

John Keller

A Motivating Influence in the Field of Instructional Systems Design

Bonnie J. Shellnut
Wayne State University
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Preface: This biography was written by Dr. Bonnie Shellnut while she was a doctoral student at Wayne State University. It is based on her careful reading of all my publications at the time and several personal interviews which I supported with references that I sent to her, especially for some of the background material. The end result is, I believe, a fair assessment of the development of my work together with its philosophical and theoretical underpinnings. *John Keller, June, 2006.*

Introduction

An analysis of learner attributes is included as a step in 27 of the 40 design models reviewed by Andrew and Goodson (1980). However, in all of these models learner analysis is used primarily to determine prerequisite skills or ability to learn. Few design models include an analysis of the learner's motivation level. John Keller claims that motivation has been the neglected "heart" of instructional technology (1979, 1983).

A philosopher before becoming an instructional systems design researcher and practitioner, Keller invokes Plato to illustrate this intrinsic component that influences one's behavior:

Plato describes the three-part nature of the soul. The first part is wisdom, or reason, which is associated with our heads, and represents the deliberative or governing part of our behavior. The second is honor, or spiritedness, which is associated with our chest or hearts, and represents the executive influence on our behavior. The final component is personal gain, which is related to the satisfaction of our bodily appetites (Keller, 1979, p. 27).

Since emphasis on models and strategies for the affective domain has lagged far behind the emphasis on cognitive domains (Main, 1993 and Keller, 1979, 1983), Keller has devoted his career to rectifying the evident neglect of motivation in instructional systems theory and practice. As a result, his life's work constitutes a major contribution to the field. First, by applying motivation theories systematically to design theory, which already encompassed behavioral theory and cognitive psychology (Keller, 1979, 1983). Second, in developing a unique problem-solving process he called the ARCS Model of Motivation (1987a, b, c).

This paper has four objectives: (1) to trace Keller's career, (2) to describe his major contributions, (3) to determine his impact on the field, and (4) to predict why and in what areas Keller will have continued influence.

Career Path

Career Preparation: From the Marines to *Metaphor and Reality*

Keller, who has a B.A. in philosophy, followed an interesting path to reach the field of instructional technology. After graduating from high school in 1956, he went to college in California, leaving after one semester when he realized he was not ready for serious study. Keller joined the U.S. Marines in 1957 and was assigned to an aviation wing where his responsibilities included the delivery of strict one-on-one instruction for flight simulator procedures. During his four-year term he began searching for greater insight into life's meaning by reading Plato, Homer, and Jung, finding pleasure in beautiful language and philosophical discussion.

After his discharge in 1961, Keller enrolled in San Bernardino State College where he met Dr. Atkins, Professor of Philosophy. Atkins helped fan a flame of inquiry and reflective thinking in Keller that had ignited in his Marine days. As a philosophy major, he delved deeply into the writings of classical philosophers. The works of Philip Wheelwright (1962, 1968) who espoused perspectivism--a philosophy which claims that "reality is known only in terms of the perspective of it seen by individuals or groups at particular moments"(Webster's unabridged dictionary, 1989, p. 1075)--caught Keller's attention. In addition, his English studies introduced Keller to the complex psychological themes of Dostoevsky and Faulkner. The subjects of free will and human potential inherent in these liberal arts studies are evident in his emphasis on human motivation in instructional design (Keller, 1979, 1983, 1987 a, b, c).

Fresh with a B.A. degree in philosophy and English, Keller became a secondary school teacher to earn a living. From 1965 to 1971, he taught high school students about literature, writing, and social studies. During that time he also pursued graduate studies. In 1971 Keller was awarded a NDEA Title IV Fellowship in instructional systems technology at Indiana University, Bloomington. Keller was guided toward his dissertation on learned helplessness and locus of control by professors William Scott and Richard Pugh. Soon after being awarded a Ph.D. in 1974, Keller continued his focus on locus of control (Keller & Pugh, 1976; Keller, Goldman, & Sutterer, 1978). More importantly, locus of control and learned helplessness were both central to the development of the seminal theoretical model of motivation, which came to fruition during his first few years at Syracuse University (Keller, 1979).

Career Development: Both Scholar and Practitioner

Keller received his Ph.D. from Indiana University in 1974 with a major in instructional systems technology and minors in research & evaluation and organizational behavior. His doctoral research led to his being named Outstanding Young Researcher by the Association for Educational Communications and Technology in 1975. He was the first recipient of this award. Keller was appointed as an assistant professor in instructional technology at Syracuse University in 1974. While at Syracuse, Keller developed into both a respected scholar and practitioner of instructional systems design.

Don Ely, known for his work on definition of the field (Seels & Richey, 1994) and C.M. Reigeluth, noted for his Elaboration Theory (1979), had both personal and professional influence on Keller. Keller notes that the ARCS Model, like Gagné's Events of Instruction and Reigeluth's Elaboration Theory, is concerned with selecting strategies that match the learners' prerequisite skills and attitudes (Keller, 1983).

Not only did Keller conduct research, write and teach in the field while at Syracuse, he applied his knowledge and skills as a consultant to a wide variety of businesses, military, and academic issues. He also took on leadership responsibilities, becoming Chairperson in the Area of Instructional Design, Development, and Evaluation, School of Education, Syracuse University from 1983 to 1984. In January of 1985, Keller was appointed Associate Professor of Instructional Science and Technology, in the College of Education at Florida State University where is now a full professor. Keller first met Robert Gagné, who was a professor at Florida State. Keller attributes Gagné with having influence on his thinking prior to 1985, especially on the "Interest" or "Attention" component of the motivation theory and models (Keller,

1979, 1983, 1987 a, b, c). Okey and Santiago (1991), however, demonstrate that Keller's ARCS Model is actually applicable to all of Gagné's nine events of instruction.

Keller has also demonstrated leadership in the field through his editorial positions with various journals. For example, he first served as guest editor for the National Society for Performance and Instruction in 1978. In addition, he was consulting editor for the following journals: *Journal of Instructional Development*, 1980-1989; *Educational Communications and Technology Journal*, 1983-1989; and *Performance Improvement Quarterly*, 1990-1993. Presently Keller serves as consulting editor for *Performance and Instruction and Educational Technology Research and Development* (J. M. Keller, personal communication, October 23, 1996).

Significant Contributions

Motivation: A Theoretical Foundation for Instructional Design

Keller has made significant contributions both as a scholar and a practitioner of instructional systems design. First, he expanded Gagné's focus on the learner's *ability* to do something (prerequisite skills) to the learner's *will* to do something (Keller, 1983). Second, he expanded the motivation focus from Skinner's extrinsic view to an intrinsic one (Keller, 1979). Furthermore, Keller laid important groundwork for developing a systematic, learner-focused design model based on the contributions of several significant theories, e.g. behaviorism, cognitivism, and humanism (Keller, 1979). Because of his emphases on a wide range of theoretical bases, Keller refers to his motivation work as both a theory and a macro model. Reigeluth cited the strength of Keller's eclectic approach and applied it to his own model known as the Elaboration Theory (1982). In fact, the eclectic approach, which attempts to combine the best of each theory, seems to be considered a strength by the majority of instructional theorists and practitioners (Flemming & Levie, 1978; Richey, 1986, 1995). This approach, however, is not without controversy. In fact, constructivists (Bendnar, et.al. 1991) argue that eclecticism is actually an inherent weakness because "abstracting and strategies from the theoretical position that spawned them strips them of their meaning" (p.88).

Keller was thinking only of how best to provide a practical solution to a problem when he first began his motivation work. A colleague at Syracuse asked him for a measure of motivation to use with an organization. Keller indicated that there was not just one measure but many for the several elements of motivation, such as curiosity, expectancy, relevancy, and satisfaction. With his own interest peaked, Keller began to wonder about comparing motivation to ability, focusing on motivation as a specific area of study. His first articles (Keller, Kelly, & Dodge; Spitzer & Keller, 1978) concentrating on measures for motivation were published. In his early research he adapted the findings of Porter and Lawler (1968) concerning motivation in management. After examining the connection between organizational motivation and expectancy value theory to improve performance, Keller began to see the connection to individual motivation.

Keller (1979) acknowledges that two major theories--behavioral psychology and cognitive psychology--have exerted significant influence on instructional technology. Behavioral elements concentrate on controlling outcomes with appropriate reinforcement. Cognitive elements, on the other hand, concentrate on the analysis of content, the learners' prerequisite skills, and organization and sequencing to fit the learners' ability and internal need to process information (Wilson & Coe, 1993). Based on the research of cognitive psychology, Keller came to the conclusion that motivation involves more than extrinsic factors, influenced by scheduled reinforcement (Keller, 1979). In fact, Keller's comprehensive review of the literature in cognitive psychology, social learning theory, and motivation theory reveal that learners are affected not only by extrinsic behavior factors but also by numerous intrinsic factors.

Keller (1979) indicates that his theoretical motivational model includes a strong foundation based on social learning theory, which is derived from the work of Tolman (1949) and Lewin (1935). Social learning theory "assumes that motivation and behavior are the result of interactions between a person and the

environment” (Keller, 1979, p. 27). This is an important aspect of the theoretical foundation because it implies that learning takes place in a social context. The basic formula stating that behavior equals function as it interacts with one’s performance and effort is written $B=f(P \& E)$ (Keller, 1979, 1983).

Keller notes (1979), that this theory “describes the processes that influence motivation and performance and that provide the basis for developing prescriptive theories of instructional influences. The outputs of effort, performance and consequences are affected by the shared inputs of the person and the conditions of instructional environment, which include design, media, strategies, delivery. Keller (1979, 1983) states that effort is affected by a person’s affective inputs of motives (values) and expectancy. Whereas the environmental inputs affecting effort come from motivational design and management. Performance is influenced by the person’s cognitive inputs of abilities, skills and knowledge. The environmental inputs affecting performance are learning design and management, which are consistent with Gagné’s approach. Consequences are influenced by the person’s inputs of cognitive evaluation and equity, which include one’s satisfaction with one’s performance. The environmental input is the contingency design and management of rewards. The graphical model demonstrates clearly the interaction of these components (Keller, 1983).

Keller (1979) based his emphasis on motivation for the design of instruction on a combination of theories, including: (1) Bandura’s Self-Efficacy (1977), (2) Berlyne’s Curiosity and Arousal (1965), (3) Maslow’s Needs Hierarchy (1954), (4) McClelland’s Achievement Motivation (1976), (5) Rotter’s Locus of Control (1975), and (6) Seligman’s Learned Helplessness (1975) to substantiate motivating factors for learners. More importantly, Keller connected the theories systematically to the key components of his theory for motivation design. Because of his emphases on a wide range of theoretical bases, Keller (1979) refers to his motivation work as a both theory and a macro model.

Keller’s motivation design (1979, 1983) involves a traditional ISD model to do the following: (1) Analyze the motivational problem (Is the problem with the instruction or with the student’s attention, relevance, confidence, satisfaction?); (2) Design motivational strategies (write motivational objectives, brainstorm strategies, select strategies); (3) Implement strategies; and (4) Evaluate consequences. Although this model prescribes the steps the designer should take to solve the motivational problem, the motivation model does not guide the designer in how to determine what motivational strategy or strategies will be most effective with the target population of learners. Keller does provide suggestions for specific strategies that should be effective in respect to attention, relevance, confidence and satisfaction (1983, 1987a, b, c).

Matching motivational strategies to these areas and to the learner is called “motive matching” (1987c). The concept of motive matching is an important contribution to the process of learner analysis. Keller suggests that effective motivation design can be applied during or following content design (1983, 1987a, b, c). The important component is to write motivational objectives that match the needs of the learners and is at or above the desired level in each motivation category (Keller, 1987c). The level of motivation could be too low, acceptable, or too high. The connection between motivation and performance is depicted as an inverted “U.” The desired level of learner motivation is in the middle of the inverted “U”. Keller’s concern is to achieve a “match between learners with a reasonable degree of curiosity, achievement, motivation, and instruction that activates and fosters those characteristics” (p. 400). This match is arrived at by conducting a thorough audience analysis, which is akin to a needs analysis (Keller, 1983). Although Keller uses a checklist for his own audience analysis, he does not include one in the model. He believes the designer should conduct his or her own learner analysis, to determine the most effective strategies to get and sustain interest, provide relevance, produce confidence and enhance satisfaction (Keller, 1983).

Keller provides several strategies for each of the four factors. As the model has developed and expanded, so have the suggested strategies. To illustrate, one strategy will be noted for each factor. (1) *Interest Strategy*: use novel, incongruous, conflicting, and paradoxical events. (2) *Relevance* (which includes personal-motive value, instrumental value, and cultural value) *Personal-motive value Strategy*: provide opportunities to achieve standards of excellence under conditions of moderate risk. *Cultural value Strategy*: use culturally relevant examples of accomplishment. (3) *Expectancy Strategy*: use techniques

that offer personal control over success. (4) *Outcomes Strategy*: use verbal praise and informative feedback rather than threats. Practice in applying the four specific categories and suggested research-based strategies should help the designer discover and use other effective and specific motivational instructional strategies.

Keller (1983) also introduced the extent to which influence of a learner's external environment--family, friends, and setting--may have on one's motivation. He calls this "cultural value" (p. 408). Keller is not alone in this view. The importance of paying attention to the learner's environmental or contextual influences is also supported by the work of Richey and Tessmer (1995).

The ARCS Model: The Final Form

According to Keller, "There is nothing as practical as a good theory," an observation he attributes to the American philosopher William James. Keller notes that arriving at the acronym ARCS (Attention, Relevance, Confidence, & Satisfaction) was from a purposeful attempt to make the model meaningful, consistent and easy to communicate. Because of its focus on matching motives to the unique affective characteristics of learners and its clear suggestions for strategies, the ARCS Model is practical indeed.

Keller first referred to the ARCS Model in a monograph (1983 b) published while in The Netherlands conducting research. He also discussed the ARCS Model in relation to teacher training (1984). Keller (1987 a, b, c) defined and described the basic components of the ARCS Model in a series of three key articles to be read by the larger public. In the final version of the ARCS Model, certain terms change to fit the acronym. "Interest" becomes "attention," and "expectancy" becomes "confidence" (Keller, 1987a, b, c). Keller (1987a) notes simply: "The ARCS Model is a method for improving the motivational appeal of instructional materials" (p. 2). It has three distinct features. First, to establish the connection with motivational theory, there are four motivational concepts: (1) Attention, (2) Relevance, (3) Confidence, and (4) Satisfaction. Second, to enhance the appeal of instruction, sets of strategies are included. Third, the ARCS Model utilizes a systematic design process. Keller emphasizes (1987a) that the ARCS Model is a problem-solving, empirical approach to applying motivation to instructional design. Motivation is not only the learner's responsibility but is also the instructor or designer's responsibility.

Each factor of the ARCS Model has three elements, which Keller (1987b) delineates. First, *Attention* includes (1) perceptual arousal--use of strategies to gain initial interest; (2) inquiry arousal--use of problem-solving, questioning, a sense of mystery and progressive disclosure to increase interest; (3) variability--use of variety (lecture with visuals, group activity, or game) for a change of pace. Second, *Relevance*, which is the concept of linking the content to the learner's needs and wants, includes: (1) goal orientation, which may mean outcome of learning such as obtaining a job, reward, etc. or may imply the means of learning; (2) motive matching involves the learner's choices about strategies of learning, such as by group interaction, competition, or individual work; (3) familiarity or connect to what one already believes and understands such as realistic graphics, people's names, personal learning experiences. Third, *Confidence*, which provides a sense of self worth and success ability in challenging tasks, involves strategies to: (1) provide learning requirements in the form of clear objectives; (2) provide success opportunities early and often enough to establish the learner's belief in his or her ability to achieve. (3) provide personal control over the learning with choices of content, objectives and activities. This relates success to one's choices and effort. Fourth, *Satisfaction* includes strategies to: (1) increase the natural consequences for use of the content, simulations, projects, real-life activity; (2) provide positive consequences--both intrinsic and extrinsic rewards; (3) assure equity of rewards so that they match achievements.

Keller (1987a) argues that designers often overlook motivational design components because they believe motivation is not a measurable aspect of learning and that motivation is too "unpredictable and changeable, subject to many influences" over which the teacher or designer has no control (p. 2). Keller maintains, however, that motivation is not as unpredictable as has been assumed. Motivation can, in fact, be approached systematically with a model rooted in Instructional Systems Design (Keller, 1979, 1983,

1987a, b, c). Okey and Santiago (1991) demonstrate clearly how Keller's motivation design theory can be used successfully in concert with Dick and Carey's instructional macro-design model and with Gagné's events of instruction.

Richey (1995) points out that Keller's ARCS Model of Motivation views learning as an "internal process." The ARCS Model and other micro-design models also indicate that learning is preceded by "sequenced instructional strategies that provide motivation, direction, guided practice, feedback, and reinforcement" (Richey, 1995a, p. 2). Whatever traditional ISD model the designer uses, the basic instructional design components are usually based in the theories originally developed by Gagné (Richey, 1995a). Five of the nine events of instruction--attention, objectives, stimulus, performance, and feedback--are essential components of motivation theory as well.

Keller's Impact on the Field

Sufficient evidence of Keller's impact on the field exists in the literature. Although the total contribution has not been fully documented, a literature review to determine the extent to which ARCS is being applied in the field is being conducted by Ruth Small of Syracuse University (J.M. Keller, personal communication, October 23, 1996). Reigeluth considered Keller's work on motivation significant enough to the field to invite Keller to contribute a chapter in Reigeluth's 1983 book, *Instructional-design theories and models* (Keller, 1983). Reigeluth also integrated Keller's strategies for motivational design of instruction into the elaboration theory (Reigeluth, 1982). Gagné and Driscoll (1988) devoted a whole chapter in *Essentials of Learning for Instruction* to Keller's motivation model. The incorporation of Keller's ARCS Model into traditional design theory and models exists in Smith and Ragan's text, *Instructional Design* (1993). Smith and Ragan dedicate several pages in their chapter on strategies for attitude change, motivation, and interest to the ARCS Model. Keller has also contributed chapters to books on human performance technology by Stolovich and Keeps (Keller, 1992), Kaufman and Thiagarajan (Keller, in press), and message design by Fleming (Keller & Burkman, 1993).

Applications of the ARCS Model to Traditional Design Problems

It is legitimate to ask: To what extent and with what results has the ARCS Model been applied to traditional design problems? Describing the widespread use of the ARCS Model, Keller notes, "As far as I can determine, ARCS is taught and / or applied in seventeen different countries, including France, Great Britain, China, Japan, Indonesia, Mozambique, Saudi Arabia, and Mexico" (J.M. Keller, personal communication, October 23, 1996). It has been used both to enhance existing materials and to develop new materials. The ARCS Model has proven to work well across delivery systems and across cultures.

First, the application of the ARCS Model to a science lesson in a science text (Keller & Kopp, 1987) supports the claim that the ARCS Model can be used effectively to enhance existing instructional materials. In addition, the ARCS Model has been used effectively in the design of computer courseware (Keller and Suzuki, 1988). The ARCS model has also been used successfully with multimedia instruction (Keller & Keller, 1991). Keller and Suzuki note that most computer-based instruction (CBI) already has a built-in attention strategy with graphics, color, and interaction. The initial appeal can fade quickly if the instructional design and content are inadequate. Therefore, the authors recommend that the ARCS Model be used with an effective instructional design model to ensure solid content.

Application of the ARCS Model to Cross-Cultural Learners

Can the ARCS Model be applied effectively to the design of the instruction for diverse learners? As noted earlier, ARCS is being taught or applied in at least seventeen countries. Keller will soon publish a paper that describes the positive outcomes of applying ARCS to the computer-aided instructional components for junior high students in Japan.

According to Keller (1987c), a “problem-solving, heuristic approach” such as the ARCS Model is more “appropriate than prescriptive and algorithmic approaches” (p. 1). Audience analysis or the development of a learner’s motivational profile is a key component of the ARCS Model. It is the thorough analysis of the learners that provides the designer with the information needed to “identify the gaps” in the learners’ entry levels of motivation and to determine the most effective motivational strategies (p. 2.) As noted before, the learners’ motivation level has to be determined based on a thorough audience analysis. The learners profile may be drawn from data collected through a survey of the learners or may be the produced by informed instructors. It is wise to validate the assumed profile with some kind of feedback collected from the prospective learners. The profile provides the designer with the information needed to plot the level of motivation from too low to too high on an arc. Having completed the audience analysis and charting the level of motivation that exists for most of the learners, the designer should establish “motivational objectives” (p. 4). Just as instructional objectives are related to the instructional strategies, the motivational objectives are related to the motivational strategies determined to be appropriate for the learners. For example, if the learners are determined to be highly motivated, the designer does not need to “establish” relevance but needs to “confirm the relevance to the material” (p. 4). However, if the learners are perceived to have low motivation levels about the subject’s relevance, the designer should build in strategies that increase the relevance factor. Even though the ARCS Model provides a systematic approach to designing motivational strategies to fit the target population, no one thing can be expected to be an motivate at all times due to the variability of learners, individuals, attitudes, expectations, situations, etc. (Keller, 1987c). Regardless of the lack of accuracy inherent in motivation design, Keller’s ARCS Model provides an important component in designing instruction for diverse learners.

Has the ARCS Model been successfully applied to diverse adult audiences? Yes, to some extent and with varying results. It was used in two field tests in which teachers involved in in-service programs in New York were taught to apply the process. The overall reactions to the model’s systematic approach to applying motivation to instructional design of lessons were positive. (Keller, 1987a). Keller later applied the ARCS Model to program to train teachers in the use of the Dick and Carey ISD model in Mozambique, Africa (Visser, & Keller, 1990).

The Mozambique experience provided a diverse audience of learners--fifteen Portuguese speaking educators were required by the Ministry of Education to attend a ten-week institute to learn Dick & Carey’s ISD process, using a combination of Spanish, English & Portuguese materials and delivery (Visser, & Keller, 1990). Facts about the learners’ country, socioeconomic background, status and work and attendance ethic were included in the audience analysis to illustrate the probable low motivational level the learners possessed to engage in and complete the assignments of the stringent course. Verbal and graphical computer-processed messages were used as the consistent weekly feedback strategy to increase adult learners’ motivation. The learners were asked questions each week about what factors helped or hindered their motivation. The students provided positive feedback about the use of written motivational messages.

The results of the clinical intervention in Mozambique indicate that the ARCS Model provides a “sound basis for positively influencing student motivation to learn” (Visser & Keller, 1990, p. 401). Use of such an intensive instruction and motivational intervention indicates that designers and instructors can deliver a viable instructional alternative to meet the needs of students who have a low motivation to learn. Central to such an effective intervention is the designer’s thorough and correct assessment of the learners so that motivational strategies can be applied appropriately.

Keller’s Influence on the Wider Field: Evaluation and Education

Keller continues to have an influence on the wider field of instructional systems design. A recent article with a Japanese colleague concentrates on the use of systems approach to training and design in Japanese corporations (Keller & Taguchi, 1996). Keller has also made contributions to the area of evaluation and organizational development, areas in which he obtained minors for his doctoral degree. In the areas of evaluation, Keller, along with Kaufman and Watkins, has suggested an expansion of the Kirkpatrick four-level model, which is concerned with the impact of training. They propose that,

the principles and process of training evaluations be expanded to consider all interventions associated with strategies and tactical planning performance improvement, organizational development, customer satisfaction/total quality, and societal contribution. ... add levels of impact because the traditional four-level approach targets only training and does not adequately address all of the key evaluation questions organizations face (Kaufman, Keller, Watkins, 1995, p.11).

Developing effective evaluation methods that apply to business issues is certainly an important practical application of Keller's knowledge and skills.

Keller has also distinguished himself as a respected educator, being an integral part of two leading university programs, Syracuse University and Florida State University. As noted previously, he has both influenced and has been influenced by major instructional systems design personalities such as Ely and Reigeluth at Syracuse and Gagné at Florida State. The subject of Keller's motivation design model and concepts are central to numerous graduate courses in instructional design. For example, in a core course at Florida State, educators and business people are asked to apply the ARCS Model to the design and delivery of classroom instruction (J.M. Keller, personal communication, October 23, 1996). The fact that Keller was honored with the Instructor of the Year Award, 1989-1990, serves to illustrate his value as an educator by those who know him best. Not only is he a leader at Florida State University, which has one of the most respected programs in the country, but he also is a leader nationally and internationally.

Perhaps the greatest reward for an educator comes from having his or her students distinguish themselves in the field. One of Keller's distinguished students is Jan Visser of UNESCO, who is known for his work in schools without walls in southern Africa. Another noted student is Katsuaki Suzuki, a leader in computer education in Japan instruction (J.M. Keller, personal communication, October 23, 1996). Keller authored articles with each of these students (Keller and Suzuki, 1988; Visser & Keller, 1990).

Continued Influence

When discussing the contribution of someone of Keller's stature, whose design influence in the field spans nearly 25 years, it is important to address questions about its continued influence. Will the ARCS Model be congruous with projected trends identified by leaders in the field (Hannafin, 1992; Merrill, Li, & Jones, 1990; Richey, 1993; Smith & Ragan, 1993)? The answer emerges as a confident yes. Keller, who himself projects changes in the field due to the information explosion and the integration of disciplines, predicts that the model will continue to be applicable (J.M. Keller, personal communication, October 23, 1996). The questions are: Why and in what areas will the ARCS Model be applied in the future?

The areas in which Keller's motivation concepts will probably have the greatest continued influence are in (1) designing and developing effective instruction for diverse learners; (2) applying the motivation design concepts to adaptive instructional systems made possible by the new emerging technologies; and (3) integrating motivation concepts into new learning philosophies such as constructivism. As Richey (1995b) emphasizes, these influences will probably constitute "enhancements" rather than radical changes.

One of the primary areas of continued influence will be in the area of diversity. Educators, designer, and trainers will need to apply Keller's motivation concepts to the design and development of effective instruction for diverse learners in various national and international settings. Business and industry (Johns, 1992) as educational environments and government institutions (Burgos-Sasscer, 1994) are facing major shifts in their employees and customers. *Workforce 2000* (Johnston & Packer, 1987) predicts that by the year 2000, the majority of new workers in American companies will be from non-traditional groups, such as women, racial minorities, and immigrants. Naturally, it will be important to provide effective instructional products and programs for diverse learners. Keller himself has recognized this need and has authored a handbook of tools that can be used in evaluating diversity (J.M. Keller, personal communication, October 23, 1996).

A second area of influence will be in adaptive instructional systems (Smith & Ragan, 1993). Because of the capabilities of emerging technologies, systems that adapt to the needs of the learner will become common place. The Internet allows learners to access vast amounts of data within seconds. Hannafin (1992) claims, "Hypermedia not only permits the construction of exceptionally elaborate conventional instructional designs, but also enables sophisticated alternative learning environments that stand in sharp contrast with conventional practice" (p. 55). Add expert systems, as described by Merrill, Li, and Jones (1990), to the mix and the possibilities for adapting instruction to individual learners, even as the learner progresses through the lesson, are almost impossible to comprehend. Designers will be able to identify both cognitive and affective needs of the learner and match strategies to them. Libraries of information about types of learners or individuals learners will be built into the expert system to allow it to adapt and enhance the cognitive and motivation strategies used for instruction. Given the possibility of such technology, it would be a shame if designers and developers of information and instruction systems addressed only the cognitive domain. Keller predicts that the future of technology and the information will provide fertile ground for the application of motivation concepts (J.M. Keller, personal communication, October 23, 1996).

The third area in which Keller's learner-focused, motivation design model will be well suited is to constructivist thinking. This appears to be true despite some constructivist criticism (Bendar, et.al., 1991) of Keller's eclectic approach. Constructivists emphasize designing instruction for "active learners" who construct meaning from within (Duffy & Jonassen, 1991). Levow (1993) who argues for increased emphasis on the affective domain and making instruction relevant to the learner, seems to connect Keller's ARCS Model to constructivist thinking. It seems clear that Keller's ARCS Model, which emphasizes attention, relevance, confidence, and satisfaction, complements constructivism. Keller, a cognitivist, recognizes some of the valid contributions of behaviorism but also espouses the philosophical stance of Wheelwright. This view holds that each person sees truth from his or her perspective at any given moment of time. This sounds a great deal like constructivist philosophy. Keller, however, thinks that constructivism, like cognitivism, requires the designer to analyze the needs of the learner and set up conditions for learning (J.M. Keller, personal communication, October 23, 1996). It seems evident that Keller's motivation design concepts apply equally well to the three major learning approaches used in the field today—behaviorism, cognitivism, and constructivism.

John Keller has certainly stamped his view of motivation indelibly on the field of instructional systems design. His work, which has covered nearly a quarter of a century, has had a significant impact on education and research as well as the real world of instructional design in business and industry. Although the "heart" of motivating learner was evidently lacking in ISD when Keller began his research, that is not the case today primarily because of his call for designers to remember the learner's needs and match motivational strategies to them. Just as Gagné linked behavioral psychology with cognitive psychology and linked theory into practice (Richey, 1995a), so has Keller linked the behavioral and cognitive with the affective domains. But true to his clarion call at the beginning of his career, Keller has successfully led the field in linking the "head" with the "heart."

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