Running Head: Investing in Instructional Technologies

Investing in Instructional Technologies at Firenze, Inc.

The Ineffectiveness of Instructional Technologies in Corporate Learning

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Introduction

Optimization of adult learning is enhanced by the application of Benjamin Bloom's taxonomy of education objectives and Malcolm Knowles' theory of andragogy. Instructional technologies (IT) should assist in achieving these objectives in a cost-effective manner, but research indicates that instead, learning processes are not helped and are often hurt by the use of IT in the curriculum. This paper will introduce the categories of Bloom's Taxonomy, and the tenets of Knowles' andragogy, and will give examples of how learning for four out of six of Bloom's categories and all of Knowles' adult learning principles are negatively impacted by the use of IT. It will also describe reasons that using IT in a curriculum is not cost-effective.

Instructional Technology and Bloom's Taxonomy

Bloom's taxonomy is easily understood and is probably the most widely applied set of learning objectives in use today (Clark, 1995). In 1956, Benjamin Bloom headed a group of educational psychologists who developed a classification of levels of intellectual behavior thought to be important in learning: knowledge, skills and attitude. The knowledge category is referred to as the cognitive domain. Bloom found that over 95 % of the test questions students encounter require them to think only at the lowest possible level within the cognitive domain...the recall of information (Alcorn, 2003).

Bloom identified six levels -- Knowledge, Understanding, Application, Analysis, Synthesis and Evaluation -- within the cognitive domain. (see Fig.1) Instructional technologies fail to provide effective learning at four of the six levels Bloom identified. The very first category in the learning process, knowledge (to recall or recite), which must be mastered before the others can take place, is negatively impacted by instructional technologies because of information overload. "Computers are envisioned as ways to empower "teaching by telling" and "learning by listening," serving as a firehose to spray information from the Internet into learners' minds. However, even without educational technology, classrooms are already drowning in data, and an overcrowded curriculum puts students and teachers on

the brink of intellectual indigestion. Adding additional information, even when coated with multimedia bells-and-whistles, is likely to worsen rather than improve educational settings" (Dede, 1998).

Understanding is the second level within the cognitive domain. Again, information overload brought about by the use of IT can thwart students' ability to comprehend (explain or distinguish) what they have learned. "Many learners are not aware that data is not necessarily information and information is not necessarily knowledge" (Fang, 2001). Consequently, they may be trying to distinguish between pieces of information that are actually not relevant to the subject matter. This is true particularly in e-learning: "The effectiveness of the Internet as a tool for learning is diminished by visible data overloads that, according to Park (as cited in Byod, 1998) decrease the ability to see the interconnectedness of things. This problem was recognized early on, but the requisite skills for understanding and filtering remain relatively underdeveloped or not well maintained… it is premature to recommend online learning as a universal and efficient learning method for all learning and teaching" (Mandefrot, 2001, p4).

The third level of the cognitive domain is application. Often, technology-based training does not offer enough instruction for the students to actually apply (demonstrate, relate) what they have learned: "Sometimes when learners try to apply what they've learned, they discover that they need to modify or alter their new skills or knowledge because their specific environment requires a different strategy or procedure. Another surprise that adult learners experience is that the training was accurate but incomplete. For example, training explained one procedure or approach but failed to mention that there's more than one way to perform the task. When this occurs, learners feel confused, or even angry.

Two of the learners I worked with experienced that frustration. One learner took the MS Project course and the other learner took the advanced PowerPoint course. Both courses taught only one way to perform each type of procedure" (Dobrovolny, 2003).

The sixth level of the cognitive domain is synthesis. Technology can foster a hurry-up attitude that does not allow students to reflect upon and synthesize (categorize, organize) what they have learned: “too much instructional activity tends to center on presentation and motivation, building a foundation of ideas and skills as well as some context for why students should care. Yet this temporary interest and readiness to master curricular material rapidly fades when no time is left for reflection and application, as teachers and students move on to the next required topic in the overcrowded curriculum, desperately trying to meet all the standards and prepare for the test” (Dede, 2001).

Instructional Technology and Knowles’ Andragogy

Malcolm Knowles was the first to chart the rise of the adult education movement in the United States; the first to develop a statement of informal adult education practice; and the first to attempt a comprehensive theory of adult education. His theory of andragogy means that instruction for adults needs to focus more on the process and less on the content being taught. (See Appendix B)

Like Bloom's taxonomy, instructional technologies fail Knowles' theory too – the technologies themselves are not flexible or adaptable, therefore they are especially ineffective for the adult learner. This does not mean that they cannot be modified, display media rich content that appeals to different learning styles or provide minimal levels of interactivity. It means they lack intelligence. Najib A. Kofahi and Nowduri Srinivas write, “Distance learning is the new rage in the world of education. Valuable as it is, distance learning is still nothing more than a new use of familiar machine. And machines, no matter how good, do not run themselves. People run machines” (Kofahi & Srinivas, 2004). Why do people run machines, because they have to? Computers work well with defined data and predictable outcomes. You only get out of them what a person puts into them. Computers cannot listen, conceptualize and adapt. People can (Oppenheimer, 2004).

Most instructional technologies are facilitator-centric rather than user-centric and essentially try to replace the instructor, but they lack many of the qualities that make the instructor irreplaceable, such

as the ability to adapt to fit the needs of the learner, relate to individuals on a personal level, place the proper contextual wrapper around training to demonstrate value and visually assess the learner's progress and provide personalized feedback (Angehrn, Nabeth & Roda, 2001).

Andragogy contends that the adult learner thrives when involved in the development and assessment of their learning. Learning activities should be experiential and task-oriented and topics should be personally and professionally relative to the learner (Smith, 2002). Instructional technologies are unable to incorporate these adult learning principles at a level equal to that of instructor-led training. Standard instructional design principles advocate assessing the needs of an audience and creating training to meet those needs. The adult learner must understand why learning this content is important and they need to believe that the instruction is relative to their personal and professional lives (Smith, 2002). Since it is impossible to target the needs and provide relativity for all students, courses are typically designed for the majority. A good instructor will adapt the course to meet the needs of the rest. Instructional technologies, such as computer based training (CBT), video, audiobooks and interactive video disks (IVD), lack the physical space (and, the instructional designers often lack the development time) to store all of the variables and unknowns that present themselves when instruction is delivered to a large, diverse audience. Unfortunately, these technologies are intended to be replacements for facilitated learning. Thus, they lack the critical element -- the facilitator -- that can fill the gaps inherent in course design.

Instructional technologies present a similar problem with problem-based learning. According to Knowles, adult learners are more receptive to learning when content is task-oriented rather than subject-oriented. This personalizes the instruction, placing it in a context that the learner understands (Smith, 2002). Instructional technologies can provide this but only to a limited degree. M.F. Abdul Karim and U. Ufuktepe note one limitation of task-based learning in the online world in a paper discussing their own distance learning software called web*Mathematica*. They explain that the application is able

to provide instruction for any type of math skill that is required, but the application is limited by its ability to truly assess the comprehension of the learner. They write, “But the important questions [sic] do the students understand the process and the underlying concepts? Some students might just use it like calculators to get quick answer [sic] and not much of mathematics is learned. Not everything can be done should be done with web*Mathematica*" (Karim & Ufktepe, 2002).

The final andragogical principle, experiential learning, also may be the most difficult to replicate using instructional technologies. Experiential learning is the idea that learning is easiest when the user first observes others performing a task and then learns by personally performing that task. Experiential learning is learning by doing (Conner, 1997-2007). Unfortunately, examples and simulations rarely duplicate the real world activity that you are trying to train. Simulations are, by definition: a) Imitation or representation, as of a potential situation or in experimental testing., b) Representation of the operation or features of one process or system through the use of another (simulation. (n.d.).

Simulations are not real. Instead they are a representation. Inevitably something will be lost. Todd Oppenheimer argues that learners attempting to learn from a simulation use at most two of their five senses. Three dimensional models on a video or computer screen are really just two dimensional simulations of the real thing (Oppenheimer, 1997). When adult learners “perform” a simulation they may not be maximizing their ability to retain that knowledge. Web 2.0 technologies, such as blogs, wikis and RSS, add a layer of interactivity and a human element in an attempt to address these shortcomings but still are unable to replicate the level of personal attention and interactivity provided by a human. Discussion and feedback is neither direct nor immediate and lacks face to face interactions and observation necessary to truly assess a learner’s comprehension (Feenberg, 1999).

Instructional Technologies and Cost

Finally, in addition to the research set forth within this paper that shows instructional technology often has a negative impact on learning processes, such technology is expensive and a

purchase / implementation should be considered very, very carefully: "In financial terms the cost of development, production and use increases as the material increases in complexity, with lecture notes tending to be relatively low cost and complex games high cost. Within all of these formats there is an underlying control exerted by the authors and developers of such material, therefore the degree of learner freedom is likely to vary depending on the parameters in use by such decision makers. Given that relatively basic Computer-Based Learning (CBL) offers learners personal control over time, pace, place and direction of learning, the value of more sophisticated CBL material, which is more expensive to develop and produce, or purchase, requires careful analysis. We might conclude that if the educational results are similar then the less expensive option should be chosen" (Cooper, 2007).

Conclusion

"Many developers and designers of online instructional systems seem to rely on the assumption that if you build it students will learn. Quite often the attitude is qualified by the conviction that there exist certain basic principles of teaching and learning that always hold true; and that learning will be promoted in direct proportion to how well the instruction implements proven practices that are based on these principles (Merrill 2002). While this may be true to some extent, Brentano (1973) has criticized educational practitioners and researchers for not capturing the true nature of the learner in the learning process. Too often designers of instruction place little emphasis on the fact that each learner approaches an educational opportunity with an assortment of abilities, interests, aspirations, expectations, habits and preferences (Gibbs 1992); their view of the learner tends to follow a largely passive model of individual functioning…Often, effective learning is the result of enthusiastic teachers who inspire their students to make exceptional learning efforts (Pratt 1998). When the teacher is removed as the director of learning and the students are required to learn more independently, they are no longer able to rely on the regulated learning controls and motivations that the traditional classroom

previously provided. The act of simply providing quality instructional materials online or otherwise, is not always enough to promote learning…" (Wright, Sunai & Wilson, 2006)

The best way to teach is through facilitated, face-to-face learning. The only way instructional technologies can be equal to facilitated, face to face learning is if the technology can replace all of the advantages provided by a facilitator. Visionaries in the fields of technology and education acknowledge the shortcomings of the instructional technologies currently available, citing a need for more robust applications that include the elements required by the adult learners for e-learning to be successful. This may include cognitive agents, which are client applications that record a user's (learner's) behavior in an effort to provide personalized feedback to that learner, and artificial intelligence, which is an application that thinks (like a human). These advanced technologies help personalize, customize and reformat the e-learning experience to suit the needs of the individual. The problem is none of this exists commercially yet. Until it does learning should remain in the classroom.

Figure 1

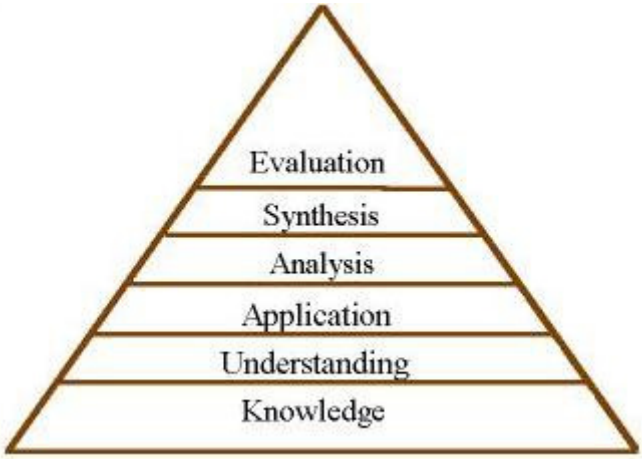

Figure 1

Melsoto, (2005)

Table 1

Bloom's Taxonomy Key Words and Examples

Knowledge	**recall, recite, identify, define, reproduce, label, match, copy, select** ***Examples:*** **dates, events, places, vocabulary, key ideas, parts of diagram**
Understanding	**explain, distinguish, contrast, summarize, restate, cite, predict, estimate** ***Examples:*** **find meaning, transfer, interpret facts, examples**
Application	**apply, illustrate, solve, complete, modify, show, compute, develop** ***Examples:*** **use information in new situations, solve problems**
Analysis	**outline, connect, analyze, illustrate, prioritize, arrange, select, order** ***Examples:*** **recognize and explain patterns and meaning, see parts and wholes**
Synthesis	**categorize, organize, invent, plan, facilitate, reinforce, collaborate** ***Examples:*** **discuss "what if" situations, create new ideas, predict and draw conclusions**
Evaluation	**decide, measure, rank, test, judge, support, criticize, persuade, justify** ***Examples:*** **make recommendations, assess value and make choices, critique ideas**

Johnson, L. & Lamb, A. (2000).

Table 2

Knowles' Andragogy

Statement of Learning

(1) Adults need to know why they need to learn something.

(2) Adults need to learn experientially.

(3) Adults approach learning as problem-solving.

(4) Adults learn best when the topic is of immediate value.

Kearsley, G. (1994)

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