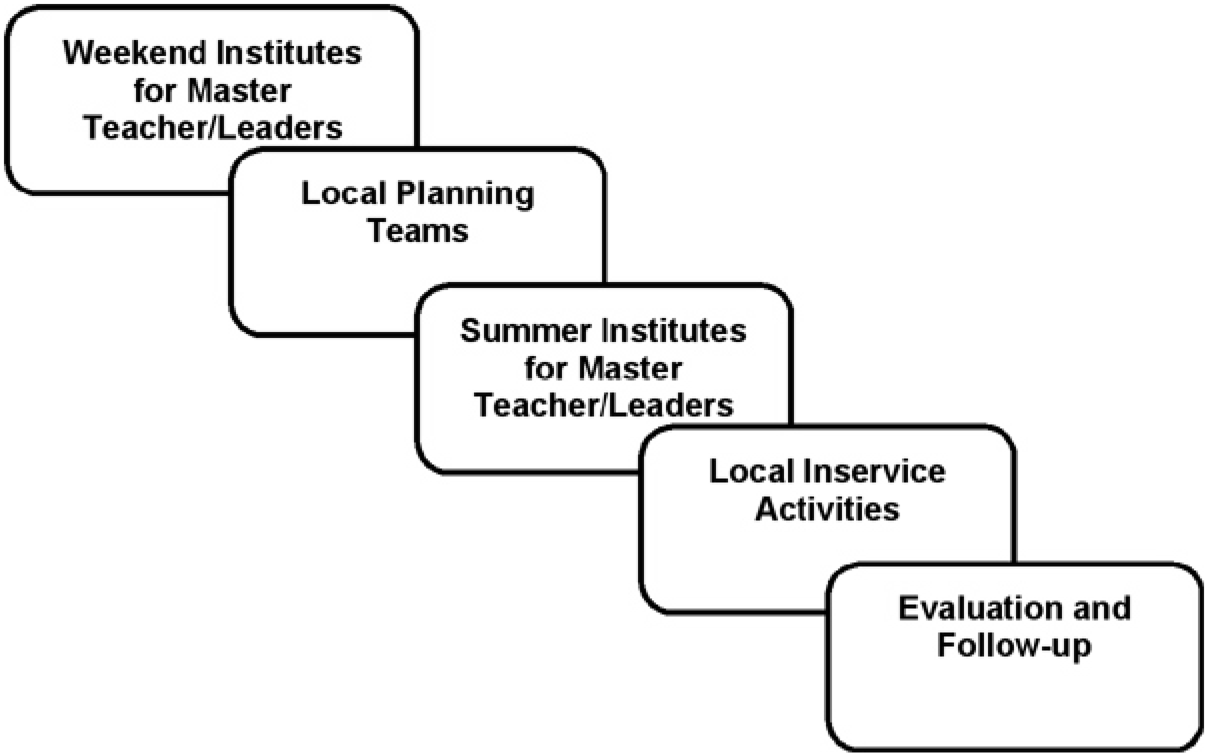

Figure 1. Five organizational components of the TELP Project.

The broad goals of TELP were to support systemic change in the delivery of technology education in Maryland by:

1. Broadening and improving the pedagogical knowledge of teachers.
2. Involving administrators and others who have significant roles in providing quality science, mathematics, and technology education.
3. Providing professional training aligned with the curriculum and instructional materials used in Maryland schools.

Recruitment of Teacher Leaders

The State of Maryland has 24 school districts with approximately 550 certified middle school and high school technology education teachers and 24 program coordinators providing administrative supervision at the district level. A major task for the Project Investigators was the recruitment and retention of 90 Teacher Leaders for the project. Teacher Leaders agreed to participate in the project for three years. When the Project started, the average Maryland technology education teacher had a bachelor's degree plus fifteen hours of post-graduate credit; 97% percent were male, 3% percent were female, and 15% were African American or other minorities. It was anticipated that over the life of the Project approximately 90% of Maryland's technology education teachers would participate.

With the direct involvement of the Maryland State Department of Education, Division of Career, Technology, and Adult Learning and the 24 district administrations, the Project Investigators had direct access to the total population of technology education teachers. To initiate the recruitment process, all administrators agreed to serve as leaders of Local Planning Teams that were responsible for coordination at the local level. In July 1998, letters and brochures were mailed to district supervisors explaining TELP goals and objectives, and the schedule of Project activities. Supervisors were asked to recommend 5 to 10 potential Teacher Leaders who met the following qualifications: (a) prior leadership experience, (b) certification in technology education, (c) access to appropriate facilities at the school and (d) demonstrated expertise as technology teachers. The response from supervisors yielded more than 150 potential participants.

Since Teacher Leaders would be required to demonstrate exceptional commitment to the project for a three-year period, the selection process was critical to retention and the overall success of the project. Recognizing this very important element, the potential Teacher Leaders were invited, via mail, to attend one of four regional information sessions and dinners that were strategically planned throughout the State. At these sessions, the Project directors provided potential Teacher Leaders with an overview of the project and answered questions. Applications were also provided to all in attendance for immediate response or submission at a later time. In addition to standard demographic data, the applicants were required to provide a written summary of their reasons for wanting to become a Teacher Leader. After attending the information sessions, several teachers were unable to commit to the project for various reasons. However, the overall positive response was excellent with more than 100 teachers completing applications. The Project directors selected 90 Teacher Leaders from the applications submitted. A special effort was made to include underrepresented ethnic and gender groups among the Teacher Leaders selected.

The attrition rate for Teacher Leader participants was very low considering the three-year time commitment. Seventy-eight of 90 Teacher Leaders were still active with TELP at the end of the initial funding period. This represents a retention rate of more than 85%.

Project Organization and Content

TELP staff members providing professional development instruction included university professors from the Department of Technology at UMES, local supervisors of technology education, and exemplary public school technology education teachers. Instruction included technical study of the Core Technologies, selected teaching/learning strategies, and facilitative leadership. Teacher Leaders received intense training in years one and two of the project in preparation for the delivery of local in-service in year three. Twelve weekend institutes for Teacher Leaders provided training during the school year. Weekend institutes were conducted on Saturdays in October, November, January, and April of years one, two, and three. Summer institutes were organized into three, two-week sessions each summer (1999 and 2000) at UMES (see Table 1). Participants received stipends, travel reimbursements, and room and board at the University. Each two-week session involved 30 teachers.

Teacher Leaders received 60 clock-hours of instruction on the Core Technologies, 43 hours of instruction on teaching/learning strategies, 15 hours of instruction on information systems, and 36 hours of instruction on facilitative leadership. Participants could earn up to six college credits for completing all phases of the Project.

Teacher Leaders were responsible for conducting ten days of local in-service training for technology teachers in their districts. Each school district established a Local Planning Team to plan and deliver 60 hours of in-service to technology teachers. Recruitment difficulties at the local level, however, resulted in a participation rate that was far below the number projected in the initial proposal, which anticipated 25 teachers from each larger district and half that number from smaller districts. At the end of the initial grant period, only 168 (out of over 300 expected) local technology education teachers had participated in TELP local in-service activities. A no-cost extension was approved by the NSF in March 2001 to allow the Project directors to continue their efforts and fully implement the local in-service workshops.

Table 1
Typical Summer Institute Schedule of Study, Week 2

SessionI SessionII SessionIII	June 26 July 18 August 7	June 27 July 19 August 8	June 28 July 20 August 9	June 29 July 21 August 10	June 30 July 22 August 11
	MONDAY	**TUESDAY**	**WEDNESDAY**	**THURSDAY**	**FRIDAY**
8:00-9:45	Mechanical Technology	Mechanical Technology	Mechanical Technology	Mechanical Technology	Engineering Design & Dev
9:45-10:15	Break	Break	Break	Break	Break
10:15-12:00	Engineering Design & Dev	Engineering Design & Dev	Engineering Design & Dev	Engineering Design & Dev	Engineering Design & Dev
12:00-1:00	Lunch	Lunch	Lunch	Lunch	Lunch

1:00-2:45	Product Generation T/L	Product Generation T/L	Product Generation T/L	Product Generation T/L	Engineering Design & Dev
2:45-3:15	Break	Break	Break	Break	Break
3:15-5:00	Product Generation T/L	Product Generation T/L	Product Generation T/L	Product Generation T/L	

The Core Technologies

The Core Technologies identified in the Maryland curriculum guidelines are considered to be the "basic building blocks" from which all technology systems are created. They include: (a) mechanical technology, (b) electrical technology, (c) electronic technology, (d) structural technology, (e) fluid technology, (f) optical technology, (g) thermal technology, (h) biotechnology, and (i) materials technology (see Appendix). Instruction on the Core Technologies provides students with an understanding of: (a) common components; (b) basic systems design; (c) simple controls; (d) system performance evaluation; (e) science concepts applied; (f) mathematics applications to measure, analyze, describe and predict; and (g) safety practices for interacting with technology systems.

What is it that students need to know about the Core Technologies? Obviously, a person could spend a lifetime studying only one facet of one of the Core Technologies, but there is some general information about which students should be aware. After an introduction to the definitions of each Core Technology, elementary school students should be able to identify the Core Technologies present in a particular example of technology. When presented with a toaster, they should readily describe where they see examples of thermal technology, electrical technology, mechanical technology, and structural technology at work. Middle school students should be able to apply knowledge of the Core Technologies to the solution of practical problems. They should make decisions about the use of various technologies based on cost, performance, environmental impact, and safety considerations as they design and construct problem solutions. To do this, they will demonstrate knowledge of the science concepts applied in Core Technologies and the use of mathematics to measure, analyze, describe, and predict system performance. High school students should be knowledgeable about the common components used in each Core Technology system, basic system design, simple controls, and system performance evaluation. They will use this information to assess, manage, design, and produce technology systems.

The Core Technologies offer technology teachers a science and mathematics-based content that supports the activities in which their students are already involved. These technologies are the bridge between science concepts and real-world technology. They provide numerous opportunities to describe, analyze, and predict physical phenomena using mathematics. The Core Technologies represent a relatively stable taxonomy by which to analyze technology systems. As technology systems evolve, they will most likely continue to incorporate combinations of these nine technologies. This means that technology teachers can develop activities that will be relevant and also consistent with the state curricular framework.

Teaching/Learning Strategies

The second content area of TELP included instruction on six teaching/learning strategies that have proved effective in Maryland in enabling students to achieve the goals of technology education. These strategies include: (a) Ingenuity Challenge, (b) Modular Technology Activity Package, (c) Topic Investigation, (d) Engineering Design and Development, (e) Product Generation and (f) Research and Experimentation. These instructional strategies require students to design, construct, test, evaluate, measure, solve problems, plan, calculate, research, investigate, and report. Each is described in more detail in the paragraphs that follow.

The **Ingenuity Challenge** provides a way for students to learn and practice systematic problem solving; develop and apply their ingenuity, creativity, and thinking skills; and make concrete applications of skills learned in science, mathematics, and language arts courses. Students are presented with problems that require the development and use of technology systems.

The **Modular Technology Activity Package** usually makes use of commercially produced materials that facilitate student engagement with minimal teacher direction. The materials may include written instructions and directions, audiovisual media, computer assisted instruction, and student worksheets.

Topic Investigations provide a way for students to learn about technology systems and technology-related topics in the context of a central theme. Student knowledge and understanding of the central theme is gained through inquiry into sub-elements of the theme and through written reports and information shared by classmates about other sub-elements of the theme.

Engineering Design and Development requires students to identify a problem and develop a solution to the problem. This strategy differs from the Ingenuity Challenge in several ways. First, students identify the problem instead of the instructor. Second, the activity takes more time to complete because of additional time required for problem identification and a research component. Finally, this strategy requires students to develop a technical report that describes the problem and why it was selected. It provides a description of the activities carried out by the engineering team. The process concludes with an oral presentation that includes recommendations for implementation and suggestions for future research.

In the **Product Generation** teaching/learning strategy, students create product designs, and then develop and operate a production system. This activity provides opportunities for students to study how the things we need and want are created and produced. The output of this activity may include hardware products, software products, or energy products.

Students involved in **Research and Experimentation** activities use the scientific method to solve a problem that is stated in the form of a question. Using the experimental method of research, students become acquainted with the significance of research in human enterprises, strengthen their skills in information retrieval, develop skill in the use of tools and machines, and gain an understanding of materials and processes.

Leadership Development

Another critical goal of TELP was to develop future leaders in the field. Each weekend institute included a leadership development session. Topics included planning and facilitating staff development, developing a curriculum process, technology education supervision, and standards-based reform for technology education.

During the two summer institutes, Teacher Leaders participated in facilitative leadership training that addressed: (a) sharing an inspired vision; (b) designing pathways to action; (c) focusing on results, processes, and relationships; (d) seeking maximum appropriate involvement; and (e) modeling behaviors that facilitate collaboration. They also worked with selected local supervisors on the curriculum development process, facility design, professional development, and the recruitment and retention of teachers.

Evaluation and Follow-Up

An experienced external evaluator coordinated all aspects of the project evaluation, including gathering formative and summative data. The evaluator's first task was to develop a Change Agent Survey, which was completed by each Teacher Leader during the first three months of the project. This survey established baseline data on all Teacher Leaders to determine their level of understanding and current use of the Core Technologies and teaching/learning strategies. It also addressed the leadership activities of the Project participants. Responses on this survey have been compared with responses on an identical survey given near the end of the project. The follow-up survey provided data on the Project's impact on teacher knowledge and changes in their instructional delivery. Surveys were mailed to 79 Teacher Leaders, with 57 returned for a total response rate of 72% for Change Agent Survey 2. Teacher Leaders were also required to evaluate the instruction and content delivery at the conclusion of each weekend and summer institute. This formative data was used to improve future activities.

A major objective of TELP was to increase the knowledge base of teachers regarding the Core Technologies. The data given in Table 2 indicate significant progress in the achievement of this objective. Of note in this table is the consistency of change in familiarity with the Core Technologies indicated by the overall increase of 24%. Previous UMES summer institutes for technology teachers addressed structural and mechanical technologies and may account for a lower level of change due to greater participant background knowledge. Also worthy of note is the increased familiarity with biotechnology, an area of weakness before TELP.

Table 2
Familiarity with Core Technologies

Rating Scale: Great (5), Considerable (4), Moderate (3), Limited (2), and Very Limited (1)	CHANGE AGENT SURVEY 1	CHANGE AGENT SURVEY 2	% CHANGE
Familiarity with **Mechanical Technology**	3.724	4.408	18%

Familiarity with **Electrical Technology**	3.184	3.816	20%
Familiarity with **Electronic Technology**	2.921	3.592	23%
Familiarity with **Structural Technology**	3.816	4.408	16%
Familiarity with **Fluid Technology**	2.905	3.816	31%
Familiarity with **Optical Technology**	2.319	3.061	32%
Familiarity with **Thermal Technology**	2.514	3.143	25%
Familiarity with **Biotechnology**	2.095	3.041	45%
Familiarity with **Materials Technology**	3.541	4.265	20%
Overall	27.019	33.55	24%

In addition to developing an enhanced understanding of the Core Technologies, the project sought to increase teachers' use of the Core Technologies in instruction. The data in Table 3 indicate positive change has occurred in all but one area.

The data suggest that teachers are incorporating the Core Technologies into their instruction but not at a frequency equal to their increased familiarity with the Core Technologies. This may be due to a lack of opportunity based on curricular focus or because of a lack of resources to support such instruction. Electronic technology, fluid technology, and biotechnologies showed a significant increase in attention after the TELP experience.

Table 3
Use of Core Technologies in Instruction

Rating Scale: Often (5), Occasionally (3), Rarely (1)	CHANGE AGENT SURVEY 1	CHANGE AGENT SURVEY 2	% CHANGE
Indicate the extent you address **Mechanical Technology** in your Technology Education program	4.222	4.652	10%
Indicate the extent you address **Electrical Technology** in your Technology Education program	3.192	3.674	15%
Indicate the extent you address **Electronic Technology** in your Technology Education program	2.863	3.587	25%

Indicate the extent you address **Structural Technology** in your Technology Education program	4.260	4.652	9%
Indicate the extent you address **Fluid Technology** in your Technology Education program	2.699	3.522 7nbsp;	30%
Indicate the extent you address **Optical Technology** in your Technology Education program	2.041	2.304	13%
Indicate the extent you address **Thermal Technology** in your Technology Education program	2.205	2.196	-.4%
Indicate the extent you address **Bio-technology**in your Technology Education program	1.849	2.413	31%
Indicate the extent you address **Materials Technology** in your Technology Education program	4.00	4.304	8%
Overall	27.331	31.304	15%

Another objective of the project was to improve teachers' skills in directing problem-solving activities that enable students to apply mathematics and science concepts to real-world problems. To accomplish this objective, TELP Teacher Leaders were trained in the use of six teaching/learning strategies that incorporated problem solving. Indications of improvement in their familiarity with the teaching/learning strategies are shown in Table 4. Survey findings indicate a consistent increase (19%) in familiarity with the teaching/learning strategies, with the greatest increase (26%) for the Topic Investigation teaching/learning strategy.

Table 4
Familiarity with Teaching/Learning Strategies

Rating Scale:	CHANGE	CHANGE	%

Great (5), Considerable (4), Moderate (3), Limited (2), And Very Limited (1)	AGENT SURVEY 1	AGENT SURVEY 2	CHANGE
Indicate your familiarity with the **Ingenuity Challenge** Teaching/Learning Strategy	3.933	4.620	17%
Indicate your familiarity with the **Modular Technology Activity** Teaching/Learning Strategy	3.263	3.760	15%
Indicate your familiarity with the **Topic Investigation** Teaching/Learning Strategy	3.413	4.300	26%
Indicate your familiarity with the **Engineering Design & Development** Teaching/Learning Strategy	3.600	4.280	19%
Indicate your familiarity with the **Product Generation** Teaching/Learning Strategy	3.474	4.120	19%
Indicate your familiarity with the **Research and Experimentation** Teaching/Learning Strategy	3.280	3.940	20%
Overall	20.963	25.02	19%

Teachers were also asked about their use of these strategies in their instructional program (Table 5). The Ingenuity Challenge strategy was the most commonly used delivery mode for these technology teachers. The other strategies were also being used at an increased level. Again, implementation appeared to lag familiarity. This may be due to the time restraints of many middle school programs that prohibit the use of the longer duration teaching/learning strategies.

An objective of the project was for teachers to use information technology to enhance problem-solving activities. The two information technology areas selected were Computer-Aided-Design and use of the Internet (Table 6). The survey revealed an increase in familiarity with both of these technologies. Internet familiarity increased significantly in spite of being an area of considerable proficiency for many before TELP. The use of Computer-Aided-Design as a tool to facilitate problem solving may have been hampered by the lack of hardware and software resources.

Table 5
Use of Teaching/Learning Strategies

Rating Scale Often (5), Occasionally (3), And Rarely (1)	CHANGE AGENT SURVEY 1	CHANGE AGENT SURVEY 2	% CHANGE
Indicate the extent to which you are *using* the **Ingenuity Challenge** Teaching /Learning Strategy.	4.120	4.75	15%
Indicate the extent to which you are *using* the **Topic Investigation** Teaching /Learning Strategy.	2.920	3.250	11%
Indicate the extent to which you are *using* the **Modular Technology Activity** Teaching /Learning Strategy.	3.135	3.851	23%
Indicate the extent to which you are *using* the **Product Generation** Teaching/Learning Strategy.	3.027	3.396	12%
Indicate the extent to which you are *using* the **Engineering Design & Development** Teaching /Learning Strategy.	2.784	2.957	6%
Indicate the extent to which you are *using* the **Research and Experimentation** Teaching /Learning Strategy.	3.351	3.833	14%
Overall	19.337	21.037	9%

Table 6
Use of Information Technology

Rating Scale: Great (5), Considerable (4), Moderate (3), Limited (2), And Very Limited (1)	CHANGE AGENT SURVEY 1	CHANGE AGENT SURVEY 2	% CHANGE
Indicate your familiarity with **Computer Aided Design**.	3.343	3.750	12%
Indicate your familiarity with the **Internet**.	3.548	4.292	21%

Another major objective of TELP was to develop the future leaders of technology education in Maryland.

Leadership development activities were included in all aspects of the project. Survey results indicate significant increases in proficiency and involvement in leadership activities (Table 7). The areas of greatest professional growth resulting from TELP activities were in the leadership areas. The data indicated increases in involvement in leadership activities of 66% in state association activities, 83% for involvement in student competitive engineering activities, and 65% for involvement in local professional development activities.

Table 7
Involvement in Leadership Activities

Rating Scale: Great (5), Considerable (4), Moderate (3), Limited (2), And Very Limited (1)	CHANGE AGENT SURVEY 1	CHANGE AGENT SURVEY 2	% CHANGE
Involvement with **Technology Education Association of Maryland**	1.986	3.298	66%
Involvement in **competitions** for technology education students	1.404	2.574	83%
Involvement in facilitation of **local in-service activities**.	2.297	3.787	65%

The process for identifying the need for the Technology Education Leadership Project included the results from the 1993 to 1997 surveys of Maryland's technology education supervisors. As a follow-up to those surveys, the TELP evaluator developed another survey to determine the effectiveness of the project and to identify future needs as rated by technology education supervisors. The results of that survey are shown in Table 8.

Comments from supervisors included: "TELP has been the most significant curricular leadership and professional development initiative in Maryland Career and Technology Education programming in the past twenty-five years." "The spin-off of TELP will fundamentally change and enhance technology education instruction in Maryland for another twenty-five years." "TELP has given teachers great insight into concepts and strategies they normally would not have had time or opportunities to appreciate." "The hands-on format kept teachers fully engaged in the learning process."

Supervisor involvement in the TELP has enabled delivery of services to all of Maryland's 24 school systems. A trend in staffing has resulted in an increasing number of supervisors being given responsibilities for other curricular areas. This situation leaves many technology teachers with supervisors whose teaching and administrative background are not in technology education. These supervisors realize their limitations and were appreciative of TELP as an avenue to program improvement.

Table 8
Effectiveness of TELP as Rated by Technology Education Supervisors

Rating Scale:	

Very High (5), High (4), Good (3), Fair (2), Less Than fair (1)	Rating
Rate the performance of the TELP Teacher Leaders from your school system in delivering high-quality staff development to other technology teachers.	4.2
Rate the performance of the TELP Teacher Leaders from your school system in assuming an active role in their professional development.	4.3
Rate the performance of the TELP Teacher Leaders from your school system in delivering high-quality instruction to their students.	4.4
Rate the degree of importance of continuing the Technology Education Leadership Project with an emphasis on the implementation of standards-based curriculum based on the national *Standards for Technological Literacy*	4.7
Rate the degree of importance of continuing the Technology Education Leadership Project with an emphasis on the implementation of standards-based curriculum based on Maryland's Academic Content Standards.	4.6
Rate the degree of importance of continuing the Technology Education Leadership Project with an emphasis on delivering high-quality instruction to their students.	4.6
Rate the degree of importance of continuing the Technology Education Leadership Project with an emphasis on further upgrading the skills and knowledge of previous TELP participants.	4.55

Summary and Conclusions

The Technology Education Leadership Project brought together instructional resources and personnel in a statewide effort to develop Maryland's technology education leaders for the 21st century. TELP activities have enhanced participants' technical knowledge base, strengthened instructional practices, and developed leadership skills. Funding from the National Science Foundation provided the opportunity to work with teachers for the sustained period of time needed to make significant changes in the way teachers administer and deliver instruction. The excellent retention rate for Teacher-Leaders appears to result from an initial commitment by the project investigators to treat participants as "very special" people who deserved the best possible support through a long, but highly structured, change agent process. Additional factors that may account for the high retention rate include:

1. Initial or pre-existing interest in the goals of the project.
2. Desire to be a part of what was perceived as a mission to make an impact on technology instruction in Maryland.
3. Quality of the professional development activities provided by TELP.
4. Respect the participants had for the instructors selected to provide the TELP professional development.
5. Recognition the Teacher-Leaders received from local and state educational agencies for their participation in the project.
6. Amenities provided to participants at the weekend and summer institutes such as nice lodging, excellent meals, the UMES campus recreational facilities, the high quality laboratories, excellent UMES instructors assisting with the program, and social activities planned through TELP.
7. Participant selection process, stipends, and instructional resources.

The low level of participation in local in-service activities appears to have been due to TELP's inability to involve local supervisors at a high enough level to make this portion of the project successful in their school districts. This may have been due to the fact that only 5 of 24 Maryland school systems had a technology education supervisor whose background was technology education. In addition, only three schools systems had a supervisor dedicated solely to technology education. Therefore, time factors and lack of background in technology may have resulted in a lack of local leadership needed to make this element of TELP more successful. In addition, the level of financial stipends for teachers at the local level may have been too low. Follow up data also suggest that teachers at the local level were, in many cases, new to technology education. Many were coming into teaching through non-traditional routes. Some of these teachers were struggling or had not made a commitment to the profession, and they found invitations to professional development activities on weekends and evenings difficult to accept.

However, formal evaluations of TELP local inservice activities indicated a high degree of satisfaction with the scope and quality of instruction provided. Both teachers and supervisors thought that the sessions were relevant, easily transferable into local curricula, and provided much-needed support to teachers. TELP's goals were, in fact, achieved where local in-service activities were well attended. Teachers reported increased use of the teaching-learning strategies promoted by TELP. They also indicated that they had altered their instruction to include more in-depth coverage of the "core technologies" and information systems. Teachers at the local level reported that they appreciated the efforts of the Teacher-Leaders, and that having local Teacher-Leaders deliver the instruction enhanced professional development.

Future plans for TELP include submitting additional proposals to NSF and the Maryland State Department of Education to support TELP Institutes that will focus on the *Standards for Technological Literacy* (International Technology Education Association, 2000). Teacher Leaders will analyze data concerning the correlation of Maryland's technology education goals with the *Standards*, and will examine implementation of the *Standards*in Maryland, including the development and modification of local and state curriculum documents to become *Standards*-based.

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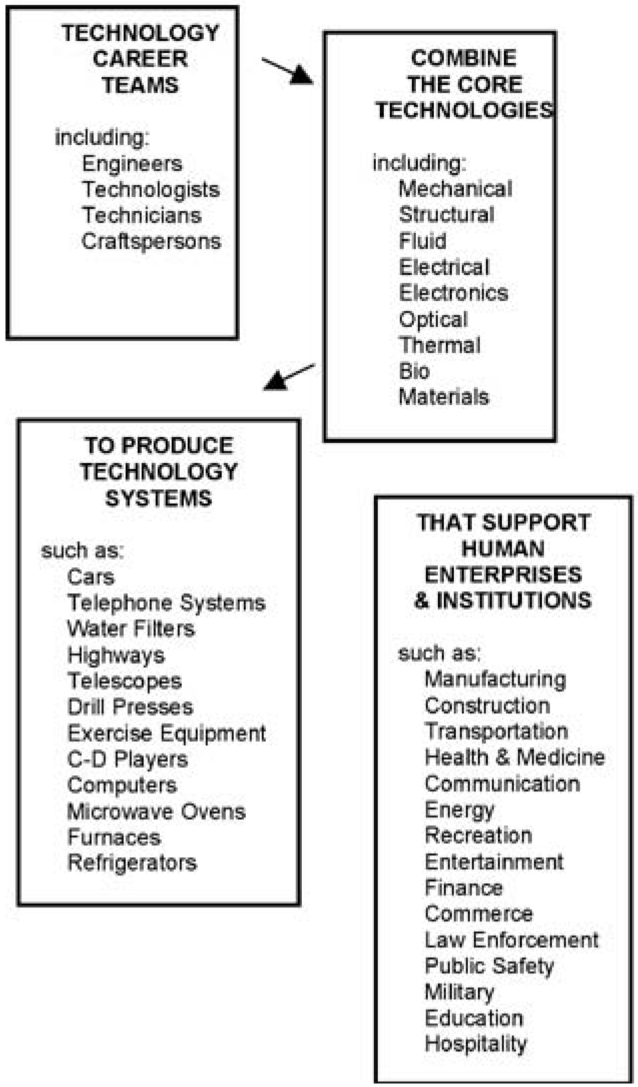
Appendix

Derivation and Application of Technology Systems: Core Technologies



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