Chapter 16
Designing and Delivering Technology Integration to Engage Students

Kevin D. Biesinger
University of Nevada Las Vegas, USA

Kent J. Crippen
University of Nevada Las Vegas, USA

ABSTRACT

In order for educators to effectively build, select and integrate technology into the delivery of curriculum and pedagogy, an accepted set of critical program design and delivery elements is needed. The authors propose that research based components such as user validation functions, trace methods, and worked examples be among these accepted design elements of technology supported learning environments. As for the pedagogical methods employed to effectively integrate technology into K-12 curricula, an epistemological shift is needed by which more instructors view learning from a student-centered perspective. Systematic changes needed to foster this view include a migration away from the traditional computer lab scenario, on-going professional development as a continuous support system, and the expectation that technology integration is required as an indication of quality instruction as evidenced in teacher evaluations.

INTRODUCTION

Providing teachers with pedagogically sound methods for introducing technology into their instruction has become a newly needed skill in order to keep students of the 21st century engaged. Recent research has noted the importance of not only creating effective e-learning environments, but remaining cognizant of student behaviors within such systems through the use of trace methods (Winne & Hadwin, 1998). In addition, education's most recent paradigm shift has moved the goals of instruction from teacher-centered to student-centered, promoting motivational constructs such as goal orientation and engagement to center stage when conducting educational research. It is our contention that the importance of motivational constructs is even more pronounced within e-learning environments, with engagement and self-efficacy serving as key predictors of performance (Pajares, 2002).

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In addition to creating effective learning systems, the onset of technology supported learning environments has made it possible for both researchers as well as instructors to obtain more authentic indications of student behaviors while engaged in academic tasks. While recent advancements made in this area have made it possible to find out what learners actually do as opposed to what they claim to do (i.e. self-report), this additional data point should enhance, and not replace learner perceptions. Using the additional information to better triangulate learner behaviors, instructional designers can keep closely informed of effective instructional strategies and better yet, design dynamic systems that can change based on learner characteristics as well as the content to be learned.

This chapter will outline the theoretical foundations of self-regulated learning (SRL) within technology supported learning environments with an emphasis on critical motivational constructs such as goal orientation (Elliot, 1999). Specific pragmatic examples will be used to illustrate important considerations for building efficient technology supported learning environments such as cognitive load (Sweller, 1988), worked example usage (Crippen & Earl, 2007), and feedback (Bower, 2005). In addition, we will introduce the concept of technology *integration* rather than implementation as well as the critical elements necessary to put these instructional practices into place. Our intent is to provide the reader with a sampling of empirically sound studies in order to gain the knowledge needed to select or build effective and engaging technology supported learning environments as well as the ideal conditions to ensure a successful migration into this new arena.

BACKGROUND

Using technology supported learning environments to engage students is a critical antecedent to positive changes in self-efficacy, goal orientation, and achievement. Self-Regulated Learning (SRL) is the theoretical model which will be used to demonstrate the importance of engagement. Pintrich (1995) defined self-regulated learners as those who regulate their own learning by deliberately engaging cognitive, metacognitive and motivational efforts to attend to tasks with perseverance while incorporating prior knowledge efficiently. By taking responsibility for one's own learning (and not because of some external source such as a teacher or extrinsic reward), these learners are typically more successful in making recurring and accurate assessments of their progress towards a clear and predefined goal. A good metaphor which demonstrates the concept of SRL is that of a thermostat. When the temperature of a controlled environment reaches a certain "cut point", an efficient ventilation system will start or stop the flow of hot or cold air. In the same fashion, a learner who possesses good self-regulation skills will effectively gauge his or her learning environment, the critical details of the task to be completed, and monitor their progress through self-evaluation and feedback until the task is successfully completed. It is important to note that this process is quite complex in contrast to the thermostat metaphor and can vary significantly dependent upon the task, the environment, and the intrinsic characteristics of the learner. Indeed, more recent theoretical developments made within SRL theory reflect the influence of social cognitive theory (Bandura, 1997) and remain grounded in the triadic reciprocal causation model (Bandura, 1986), whereby the agency of a learner represents an interdependent relationship between behavior, personality factors (cognition, motivation and biology) and the learning environment. Events and dispositions from each of these three factors "operate as interacting determinants that influence one another bi-directionally" (Bandura, 1997). Although other sub-factors such as feedback (Winne & Hadwin, 1998; Zimmerman, 1990) and goal orientation (Pintrich, 2000a) have shed new light on the theory, most variation in recent