

A Framework for Assessing Technology-Assisted Learning Outcomes

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INTRODUCTION

Colleges and universities have been actively engaged in integrating technology in teaching and learning activities since the early 1990s. These activities have been as varied as the university's missions and the clarity of their aims for technology-assisted instruction allowed. In tandem with the widespread institutional support for new computers and software many faculty invested time and energy in learning how to use the new tools in their own teaching and disciplines; other faculty went further and became agents for transforming teaching and learning within their institutions and in their professional organizations.

However, worldwide global changes are happening faster than change is occurring in higher education teaching and learning curricula and the resulting learning outcomes of students. Acquiring the intellectual capabilities necessary for technology fluency and information literacy generally and in particular within content domains remains elusive. Growing calls for students to demonstrate technology fluency competencies in their disciplines and chosen professions is a pressing challenge and a necessity.

If recent history is any indicator, groups pressing for accountability are likely to propose their own solutions to colleges and universities – some benefiting learning and some not. Actively engaging in the search for solutions for addressing accountability has become an institutional priority. The need is pressing for colleges and universities to show the many publics they serve that they are preparing an educated, responsive citizenry who will engage contemporary social, economic and political imperatives actively and progressively.

This article discusses a framework for information technology literacy that describes three categories of information technology knowledge: contemporary skills; foundational concepts, and intellectual capabilities. This framework was published in a report of a two-year study commissioned by the National

Research Council of the U.S. (NRC, 1999). The goal of the report was to set forth standards for skill and knowledge acquisition of the computing, information and communication technologies that characterize our present and future society and economies. This report, *Being Fluent with Information Technology*, describes a three-tiered framework of the components of fluency with information technology and the accompanying pressing needs and ongoing opportunities. This article discusses the usefulness of this framework for assessing learners' knowledge in these three categories and just where progress is occurring and where it is not.

BACKGROUND

The “new economy” of the 21st century is driven in large measure by unprecedented advances in computing, information and communications technologies and transportation. To be competitive, industrialized and developing nations alike are driven by the need for greater use of science and technology tools by average citizens; improved understanding of highly complex, interacting systems; the need for building community and solving local challenges in the face of globalization and mass customization; and a substantial rethinking of retailing, services, and business in general.

In *The Singularity Is Near* Ray Kurzweil (2005) proposes that the exponential rates of technological change in modern times offer possibilities for significant shifts in the way we approach healthcare, energy, agriculture, communications, and many other fundamental challenges. Shifts will occur as time-honored content and emerging ideas integrate in innovative ways with old and new technologies to benefit modern society's needs.

Educators have the responsibility to structure curricula and learning so that students will acquire the skills and knowledge to lead and participate in these upcoming shifts. Deciding what students need to know

and will be able to do *in the context of* a changing panoply of computing, information and communications technologies is a critical step in implementing this framework. A next step is rigorous assessment that demonstrates the manner and degree to which the learning is taking place. An assessment shift is immediately apparent as the framework demands that we assess information literacies, technology fluencies and content competencies at once, and not as separated remnants of the last century's economic and social imperatives (Goldin, 2001).

It is not surprising that reports continue to fill the early years of the 21st century calling for increased accountability in higher education. Outcomes are a major theme. The recommendations often challenge higher education to “measure up” and “make the grade” because “what gets measured gets our attention, gets funding, and gets taught.” Public discourse aside, good assessment of learning outcomes does not present itself as a simple task. Asking the right question is critical to measuring aims in the short term, much less assessing outcomes that will continue to develop and last over a lifetime (Shavelson, 2007).

The rapidly changing technologies and their relationships to contemporary learning imperatives emphasize the need to explore seriously and systematically what students need to know and to be able to do in this millennium's technology-enabled learning environments, their local communities and professions, and the global marketplace.

THE FIT-NESS FRAMEWORK FOR LEARNING AND ASSESSING INFORMATION LITERACIES

In 1999 the National Research Council (NRC) in the U.S. published the results of a two-year study of information technology literacy requested by the National Science Foundation (NSF-U.S.) The NSF had requested the study because the ubiquity of computing, information and communications technologies in modern life called for improved articulation of what everyone needs to know and to be able to do to be productive citizens. This report, *Being Fluent With Information Technology*, acknowledged the tendency to focus on skills when discussing technology literacy. The report explained that literacy today requires a hierarchy of

components of knowledge and related abilities to be fluent in information technology (FIT). The report offers an intellectual framework that can be useful for differentiating *achievements at a particular time*, such as within an educational program from *learning outcomes over time*, such as intellectual capabilities for realizing the value of information technologies. In other words, the framework differentiates student assessment within a set of learning experiences from assessment of what students need to know and to be able to do in the technology-rich environments in which they live and work today.

By extension this framework can also help to differentiate the pursuits of researching teaching and learning theories, evaluating learning programs and processes and assessment of learning outcomes within a school setting from the efforts needed to do the research, evaluation and assessment to show how students measure up or make the grade in technology-rich environments over time.

The Purpose of the FIT-ness Framework

The intent of the NRC report was to “lay an intellectual framework for ‘fluency with information technology’ that is useful for others in developing discipline-specific and/or grade appropriate efforts” to promote this fluency. Being “fluent with information technology” — often abbreviated to “FITness” — sets standards for three kinds of knowledge: (NRC, 1999, pp. 1-5).

- Contemporary skills: the ability to use today's computer applications;
- Foundational concepts: the principles and ideas of computers, networks, and information;
- Intellectual capabilities: the ability to apply information technology in complex and sustained situations

The contemporary skills will change as technology changes. The foundational concepts explain the how and why of the technologies — the computers, networks and information — and are the foundation for understanding new information technology as it evolves. The intellectual capabilities are the ability to apply the technologies to the problems and challenges that occur over time. These are the capabilities that empower people to think more abstractly about the

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