A Focus on Technological Literacy in Higher Education

John M. Ritz

Abstract

Technological literacy continues to be an important construct for learners in all societies.Quite often it is a knowledge area not required of university students unless they are engineering or technology majors. If the mission of design and technology education is literacy for all, this same mission should apply at the university level. An analysis was made of 256 students to determine their attitudes of knowledge gained from a general studies technological literacy course. The course was offered at the 100 level and was designed to expose students to various technologies so they would have a better foundation for selecting a major. It was found that this was the first time that 64% of the students studied technology. It also was noted that students gained improved understandings of the effects of technology, a working knowledge of technology, and technology and careers.

Literacy is an important term when one judges the capabilities of people. Connotations of the term literacy reflect on citizens' abilities to read, write, and use basic mathematics. Countries, where average adult literacy rates are low, often are referred to as developing countries. The levels of literacy are not equal around the globe. Often literacy is associated with a country's ability to graduate its youth from high school. These rates are important considerations when one applies for a position at a company in the developing and developed world (e.g., high school graduate, college graduate, graduate with a master's degree). In the U.S. Workforce Investment Act of 1998, literacy is defined as "an individual's ability to read, write, speak in English, compute and solve problems at levels of proficiency necessary to function on the job, in the family of the individual and in society" (p. 131).

Demographics on worldwide education can be used to compare the education rates of different countries. According to Huebler (2008),

> The unweighted mean of the adult literacy rate is 81.2 percent. In 71 countries – including most of Eastern Europe, East and Southeast Asia, and Latin America – 90 percent or more of the adult population can read and write. The highest adult literacy rate, 99.8 percent, is reported for Cuba, Estonia and Latvia. Most countries without data are in the group of industrialized countries, where literacy rates are also likely to be above 90 percent. In 23 countries, the adult literacy rate is between 80 and 90 percent. (para. 2)
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> At the other extreme are eight countries with literacy rates below 40 percent: Mali (23.3), Chad (25.7), Afghanistan (28.0), Burkina Faso (28.7), Guinea (29.5), Niger (30.4), Ethiopia (35.9), and Sierra Leone (38.1). Another 16 countries have literacy rates between 40 and 60 percent: Benin (40.5), Senegal (42.6), Mozambique (44.4), Central African Republic (48.6), Cote d'Ivoire (48.7), Togo (53.2), Bangladesh (53.5), Pakistan (54.9), Liberia (55.5), Morocco (55.6), Bhutan (55.6), Mauritania (55.8), Nepal (56.5), Papua New Guinea (57.8), Yemen (58.9), and Burundi (59.3). Almost all of these countries are in Sub-Saharan Africa and South Asia. (para. 3)
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> Finally, the world's two largest countries in terms of population have very different literacy rates. In China, the adult literacy rate is 93.3 percent. In India, only 66 percent of the adult population can read and write. (para. 4)

A useful demographic data source for analyzing adult literacy rates is NationMaster (2009), a massive central data source and a handy way to graphically compare nations. This tool is a vast compilation of data from such sources as the CIA World Factbook, United Nations (UN), and Organisation for Economic Co-operation and Development (OECD). This source lists the top 100 nations in the world by the average years of schooling completed by its youth. The top five countries cited include the United States, Norway, New Zealand, Canada, and Sweden.

The bottom five countries among the 100 noted for years of schooling includes the following: Guinea-Bissau, Mali, Niger, Mozambique, and Afghanistan.

Also, NationMaster (2009) lists the mathematical literacy found in countries; the top five were Japan, South Korea, New Zealand, Finland, and Australia. They include grade 12 advanced science students such as those in Norway, Sweden, Denmark, Slovenia, and Germany.

Why are these figures important? Governments from around the world are now taking a strong interest in the educational issues and barriers within their specific nations. Regarding high-tech industries, companies have been vying for the brightest graduates from science, computer science, and engineering. Developed countries continue to do this, but there is competition from Brazil, Russia, India, China, and South Korea, also known as the BRICK countries, and these countries fight immigration roadblocks from their own governments to increase their power in the world economy. What the countries seek in the form of education is the following**:**

> A new form of literacy – a technological literacy . . . This is a vital necessity if citizens are to participate in assessing and determining the relationship of technological systems to human needs. To function in this role requires that all citizens be conversant in the language of technological systems and comprehend basic concepts of the dynamics of the interrelated systems for all levels of society. (DeVore, 1980, p. 338)

Countries are reexamining their policies and educational systems to enhance the education of their citizens in the STEM subjects (Science, Technology, Engineering, and Mathematics). Although this push is for primary and secondary education systems to improve the education of their students, the word on U.S. campuses is STEM. Much of this is pushed by the funding avenues established by the National Science Foundation. This U.S. government foundation funded 138 STEM projects from September 2003 through April 2009. A total of $149,838,383 was approved to conduct research to improve the teaching of STEM subjects (NSF, 2010). A new objective for the NSF in recent years has been to fund innovative grants for kindergarten through high school (K-12) STEM enhancements.

STEM education and technological literacy are interwoven concepts, and many educators in design and technology education have focused their curriculum and student study in these knowledge areas. Technological literacy has become the aim of much of design and technology education that is being taught worldwide. It has been defined in *Standards for Technological Literacy* (ITEA, 2000) as "the ability to use, manage, understand, and assess technology" (p. 242). In practice, its study has been focused mainly on technical expertise, instead of how useful or pertinent technologies can be (Ginestié, 2008).

To "understand, use, assess, and manage technology" (ITEA, 2000, p. 242) is much different than to develop expertise in a few technologies. According to Pearson and Young (2002),

> Technological literacy is not the same as technical competency. Technically trained people have a high level of knowledge and skill related to one or more specific technologies or technical areas. . . a technologically literate person will not necessarily require extensive technical skills. Technological literacy is more a capacity to understand the broader technological world rather than an ability to work with specific pieces of it. (pp. 21-22)

However, tradition has led many educators to teach technical expertise. This may be in part because a design and technology teacher is given a laboratory with a variety of tools within its confines. It is natural for educators to teach these technologies when they are given these new tools. Might it be a systematic technology means-or-end problem that new technology creates?

Because much of the world continues to experience new technologies and changing economic situations, and the education system is almost void in explaining these developments and how or if they should be used for the betterment of society, these knowledge and abilities should eventually become one focus of teacher instruction through their design and technological studies programs. According to

DeVore (1972), "It is self evident that we can control only that which we know about and understand in behavioral terms" (p. 8).

School children (all ages) should become more literate about technologies. In some countries, the study of design and technology is mandatory. In others it is an elective subject. The design/technology/engineering education professionals are constantly working to get the study of technology into the required school curriculum. In different countries professionals have taken differing approaches to gain this leverage. Recently, in the United States, the decline of scientific, technological, engineering, and mathematics workers has led to a legislative act to increase STEM education (America Competes Act, 2007). Others are getting a nudge from the engineering professions to teach engineering principles at the high school level in order to attract more young people to engineering careers (e.g., Project Lead the Way in the U.S.A.). These trends are aimed at keeping the United States an economic leader through the generation of technological innovations. Industrialists believe that students should be taught how to innovate, using STEM skills, so they will become the generation that creates new technologies and products that the world's consumers will demand. Entrepreneurs also know that schooling in the sciences, technologies, engineering, and mathematics is crucial to their companies, if they are to remain productive and develop products that will gain an increased market share.

Pearson and Young (2002) stated that "technological literacy – an understanding of the nature and history of technology, a basic hands-on capability related to technology, and an ability to think critically about technological development – is essential for people living in a modern nation . . ." (pp. 11-12). Such people have knowledge of technology and are capable of using it effectively to accomplish various tasks. They can think critically about technological issues and act accordingly. Technological literate people would possess knowledge, ways of thinking and acting, and capabilities that assist them as they interact with the technology found in their environments (Pearson & Young, 2002). These "traits" include the following:

Knowledge

- Recognizes the pervasiveness of technology in everyday life.
- Understands basic engineering concepts and terms, such as systems, constraints, and trade-offs.
- Is familiar with the nature and limitations of the engineering design process.
- Knows some of the ways technology shapes human history and people shape technology.
- Knows that all technologies entail risk, some that can be anticipated and some that cannot.
- Appreciates that the development and use of technology involve trade-offs and a balance of costs and benefits.
- Understands that technology reflects the values and culture of society.

Ways of Thinking and Acting

- Asks pertinent questions, of self and others, regarding the benefits and risks of technologies.
- Seeks information about new technologies.
- Participates, when appropriate, in decisions about the development and use of technology.

Capabilities

- Has a range of hands-on skills, such as using a computer for word processing and surfing the Internet and operating a variety of home and office appliances.
- Can identify and fix simple mechanical or technological problems at home or work.
- Can apply basic mathematical concepts related to probability, scale, and estimation to make informed judgments about technological risks and benefits. (Pearson & Young, 2002, p. 17)

Context

At the author's university, faculty members have worked for the past 30 years to make technological literacy a general (or liberal) education requirement for all students. Faculty members have worked to put technology into the university curriculum, just as the social sciences and sciences are part of all students' liberal education. This work culminated in 1994 when the university decided it was time to re-visit its core liberal studies curriculum. At our university, this process occurs about every 10 years. (It was found that if one is not at the table when these study committees commence to work, it is very difficult to have an impact on the general studies offerings.) Thus, the author worked to get onto the committee that was responsible for the review.

The committee deliberated for two years, and much was to be said by the arts and letters and science faculty. The author worked with engineering and business faculty to have a voice to establish the importance and impacts that technology will continue to have on the graduates who studied at the university. The arts and science faculty listened. These faculty members needed to be educated in the idea that technological literacy was much more than the use of computers, although computer education was also needed and became a part of the curriculum.

This university included in its curriculum lower level (100/200) general education ***foundation*** courses and (300/400) level general education ***perspective*** courses. The technology education faculty members attempted to have one course in each category (foundations and perspectives), and they were successful in their endeavor. The 100-level course designed to meet the science and technology foundations is *Technology in Your World*. The intent of this course is to show the many technologies that impact and are used in differing careers. Through it students study the background of technological literacy, the systems of technology, such as medical, agricultural and bio-related, energy and power, information and communication, manufacturing, and construction technologies (ITEA, 2000), and careers that are found in these technologies. The intent is to help first-year students to be better educated when selecting a career and major.

At the 300/400 level, students can select cluster courses (focused study coming from an interdisciplinary perspective). Technology education faculty developed a 300-level course titled *Technology and Society* to meet this interdisciplinary study general education requirement (Old Dominion University, 2010).

The technology education faculty members have supplemented their programs by enrollments in these courses via general studies students (enrollment for the university is approximately 24,000 students). Annually, 14 sections of the 100-level course are offered and five sections of the 300-level course are offered. There is an additional section of the 300-level courses offered each fall on televised distance learning; enrollment averages 120 students. Old Dominion University has made technological literacy a mainstay of its course offerings. These courses enroll approximately 600 students annually.

The general studies program of the university was again reviewed in 2006. This review had a much smaller committee, and it did not include faculty from the technology education program. Faculty members knew that if they had data from assessments showing that students thought these technological literacy courses were important to their education and if it could be shown the types of knowledge students gained, there would be a much better chance of retaining this subject (technological literacy) as a general studies requirement at the university.

To enable this to happen, the author developed a survey that measured the educational objectives of the 100-level *Technology in Your World* course. This survey was administered for two years. The author was invited to a private meeting of the 2006 general education review committee to discuss changes the members were making to a computer literacy requirement for the university. The technology education program offers a course to meet this requirement in general education. Having the invitation, the author clarified questions the committee had about computer literacy. The committee praised the content that the technology education program covered in its information and computer literacy course (Word Suite plus information literacy, i.e., determining what was good information, searching the internet, and paper formatting), and it did not like the way that the other campus departments were teaching the course (Word Suite driven).

After this short discussion with the general studies committee, the author addressed the technological literacy courses that were offered and gave an overview of students' perceptions of the 100-level *Technology in Your World* course. Data had been gathered two years prior from students who were enrolled in this course.

Survey on Technological Literacy

In an effort to protect the gains made in bringing technological literacy into the university's general education program, our faculty decided that it would measure the educational progress of students who enrolled in *Technology in Your World*. Faculty decided to assess student progress according to the goals established by the general education committee for the technological literacy perspective: assessing the impacts technology has on humankind (us), the knowledge of the workings of technology, and the assistance given to students in making informed career decisions.

Over the two-year period that the survey was administered: 256 students participated. A five-point Likert-type scale was used to assess student opinions, with (5) representing strongly agree and (1) representing strongly disagree. It was found that taking this general studies course was the first time this group of students studied technology. Amazingly, it was the first such study for 64% of the general studies group. Following is an analysis of the survey findings.

Impacts of Technology

Questions 1-5 addressed the topic of impacts of technology and if these impacts had an effect on the students enrolled in the course. Question 1 stated: *I am aware of and understand how technology has evolved from the Stone Age to the present*. Many students (163) responded with strongly agree (52.0%), 103 (40.1%) agreed, 14 were uncertain (5.5%), 5 disagreed (2.0%), and 1 strongly disagreed (0.4%). The mean was 4.41, indicating agreement with this statement.

Question 2 read: *I understand the impact technology has on the development of society*. More than half (166) students responded strongly agree (64.8%), 87 agreed (34.0%), 1 was uncertain (0.4%), 1 disagreed (0.4%), and 1 strongly agreed (0.4%) with this statement. The mean score was 4.63, strongly agree.

Question 3 stated: I *feel comfortable in using the problem solving methods to solve a problem*. This was a teaching strategy used with hands-on knowledge reinforcement activities throughout the course. Less than half (110) strongly agreed (43.0%), 103 agreed (40.2%), 34 were uncertain (13.3%), 8 disagreed (3.1%), and 1 (0.4%) strongly disagreed with this statement. The mean score was 4.22, agree.

Question 4 read: *I understand that different career fields are based upon the application of technology*. Many students (130) strongly agreed (50.8%), 110 (43.0%) agreed, 14 were uncertain (5.5%), and 2 disagreed (0.8%) with this statement. The mean score was 4.44, agree.

Question 5 stated: *I have taken technology courses prior to this course*. Surprisingly, 64% indicated that this was the first course they had taken in the study of technology. This was an unexpected finding that these students had not taken courses in technology, either in high school or at the university, prior to enrollment in this course. This question points out that in the United States not as much emphasis is placed on the study of technology as should be. Table 1 presents a summary of impacts of technology information from university students in this study.

Technology Working Knowledge

The *Technology in Your World* course included readings, discussions, video information, and laboratory activities that focus on the systems of the technologically designed world. The next set of questions on the survey sought to measure students' understanding of concepts associated with these technological systems.

Question 6 read: *I understand the difference between energy sources*. One half of the students (128) strongly agreed (50.0%), 111 agreed (43.4%), 14 were uncertain, and 3 disagreed (1.1%) with this statement. The mean score was 4.43, agree.

Question 7 stated: *I understand that many products may be made from polymer and composite materials*. Less than half of the students (102 or 39.8%) strongly agreed, 109 agreed (42.6%), 36 responded uncertain (14.0%), 8 disagreed (3.1%), and 1 strongly disagreed (0.4%) to this statement. The mean score was 4.21, agree.

Question 8 asked: *I have used materials to*

Table 1. Impacts of Technology

Item	SA		A		U		D		SD		Mean
1. I am aware of and understand how technology has evolved from the Stone Age to the present.	133	52.0%	103	40.1%	14	5.5%	5	2.0%	1	0.4%	4.41
2. I understand the impact technology has on the development of society.	166	64.8%	87	34.0%	1	.4%	1	.4%	1	0.4%	4.63
3. I feel comfortable in using the problem solving method to solve a problem.	110	43.0%	103	40.2%	34	13.3%	8	3.1%	1	0.4%	4.22
4. I understand that differing career fields are based upon the application of technology.	130	50.8%	110	43.0%	14	5.5%	2	.8%	0	0.0%	4.44
5. I have taken technology courses prior to this course.	Yes	92	36%		No	164	64%				

construct/build something of my own. Many students (108 or 42.2%) strongly agreed, 105 agreed (41.0%), 16 were uncertain (6.2%), 24 disagreed (9.4%), and 3 strongly disagreed (1.2%) to this statement. The mean score was 4.14, agree.

Question 9 stated: *I know that technology evolves over time*. Seventy-six percent of the students (196) strongly agreed with this statement, fifty-eight (22.6%) agreed, 1 was uncertain (0.4%), and 1 disagreed (0.4%) with this statement. The mean score was 4.75, strongly agree.

Question 10 read: *I understand that all technologies have social, cultural, environmental, economic, and political impacts*. More than half of the students (164) strongly agreed (64.1%), 86 agreed (33.6%), 3 were uncertain (1.2%), 2 disagreed (0.8%), and 1 strongly agreed (0.4%) with this statement. The mean score was 4.50, strongly agree.

Question 11 asked: *I can identify the basic components of an electrical circuit.* Sixty-four students strongly agreed (25.0%), 112 agreed (43.8%), 44 were uncertain (17.2%), 26 disagreed (10.2%), and 10 strongly disagreed (3.76%) to this statement. The mean response to the statement was 3.76 or agree.

Question 12 inquired: I *enjoy working with my hands.* Ninety-six students strongly agreed (37.5%), 106 agreed (41.1%), 28 were uncertain (10.9%), 20 disagreed (7.8%), and 5 strongly disagreed (2.0%) with this statement. The mean response to this statement was 4.05 or agree.

Question 13 stated: *I use the Internet as a resource tool to locate information on topics of interest to me*. Two hundred-one students strongly agreed (78.5%), 49 agreed (19.1%), 39 were uncertain (15.2%), and 3 disagreed (1.2%) to this statement. The mean score was 4.75, strongly agree.

Question 14 determined: *I use the Internet on a daily basis*. Two hundred-eight students strongly agreed (81.2%), 46 agreed (18.0%), and 2 disagreed (0.8%) with this statement. The mean score for this statement was 4.80, strongly agree.

Question 15 sought: *I communicate mainly by e-mail/text messaging*. Eighty-six students responded strongly agree (33.6%), 97 agreed (37.9%), 20 were uncertain (7.8%), 51 disagreed (19.9%), and 2 strongly disagreed (0.8%) with this statement. The mean score was 3.84, agree.

Question 16 inquired: *I see that computers can be applied to various technologies*. One hundred-seventy-four students strongly agreed (68.0%), 81 agreed (31.6%), and 1 was uncertain (0.4%) with this statement. The mean score for this item was 4.68 or strongly agree.

Table 2. Technology Working Knowledge

Item	SA		A		U		D		SD		Mean
6. I understand the difference between energy sources.	128	50.0%	111	43.4%	14	5.5%	3	1.1%	0	0.0%	4.43
7. I understand that many products may be made from polymer and composite materials.	102	39.8%	109	42.6%	36	14.0%	8	3.1%	1	0.4%	4.21
8. I have used materials to construct/build something of my own.	108	42.2%	105	41.0%	16	6.2%	24	9.4%	3	1.2%	4.14
9. I know that technology evolves over time.	196	76.6%	58	22.6%	1	0.4%	1	0.4%	0	0.0%	4.75
10. I understand that all technologies have social, cultural, environmental, economic, and political impacts.	164	64.1%	86	33.6%	3	1.2%	2	0.8%	1	0.4%	4.60
11. I can identify the basic components of an electrical circuit.	64	25.0%	112	43.8%	44	17.2%	26	10.2%	10	3.9%	3.76
12. I enjoy working with my hands.	96	37.5%	106	41.4%	28	10.9%	20	7.8%	5	2.0%	4.05
13. I use the Internet as a resource tool to locate information on topics of interest to me.	201	78.5%	49	19.1%	39	15.2%	3	1.2%	0	0.0%	4.75
14. I use the Internet on a daily basis	208	81.2%	46	18.0%	0	0.0%	2	0.8%	0	0.0%	4.80
15. I communicate mainly by e-mail/text messaging.	86	33.6%	97	37.9%	20	7.8%	51	19.9	2	0.8%	3.84
16. I see that computers can be applied to various technologies.	174	68.0%	81	31.6%	1	0.4%	0	0.0%	0	0.0%	4.68
17. I understand the purpose of construction building codes.	104	40.6%	96	37.5%	38	14.8%	13	5.1%	5	2.0%	4.10
18. I know that different types of construction require different technologies.	130	50.8%	116	45.3%	8	3.1%	2	0.8%	0	0.0%	4.46
19. I understand how products are manufactured.	89	34.8%	127	49.6%	32	12.5%	7	2.7%	1	0.4%	4.16
20. I understand that transportation is a vital component of advanced societies.	178	69.5%	73	28.5%	5	2.0%	0	0.0%	0	0.0%	4.68
21. I know what is meant by biotechnologies.	124	48.4%	110	43.0%	19	7.4%	2	0.8%	1	0.4%	4.38
22. I know what is meant by nanotechnology.	78	30.5%	104	40.6%	42	16.4%	26	10.2%	6	2.3%	3.87

Question 17 stated: *I understand the purpose of construction building codes*. One hundred-four students strongly agreed (40.6%), 96 agreed (37.5%), 38 were uncertain (14.8%), 13 disagreed (5.1%), and 5 strongly disagreed (2.0%) with this statement. The mean was 4.10, agree.

Question 18 asked: *I know that different types of construction require different technologies*. One hundred-thirty students strongly agreed (50.8%), 116 agreed (45.3%), 8 were uncertain (3.1%), and 2 disagreed (0.8%) with this statement. The mean score was 4.46, agree.

Question 19 inquired: *I understand how products are manufactured*. Eighty-nine students strongly agreed (34.8%), 127 agreed (49.6%), 32 were uncertain (12.5%), seven disagreed (2.7%), and 1 strongly agreed (0.4%) with this statement. The mean score was 4.16, agree.

Question 20 stated: *I understand that transportation is a vital component of advanced*

Table 3. Career Decisions

Item	SA		A		U		D		SD		Mean
23. I understand the relationship between technology and the economy.	120	46.9%	119	46.5%	12	4.7%	4	1.6%	1	0.4%	4.38
24. I understand that the more I know how to use technology, the more valued I am to an employer.	156	60.9%	88	34.4%	6	2.3%	4	1.6%	0	0.0%	4.58
25. I realize technology will continue to affect my life.	193	75.4%	59	23.0%	3	1.2%	0	0.0%	1	0.4%	4.73
26. This course offered opportunities for me to use technologies associated with the workplace.	109	42.6%	100	39.0%	24	9.4%	16	6.3%	7	2.7%	4.13
27. This course provided experiences to assist me with future career selections.	88	34.4%	87	34.0%	46	18.0%	23	9.0%	12	4.7%	3.84

societies. One hundred-seventy-eight students strongly agreed (69.5%), 73 agreed (28.5%), and 5 were uncertain (2.0%) with this statement. The mean score was 4.68, strongly agree.

Question 21 asked: *I know what is meant by biotechnologies*. One hundred-twenty-four students strongly agreed (48.4%), 110 agreed (43.0%), 19 were uncertain (7.4%), 2 disagreed (0.8), and 1 strongly agreed (0.4%) with this statement. The mean was 4.38, agree.

Question 22 stated: *I know what is meant by nanotechnology.* Seventy-eight students strongly agreed (30.5%), 104 agreed (40.6%), 42 were uncertain (16.4%), 26 disagreed (10.2%), and 6 strongly agreed (2.3%) with this statement. The mean score was 3.87, agree.

Technology and Careers

The third part of the survey sought student responses to questions about technology and their careers. The *Technology in Your World* course covered content on technological systems. During this analysis implications were continually directed to the use of these technologies with various career fields. These were summary questions about these interrelationships.

Question 23 read: *I understand the relationship between technology and the economy*. One hundred-twenty students strongly agreed (46.9%), 119 agreed (46.5%), 12 were uncertain (4.7%), 4 disagreed (1.6%), and 1 disagreed (0.4%) with this statement. The mean score was 4.38, agree.

Question 24 stated: *I understand that the more I know how to use technology, the more valued I am to an employer*. One hundred-fifty-six students strongly agreed (60.9%), 88 agreed (34.4%), 6 were uncertain (2.3%), and 4 disagreed (1.6%) to this statement. The mean score was 4.58, strongly agree.

Question 25 said: *I realize technology will continue to affect my life*. One hundred-ninety-three students strongly agreed (75.4%), 59 agreed (23.0%), 3 were uncertain (1.2%), and 1 strongly disagreed (0.4%) to this statement. The mean score was 4.73, strongly agree.

Question 26 stated: *This course offered opportunities for me to use technologies associated with the workplace*. One hundred-nine students strongly agreed (42.6%), 100 agreed (39.0%), 24 were uncertain (9.4%), 16 disagreed (6.3%), and 7 strongly disagreed (2.7%) to this statement. The mean score was 4.13, agree.

Question 27 asked: *This course provided experiences to assist me with future career selections*. Eighty-eight students strongly agreed (34.4%), 87 agreed (34.0%), 46 were uncertain (18.0%), 23 disagreed (9.0%), and 12 strongly disagreed (4.7%) to this statement. The mean score was 3.84, agree.

Discussion

Literacy is important to citizens of the world. Literacy goes beyond the educational basics of reading, writing, and mathematics. Literacy has moved into other school subjects. For nations to prosper economically, the technological literacy capabilities of its citizens are important. University technology departments can contribute to the literacy of nations. Technological literacy courses at the university level can be used to support design and technology's contributions to the general education of all students. Student enrollment in general education courses can be used to support and further justify the very existence of our programs. Universities continually review program enrollments to make decisions on those that it wishes to support financially. If our design and technology program relies entirely on enrollments from teacher preparation students, it could become labeled as a low-enrolled program. By gaining support for technological literacy courses as a general education requirement, design and technology education programs can build enrollment and, at the same time, increase their teaching of technological literacy to a wider population of university students.

Having data from students who complete technological literacy courses can show the value of these courses and the data can be used as a tool to support discussions of why these courses should be offered. Faculty members of other technological literacy courses in the program at Old Dominion are now conducting this type of research, and they have noted the value of conducting such research.

The surprising response to this study was the lack of experiences students had with the study of technology, prior to the selection of this course. Sixty-four percent of the students indicated that they did not take a prior course on technology either in high school or at the university before this course. The first-year statistics for this study indicated that this number was as high a 70%. Students found that technology does have an impact on the world in which they live and the career path that they plan to purse.

There are many technologies that compose the designed world. Although each technology has its particular systems and subsystems, its development has progressed because of the innovative and problem solving abilities that people working in these areas have pursued. Students were exposed to many systems, including agriculture, communication and information, construction, energy and power, manufacturing, medical, agriculture and bio-related technologies, and transportation technologies. Students learned to use activities in these areas to solve problems. In doing this they were (and can be) exposed to some of the knowledge and skills needed if they pursued careers in these technologies. Students indicated the value of such courses in their preparation for careers after they complete their degrees.

Summary

Faculty members have found the importance of enabling students to study technological literacy at the university level. Technology can contribute to the education and literacy of university students. If one looks at the larger picture of education and the technological literacy of its students, is not this the mission that our profession has as design and technology educators? Expanding design and technology courses to the university general population can be used as numbers to support academic programs while also contributing to a wider student population. This helps us achieve technological literacy for all.

Dr. John M. Ritz is the Graduate Program Director for Occupational and Technical Studies within the Department of STEM Education and Professional Studies at Old Dominion University, Norfolk, Virginia. He is a member of the Alpha Upsilon Chapter of Epsilon Pi Tau.

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