How A Design Model With Behaviorist Underpinnings Can Offer A Framework For Learning, Anytime, Anywhere

Abstract: As mobile technologies become increasingly ubiquitous, personalized, penetrating and transforming to our everyday cultural practices and space, interest continues to grow among educators as they look for ways to use the benefits of mobile devices for learning and training. Instructional system design is the practice of creating instructional tools and content to help facilitate learning. How individuals learn, and how learning takes place are essential considerations for instructional designers. This paper takes a look at design considerations and how an instructional design model with behaviorist underpinnings can offer a sound framework for learning, anytime, anywhere.

Introduction

With the advent of the Internet and the World Wide Web, the shift towards making learning electronic is growing i.e. e-learning, distance learning (d-learning), blended learning, m- learning. The trend is towards convergence where a single device is capable of handling multiple functions and media types i.e. email, texting, Internet browsing, multimedia, photo/video capabilities (MacManus, 2002). As mobile technologies transform our everyday cultural practices and space, interest continues to grow among educators as they look for ways to use the benefits of mobile devices for learning and training.

Pedagogy of Mobile Learning (m-learning)

Mobile learning (m-learning) can be viewed as "the processes of coming to know through conversations across multiple contexts amongst people and personal interactive technologies" (Sharples, Taylor & Vavoula, 2005). It bears the influence of many different learning theories: behaviorist, constructivist, situated, collaborative, activity theory, informal and lifelong learning (Naismith, Londsdale, Vavoula, & Sharples, 2004). Sharples (2002) proposed a theory of mobile learning, drawing on Dewey's philosophy of Pragmatic Technology and Pask's Conversation Theory as foundations for the process of coming to know in a world mediated by mobile technology (Sharples et. al., 2005). According to Tella (2003), mobile devices increase cognitive growth as an individual's motivation is enhanced when he or she is able to develop based on needs and context.

Although technology plays a critical role in this new medium, it is important that we make mobile learning about the learner rather than the technology (Sharples et. al., 2005). How individuals learn and how learning takes place are essential considerations for instructional designers, especially in designing learning activities in a mobile learning environment.

Features of Mobile Learning

However, before considering a design model it is necessary to understand the key features that represent the learning environment common features of a mobile learning environment are:

1. Knowledge building takes place in different contexts (across disciplines).
2. Data gathered is unique to the current location, environment, and time (real and simulated).
3. Learners construct their own understanding (customized to the individuals path of investigation).
4. The pattern of learning or work activity is changed (supports interactivity).
5. Mobile learning applications are mediating tools and can be used in conjunction with other learning tools.
6. The context of learning goes beyond time and space in which learning becomes part of a greater whole: a process
7. Mobile learning raises ethical issues of privacy and ownership (Sharples, 2006).

The widespread availability and use of mobile devices attracts learners; it gives them a sense of familiarity making them more open to learning concepts through such means. Since most learners own their device this creates a sense of ownership, which is directly transferable to learning.

Learning Principles for Designing Mobile Learning Materials

The design of the materials must be based on sound learning theories and instructional design principles. According to Miller (1956), because humans have limited short-term memory capacity, information should be organized into pieces to facilitate processing, five to nine meaningful units. Therefore chunking information to display on mobile devices can help to compensate for the limited capacity of human, short-term memory as it directs the designers' efforts and the learners' focus, and thus supports learning.

Since information is presented in pieces learners need to be able to integrate the pieces and incorporate details of the lesson for understanding. Pre-instructional strategies and the use of advanced and comparative organizers can help with making sense of and understanding new material, as well as prevent information overload (Ausubel, 1974).

Information presented in multiple formats and not just in textual form, with the capability to be organized in the form of a concept map or a network to show the main ideas and the relationships between terms, can facilitate understanding. Stoyanova and Kommers (2002) believe concept maps help with critical reflection and are a way of externalizing the cognitive structure of the learners' brain to facilitate deep processing. This is similar to the way information is stored in long-term memory (Novak, Gowin & Johanse 1983).

Therefore, learning materials or a lesson for mobile learning devices should include a number of learning objects sequenced to form an instructional event and should be accessible from a database for instant access by learners, intelligent agents and instructors (Ally, 2004b). The interface of the mobile learning system should be appropriate for individual learners so as to enhance motivation and learning. Cognitive psychologists view learning to involve the use of memory, motivation, thinking, and reflection (Craik and Lockhart 1972).

A Design Model for Mobile Learning

One of the common issues with online learning has been student attrition: drop out rate. Lack of motivation has been seen as the underlying reason for this (Visser, Plomp, Amirault & Kuiper, 2002). Keller's (2000) ARCS model of motivational design supplies a "systematic" approach for addressing this particular design problem, making it a particularly, good model for use with mobile learning (p. 3).

Merrill (2002) introduced the basic principles of instruction known as the first principals of design, e.g. identify the problem, activate prior knowledge, demonstrate the skill, apply the skill and integrate it into real experience. They are viewed as best practices, which are prescriptive principles of learning that are common to all theories of instructional design and can be applied to any given situation.

Keller expands on this and introduces the first principles of motivation that are common to all learning settings. The goal is to support and sustain motivation throughout the learning process (Keller, 2008). He draws on the ideas of expectancy-value theory in, which "effort" is seen as a major measurable motivational outcome. For successful learning to take place the person must value the task and believe, he or she can succeed at it (Porter & Lawler, 1968).

The ARCS Model "contains a ten-step process for the development of motivational systems in work and learning settings" (Keller, 2000, p. 3). These steps can be divided in to four categories of *analyze* (content and audience), *design* (brainstorm, dream and pragmatic excellence), *develop* (accept, modify and create) and *evaluate* (Keller, 2000). Recognizing that this could become burdensome, Keller created a 'simplified' version specifically for computer-based instruction (CBI) (Keller, 1999). In which he includes a fifth category of "*volition* or *self-regulation*" (Keller, 2008, p.176). These factors support motivation by explaining attitudes and behaviors that help a person overcome obstacles during learning.

Its learning cycle based on the key words that represent each category includes: Attention, Relevance, Confidence, and Satisfaction (ARCS), plus Volition (Keller, 2008).

- Attention: is about building curiosity and sustaining active engagement during an activity (Keller, 2008, p. 176). Keller recognizes the importance of varying the approach to instruction and of

introducing a change of pace at a level that is consistent with the learner's motivation.

- Relevance: includes concepts and strategies that establish connections between the instructional environment i.e. content, teaching strategies, social environment and the learner's goals, and past experiences (Keller, 2008, p.177). Self-determination and being engaged in an activity that is of interest creates stronger motivation as well as accounts for deeper learning (Deci & Ryan, 1985). The needs for achievement, affiliation and power are other factors that make a task relevant (McCelland, 1984).
- Confidence: is related to student personal control and expectancy for success (Keller, 2008, p.177) When students relate their accomplishments to their own abilities and effort, rather than to luck or other external factors, then confidence is improved and greater learning is accomplished (Keller, 2008).
- Satisfaction: is when users have positive feelings about their learning experiences and develop continuing motivation to learn (Keller, 2008, p.177). Opportunity for students to apply what they learn and receive recognition builds satisfaction.
- Volition or Self-regulation: is about persistence and staying motivated enough to achieve one's learning goals. It is about 'effort', overcoming discouragement faced during learning and maintaining goal-oriented behavior (Keller, 2008, p.178).

Mobile learning, with its unique features not only holds learner attention through various forms of messaging and multimedia content; it allows the opportunity for learners to create their own understanding creating relevance for the activity, e.g. via web search, authentic and experiential learning. Even though a task may be isolated the interactive nature of m-learning and its capability for contextualizing information integrates learning with a greater whole. As learning moves outside the walls of the classroom the learner connects concepts with his own understandings and comes to perceive the bigger picture. Thus the task becomes meaningful. It remains challenging, bolsters achievement, and allows the learner to achieve success. This leads to a sense of accomplishment increasing self-confidence and student satisfaction, which eventually leads to greater interest and motivation.

Numerous studies illustrate the power of learning content via mobile learning in conjunction with a instructional design model such as the ARCS model. Learning language via mobile phones was found to be successful when content was used for frequent practice of previous and new vocabulary, paced learning, and mastery of specific words and phrases. Student achievement was seen to improve when authentic, personal and visual content were added to mobile learning e.g. posting pictures and text to a web site. This created further opportunities for language creation (journaling) and collaboration. It was noticed that the vast majority of students preferred the SMS instruction and wished to continue such lessons, and saw it as a valuable teaching method (Thornton & Houser, 2002; 2005).

Gomez (2007) examined the effects of delivering course content and lectures via mobile devices (cell phones) through podcasts, audio and video files. In general it was observed student enjoyment increased and learning outcomes were rated highly. Despite an initial adjustment period most students enjoyed the ability to access information on their own time and access information easily. When learners can choose their own time to learn greater engagement, higher satisfaction and better learning outcomes are achieved.

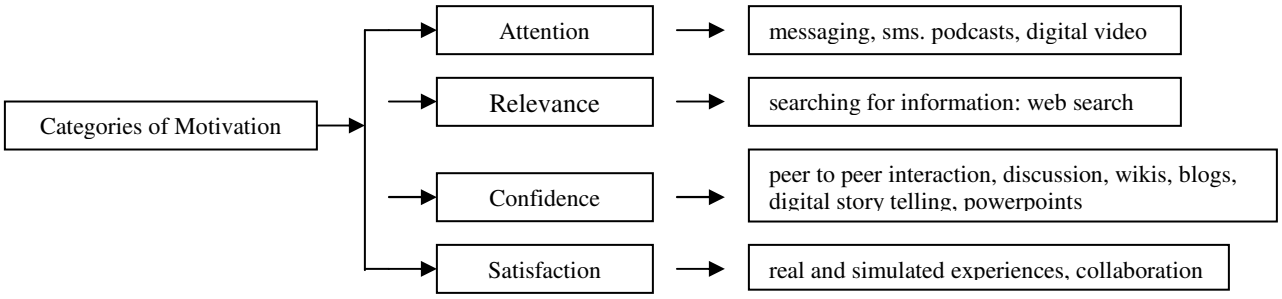
At the University of California, San Bernardino (2006), forty-six students in a literature course used smart phones. Learning units designed, to be completed within a fairly short period of time were used to retain attention. Short messages (SMS) were sent to students to engage them – or in many cases, push them forward – in their group projects. Students were able to take a quiz or interpret an illustration while standing in line at the bank, stuck in traffic, or any other situation where a standard computer would be impractical. Students were encouraged to use their smart phones for creating digital story telling course projects. In addition, assessment was built in to gauge student readiness for mobile learning.

Results indicated students were highly motivated, there was more interaction between instructor/student and peer to peer, collaboration was high, quality of learning was better and students

valued the flexibility of learning anytime, anywhere. The instructor was able to better assist students who needed support even though it was challenging to receive responses and feedback on his own mobile device (Shih & Mills, 2006).

Thus, the Keller's ARCS model functions as a framework of support integrating content and information within a mobile learning environment.

Figure 1: Classification of Motivation (Shih & Mills, 2006)



Rationale for ARCS as a Design Model for Mobile Learning

Behavioral theory and constructivist, cognitive science, contrast dramatically in terms of underlying epistemological assumptions. Behavioral elements concentrate on controlling outcomes with appropriate reinforcement with focus on the design of learning environments. Whereas, constructivist, cognitive elements concentrate on the analysis of content, and sequencing to fit the learners' ability, and internal need to process information (Wilson, Jonassen, & Cole, 1993). This has wide ranging implications for the design process from the learning objective, the specifications of goal outcome, methodologies of analysis, synthesis and evaluation (Bednar, Cunningham, Duffy & Perry, (1995). However both theories seek to communicate and transfer knowledge to the learner in the most efficient and effective manner possible (Bednar et. al., 1995, p.91).

The Keller model's organizational structure and focus on motivation offers a seamless integration into distance learning instructional design. However, it is not without limitations; motivation can be transitory, changing often during the task making it difficult to measure. The model does not advocate strategies for re-mediating motivation when the match between individual and content is not ideal. Likewise 'effort' as a factor of motivation has many facets all of which are not always easily discernable (Hardre & Miller, 2006). This makes it difficult and not always possible to measure the important elements that influence learner motivation. Also, in many instances its behaviorist leanings do little to encourage development of communities of practice (Keller, 1988).

Conclusion

Despite these limitations the Keller ARCS model provides support to learners so they can integrate chunked information, and organize it so the relationships between concepts are understood. The model supplements technology-based instruction, providing solid content that extends beyond the initial appeal or 'cool factor' of technology (Hardré & Miller, 2006). Its systematic approach targets design issues e.g. student motivation providing the basis for sustained learner motivation making it a viable instructional design model for use with mobile learning.

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