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Learner motivation and E-learning design: a multinationally validated process

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A general model for motivational design of instruction is described and reviewed in terms of its application to E-learning contexts. Following a description of what is meant by E-learning environments and an overview of the four category model and design process known as the ARCS model, a variety of studies are summarized. The ARCS model is based on a synthesis of motivational concepts and a problem-solving approach to design, rather than the application of specific motivational solutions that are advocated without regard to the specific characteristics of a given situation. The first group of reviewed studies illustrates the results of testing the motivational design process in several different E-learning settings, in relation to learner self-regulation and in terms of the interaction of personality characteristics and motivational strategies. The second group of studies includes tests of the validity of a simplified motivational design process that has been used in diverse types of E-learning settings, including multiple countries and cultures. Overall, the results of these empirical studies have confirmed the validity of this model for the systematic design of motivationally enhanced instruction in E-learning settings with regard to lowering drop-out rates and other positive motivational outcomes.

Introduction

Technology offers many innovative features that can be used to make instruction more appealing to learners. However, many of these features are interesting only because they are novel and may lose their appeal as learners become accustomed to them. Problems with regard to stimulating and sustaining learner motivation are well documented in the literature of E-learning and the broader context of distance learning (Zvacek, 1991; Rowntree, 1992; Visser L., 1998), especially when learners are working independently at a distance. Overcoming these motivational challenges can be difficult because of the complexity of human motivation and the vast number of motivational concepts and theories that exist. Frequently, specific motivational concepts become 'popular' and are included in research studies of learner motiv-

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ation in relation to interest, attrition or other dependent variables. Such was the case with 'locus of control' in times past and currently with 'self-efficacy' and 'self-regulation'. These are important components of motivation, but they are not sufficient to explain it, nor do these motivational concepts provide guidance in and of themselves as to how to design motivational E-learning.

Motivation and E-learning

One of the first issues to consider with regard to E-learning is 'What is it?' The term has become very popular, but like the phrase 'distance learning', it can refer to rather dramatically different kinds of learning environments. In the present paper we use the term broadly to refer to almost any learning environment in which electronic media, such as computers, are used as a component of an instructional delivery system. These can range from the use of Email to supplement print-based materials distributed at a distance to courses that are delivered entirely by means of technology such as computers or the World Wide Web.

There are similarities in motivational problems in all of these settings, even though there are specific motivational challenges within each major system. For example, drop-out rates tend to be higher than in face-to-face settings, learners often feel isolated and levels of learning interactivity are often trivial and do not approach the richness of case studies and projects in face-to-face settings (Moore & Kearsley, 1996). There are notable exceptions in some Web-based learning systems that are instructor-led and in which virtual groups work collaboratively, but even in these settings there are motivational challenges with regard to effective delivery of instruction and methods of managing the virtual learning environment (Joung & Keller, 2004).

It is one thing to document motivational challenges in these settings, but it is something else to determine what to do about it. For several years Keller (1987a,b) has been developing and testing a model to assist educators in a systematic process for analyzing learner motivation and designing motivational tactics that are keyed to specific areas of motivational problems and integrated with teaching/learning strategies. This process was derived from a comprehensive review and synthesis of motivational literature that classifies the major motivational concepts and theories into four categories depending on whether their primary area of influence is on gaining learner attention, establishing the relevance of the instruction to learner goals and learning styles, building confidence with regard to realistic expectations and personal responsibility for outcomes and making the instruction satisfying by managing learners' intrinsic and extrinsic outcomes. This process is called the ARCS model based on its acronym (*a*ttention, *r*elevance, *c*onfidence and *s*atisfaction). Following a description of this model, we will describe some of the findings with regard to improving motivation in E-learning environments.

Characteristics of the ARCS model

First, a lesson must gain and sustain the learner's *attention*. Research on curiosity, arousal, and boredom (Berlyne, 1965; Kopp, 1982) illustrates the importance of incorporating a variety of tactics to gain learner attention by the use of interesting graphics, animation or any kind of event that introduces incongruity or conflict. A second level of curiosity is aroused by using mystery, unresolved problems and other techniques to stimulate a sense of inquiry in the learner. An additional important component of attention is variability. No matter how interesting a given tactic is, people will adapt to it and lose interest over time. Thus, it is important to vary one's approaches and introduce changes of pace.

The second requirement is to build *relevance*. Attention and curiosity are necessary, but not sufficient, conditions for motivation. It is also necessary for learners to perceive the instructional requirements to be consistent with their goals, compatible with their learning styles and connected to their past experiences. Having clear goals is a key component of relevance. Learner goals can be extrinsic to the learning in that it is necessary to pass a course to be eligible for a desired opportunity, but a stronger level of motivation to learn is achieved when the learner experiences intrinsic goal orientation, i.e. when the learner is engaged in actions that are personally interesting and freely chosen. This condition of intrinsic motivation is an example of self-determination (Deci & Ryan, 1985) that leads to sustained goal-oriented behavior. Thus, relevance results from connecting the content of instruction to the learners' future job or academic requirements or to intrinsically interesting topics. For example, secondary school children enjoy reading stories with themes of stigma, popularity and isolation, because these are important issues at that time of their lives. In recent years it has been popular to refer to these aspects of relevance as 'authentic' learning experiences, which is a concept from constructivist literature (Duffy *et al.*, 1993). Other motivational concepts that help explain relevance are motives such as the needs for achievement, affiliation and power (McClelland, 1984), competence (White, 1959) and flow (Csikszentmihalyi, 1990).

The third condition required for motivation is *confidence*. This is accomplished by helping students establish positive expectancies for success and to then experience success under conditions where they attribute their successes to their own abilities and efforts rather than to luck or the task being too easy or difficult (Weiner, 1974). Even a successful accomplishment is not likely to increase one's confidence if the person believes that the only reason success occurred was because of luck. This category of confidence includes some of the most currently popular areas of motivational research, two of which are self-efficacy (Bandura, 1977) and attribution theory (Weiner, 1974).

The first three conditions are necessary to establish the motivation to learn and the fourth, *satisfaction*, is necessary in order for learners to have positive feelings about their learning experiences. This means that extrinsic reinforcements, such as positive rewards and recognition, must be used in accordance with established principles of behavior management (Skinner, 1968) and must not have a detrimental effect on intrinsic motivation (Condry, 1977). Such things as opportunities to apply

what one has learned coupled with personal recognition support intrinsic feelings of satisfaction. Finally, a sense of equity or fairness is important (Adams, 1965). Students must feel that the amount of work required by the course was appropriate, that there was internal consistency between objectives, content and tests and that there was no favoritism in grading.

If all of these conditions are met, then students are likely to not only have a high level of motivation to learn in the immediate setting, but to also have a continuing motivation to learn, which is defined by Maehr as voluntary engagement in continuing to learn more about a given topic (Maehr, 1976). However, these categories do not in and of themselves explain what motivational tactics to use or when to use them. For this it is helpful to use a systematic motivational design process that provides guidance in creating motivational tactics that match student characteristics and needs (Keller, 1987a).

The ARCS model contains a ten-step design process (Figure 1) for the development of motivational systems in work and learning settings. The first two steps, which are parts of the overall analysis components of the process, produce information about the status quo and provide the basis for analyzing gaps and their causes, which are done in the third and fourth steps. Based on these analyses, in the fifth step one prepares objectives for the performance improvement project and specifies how they will be assessed. There are then two steps in design: brainstorming within each motivational category to generate a rich list of potential solutions; selection of the final tactics, which is a more critical and analytical process for selecting tactics that best fit the time, resources and other constraining factors in the situation. The final steps include both development and evaluation and are similar to any other development model. Numerous reports and studies have described and confirmed the validity of this model with respect to its conceptual foundation (see, for example, Visser & Keller, 1990; Small & Gluck, 1994; Means *et al.*, 1997).

Systematic improvement of motivation in E-learning

The ARCS model has also been validated multinationally as a means of improving learner motivation in E-learning. In a recent study Chyung *et al.* (1999) used the ARCS model in combination with a systematic needs assessment process to design and implement interventions that would decrease the drop-out rate in a distance learning program. There are frequent citations in the literature to the symptoms associated with drop-out (Moore & Kearsley, 1996; Visser, 1998), but the incorporation by Chyung *et al.* (1999) of a needs assessment process assisted them in identifying the causes of the problem. These included such things as learners having doubts about their online communication skills, lack of confidence in using the DE software, feelings of being overwhelmed and other problems with confidence and relevance. Based on these results, which were combined with an ARCS model analysis and design process, the investigators developed a list of targeted interventions. These were implemented over a period of three semesters (spring, summer and autumn). The results indicated that there were improvements in both learning and motivational reactions in all four motivational categories (attention, relevance,

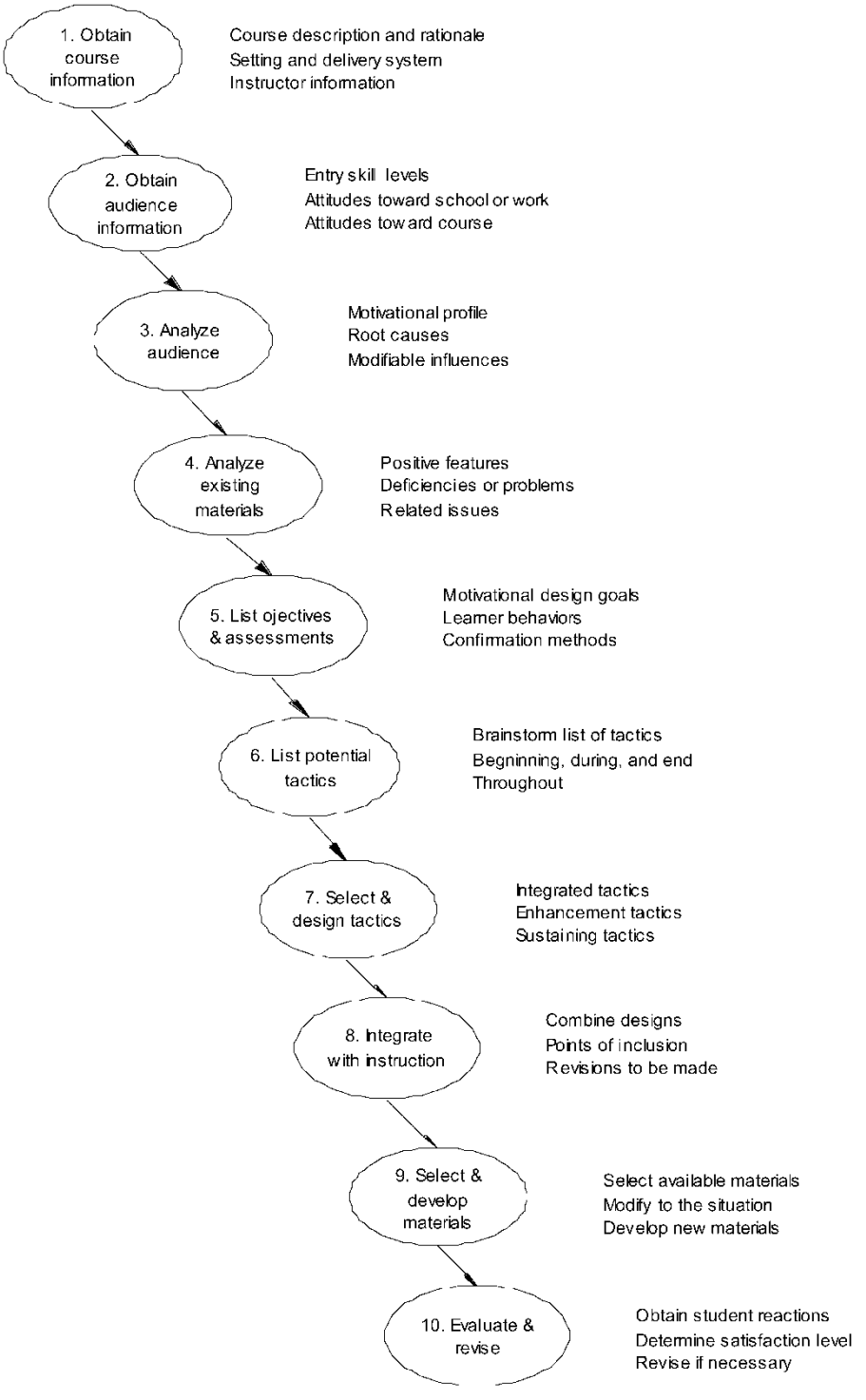

Figure 1. ARCS motivational design process

confidence and satisfaction). Also, there was a significant reduction in the drop-out rate, which decreased from 44 to 22%.

In a study that focused primarily on the relevance dimension of motivation, Chang and Lehman (2001) used the ARCS model to guide the development of a set of tactics to improve motivation and performance in a distance learning class. Several of their tactics were designed to facilitate easy scanning of online text, reduce the word count on a screen compared with printed text, improve the quality of quizzes as a motivational tool and incorporate more interactive features. Most of these tactics are also consistent with cognitive load theory (Pass *et al.*, 2003), which has implications for learner motivation. The investigators found a significant improvement in learner perceptions of motivation and in scores on a comprehension test.

In addition to the direct effects that can result from applying the ARCS model, personality characteristics can interact with the tactics that are used. Bellon and Oates (2002) used the Jung Typology Test to measure learners and correlate the results with their motivational reactions to various features of the Web-based course that were designed in accordance with the ARCS model. They found no differences in relation to some aspects of the course, but they did find interactions in that certain personality types had higher levels of motivation for posting Emails and for various types of course materials.

Astleitner and Hufnagl (2003) found an aptitude–treatment interaction between ARCS designed tactics and situation–outcome–expectancies (SOE) with regard to self-regulated learning in a Web lecture course. SOE (Rheinberg *et al.*, 2000) refers to a person's belief that a given situation will lead to predictable outcomes more or less automatically. An example of high SOE in relation to the critical thinking task in this study was 'I am excellent in critical thinking, even when I do not prepare for it'. In contrast, a low SOE person would express an opinion such as 'If I do not do at least five additional tasks, I will not be able to finish my final examination'. Astleitner and Hufnagl found that participants who had low SOE had higher motivation and higher levels of achievement in the motivationally enhanced condition based on ARCS design principles, while the high SOE learners did not. There were no differences in the motivationally unenhanced condition, and they concluded that motivationally designed instruction had a positive effect on self-regulation for low SOE learners. These investigators also provided a further confirmation of a previously validated finding (Suzuki & Keller, 1996) that the ARCS design process helps one include essential motivational tactics and avoid having excessive tactics that might in fact annoy the learners.

Validation of a simplified motivational design process in E-learning

One of the challenges in using the full 10-step process for motivational design is that it can be time consuming and works best for large-scale projects. As a means of facilitating systematic motivational design, Suzuki (Suzuki & Keller, 1996; Keller, 1997) created a simplified approach and tested its effectiveness in a project with 25 teachers in eight subject areas at Sendai Daichi Junior High School in Sendai, Japan.

These teachers had been developing computer application and E-learning projects for several years as part of a demonstration project sponsored by the Japanese national government. During the final 2 years of the project they were asked to incorporate systematic motivational design into their process. The goal of the simplified approach was to develop in a simple matrix format a condensation of the steps from the larger model. It was designed to ensure that the teachers would identify key motivational characteristics of the learners, the content area to be taught and the hardware or software to be used. The teachers then evaluated this information and prescribed tactics based on identified motivational problems.

To facilitate their identification of motivational tactics, Suzuki provided checklists and tables of potential tactics (Keller & Suzuki, 1988; Keller & Burkman, 1993). This process helped ensure that teachers avoided the inclusion of excessive numbers of tactics or tactics derived from their own preferred areas of interest without regard to the characteristics of the students and the situation. An evaluation of the effectiveness of this motivational design process (Suzuki & Keller, 1996) verified that the teachers were able to use the matrix accurately with only a few entries not being placed appropriately and more than two-thirds felt that it definitely helped them produce a more effective motivational design. Some teachers had difficulties with the analysis phase, which indicates that this is a critical area to address in training people to use the process.

This simplified design process was modified (Keller, 1997) and used in two subsequent projects. The first of these was to develop and test a prototype of motivationally adaptive computer-based instruction. In the first, Song (Song & Keller, 2001), building on the work of Astleitner and Keller (1995) and del Soldato & du Boulay (1995), designed and tested an approach to motivationally adaptive instruction. He built checkpoints into an instructional program on genetics for junior high school students. At predetermined points students in the primary treatment group received a screen asking several questions about their motivational attitudes. Based on the responses, which were compared to actual performance levels, students would receive motivational tactics designed to improve attention, relevance or confidence. The simplified ARCS model design process was used to create specifications for tactics to be included in the adaptive treatment, which was compared with a full-featured treatment containing all of the motivational tactics and a minimalist treatment. The results indicated that both the adaptive and full-featured treatments were superior to the minimalist treatment and, in most instances, the adaptive treatment was superior to the full-featured one.

The second extension of the simplified design process (Visser L., 1998) was in a somewhat traditional distance learning course in which printed materials and multimedia were posted to students in several different countries who could then use Email, depending on its availability, to communicate with the tutor. It was not possible to modify the materials in this study, however L. Visser postulated that significant improvements in retention could result from improvements in student support activities. She adapted a motivational strategy developed and validated in an adult education setting in Mozambique (Visser, J. & Keller, 1990). This approach includes the creation and distribution of 'motivational messages' that are sent to

students according to two schedules. The first is a set of fixed points based on predictions of the points during the course when these messages might have the strongest effect. These messages are the same for everyone. The second schedule consists of personal messages sent to students when the instructor, or in L. Visser's case the tutor, deems it appropriate. These messages were in the form of greeting cards, which conveyed messages of encouragement, reminders, empathy, advice and other appropriate content. To assess the effectiveness of this intervention, she compared retention rates in the experimental section of the course to three other sections that did not receive motivational messages and she did a qualitative review of student responses to various course evaluation and feedback instruments. She did not ask them directly about the effects of the motivational messages to avoid stimulating attitudes that may not have been present spontaneously in the students' minds. However, students included a variety of direct and indirect comments that validated the effectiveness of the messages. Also, improved retention rates of 70–80%, which are similar to conventional education, offered clear support for this application of systematic motivational design.

The model has been tested and validated in many different contexts and cultures (Klein & Freitag, 1992; Bohlin *et al.*, 1993; Suzuki *et al.*, 1993), including educational and employee training at virtually all levels and in settings as diverse as Japan, Austria, Mozambique and Ireland, to mention only a few. Not all of the efforts to apply the model can be assumed to have been successful, but they are not likely to be published. However, there is an example of a partial study that was conducted by Astleitner and Lintner (2003). They administered a motivationally enhanced treatment over a period of time in which participants were tested three times. The self-regulated learners performed worse in the motivationally enhanced condition than in the unenhanced condition on the first test, there were no differences on the second test, but they performed better on the third test. It appeared in this situation that there was a long-term benefit to the motivational enhancements, even for self-regulated learners, although there was no short-term benefit. The investigators discussed possible modifications to make in future studies.

Conclusion

The primary conclusions to be drawn from the research to date seem to be that it is possible to implement systematic approaches to identifying the motivational requirements of learners in E-learning settings and to design motivational enhancements that will predictably improve learner motivation and performance. In particular, the ARCS model (Keller, 1987a,b) has been proven in numerous studies to be effective. Based on this research, it is clear that systematic, holistic motivational analysis of the audience as incorporated in the ARCS model will help lead one to the creation and selection of motivational tactics that are consistent with the motivational needs of the audience. In contrast, in motivational design projects where the audience analysis phase is omitted or restricted to an isolated aspect of motivation, the result can be to include too many motivational tactics or irrelevant ones (Farmer, 1989; Suzuki & Keller, 1996). The research on motivational design, both

in areas that incorporate the ARCS model and in areas that will be incorporated into the ARCS model, are continuing into new and interesting areas, including studies of emotion with regard to motivation and learning (Ortony *et al.*, 1988; LeDoux, 1996), the affective and other motivational effects of animated pedagogical agents (Baylor, 1999) and the design of affective elements into computer interfaces (Picard, 2000). All of these efforts are contributing to more systematic and predictably effective ways of understanding and influencing learner motivation. In closing, it is important to note the emphasis on influencing learner motivation, not controlling it. Ultimately, instructors and machine-based instruction cannot control learner motivation, but on the other hand, they cannot avoid influencing the motivation of learners, either positively or negatively. Systematic motivational design has been shown to be effective when used properly and within the boundaries of modifiable influences on learners.

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