Conversations on Student Success

Topic 5. Technology Literacy

Note: For articles below that require a log-in, see these instructions.

Introduction

Technology literacy in this “Conversation” ranges from basic computer literacy, fluency in information technology and use of campus technologies to the basic understanding of technologies encountered in everyday life. Both student and teacher technology literacy are addressed. Although there is some overlap, information and media literacy will be discussed in Conversation 7.

Best Bet Articles


Learning to use new technologies appears effortless for some students and laborious for others. This observation led to the hypothesis that “technology intelligence” may partially explain these observed differences. To explore this hypothesis, 4 classes of undergraduate Education students took online Myers-Briggs (MBTI) and multiple intelligence inventories. Results of the study indicated a relationship between Myers-Briggs type, bodily-kinesthetic intelligence and interpersonal intelligence. “Intuitors” on the MBTI reported more satisfaction in using technology. (author abstract)


Among other results, these are significant. The public is virtually unanimous in believing that the study of technology should be included in the school curriculum. Just short of two-thirds say the study of technological literacy should be integrated into other subjects in lieu of being taught as a separate subject. Those believing that technological literacy should be taught as a separate subject are equally divided on the issue of whether the subject should be optional or required. Close to two-thirds agree that technological literacy should be required as part of high school graduation requirements, and an even higher percentage believe questions designed to determine how much students understand and know about technology should be included in testing programs mandated by the federal government.

This classroom study investigates the role of computer literacy (procedural computer-related knowledge, self-confidence in using the computer, and familiarity with computers) as a learning prerequisite for knowledge acquisition, and analyzed the learners’ patterns of media use as processes that might explain this role. Students with greater familiarity with computers acquired significantly less knowledge. In the light of the patterns of media use, these findings might be explained by different navigation styles adopted by students with high and low familiarity with computers: students with high familiarity with computers exhibit more shallow processing strategies (‘browsing’) which are less functional for learning.

**Assorted definitions of technology literacy**


The Student Technology Arc is a developmental model designed to measure the growth and maturity in technological literacy necessary for higher education students. These include: the ability to use computer hardware and software; critical discernment and ethical considerations when using the Internet; a capacity for engaging in productive academic relationships using computer programs and electronic communication; proficiency in combining technology use with the manual tasks of learning; acceptance of multiple perspectives through cyberspace; creative engagement with technology; and increasing sophistication of worldview and intellectual abilities.


In defining “technology literacy,” various education organizations and businesses list information science skills, digital media fluency, advanced computer, and internet communications, as well as the newborn term “technacy” — a deep knowledge of technological systems.


National Assessment of Educational Progress draft document defines technological literacy as the capability to use, understand, and evaluate technology as well as to apply technological concepts and processes to solve problems and reach one’s goals. For purposes of this framework, it comprises the three areas of Technology and Society, Design and Systems, and Information and Communication Technology.

*From this document, beginning on p.1-7 (or PDF page 26.)*

A technologically literate person should be able to apply cross-cutting practices that are generalizable ways of thinking, reasoning, and acting that are important across all areas of technological literacy. The practices can be grouped into three broad categories:

**Identifying and Applying Principles**

- Understands the nature of technology in its broadest sense.
- Is aware of the various digital tools and their appropriateness for different tasks.
- Knows how technology is created and how it shapes society and in turn is shaped by society.
- Understands basic engineering concepts and terms, such as systems, constraints, and trade-offs.
- Understands cultural differences by engaging with learners of other cultures.

**Using Processes to Solve Problems and Achieve Goals**
• Uses a wide range of technological tools and systems, ranging from kitchen appliances and alarm clocks to cars, computers, communication devices, and the Internet.
• Can apply technological concepts and abilities creatively, including those of engineering design and information technology, to solve problems and meet goals.
• Collects and analyzes data to develop a solution and complete a project.
• Uses multiple processes and diverse perspectives to explore alternative solutions.
• Can evaluate claims and make intelligent decisions.

Communicating and Collaborating
• Communicates information and ideas effectively to multiple audiences using a variety of media and formats.
• Participates thoughtfully and productively in discussing critical societal issues involving technology related to humans, the environment, knowledge, and citizenship.
• Collaborates with peers and experts.

✓ For assessment content from this report, begin in Chapter 2, p. 2-2 (or PDF pages 38.) Subsequent pages detail competencies student should have in each sub-area by grade 4, grade 8, and grade 12.
Note: In the Assessment section of this annotated bibliography, see Fletcher (2009) and Nagel (2009) for opinions about this document.

Teachers and learners of technology


Some technology education programs have focused on developing computer skills, others on exploring technology, others on career and technical skill development, and still others focus on vocational training. Therefore, facilities vary and planning a new one is problematic. Using Standards for Technological Literacy as a focus will guide development of new flexible high tech educational learning environments and reassure stakeholders that the future is being taken into consideration. The article gives guidelines for this planning process.


The purpose of this study was to determine whether taking a Computer Literacy and Applications (CLA) course has an impact on students' attitudes toward computer applications, across various undergraduate disciplines. The study population was divided into two groups according to the students’ field of study: quantitative-oriented and qualitative-oriented. A significant difference was found in attitudes before and after the CLA course only in the quantitative group. Based on the results of this study, it is recommended to develop and teach a different CLA course to students with different orientations. The syllabus for each orientation should focus on those computer applications that are more relevant and suitable to their field of study. The syllabus for the qualitative orientations should focus mainly on Word, Internet, and PowerPoint, and less on Excel. The syllabus for the quantitative orientations should focus mainly on Excel and less on the other applications. In addition, study of Excel should be extended beyond topics covered in the current CLA course and include topics related to management, economics, and accounting.

Addressing the lack of technological literacy in the United States, the International Technology Education Association - Center to Advance the Teaching of Technology and Science (ITEA-CATTS) developed the Engineering by Design™ National Model Program. The mission is to provide courses of study enabling students to meet local, state, and national standards for technological literacy. The program consists of 10 standards-based courses starting in the sixth grade and continuing through college-level coursework. Foundations of Technology is the cornerstone high school Engineering by Design™ course. The course focuses on three dimensions of technological literacy, "knowledge, ways of thinking and acting, and capabilities. The article describes teacher attitudes about the course.


Technology professional development often falls short when teachers return to the classroom confused and reluctant to implement what they were taught. The author recommends follow-up by knowledge broker teachers or instructional technologists. They are described as harbingers of innovation, masters of strategies and techniques, teaching artists who can draw the picture of how the technology can be used in an individual teacher's classroom, available Johnny-on-the-spot, and known and admired as catalysts for unified change.


This research examined the relationship between adult students' self-directed learning (SDL) ability and instructional technology (IT) competency in an online course. The study also investigated motivation and learning strategies that the students used to learn instructional technology. The research involved surveying 198 continuing education professionals who took online courses at a large Midwest state university. The results indicate a statistically significant positive correlation between SDL ability and IT competency in students with above average SDL ability. The results also indicate that motivation is an important factor for learning technology in an online course regardless of the students' SDL ability. Additionally, the results show that students with higher level of SDL ability are likely to exhibit higher level of self-efficacy for learning and performance, and higher level of effort regulation.


A study measured technology usage between student teachers and experienced teachers at different grade levels and to determine if usage was in agreement with the International Society for Technology in Education's (ISTE) National Educational Technology Standards (NETS) for Students. There were statistically significant differences found among technology uses across
grade levels; the experience level of the teachers did not contribute to this difference. Findings in this study showed that primary grades conform more than the upper grades to national technology-literacy standards.

**Student use of and expectation about technology in an educational setting**


A survey done by O'Keeffe & Company for CDW, an information technology company, examines the current and future role of technology in higher education. Some results include the following:

- Students see increasing educational value in campus technology; 81 percent of students report using technology every day to prepare for class, up from 63 percent in 2008
- Faculty's technology use does not meet students' expectations. Students rate faculty lack of technology knowledge as the biggest obstacle to classroom technology integration.
- Institutions are lagging in workforce preparation. Less than one-third of students and only 22 percent of faculty strongly agree that higher education institutions are preparing students to successfully use technology in their chosen profession.


Identifies these technologies that are having or are predicted to have the most direct impact on higher education: cyber-infrastructure and high performance computing; open-source learning management systems; product managers in IT organizations; information resource management technologies for libraries; and IT service management. This annual survey shows more emphasis on technology for direct student services than some previous years.


Report identifies and describes emerging technologies likely to have a large impact on teaching, learning, research, or creative expression within learning-focused organizations. It predicts the time frame for widespread adoption of each one within educational institutions.

- **Mobiles** (*application rich like iPhones*).
- **Cloud computing** (*networked computers that distribute processing power, applications, and large systems among many machines*).
- **Geo-location technology** (*use in field research, real-time data overlays for maps, links to historical info at sites and more*).
- **Personal web** (*personal web-based environments to support social, professional, and learning activities using whatever tools individuals prefer*).
• **Semantic aware applications** (tools designed to use the meaning, or semantics, of any information to retrieve only content using your preferred context, for your purpose).

• **Smart objects** (technology attaches information to a physical object that connects it to a store of information about the object.)
  Example: each ingredient in a prescription drug formula is tagged with information about manufacturer, location, route taken through the distribution channels, etc. Useful for preventing counterfeit prescription drugs and for product recalls.
  Read more [Challenges for database management in the internet of things](#).


See technology related survey results (Academics and Technology, Satisfaction with Academic Computing and Amount of Time Spent Online) on document pages 9-10 (PDF pages 13-14).

**Assessment**


The article argues that the National Assessment of Educational Progress (NAEP) test for measurement of technological literacy, due to be administered in 2012, is based on standards that are different from those of most states, which follow the National Educational Technology Standards created by the International Society for Technology in Education. It is also different from anything contained in the No Child Left Behind Act. It predicts disappointing results and political problems in 2012.


NOTE: The PDF executive summary can be downloaded for free from this publisher web site. Some other portions of the book can be viewed for free.

The work is designed as guidelines for developing assessments, not actual assessments. The original charge, which included K–16 students and teachers, was modified because the committee was unable to identify opportunities for assessing college students and faculty (with the exception of pre-service teachers). See also this extensive [book review](#).


The authors conclude that “The results of this study suggest that using information technology for educational purposes is linked to how college students engage in effective educational practices (e.g., active and collaborative learning) more generally. The results of this study prompt us to consider how established indicators of student engagement may benefit from tying information technology items to activities related to collaborative learning, for example. In doing so, however, two things should be kept in mind. First, measuring students’ engagement in information
technology may not add to our ability to explain educational outcomes above and beyond what is already captured by other measures of student engagement. If this is the case, we need to ask whether value is added by their inclusion. Second, we should not be boxed in by what we already measure. It is important to ask if there are ways students engage information technology that are independent of the established indicators of engagement represented by the NSSE survey and other instruments.”


The State Educational Technology Directors Association (SETDA), publicly urges the National Assessment Governing Boards to reconsider its position on use of the NAEP Technological Literacy Assessment by describing the chaos it will cause.