AC 2010-1750: ASSESSING TECHNOLOGY LITERACY AND THE USE OF ENGINEERING AND TECHNOLOGY CURRICULA BY UTAH K-12 EDUCATORS

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Introduction: the Need for Common Technological Literacy

Thomas Friedman in *The World is Flat* wrote, "The NSB (National Science Board) report found that the number of American eighteen- to twenty-four-year-olds who receive science degrees has fallen to seventeenth in the world, whereas we ranked third three decades ago."[1] The primary reason for this results from K-12 students' declining interest in engineering and technology.

Engineering and technology are as intertwined with society just as they are with each other, unfortunately members of society do not always understand engineering and technology, nor their relationship. In fact, at times, people are accepting of their lack of understanding—they feel there is no need for them to try to understand technology, engineering, and their interplay. Instead, they feel their ability to use technology suffices, and represents a "satisfactory or adequate" understanding.

Regardless of the perception people have of engineering and technology, it is not sufficient to only be able to use technology. The incorporation of technology within society requires that people are able to make personal and community decisions about the risks, economics, standards, and tradeoffs of technologies.[2] Members of communities, governments, and families, need an understanding of technology to make informed socio-scientific and ethical decisions, to continue to guide their constituents in the forefront of using technology to meet their needs, and to prevent exclusion and manipulation.[3]

Background

In 2001 and 2004, the Gallup Organization conducted surveys for the International Technology Education Association (ITEA) regarding the American public's technological literacy.[4,5] The following conclusions were drawn from these surveys:

1. "The public understands the importance of technology in our everyday lives and understands and supports the need for maximizing technological literacy.
2. There is a definitional difference in which the public thinks first of computers when technology is mentioned, while experts in the field assign the word a meaning that encompasses almost everything we do in our everyday lives.
3. The public wants and expects the development of technological literacy to be a priority for K-12 schools.

Educational stakeholders and the general public agree on the importance that people be able to understand and use technology, and on the need to include technological literacy as part of school curriculum.[4,5] However, technological literacy research has shown that most people have a limited definition and understanding of technology. In the most recent ITEA Gallop Poll assessing the public's technological literacy, over 68% of those surveyed defined technology as computer related devices. Although this limited definition may be a result of our familiarity and ubiquitous use of computer related technology (e.g., laptops, ipods, and so forth), we feel federal and state agencies have done little to rectify and enhance the teaching of a more broad and

inclusive definition of technology and engineering. In fact, we believe the No Child Left Behind Act (NCLB) of 2001 is also at fault for causing educational institutions to not adequately teach technology and engineering. In the specific area of NCLB where technology is addressed, the only requirements the federal government has made to include technology and engineering center on computer literacy skills. The following quote from NCLB Title II Part D outlines this sentiment:

> "(1) PRIMARY GOAL- The primary goal of this part is to improve student academic achievement through the use of technology in elementary schools and secondary schools.
> (2) ADDITIONAL GOALS- The additional goals of this part are the following:
> (A) To assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location, or disability.
> (B) To encourage the effective integration of technology resources and systems with teacher training and curriculum development to establish research-based instructional methods that can be widely implemented as best practices by State educational agencies and local educational agencies."[6]

Not only did NCLB not address a more inclusive understanding and definition of technology and engineering, it did not prescribe how individual states were to meet the technological demands of NCLB and current industry trends and conditions. Consequently, individual states were left on their own to develop programs to see that these goals were met in their school systems.

In response to this egregious error regarding limited directive on what should be included as technology literacy components of NCLB, many organizations such as the National Science Foundation (NSF), ITEA, the American Association for the Advancement of Science (AAAS), the National Academy of Engineering (NAE), and other organizations have been attempting to raise the awareness of technological literacy. The ITEA's *Standards for Technological Literacy: Content for the Study of Technology (2000/2002/2007)* was a significant effort in attempting to establish a framework and a set of technological standards for K-12 education.[14]

In spite of these efforts, we seem to be making very little progress in educating our young people in technology and engineering. The following is taken from a recent report, *Changing the Conversation*, published by the National Academy of Engineering.

"Considerable efforts have been undertaken in the United States to improve the public understanding of engineering (PUE). A survey by the National Academy of Engineering

> (NAE) in 2002 of 177 organizations involved in public understanding of engineering activities revealed that they spend an estimated $400 million annually.[15] However, the actual national investment can be assumed to be much higher, because the survey is believed to have reached only a fraction of the institutions that have PUE initiatives. Despite these efforts, the impact of engineering on our daily lives, the nature of what engineers do, and the opportunities available through an engineering education are still largely unknown to most Americans. Educational researchers have found that k–12

> teachers and students generally have a poor understanding of what engineers do.[16-19]

The studies referenced in the above quote represent the very few studies that have been done in the intervening years following the ITEA Gallup polls. These studies were conducted by the National Center for Technological Literacy (NCTL) that was founded by and is housed at the Boston MOS. The NCTL lists the following goal on its web site,

> "NCTL's goal is to integrate engineering as a new discipline in schools nationwide and to inspire the next generation of engineers and innovators. NCTL fosters learning about how technologies are created and used. It offers educational products and programs for pre-K-12 students and teachers, creates curricula, supports an online resource center, and engages in partnership and outreach with other institutions. NCTL works with state departments of education and teacher organizations to facilitate the re-engineering of curricula and learning standards."[20]

The NAE has also produced two reports from an initiative called the Engineer of 2020 Project. These reports, *The Engineer of 2020: Visions of Engineering in the New Century* and *Educating the Engineer of 2020: Adapting Engineering Education to the New Century*, both advocate the need for the engineering community to be involved in technological literacy.[21,22] A major recommendation from the second report is that "the engineering education establishment should participate in efforts to improve public understanding of engineering and the technological literacy of the public and efforts to improve math, science, and engineering education at the K-12 level."[22]

In NAE's report *Tech Tally: Approaches to Assessing Technological Literacy*, the writers state the following, "the starting point for improving technological literacy must be to determine the current level of technological understanding and capability . . . . . the committee defined technological literacy as having three major components, or dimensions: knowledge, capabilities, and critical thinking and decision making."[23]

With this need for technological literacy, large steps have already been taken to integrate technological literacy into school curriculums in some areas. For example, the state of Massachusetts has developed PreK – 12 Instructional Technology Standards[24] which school districts are expected to adopt. A second example comes from the state of Utah, where two general approaches to teaching engineering and technology have been adopted. One has been to incorporate a nationwide program called Project Lead the Way (PLTW).[26] PLTW involves a four-year sequence of technology education courses that are designed to help high school students prepare for engineering and technology higher education disciplines. One problem that some school systems have had in implementing this program is the cost associated with professional development and curriculum materials. A second approach has been to use less expensive curricula, such as the Utah Plan (a state developed basic engineering education curriculum), or to incorporate engineering and technology material within existing courses. Although these efforts made by Massachusetts and Utah are moves in the right direction, sadly they are not representative of a national effort to include more technology and engineering in the K-12 environment.

On a national level, No Child Left Behind calls for enhancement of education through technology and increased technology funding. But, there is still much progress to be made. In a recent report from the NAE called *Engineering in K-12 Education: Understanding the Status and Improving the Prospects*, the researchers wrote the following in their summary regarding the state of engineering education issues within K-12 grades:

> In recent years, educators and policy makers have come to a consensus that the teaching of STEM subjects in U.S. schools must be improved. The focus on STEM topics is closely related to concerns about U.S. competitiveness in the global economy and about the development of a workforce with the knowledge and skills to address technical and technological issues. To date, most efforts to improve STEM education have been concentrated on mathematics and science, but an increasing number of states and school districts have been adding technology education to the mix, and a smaller but significant number have added engineering. In contrast to science, mathematics, and even technology education, all of which have established learning standards and a long history in the K-12 curriculum, the teaching of engineering in elementary and secondary schools is still very much a work in progress. Not only have no learning standards been developed, little is available in the way of guidance for teacher professional development, and no national or state-level assessments of student accomplishment have been developed. In addition, no single organization or central clearinghouse collects information on K-12 engineering education.[25]

We feel that a major issue involved in enhancing the technology and engineering content that is being taught to K-12 students, is the technology literacy of the K-12 teachers. In an effort to understand that literacy and what is being done in the public schools to ensure teachers are technologically literate, we developed a survey evaluating current teachers' technological literacy. Additionally, our survey evaluated what Utah public school systems are doing to train teachers in technology related issues, processes, tools, and techniques. The survey was then piloted in several Utah schools.

A second major issue is the preparation of our own technology and engineering education students. For years, technology literacy has been a topic of instruction for our undergraduate students, but recently we have added a technology literacy course to our masters program. Students in our masters program come to us from a variety of disciplines and experience. Many of these students are in-service teachers. The new course will help our graduate students who pursue teaching careers meet the need to increase content in this important area.

Teacher Technological Survey Development

In preliminary work, the investigators closely worked with various NCETE (National Council of Engineering Technology Education) committee members, with ITEA personnel, and with the Boston Museum of Science, in collaboration dealing with K-12 technological literacy. The results of their discussions and collaboration informed and advanced the development of a K-12 Technological Literacy pilot study implemented at three Utah schools. The pilot study used two methods to aggregate data regarding technological literacy of teachers. First several teachers representative of each grade level were interviewed regarding their understanding and beliefs of

technology. These interviews have helped to inform the second aggregation effort, a widespread survey of K-12 teachers.

The survey was developed in result of an extensive literature review, findings from the interviews, and collaboration with various people and entities interested in technological teacher literacy (ITEA, BMS). The survey is titled: the *Teacher Technological Literacy Survey*. The following list outlines a representative sample of the type of questions included in the survey:

What is your definition of technology?

- How able are you understand and use new technologies?
- According to your definition of technology, list several examples.
- How comfortable are you with answering students' technology related questions?
- How comfortable are you with teaching students about technology?
- How comfortable are you with explaining to students what engineers and or technologists do?
- How comfortable are you with describing the engineering design process?
- How comfortable are you with using the design process?
- How comfortable are you with answering students' engineering related questions?
- How comfortable are you with answering students' technology related questions?
- How much interest do you have in advances and innovations in biotechnologies?
- How much interest do you have in general technologies in manufacturing?
- How much interest do you have in the impact of multimedia on society?
- How much interest do you have in alternative forms of energy?
- How much interest do you have in the impact technology has on the environment?
- How much interest do you have in advances and innovations in engineering?
- How informed are you about the advances and innovations in engineering?
- How informed are you about general technologies in manufacturing?
- How informed are you about the development of more powerful communication systems?
- How informed are you about the impact of multimedia on society?
- How informed are you about alternative forms of energy?
- How informed are you about the impact technology has on the environment?
- How important is it that high school students are able to understand the relationship between technology, math, and science?
- How important is it that high school students are able to understand the effects of technology on society?
- How important is it that high school students are able to understand the relationship between technology and the environment?
- How important is it that high school students are able to understand the relationship between technology and the economy?
- How important is it that high school students are able to evaluate the pros and cons of specific technologies?
- Should technology be included as part of current standardized tests, be it's own standardized test, not be included?
- Should the study of technology be included as a component of required classes or should it be its own class?

- Is technology being taught in your classroom (if so, how)?
- What grade level should the teaching of technology begin?
- How should technology be taught?

Technology Literacy Assessment Surveys were sent out to a sample of K-12 Utah teachers as part of a preliminary data aggregation and analysis phase. Site administrators at elementary, middle/junior, and high schools were contacted and invited to email the survey to their teachers. The teachers, both male and female, ranged from all backgrounds of ethnicity (i.e., Caucasian, Hispanic, Asian, and so forth), and also cover the age spectrum from 20 – 70 years. The teachers also cover a broad range of teaching experience and content areas (i.e., first year teachers, tenured teachers, English teachers, STEM teachers, and so forth.)

Formative results from the first survey dissemination were compiled, at which time a preliminary thematic analysis was conducted. The survey was administered in a second phase of our pilot study to two Utah school districts following the preliminary analysis phase. The reason for these preliminary phases is to ensure there are not any lurking issues that were not identified during our initial survey development phase. The final dissemination of the survey will be more extensive, reaching each school district within the state of Utah. In the future, we hope to expand the research efforts and survey collection to other states.

Data Collection. The responses from teachers will be collected using an online survey hosted by the *Qualtrics* survey system. This system ensures a safe and secure dissemination of surveys, and immediately aggregates data as soon as survey responses are submitted; consequently immediately upon completing the survey, teacher responses to the survey will be collected in a *Qualtrics* account. We will download the survey data and keep the data on an external HD for safe and secure storage. The survey will be administered for a two-month period of time. After two-months the survey will be closed to participants; at this point the data will be analyzed.

Data Analysis. Although the survey tool, *Qualtrics*, provides some general statistics, SPSS will be used to further analyze the data. Additionally, a Spradley analysis technique based on theme analysis and taxonomic development will be used to further organize and create understandings from the survey data. The SPSS results will provide quantitative disaggregation of the data (i.e., Mean, Variance, Standard Deviation, Chi Square, and so forth), while the Spradley analysis will provide a qualitative examination of the data. Together, these techniques will help triangulate the most central and important themes resulting from the survey.

Technology Literacy Course

The purpose of the Technology Literacy Course is to teach students (e.g., first year graduate students) about the fundamental principals and processes of technology. The topics will include: the history and evolution of technology, technology's impact on the past, present and future of economics, ethics, politics, and the environment. Additionally, the course will introduce the primary domains of technology, which include: communication and computer technologies, manufacturing technologies, medical technologies, transportation technologies, agricultural technologies, and construction technologies. Since the use of surveys is very popular in educational research, the course will also include how to develop and analyze both qualitative

and quantitative surveys. The reason we are first teaching this course to graduate students is because it is expected that the graduate students will not only participate in the course, but also help develop the material (e.g., instructional activities, curriculum) for a technology literacy course to be used in the K-12 environment.

Results of the Pilot Technology Literacy Survey.

At present we have implemented and analyzed the interview and pilot technology literacy survey questions from the first phase of our pilot study. These findings will be discussed below. However, we anticipate by ASEE 2010 we will have conducted the second phase of our pilot study and will have implemented, disseminated, and analyzed results from our primary survey tool, the "Teacher Technology Survey" and from teaching our Technology Literacy Course (tentatively scheduled to be taught Spring 2010). We will use student feedback and peer and self-evaluations as the basis for our data analysis of the Technology Literacy Course.

In the first phase of our pilot, we received results back from 44 teachers. Most of those who completed the survey were female (75%) and were teachers at the middle/junior high school levels (grades 6-8). When asked what subjects each teacher taught, most taught core subject areas: math (25%), science (25%), English (15%), social studies and history (35%). Those who took the survey were asked to identify what about technology was being taught in their classrooms according to the three primary technology domains defined by ITEA. These stands include: 1) Information and communication technologies, 2) Relationships among technologies, and 3) The role of society in technology development and use. An important finding from this question was that most of the teachers (84%) didn't teach any of the three strands in their classroom. Of the teachers who did report they taught one or more of the strands, the most common strand taught (78%) was information and communication technologies. However, when these same teachers were specifically asked to define how they taught this strand, they reported they had students use computers to make brochures, presentations, and posters on computers. What was most interesting about this question is that immediately following this question, the participants were asked if they taught technology in their classroom. Surprisingly, 67% of the teachers said yes. When asked what they are teaching about technology, they said: "Computer." What we also found interesting was that there was an even split (50%) between teachers who believed technology should be integrated and taught in all classes with those teachers who felt technology should be it's own class. Sadly, most of the teachers who responded to this question defined the technology that should be taught as it's own course or integrated into the main curriculum as: "computers."

The findings of the first phase of our pilot study show three primary emergent themes: 1) most (92%) K-12 public teachers define technology as computer related devices. 2) Although most teachers (80%) claim to be regularly using technology in their class, the technologies they reported using only included items such as: computers, calculators, and projectors. 3) Most of the teachers surveyed believe technological literacy is an important topic for students to know (95%), many also believed it should be both included in traditional content areas (78%) and be a standalone class (81%). One interesting note was that some said that it was not being taught at all.

In addition to these results, we found the following. The majority (67%) who participated in the survey said they were very able (33% reported they were either "somewhat able" or "able") to understand and use new technologies. Survey participants were then asked how comfortable they were with various technology and engineering related issues. Most were comfortable with questions regarding technology (mean of 4.33 on a 5 point likert scale), but were uncomfortable with issues related to engineering (mean of 2 on a 5 point likert scale). The survey also asked how informed they were about different technological issues (i.e., advances in innovations in engineering, manufacturing, alternative forms of energy, and so forth). Surprisingly, most (86%) were either not informed or only somewhat informed about the majority of the issues presented. A similar percentage was also recorded for the question regarding the impact of communication and multimedia on society (80%).

The results of the first phase of our pilot study informed additional survey revisions, and provided data to present at the ITEA professional conference, where we were able to receive feedback and collaborate with others who share interest and have expertise in technological literacy. These conversations have helped us further refine the survey questions and methodologies, and ultimately develop the *Teacher Technological Survey.* The survey is listed in Appendix A. We now believe the survey is ready for the second phase of our pilot and to be more broadly disseminated to schools in two Utah school districts.

Summary

Although there are some initiatives to encourage technological literacy in schools, it seems these initiatives have had little impact. Most of the efforts have involved mandating particular computer classes for junior and high school students in response to NCLB's call for improved technology literacy of digital devices and related technology. Other efforts have and are occurring in teacher training programs, where many universities are encouraging students to take technology literacy classes. Sadly, the majority of these classes are based upon the International Society for Technology in Education (ISTE) standards, which explicitly focus on computer literacy. We believe technological literacy involves more than a basic understanding of digital devices and communication technologies. We feel that to be technologically literate, one must posses a more broad and fundamental understanding of technology, associated processes, and its influence on economics, politics, and the environment.

Considering the widespread influence technology has on world economics, politics, and environment, the need to be technologically literate has never been more important. The problem however, is not identifying that there is a need to increase people's technological literacy, rather, the problem is what does it mean to be technologically literate, and how to help people be technologically literate. We anticipate the findings from this study will help address these issues, by providing a clear and holistic definition of what it means to be technological literate. We also feel the findings will provide justification for including Technology Literacy education as a core content area in the K-12 and collegiate environments. Finally, we feel the findings will stimulate further discussion of curriculum and pedagogical practices that should be included in Technology Literacy type courses.

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Appendix A

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Technology Literacy Survey

Thank you for taking the time to complete this important survey. The results of the survey will be used to help further enhance the K-12 learning environment. Note: survey results will remain anonymous. If you have any questions or feedback please feel free to contact the PI of this research study: geoffwright@byu.edu

Block 1

Sex:

- ○ Male
- ○ Female

Of the following, which subjects do you currently teach? (Check all that apply)

☐	Math	☐	Social Studies
☐	Science	☐	Physical Education (P.E.)
☐	Biology	☐	Technology
☐	Chemistry	☐	Home Economics
☐	Physical Science	☐	Computer Science
☐	Physics	☐	Government
☐	History	☐	Multimedia
☐	English	☐	Other (Please specify):

What grade level(s) do you currently teach? (Check all that apply)

- [ ] K-2
- [ ] 3-5
- [ ] 6-8
- [ ] 9-12

Please enter the number of years you have been teaching.

- ( ) 1 - 3
- ( ) 4 - 6
- ( ) 7 - 10
- ( ) 11 - 15
- ( ) 16 - 20
- ( ) 20 +

Where did you obtain your degree?

What did you get your degree in?

Did you graduate with a teaching certificate?

- ( ) Yes
- ( ) No

Default Question Block

What is your definition of technology?

How able are you to understand and use new technologies?

Very Unable	Unable	Somewhat Able	Able	Very Able
○	○	○	○	○

Please list some examples of technology:

How comfortable are you with the following?

	How Comfortable				
	Very uncomfortable	Uncomfortable	Somewhat comfortable	Comfortable	Very comfortable
Answering students' technology related questions.	○	○	○	○	○
Teaching students about technology.	○	○	○	○	○
Explaining to students what engineers do.	○	○	○	○	○
Describing the engineering design process.	○	○	○	○	○
Answering students' engineering related questions.	○	○	○	○	○

How much interest do you have in the following topics?

	Interest		
	Not at all Interested	Somewhat Interested	Very Interested
Advances and innovations in biotechnologies.	○	○	○
General technologies in manufacturing.	○	○	○
The development of more powerful communications systems (i.e., computers, the Internet, mobile devices, etc.).	○	○	○
The impact of multimedia on society.	○	○	○
Alternative forms of energy.	○	○	○
The impact technology has on the environment.	○	○	○
Advances and innovations in engineering.	○	○	○

How informed are you about the following topics?

	How Informed		
	Not at all Informed	Somewhat Informed	Very Informed
Advances and innovations in engineering.	○	○	○
General technologies in manufacturing.	○	○	○

The development of more powerful communication systems (i.e., computers, the Internet, mobile devices, etc.).	○	○	○
The impact of multimedia on society.	○	○	○
Alternative forms of energy.	○	○	○
The impact technology has on the environment.	○	○	○
Advances and innovations in biotechnologies.	○	○	○

Which of the following are examples of what an engineer does? (Check all that apply)

☐	Improve machines	☐	Install wiring
☐	Supervise construction	☐	Teach children
☐	Set up factories	☐	Innovate products and processes
☐	Design buildings	☐	Repair cars
☐	Design ways to clean water	☐	Drive machines
☐	Work as a team	☐	Build homes

Below is a list of things a high school student might or might not know or be able to do. How important is it that high school students are able to understand and do each thing?

	Importance			
	Not at all Important	Somewhat Important	Important	Very Important
Understand the relationship between technology, math, and science.	○	○	○	○
Have knowledge and skills to apply technology.	○	○	○	○
Understand the effects of technology on society.	○	○	○	○
Understand the relationship between technology and the environment.	○	○	○	○
Understand the relationship between technology and the economy.	○	○	○	○
Evaluate the pros and cons of specific technology use.	○	○	○	○

The federal government requires that students be tested in science, math, and reading. Should technology:

- ○ Be included as part of current standardized tests?
- ○ Be its own standardized test?
- ○ Not be included at all?

Is technology being taught in your classroom?

- ○ Yes
- ○ No

Block 4

Should the study of technology be included as a component of required classes or should it be its own class?

- ○ Yes, it should be part of required classes. (What class?)
- ○ No, it should be its own class.
- ○ Both

In what grade level should the teaching of technology begin?

- ○ K-2
- ○ 3-5
- ○ 6-8
- ○ 9-12

Block 3

How is technology being taught?

What about technology is being taught in your classroom? (Check all that apply)

- ☐ The characteristics and scope of technology.
- ☐ The core concepts of technology.
- ☐ Relationships among technologies.
- ☐ The cultural, social, economic, and political effects of technology.
- ☐ Using and maintaining technological products and systems.
- ☐ Assessing the impact of products and systems.
- ☐ Medical technologies.
- ☐ Agricultural and related biotechnologies.

☐	The effects of technology on the environment.	☐	Energy and Power technologies.
☐	The role of society in the development and use of technology.	☐	Information and communication.
☐	The influence of technology on history.	☐	Transportation technologies.
☐	The attributes of design.	☐	Manufacturing technologies.
☐	Engineering design.	☐	Construction technologies.
☐	The role of research and development, invention, and innovation in problem solving.	☐	None of the above.
☐	Applying the design process.	☐	Other (Please Specify):

Should the study of technology be included as a component of required classes or should it be its own class?

- ○ Yes, it should be part of required classes. (What class?)
- ○ No, it should be its own class.
- ○ Both.

In what grade level should the teaching of technology begin?

- ○ K-2
- ○ 3-5
- ○ 6-8
- ○ 9-12

Block 2

Did you obtain a teaching certificate after working in a related field?

- ○ Yes
- ○ No

What is your definition of technology?

How able are you to understand and use new technologies?

Very Unable	Unable	Somewhat Able	Able	Very Able
○	○	○	○	○

Please list some examples of technology:

How comfortable are you with the following?

	How Comfortable				
	Very uncomfortable	Uncomfortable	Somewhat comfortable	Comfortable	Very comfortable
Answering students' technology related questions.	○	○	○	○	○
Teaching students about technology.	○	○	○	○	○
Explaining to students what engineers do.	○	○	○	○	○
Describing the engineering design process.	○	○	○	○	○
Answering students' engineering questions.	○	○	○	○	○

Do you agree with the following statements?

	Agreement				
	Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree
Technology is a small factor in everyday life.	○	○	○	○	○
Engineering and technology are basically one and the same thing.	○	○	○	○	○
Science and technology are basically one and the same thing.	○	○	○	○	○

How much interest do you have in the following topics?

	Interest		
	Not at all Interested	Somewhat Interested	Very Interested
Advances and innovations in biotechnologies.	○	○	○

General technologies in manufacturing.	○	○	○
The development of more powerful communications systems (i.e., computers, the Internet, etc.).	○	○	○
The impact of multimedia on society.	○	○	○
Alternative forms of energy.	○	○	○

How informed are you about the following topics?

	How Informed		
	Not at all Informed	Somewhat Informed	Very Informed
Advances and innovations in engineering.	○	○	○
General technologies in manufacturing.	○	○	○
The development of more powerful communication systems (i.e., computers, the Internet, etc.).	○	○	○
The impact of multimedia on society.	○	○	○
Alternative forms of energy.	○	○	○

Which of the following are examples of what an engineer does? (Check all that apply)

☐	Improve machines	☐	Install wiring
☐	Supervise construction	☐	Teach children
☐	Set up factories	☐	Innovate products and processes
☐	Design buildings	☐	Repair cars
☐	Design ways to clean water	☐	Drive machines
☐	Work as a team	☐	Build homes

Below is a list of things a high school student might or might not know or be able to do. How important is it that high school students and are able to understand and do each?

	Importance			
	Not at all Important	Somewhat Important	Important	Very Important
Understand the relationship between technology, math, and science.	○	○	○	○
Have knowledge and skills to apply technology.	○	○	○	○
Understand the effects of technology on society.	○	○	○	○
Understand the relationship between technology and the environment.	○	○	○	○
Understand the relationship between technology and the economy.	○	○	○	○
Evaluate the pros and cons of specific technology use.	○	○	○	○

The federal government requires that students be tested in science, math, and reading. Should technology:

- ○ Be included as part of current tests?
- ○ Be its own standard test?
- ○ Not be included at all?

Is technology being taught in your classroom?

- ○ Yes
- ○ No