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Enhancing e-Learning Effectiveness

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Chapter Five
Enhancing e-Learning Effectiveness

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> *The calls for more accountability in higher education, the shrinking budgets that often force larger class sizes, and the pressures to increase degree-completion rates are all raising the stakes for colleges and universities today, especially with respect to the instructional enterprise. As resources shrink, teaching and learning is becoming the key point of accountability.*
>
> -- Malcolm Brown & Veronica Diaz (2011, p. 41)

Introduction

While there is considerable evidence that effective leadership makes a significant difference in student achievement in the K-12 environment (Waters, Marzano, & McNulty, 2003), similar research linking leadership in e-learning to student success does not exist. Indeed, similar research has not been undertaken at post-secondary levels at all, most likely because student learning at institutions of higher education has not been subject to the same scrutiny as it has K-12 schools. This state of affairs is changing rapidly, however, driven to no small extent by the rise of online education, and student achievement at post-secondary institutions is increasingly being questioned. E-learning effectiveness, therefore, is an issue that e-learning leaders must take very seriously.

This chapter explores what e-learning leaders should know about learning effectiveness. Because there are still many who doubt the efficacy of e-learning, it first reviews current evidence which finds that students learn at least as much if not more in online classes as they do in traditional, face-to-face classes. It then briefly examines the notion that the online medium is better suited for new pedagogical approaches, and suggests "constructivism" as a

epistemological foundation for much online teaching. However, learning is an extremely complex activity, and all learning contexts are unique. The chapter thus advocates for e-learning leaders making themselves particularly knowledgeable about their own unique e-learning contexts through the collection and analysis of empirical data. The chapter thus describes the role of learning analytics and data-based decision-making and advocates for exploring the inputs and processes of learning as well as learning outcomes. Two different approaches to assuring quality in the design of online courses are described, along with several approaches to measuring learning processes including the Community of Inquiry survey. Finally, the chapter identifies a variety of outcomes measures that are useful in this environment.

e-Learning vs. Traditional Classroom Instruction

At its most basic, the goal, the product, the raison d'etre of education is learning. Ensuring and enhancing learning effectiveness must thus be of prime importance to all higher education leaders, especially in light of the growing national concern about the value of a college education. Ensuring and enhancing learning effectiveness must be particularly important to e-learning leaders because, in spite of the fact that we have over a decade of evidence that students learn as much or more from online classes than they do from traditional teaching and learning (Arbaugh, 2000; Bernard et al., 2004; Blackley ,& Curran-Smith, 1998; Cavanaugh, 2013; Fallah, & Ubell, 2000; Johnson, Aragon, Shaik, &Plama-Rivas, 2000; Maki, Maki, Patterson, Whittaker, 2000), a majority of higher education faculty continue to believe that e- learning is inferior to face-to-face learning. Indeed, a recent APLU survey of over 10,700 faculty members at 69 colleges and universities found that 70% of all respondents believed e-learning was less effective than traditional instruction (Seaman, 2009). In fact, even 48% of responding faculty members who had developed or taught at least one online course thought e-learning was

inferior, while just 15% of this group thought it was superior to learning in traditional classrooms. Only 6% of the total population surveyed believed e-learning was superior.

The first learning effectiveness task for an e-learning leader, then, often involves justifying the efficacy of learning online. If nothing else, e-learning leaders should familiarize themselves with two large-scale studies which provide strong evidence that online students learn as much or more and are more engaged than students learning in traditional face-to-face environments.

U.S. Department of Education Meta-Analysis

The first of these is a meta-analytic study comparing the learning outcomes of online and blended learning with traditional instruction. The study was commissioned by the U.S. Department of Education and conducted by a group of researchers from the Center for Technology in Learning at SRI International led by Barbara Means (Means, Toyama, Murphy, Bakia, & Jones, 2009). The researchers reviewed over a thousand studies on online learning which compared learning outcomes between online and face-to-face instruction published between 1996 and 2008. From these they selected 46 studies, all of which involved higher education, from which effect sizes could be generated. Effect sizes were computed or estimated for a final set of 51 contrasts. Among the 51 individual study effects, 11 were significantly positive, favoring the online or blended learning condition, and two were significantly negative.

The findings of the meta-analysis revealed a positive effect of +0.21 ($p<.01$), or about 1/5 of a standard deviation, for the online and blended learning conditions together relative to traditional learning, and a larger effect of +0.35 ($p<.001$), or slightly over 1/3 of a standard deviation, for the blended condition alone. This effect size is a good bit larger than that for studies comparing purely online and purely face-to-face conditions, which had an average effect size of just over

+0.14 ($p < .05$). The findings provide robust evidence that students generally learn at least as well and perhaps slightly better in online environments than in they do in traditional face-to-face ones. They quite clearly show that greater learning results from education which combines e-learning and face-to-face elements than they do from traditional, face-to-face education alone.

National Survey of Student Engagement (NSSE)

Similar sorts of conclusions can be drawn from recent analyses undertaken by researchers from the National Survey of Student Engagement (2009). In 2009, questions about three types of technologies commonly used to support teaching & learning – learning management systems, interactive technologies (social and collaborative applications such as wikis, blogs and virtual worlds), and high-tech communications (including discussion boards, text messaging, and networking sites as well as email) -- were included in the versions of the NSSE survey administered to 31,000 students attending 58 institutions. Controlling for age, gender, major, Carnegie classification and number of fully online courses taken, the researchers used regression analyses to assess the relationship between the use of Internet technologies and student engagement in college classes.

They found that Internet technology use was positively related (p=.001) to all three categories of engagement measured by the NSSE survey – NSSE benchmarks (academic challenge, active and collaborative learning, supportive campus environment, student- faculty interaction), deep approaches to learning (higher order thinking, integrative learning, reflective learning), and self-reported learning outcomes (personal and social development, practical competence, general education). The use of course management technology was most strongly related to student-faculty interaction and self-reported gains in personal and social development. The use of interactive technologies corresponded most strongly with students' self-reported learning gains

and the supportive campus environment benchmark. The use of high-tech communications was strongly correlated strongly with every NSSE measure (National Assessment of Student Achievement, 2009). The researchers concluded that their results demonstrated a significant and meaningful relationship between course technology use and learning and other gains, such that technology use may in fact represent another important concept under the umbrella of student engagement (Chen, Lambert, & Guidry, 2009).

Paradigm Change

Indeed, we have good and ample evidence that students learn at least as much, and often more, from online classes than they learn in traditional classroom environments. At present, it is important for e-learning leaders to be conversant with that literature to answer the charges of critics. However, comparisons of e-learning and learning from traditional instruction gloss over real differences in the online medium that might be uniquely supportive of particular ways of knowing and learning. For example, Parker and Gemino (2001) compared student learning between traditional and online versions of a course in systems analysis and design for business majors. Although there were no significant differences in final exam scores between classes, on closer examination they found that students in the traditional classes scored significantly higher on the technical parts of the exam, while students in the online sections scored significantly higher on the conceptual parts of it.

More research of this type is certainly called for, but more importantly, research that explores the learning potential of different approaches within e-learning environments is critical. The unrelenting concern with comparisons of traditional and online delivery draws our attention away from needed explorations to concentrate on issues that have really already been settled.

Indeed, perhaps the biggest obstacle to innovation in online learning is thinking things can or should be done in traditional ways (Twigg, 2001).

Henry Jenkins (2006) writes that media are characterized not only by the technologies they employ, but by the cultural practices that surround their use. Similarly, what distinguishes e-learning from the distance education of a previous era is not just the digital technologies from which it takes its name, but, more importantly, the pedagogical approaches such technologies uniquely afford. Where distance education was materials and teacher-centered, online learning is student-centered; where distance education focused on independent study, online learning focuses on collaboration; where distance education was grounded in behaviorist psychology, online learning is grounded in constructivist theories of learning.

E-learning leaders should familiarize themselves with such approaches for two important reasons. First, if they are to manage learning effectiveness across courses and programs, leaders need to be familiar with foundational theories and with national and international models for designing instruction and for evaluating learning effectiveness. Second, leaders must be able to represent these issues to the institution at large, especially when reporting to academic governance groups, and when working on institutional policies that relate to learning effectiveness in such areas as faculty development and support, technology requirements, student support, instructional design, and evaluation. Leaders cannot be experts in everything, but they must be familiar with the unique attributes of the online learning environment in order to help it reach its full potential in a broader institutional culture

Constructivism

Constructivism is the name given to a set of epistemological alternatives to objectivist theories of knowledge which share the notion that we impose meanings on the world, rather than discover the meanings extant in it (Duffy & Jonassen, 1992). Constructivists hold that meaning is constructed in our minds as we interact with the physical, social, and mental worlds we inhabit, and that we make sense of our experiences by building and adjusting the internal knowledge structures in which we collect and organize our perceptions of and reflections on reality. Social constructivists further contend that such knowledge construction is facilitated through social interaction (Vygotsky, 1978), with some social constructivists viewing cognition as distributed among the thinking individual, interacting others, and cognitive tools (Brown, Collins, & Duguid, 1989).

While constructivism, then, is first and foremost a learning theory and not a theory of instruction, particular conceptualizations of learning suggest corresponding pedagogical approaches. According to constructivists, no matter how we are taught, all learning occurs in our minds as we create and adjust our internal mental structures to accommodate our ever growing and ever changing stores of knowledge (Piaget, 1957). Constructivists thus believe that all learning is an active process, that it is unique to the individual, and that it is, accordingly, intimately tied to individual experience and the contexts of that experience, no matter how or where it takes place. Such beliefs have obvious pedagogical implications. Most importantly, they shift the pedagogical focus from knowledge transmission to knowledge construction; that is, from teaching to learning.

This shift in focus is particularly well captured in *How People Learn* (Bransford, Brown, & Cocking, 2000), a publication of the National Research Council which summarizes research on learning and its educational implications from a constructivist perspective. The central

pedagogical tenet of *How People Learn* is that educators should not be focused on instructional design, but rather on the design of learning environments. Although this distinction may appear merely semantic, it is not. Bransford, Brown and Cocking urge replacing a traditional concern with the design and delivery of instruction and instructional materials with design approaches that focus on the creation of environments that foster and support active learning in collaborative communities. Constructivist learning environments, they argue, should be learner-centered, knowledge-centered, assessment centered, and community-centered. E-learning leaders would do well to consider advocating for constructivist approaches and ensuring their courses meet these criteria.

Community of Inquiry (CoI) Framework

The Community of Inquiry (CoI) framework (Garrison, Anderson & Archer, 2000), which is one or the most widely used models of online learning, is grounded in a collaborative constructivist view of higher education. The CoI framework is a process model which assumes that effective online learning requires the development of a community (Rovai, 2002; Shea, 2006) that supports meaningful inquiry and deep learning. The CoI framework has been quite widely used to inform both research and practice in the online learning community and an increasing body of research supports its efficacy for both describing and informing online learning (Arbaugh, et al., 2008; Swan, Garrison, & Richardson, 2009).

Building from the notion of social presence in online discussion, the CoI framework represents the online learning experience as a function of the relationship between three presences: social presence, teaching presence and cognitive presence (see Figure 1). The CoI framework suggests

that online learning is located at the intersection of these three presences; that is, all three presences are necessary for learning in an educational context to take place.

**** INSERT FIGURE 1 ABOUT HERE ****

Social presence refers to the degree to which participants in online communities feel socially and emotionally connected with each other. A number of research studies have found that the perception of interpersonal connections with virtual others is an important factor in the success of online learning (Picciano, 2002; Richardson & Swan, 2003; Swan, 2002; Swan & Shih, 2005; Tu, 2000). Research also suggests that these elements are strongly affected by teaching presence – both instructor behaviors (Shea, Li, Swan & Pickett, 2005; Shea & Bidjeramo, 2008) and course design (Swan & Shih, 2005; Tu & McIssac, 2002).

Teaching presence is defined as the design, facilitation, and direction of cognitive and social processes for the realization of personally meaningful and educationally worthwhile learning outcomes (Anderson, Rourke, Garrison & Archer, 2001). Researchers have documented strong correlations between learner's perceived and actual interactions with instructors and their perceived learning (Jiang & Ting, 2000; Richardson & Swan, 2003; Swan, Shea, Fredericksen, Pickett, Pelz & Maher, 2000); and between teaching presence and student satisfaction, perceived learning, and development of a sense of community in online courses (Shea, Li, Swan & Pickett, 2005). In fact, the body of evidence attesting to the critical importance of teaching presence for successful online learning continues to grow (Garrison & Cleveland-Innes, 2005; Murphy, 2004; Swan & Shih, 2005; Vaughn & Garrison, 2006; Wu & Hiltz, 2004) with the most recent research suggesting it is the key to developing online communities of inquiry (Shea & Bidjeramo, 2008).

Cognitive presence describes the extent to which learners are able to construct and confirm meaning through course activities, sustained reflection, and discourse (Garrison, Anderson &

Archer, 2000. Although some researchers have found that cognitive presence rarely moves beyond exploration (Garrison & Arbaugh, 2007; Kanuka & Anderson, 1998; Luebeck & Bice, 2005; Murphy, 2004), students did progress to resolution in studies in which students were challenged to do so and in which explicit facilitation and direction were provided (Meyer, 2003; Murphy, 2004; Shea & Bidjermo, 2008; Wang & Chang, 2008).

Learning Analytics and Data-Based Decision Making

It is plainly important for e-learning leaders to stay conversant with the literature on online learning research and with best practices in the field . This isn't easy because staying conversant is an ongoing activity, made especially so by a constantly changing technology culture. It is also clear, however, that learning is an extremely complex activity, and that all learning contexts are unique. E-learning leaders, therefore, should become particularly knowledgeable about e-learning in their own unique context. An understanding of the e-learning field in general provides ideas for innovation; an understanding of one's own context is the foundation for intelligent decision making. An understanding of one's own context, moreover, can no longer be grounded solely in networking and intuition; it must also be grounded in data.

We have passed from an industrial to an information age. One consequence of this move is the information overload envisioned by Vannevar Bush (1945) over a half century ago. The growth of data often seems to threaten the ability of organizations to make sense of it. However, the gargantuan amount of available data also has enabled the development of new techniques that have changed the very ways businesses are managed (Brynjolfsson, Hitt, & Kim, 2011; Davenport, & Harris, 2007), doctors make diagnoses (London School of Hygiene and Tropical Medicine, 1999), and baseball managers recruit and coach players (Kehri, 2011). Advances in knowledge modeling and representation, data mining, and analytics are creating a foundation for

new models of knowledge development and analysis (Markoff, 2011). Perhaps nowhere are these new models more needed than in higher education.

Institutions of higher education generate enormous amounts of data on a daily basis but currently approach this enterprise from mostly a reporting and archival perspective. This is about to change and change radically. Today in higher education, analytics are most often used, if they are used at all, to guide administrative tasks – for example, in student recruitment and capital campaigns. As calls for academic accountability in such areas as degree completion and student success become increasingly strident, however, analytics are quickly being applied to teaching and learning. When applied in these areas, they are most often called *learning analytics*, and to gain some measure of how important learning analytics are very rapidly becoming, consider that they are a major priority for the Gates Foundation's U.S. funding, one of five key areas targeted by the NextGen challenges (http://nextgenlearning.org/), were highlighted as one of six technologies likely to significantly impact education in the next five years in the 2011 Horizon Report (Johnson, Smith, Willis, Levine, & Haywood, 2011), and are the basis for the Educause Learning Initiative's new *Seeking Evidence of Impact* program (Brown & Diaz, 2011).

Learning analytics are thus an area with which e-learning leaders must acquaint themselves. According to the 1st International Conference on Learning Analytics and Knowledge, "learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs" (Long & Siemens, 2011, p. 32). Campbell, DeBlois and Oblinger (2010, 42) write, "Analytics marries large data sets, statistical techniques, and predictive modeling. It could be thought of as the practice of mining institutional data to produce 'actionable intelligence'."

Learning analytics are a particularly appropriate tool in e-learning leadership simply because online environments produce vast amounts of data that could be used to enhance learning when explored at the leadership level. To date, e-learning analytics have focused primarily on using learner characteristics to identify students generally at-risk for failure who can then be provided with extra support (Johnson, Smith, Willis, Levine, & Haywood, 2011). However, one need only consider the data produced by Learning Management Systems (LMSs) to realize that there all sorts of data being commonly generated that could yield a variety of 'actionable intelligence.' Morris, Finnegan, and Wu (2005), for example, found significant differences in time-on-task related participation in an LMS between students who withdrew from online classes and those who successfully completed them. This sort of analysis goes well beyond the gross identification of at-risk students from learner characteristics, leading many e-learning educators to call for reporting tools that can flag students as soon as they become at-risk (Macfadyen, & Dawson, 2010). Indeed, commercial applications that purport to do so are already emerging.

This sort of analysis is also clearly context dependent. E-learning leaders who would enhance learning effectiveness must become comfortable, then, collecting, analyzing, and using data to make informed improvements in teaching and learning. Using learning analytics requires one to think carefully about what questions most need answering and what data are likely to produce meaningful answers to them. One way to guide such thinking involves conceiving of the e-learning process in terms of its inputs, processes, and outcomes (Figure 1), and being sure to ask questions that identify and collect data associated with each of these areas. For example, the question "*Does the use of video conferencing enhance learning in online courses?*" is not specific enough to produce useful answers, whereas "*Does the use of video conferencing to*

support interactions between instructors and students in entry level, freshman courses enhance students' learning of important course concepts?" is more likely to do so.

**** INSERT FIGURE 2 ABOUT HERE ****

Inputs to e-learning are those factors that precede teaching and learning online but contribute to its success and its outcomes. E-learning processes are the interactions through which teaching and learning proceed online. These clearly affect learning outcomes, which are the desired knowledge, skills and attitudes that students should take away from a course. Because each of the three parts of the e-learning process are clearly important, and specifically because outcomes alone, especially gross outcomes, don't provide the information needed to improve teaching and learning, an effort should be made to specify aspects of each element and collect corresponding data.

In the sections which follow, each of the element in the e-learning process and particular data sources related to them are discussed.

Inputs to e-Learning

There are multiple inputs to online learning that can have significant impacts on learning effectiveness. Three of these, faculty and faculty development, students and student services, and technology environments and supports are addressed in other chapters and so will not be dwelt on here. It should be noted, however, that these are clearly areas e-learning leaders should pay attention to and that data on all these sorts of inputs need to be collected on an ongoing basis. In addition, leaders should develop ways of making such data useful so that analyses of the relationships among inputs, e-learning processes, and learning outcomes can be carried out.

For example, learner characteristics such as technology skills and experience (Bernard, Brauer, Abrami, & Surkes, 2004; Dupin-Bryant, 2004; Maki, & Maki, 2002; Pillay, Irving, & McCrindle, 2006); good attitudes toward computers and online learning (Pillay et al., 2006), technology self-efficacy (Bernard et al., 2004; Osborn, 2001), GPA (Bernard et al., 2004; Cheung, & Kan, 2002;; Dupin-Bryant, 2004; Willging, & Johnson, 2004; Wojciechowski, & Palmer, 2005), self-motivation (Waschulle, 2005) and/or self-directedness (Bernard et al., 2004), and internal locus of control (; Parker, 2000; Wang, & Newlin, 2000) have been shown to affect learning online. As these characteristics can be indicators of risk and as many of them can be remediated, they can be important flags for early intervention of which e-learning leaders should be aware. In any case, such data should be collected and reviewed.

Within courses, research demonstrates that the perceived interactivity (Fasse, Humbert, & Rappold, 2009; Lenrow, 2009) and utility (Meyer, Brunwelheide, & Poulin, 2006) of courses, and faculty responsiveness (Lenrow, 2009; Shelton, 2009) are good predictors of course completion. The strongest predictor of student success, however, seems to be the perceived presence of the instructor and peers (Boston, Diaz, Gibson, Ice, Richardson, & Swan, 2009; Liu, Gomez, & Yen, 2009; Meyer et al., 2006), which will be discussed in the section on the Community of Inquiry framework which follows.

Student supports, such as access to online orientation programs (Lenrow, 2009; Wojciechowski, & Palmer, 2005), peer mentoring (Bogle, 2008; Boles, Cass, Levin, Schroeder, & Smith, 2010 and freshman interest groups (Rovai, 2003), computers and good Internet connections, (Osborne, 2001; Waschull, 2005), and personal support (Boles, et al. 2010; Chyung, 2001; Frid, 2001) can have a significant impact on student success with e-learning. E-learning leaders should make sure as many of these variables as possible are collected, even when they aren't sure how they

might use them, because they might become important for future analyses. As Chuck Dziuban reminds us "uncollected data cannot be analyzed" (Dziuban, 2011, p. 48).

Another clearly influential input to e-learning, and one that will be discussed in some depth below, is the design of online courses. Several rubrics have been developed to evaluate online course design. Two of the most commonly used of these are the Chico State *Rubric for Online Instruction* (Center for Online Learning, 2003) and the Quality Matters (QM) Rubric Standards (MarylandOnline, Inc., 2011). Rubrics such as these two can be used by e-learning leaders to establish standards for quality in course design across a program, a college or and institution.

Chico State Rubric for Online Instruction

California State University Chico developed its Rubric for Online Instruction (Committee for Online Instruction, 2003; see also http://www.csuchico.edu/celt/roi/) as a self-evaluation tool to help designers and instructors developing and/or redesigning courses. The rubric explicitly identifies three levels of achievement related to standards in six categories – learner support and resources, online organization and design, institutional design and delivery, assessment and evaluation of student learning, innovative teaching with technology, and faculty use of student feedback. The rubric provides clear guidelines for elements that need to be included in high quality online courses but the three achievement levels are somewhat subjective, hence difficult to quantify, and the rubric mixes inputs and processes, not only across categories but within them. However, it does provide data on course design that could be transformed into numerical information and it has the advantage of being a-theoretical. The Chico State Rubric was also specifically designed for self-evaluation, thus leaders can share it with course developers and support their use of it without seeming to impose top-down standards.

Quality Matters Rubric Standards

Quality Matters, on the other hand, employs a faculty-oriented but external, peer review process designed to assure quality in online and blended courses. It is centered on a rubric, originally developed through a FIPSE grant to MarylandOnline, but which is continually updated, most recently in 2011. The rubric is based on instructional design principles (Quality Matters, 2005; see also http://www.qmprogram.org/latest-research-support-rubric-standards) and is organized around eight categories – course overview, learner objectives, assessment and measurement, resources and materials, learner engagement, course technology, learner support, and accessibility (see Appendix B). An important aspect of the QM review process is that the review, while external, is conducted by faculty and instructional designers who themselves have been through the process and that it is conceived as an ongoing review and revision process, making it less onerous to faculty and course designers.

Within these eight categories are 41 individual standards with ratings of 1, 2 or 3. There are 21 standards with a rating of 3 points. A course must meet all of these to meet the QM level of quality course design. Eight of the 3 point standards are tied to the explicit provision of module level objectives. Three trained reviewers analyze the course site and rate each standard as existing, or not, at an 85% level or higher. In doing so, they reference a QM Instructor Worksheet that provides them with information about the course that may not be immediately evident. If the reviewer believes the standard exists at the 85% level, the full point value is awarded. A standard that isn't met at the 85% level gets no points.

Two of the three reviewers must rate a standard as being met for that standard to be identified as met in the course review. The three reviews are combined to determine the level at which the

course has been rated and those areas which are in need of revision are presented to the instructor. A major strength of the QM process is that comments are provided by the reviewers for each standard that is not met and these comments then guide the instructor during course redesign. Changes are made to the design based upon the identified needs and a second review is performed to assure that all identified changes have been made.

Little research to date has explored links between QM review/redesign and learning outcomes. Preliminary research by Legon, Runyon, and Aman (2007) found higher grades and greater student interaction with course materials after redesign of a large enrollment undergraduate course. Swan, Matthews, Bogle, Welch-Boles, and Day (2012) similarly found higher overall course grades as well higher grades on two major course assignments after a QM review and redesign of a graduate course in educational research methods.

Although the QM rubric is clearly objectivist in nature, as seen in the importance of module level objectives to achieving a successful review, what is particularly useful about it is that it the review process is standardized, scoring is quite clear cut (standards are either met or not), and the review results in a numerical score. Currently, over 300 colleges and universities in 44 states are QM subscribers, including 11 statewide systems and several large consortia. E-learning leaders thus can both improve the quality of courses at their institution and achieve public recognition for doing so by participating in the QM consortium.

Assessing Learning Processes in e-Learning Environments

There are many ways to assess learning processes in online courses. Because most online learning happens within LMSs, such things as online discussions, instructor feedback, the online activities of both instructors and students can be accessed quite easily. At least three sorts of

learning processes can be categorized and/or measured using LMS reports and archived courses – pedagogical approaches, interactions, and forms of assessment. E-learning leaders should think carefully about which of these, and which aspects of these, are most important in their institutional context.

Pedagogical approaches can be categorized as objectivist vs. constructivist; formal vs. informal; low touch vs. high touch, and so on, and their effects studied. Ben Arbaugh (2010), for example, has found pedagogical differences between what he identifies as hard and soft disciplines in business education. Aviv, Erlich, Ravid and Geva (2003) compared structured and unstructured online discussions and found higher levels of critical thinking in the structured discussion. Shea, Pickett, & Pelz (2003) found strong correlations between teaching behaviors and perceived learning across a variety of courses and institutions involved in online learning through the SUNY Learning Network. Other pedagogical approaches that might be identified include the use of instructional strategies such as collaborative (Benbunan-Fich, & Hiltz, 1999) or problem-based learning (Oliver, & Omari, 1999), and/or the incorporation of technologies into instruction (Ice, Curtis, Phillips, & Wells, 2007).

Michael Moore (1989) identified three types of interactions that take place online – learner-instructor interactions, learner-content interactions, and learner-learner interactions. Hillman, Willis, and Gunawardena (1994) added interactions with interfaces to these three. There are many ways to measure interactions among participants in online courses, many of which can be accessed through LMS reporting functions. Research has shown that interactions with instructors (Jiang & Ting, 2000; Picciano, 1998; Richardson & Ting, 2001; Swan, 2001), and interactions among classmates (Jiang & Ting, 2000; Picciano, 1998, 2002; Swan, 2001) enhance perceived and actual learning in online courses. Indeed the Chico State Rubric for Online

Instruction (Committee for Online Instruction, 2003) includes items focused on both these factors.

Assessment itself is another sort of learning process. Besides determining what sorts of outcomes are measured, the importance of which cannot be exaggerated, what is assessed and how affects both learning processes themselves and general course outcomes (Swan, Shen, & Hiltz, 2006). Hawisher and Pemberton (1997) related the success of the online courses they reviewed to the value instructors placed on discussion. Likewise, Jiang and Ting (2000) reported correlations between perceived learning in online courses and the percent of course grades based on discussion. Perhaps more importantly, researchers have shown that how online activities are assessed significantly affects student behaviors (Swan, Schenker, Arnold, & Kuo, 2007).

There are other ways of exploring online learning processes -- social network analysis (Haythornthwaite, 2002), for example, or content analyses (Shea, & Bidjeramo, 2010), but what such methods and those previously mentioned have in common is that they all take an objectivist or quasi-objectivist stance. That is, they approach learning process from the outside looking in. If one accepts the constructivist perspective, however, learning is uniquely individual, and can therefore best be explored through the perspective of individual learners. One instrument that does just that is the Community of Inquiry (CoI) survey. The CoI survey also has the advantage of being grounded in one of the most widely accepted theoretical models of learning in online and blended environments.

Community of Inquiry Survey

In 2008, researchers working with the CoI framework developed a survey (Swan et al., 2008) designed to measure student perceptions of the extent to which each of the presences – teaching

presence, social presence and cognitive presence – is expressed in online courses. The survey consists of 34 items (13 teaching presence, 9 social presence, and 12 cognitive presence items) that ask students to rate their agreement on a 5 point Likert scale (1=strongly disagree; 5=strongly agree) with statements related to each of the presences (Appendix B). It should be noted that assessing the extent to which communities of inquiry have developed in online courses through the eyes of students participating in online them is very appropriate from a constructivist perspective. The CoI survey also provides a way to collect data on online learning processes from the very people with an intimate knowledge of them.

The CoI survey was validated through a confirmatory factor analysis of survey responses from 287 students at four institutions of higher education in the U. S. and Canada (Arbaugh, et al, 2009). The results validate both the survey and the CoI model itself.

The validated survey provides a quantitative measure of learning processes that can be used to assess the effectiveness of technological and pedagogical innovations in online courses across time and institutions. It has been used to further explore the CoI framework and the interactive effects of all three presences (Garrison, Cleveland-Innes & Fung, 2010; Shea & Bidjerano, 2009) with some meaningful results. For example, researchers have begun linking perceptions of the presences to course outcomes (Arbaugh, Bangert & Cleveland-Innes, 2010; Boston et al., 2010, Swan et al., in press). Boston and colleagues linked 21% of the variance in program retention to two social presence survey items (Boston et al., 2010).

The survey has also been used to explore the effects of particular technologies and/or pedagogical strategies on learning processes. For example, researchers have shown that the use of audio for instructor feedback (Ice et al., 2010) and mini-presentations (Dringus, Snyder, &

Terrell (2010) enhances the development of all three presences, that the use of video can enhance teaching presence (Archibald, 2010), that the use of digital storytelling can enhance social presence (Lowenthal, & Dunlap, 2010), and that the forms of online discussion used in online classes influences the development of cognitive presence (Richardson, & Ice, 2010). Researchers have even found that the choice of learning management system can influence the development of communities of inquiry (Rubin, Fernandes, Averginou, & Moore, 2010).

The CoI survey can also be used by e-learning leaders to assess the quality of learning processes in online courses. It not only provides quantitative measures of the both overall CoI development and the development of each of the presences, but the individual survey items point to areas of strength and weakness in particular courses. For example, at the University of Illinois Springfield, faculty in the Teacher Leadership program are using a combination of an initial Quality Matters revision and ongoing, iterative revisions to course implementation based on CoI scores to improve both the design and delivery of their fully online core courses. Preliminary findings show significant improvements in course outcomes in the first course to undergo this review and revision process (Swan et al., 2012). Indeed, several e-learning programs have adopted it as their end-of-course survey precisely because it can provide actionable data. One such institution to do so is American Public University Systems (Boston et al., 2009) where e-learning leaders are using it to pinpoint areas that might be changed to enhance student retention.

e-Learning Outcomes

Learning outcomes are, of course, what learning analytics measure most everything against. A large part of the point of keeping careful data on e-learning inputs and processes is to explore how these effect learning outcomes. With the escalating calls for greater accountability in higher

education, and the recent scrutiny placed on e-learning in particular, learning outcomes are in the spotlight and e-learning leaders need take charge of the kinds of outcome data their institutions collect. Learning outcomes alone, however, will not produce actionable intelligence. There are about six sorts of outcomes measures commonly used to assess learning effectiveness – satisfaction, retention, course grades/success, achievement, proficiencies, and performance.

Some of these, such as ***learner satisfaction and retention***, are discussed in other chapters of this book. Suffice it to say with regard to both these measures, that while these are the easiest metrics to obtain, they are also the easiest to misinterpret or misrepresent. It is very important to define in detail what exactly it is that you are measuring. A common measure of retention, for example, is *course completion*, or the percentage of students enrolled as of a certain date who are still enrolled at the end of the semester, regardless of their grades (Bloemer, 2009; Shelton, 2009: Willging & Johnson, 2004). However, some institutions count students still enrolled at the end of the semester except those with failing (F) grades (Fasse, Humbert, & Rappold, 2009; Lenrow, 2001; Nash, 2005; Twig, 2003) and some institutions count students earning a C or better (Bloemer, 2009). Moreover, institutions vary as to the date at which students are considered "enrolled," and semesters vary from five to sixteen weeks in length making "enrollment after the tenth working day," for example, a somewhat slippery concept. Another measure of retention is *semester to semester enrollment* (Boston et al., 2009; Chyung. 2001; Meyer, Bruwelheide, & Poulin, 2006), but again, there is no common agreement on a definition of "enrollment". And so it goes. It is therefore incumbent on e-learning leaders to carefully consider what precise measures they will use and explicitly define them. Such considerations should probably take into consideration the audience and use to which you will put the data you collect.

Another very commonly used source of outcome data is ***overall course grades*** (Arbaugh, 2000; Cavanaugh, 2001; Means et al., 2009). Overall course grades, however, are not particularly useful for anything other than within course comparisons because they, especially in higher education, they can vary widely between courses, programs, disciplines, and institutions. A similar, but much more useful measure is the percentage of student ***success***, which refers to the number of students who were enrolled in the beginning of a course and who both remain enrolled and obtained a grade of C or better at the undergraduate level, or B or better at the graduate level (Bloemer, 2009; Clark, Holstrom, & Millacci, 2009; Dziuban, Moskal, & Dziuban, 2000; Roblyer, & Marshall, 2002/2003; Wojciechowski, & Palmer, 2004). A course with a grade of C/B or better can usually be transferred to other institutions, indicating common acceptability while avoiding the trap of grade variations between programs, disciplines, and/or institutions.

One of the better outcome measures for individual courses and/or programs is ***achievement***. Achievement refers to whether or not students achieve the major goals set for them (Blackley, & Curran-Smith, 1998; Johnson, Aragon, Shaik, & Plama-Rivas, 2000; Maki, Maki, Patterson, & Whittaker, 2000; Picciano, 2002). One good way to identify such goals is to focus on what Wiggins and McTighe (2005) call "enduring understandings." Enduring understandings are the big ideas that learners should remember five years after they finish a course or program, if not for the rest of their lives. The authors distinguish enduring understandings from things that are important to know and be able to do, which students should learn, and things worth being familiar with, which are the interesting facts, skills and narratives that are fun to know but far from essential (Figure 3).

**** INSERT FIGURE 3 ABOUT HERE ****

E-learning leaders can and should work with their faculties to identify enduring understandings and to develop ways of assessing their acquisition. This is particularly important at the program level where faculty must map the development of big ideas across program courses. It is important to note that Wiggins and McTighe (2005) also maintain that enduring understandings are often quite complex and so require complex assessment. Sometimes this can be achieved with comprehensive testing, such as for the goal that students develop a basic knowledge of a discipline. However, more often than not, assessing the development of enduring understandings requires problem-based or project-based assessments that explore students' abilities to apply what they have learned.

Proficiencies are the knowledge, skills and attitudes deemed essential for particular disciplines. Most professions use certification exams to test proficiencies and these are a good means for assessing the learning effectiveness of one's own programs relative to a national standard (Nesler, & Lettus, 1995). While proficiency tests are not common in the sciences or humanities, the growing calls for increased accountability and increased standardization of outcomes in higher education suggest that that proficiency or certification measures in these areas may be on the horizon. E-learning leaders should at least keep abreast of certification developments and possibly take a pro-active stance concerning them by empowering their faculties to develop certification standards.

Performance is in some sense the gold standard of learning outcomes. It refers to students' success after graduation in obtaining or performing in a position, or in some cases being admitted to graduate programs. Performance is clearly a difficult outcome to measure because it requires keeping track of students after they graduate, but it can be done. In a study of community health nursing students, for example, Blackley and Curran-Smith (1998) not only found that distant

students were able to meet their course objectives as well as resident students, but that the distant students performed equivalently in the field. Similarly, Nesler and Lettus (1995) reported higher ratings on clinical competence among nurses graduating from an online program than nurses who were traditionally prepared. Moreover, there are increasingly strident calls for just these sorts of measures to justify the high cost of higher education, especially as regards e-learning. Performance measures are for this very reason worth considering, especially in professional colleges where certifications are common.

Conclusions and Recommendations

This chapter explored what e-learning leaders need to know about learning effectiveness. This final section reviews the major points made and their implications for e-learning leadership, and offers a few recommendations concerning how e-learning leaders might use that knowledge to ensure online learning effectiveness.

The first thing such leaders need to recognize is that online learning is different from traditional learning and that the online environment has different affordances and constraints than the face-to-face classroom. Constructivist approaches seem particularly well suited for e-learning, but it is clearly important that e-learning leaders stay conversant with contemporary learning theory, online learning research, and best practices in the field, as it is in constant flux. Interestingly, among the seven skills of K-12 leaders identified in Waters, Marzano, and McNulty's (2003) meta-analysis as accounting for at least 9% of the variance in student achievement was knowledge of current educational theories and practices and the sharing of that knowledge with faculty. The authors also uncovered the importance of leaders being able to communicate their pedagogical vision and act as agents of change within their units or institutions, and the importance of their advocating for it with the general public.

Secondly, e-learning leaders need to make themselves particularly knowledgeable about their own unique e-learning contexts, not just through immersing themselves in the culture of their institution, but through the ongoing collection and analysis of empirical data on the inputs, processes and outcomes of e-learning at their institution. As regards inputs, e-learning leaders should provide faculty with access instructional design support and work to develop common design standards. As regards processes, e-learning leaders should encourage faculty, especially early adopters, to share their techniques and strategies for enhancing learning with each other. Moreover, they should involve faculty in developing output measures to assess the effectiveness of any changes made. Again, among the leadership skills identified as particularly important in enhancing student success in K-12 schools (Waters, Marzano, & McNulty, 2003) were situational awareness, the ongoing monitoring of the impact of school practices on student learning, and the involvement of faculty in important decisions.

Although this chapter did not cover faculty development, faculty or student support, or optimal uses of technology because they are covered in other chapters of this book, it is important that e-learning leaders not lose sight of the critical importance of all of these in e-learning effectiveness. Faculty must be prepared to teach online and supported in their work; students must be oriented to the challenges and rewards of online learning and their efforts supported on an ongoing basis; technologies used must support pedagogical goals, function properly, and be accessible and transparent to student users. E-learning leaders must attend to each of these issues if they would enhance learning effectiveness.

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Appendix A: Quality Matters Rubric

	STANDARDS	PTS
Course Overview and Introduction	1.1 Instructions make clear how to get started and where to find various course components.	3
	1.2 Students are introduced to the purpose and structure of the course.	3
	1.3 Etiquette expectations (sometimes called "netiquette") for online discussions, email, and other forms of communication are stated clearly.	2
	1.4 Course and/or institutional policies with which the student is expected to comply are clearly stated, or a link to current policies is provided.	2
	1.5 Prerequisite knowledge in the discipline and/or any required competencies are clearly stated.	1
	1.6 Minimum technical skills expected of the student are clearly stated.	1
	1.7 The self-introduction by the instructor is appropriate and available online.	1
	1.8 Students are asked to introduce themselves to the class.	1
Learning Objectives (Competencies)	2.1 The course learning objectives describe outcomes that are measurable.	3
	2.2 The module/unit learning objectives describe outcomes that are measurable and consistent with the course-level objectives.	3
	2.3 All learning objectives are stated clearly and written from the students' perspective.	3
	2.4 Instructions to students on how to meet the learning objectives are adequate and stated clearly.	3
	2.5 The learning objectives are appropriately designed for the level of the course.	3
Assessment and Measurement	3.1 The types of assessments selected measure the stated learning objectives and are consistent with course activities and resources.	3
	3.2 The course grading policy is stated clearly.	3
	3.3 Specific and descriptive criteria are provided for the evaluation of students' work and participation and are tied to the course grading policy.	3
	3.4 The assessment instruments selected are sequenced, varied, and appropriate to the student work being assessed.	2
	3.5 Students have multiple opportunities to measure their own learning progress.	2
Instructional Materials	4.1 The instructional materials contribute to the achievement of the stated course and module/unit learning objectives.	3
	4.2 The purpose of instructional materials and how the materials are to be used for learning activities are clearly explained.	3
	4.3 All resources and materials used in the course are appropriately cited.	2
	4.4 The instructional materials are current.	2
	4.5 The instructional materials present a variety of perspectives on the course content.	1
	4.6 The distinction between required and optional materials is clearly explained.	1
Learner Interaction and Engagement	5.1 The learning activities promote the achievement of the stated learning objectives.	3
	5.2 Learning activities provide opportunities for interaction that support active learning.	3
	5.3 The instructor's plan for classroom response time and feedback on assignments is clearly stated.	3
	5.4 The requirements for student interaction are clearly articulated.	2
Course Technology	6.1 The tools and media support the course learning objectives.	3
	6.2 Course tools and media support student engagement and guide the student to become an active learner.	3

	6.3 Navigation throughout the online components of the course is logical, consistent, and efficient.	3
	6.4 Students can readily access the technologies required in the course.	2
	6.5 The course technologies are current.	1
Learner Support	7.1 The course instructions articulate or link to a clear description of the technical support offered and how to access it.	3
	7.2 Course instructions articulate or link to the institution's accessibility policies and services.	3
	7.3 Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help students succeed in the course and how students can access the services.	2
	7.4 Course instructions articulate or link to an explanation of how the institution's student support services can help students succeed and how students can access the services.	1
Accessibility	8.1 The course employs accessible technologies and provides guidance on how to obtain accommodation.	3
	8.2 The course contains equivalent alternatives to auditory and visual content.	2
	8.3 The course design facilitates readability and minimizes distractions.	2
	8.4 The course design accommodates the use of assistive technologies.	2

Appendix B: Community of Inquiry Survey

The following statements relate to your perceptions of "**Teaching Presence**" – the design of this course and your instructor's facilitation of discussion and direct instruction within it. Please indicate your agreement or disagreement with each statement.

#	statement	Agreement 1 = strongly disagree; 5 = strongly agree				
1	The instructor clearly communicated important course topics.	**1**	**2**	**3**	**4**	**5**
2	The instructor clearly communicated important course goals.	**1**	**2**	**3**	**4**	**5**
3	The instructor provided clear instructions on how to participate in course learning activities	**1**	**2**	**3**	**4**	**5**
4	The instructor clearly communicated important due dates/time frames for learning activities.	**1**	**2**	**3**	**4**	**5**
5	The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.	**1**	**2**	**3**	**4**	**5**
6	The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.	**1**	**2**	**3**	**4**	**5**
7	The instructor helped to keep course participants engaged and participating in productive dialogue.	**1**	**2**	**3**	**4**	**5**
8	The instructor helped keep the course participants on task in a way that helped me to learn.	**1**	**2**	**3**	**4**	**5**
9	The instructor encouraged course participants to explore new concepts in this course.	**1**	**2**	**3**	**4**	**5**
10	Instructor actions reinforced the development of a sense of community among course participants	**1**	**2**	**3**	**4**	**5**
11	The instructor helped to focus discussion on relevant issues in a way that helped me to learn.	**1**	**2**	**3**	**4**	**5**
12	The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.	**1**	**2**	**3**	**4**	**5**
13	The instructor provided feedback in a timely fashion.	**1**	**2**	**3**	**4**	**5**

The following statements refer to your perceptions of "**Social Presence**" -- the degree to which you feel socially and emotionally connected with others in this course. Please indicate your agreement or disagreement with each statement.

#	statement	Agreement 1 = strongly disagree; 5 = strongly agree				
14	Getting to know other course participants gave me a sense of belonging in the course.	**1**	**2**	**3**	**4**	**5**
15	I was able to form distinct impressions of some course participants.	**1**	**2**	**3**	**4**	**5**
16	Online or web-based communication is an excellent medium for social interaction.	**1**	**2**	**3**	**4**	**5**
17	I felt comfortable conversing through the online medium.	**1**	**2**	**3**	**4**	**5**
18	I felt comfortable participating in the course discussions.	**1**	**2**	**3**	**4**	**5**
19	I felt comfortable interacting with other course participants.	**1**	**2**	**3**	**4**	**5**
20	I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.	**1**	**2**	**3**	**4**	**5**
21	I felt that my point of view was acknowledged by other course participants.	**1**	**2**	**3**	**4**	**5**
22	Online discussions help me to develop a sense of collaboration.	**1**	**2**	**3**	**4**	**5**

The following statements relate to your perceptions of "**Cognitive Presence**" -- the extent to which you were able to develop a good understanding of course topics. Please indicate your agreement or disagreement with each statement.

#	statement	Agreement 1 = strongly disagree; 5 = strongly agree				
23	Problems posed increased my interest in course issues.	**1**	**2**	**3**	**4**	**5**
24	Course activities piqued my curiosity.	**1**	**2**	**3**	**4**	**5**
25	I felt motivated to explore content related questions.	**1**	**2**	**3**	**4**	**5**
26	I utilized a variety of information sources to explore problems posed in this course.	**1**	**2**	**3**	**4**	**5**
27	Brainstorming and finding relevant information helped me resolve content related questions.	**1**	**2**	**3**	**4**	**5**
28	Online discussions were valuable in helping me appreciate different perspectives.	**1**	**2**	**3**	**4**	**5**
29	Combining new information helped me answer questions raised in course activities.	**1**	**2**	**3**	**4**	**5**
30	Learning activities helped me construct explanations/solutions.	**1**	**2**	**3**	**4**	**5**
31	Reflection on course content and discussions helped me understand fundamental concepts in this class.	**1**	**2**	**3**	**4**	**5**
32	I can describe ways to test and apply the knowledge created in this course.	**1**	**2**	**3**	**4**	**5**
33	I have developed solutions to course problems that can be applied in practice.	**1**	**2**	**3**	**4**	**5**
34	I can apply the knowledge created in this course to my work or other non-class related activities.	**1**	**2**	**3**	**4**	**5**

See also: http://communitiesofinquiry.com/methodology

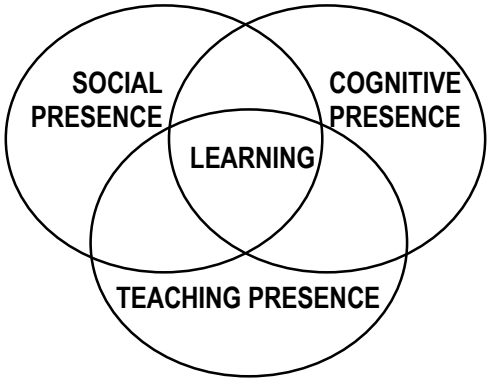

Figure 1. CoI Framework (adapted from Garrison, Anderson & Archer, 2000)

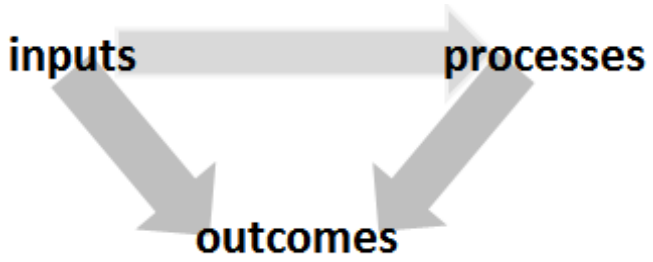

Figure 2. Three elements in the (e-) learning process

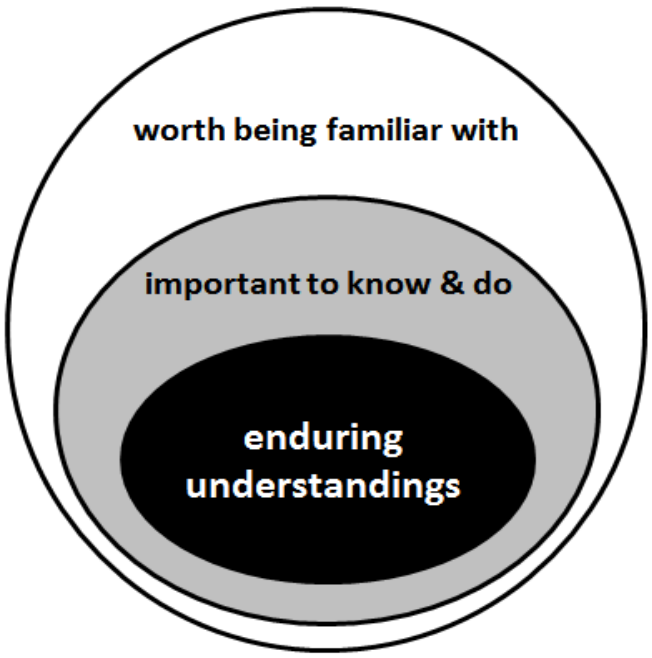

Figure 3. Enduring Understanding (adapted from Wiggins & McTighe, 2005)