

# Creation and Cross Cultural Validation of an ARCS Motivational Design Matrix<sup>1</sup>

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## Purposes

This study combined a cross-cultural test of the ARCS model of motivational design (Keller, 1987, 1992) with a test of the feasibility of adopting the ARCS framework in designing instructional units utilizing computers as learning tools. Specifically, an ARCS motivational design matrix was proposed by the first author and used by teachers in the computer project team at a junior high school in north-central Japan. When designing units of computer-based instruction, teachers used the matrix to determine whether the role of computers in learner motivation could become more apparent and could be improved by analyzing the motivational characteristics of the learning task, the learner, and the instructional methods

## Theoretical framework

With an early introduction of instructional computers in 1976 and their frequent utilization in various subject areas since then, computers have become a familiar and accepted support system at Sendai Daiichi Junior High School in Sendai, Japan. One consequence of this is that unlike many other schools that are just starting to use computers extensively, computer based instruction (CAI) at this school has lost its novelty effect. Computers have become a stable part of the instructional environment. This creates motivational challenges because CAI is no longer appealing just because it is different and unusual. Meanwhile, Japan's new Standard Course of Study has set forth the direction of school instruction to emphasize students' motivation and self-directedness in learning. A new framework was in need to assist in computer utilization so that computers could be used beyond their novelty effect and have a positive influence on learner motivation.

Keller's ARCS Model of motivational design provides four basic categories for motivational tactics: Attention to capture the interest of learners and to stimulate curiosity to learn, Relevance to meet the personal needs and goals of the learner, Confidence to help the learner develop positive expectancies for success, and Satisfaction to reinforce accomplishment (e.g., Keller, 1992). These categories are based on a synthesis of concepts and theories of human motivation (Keller, 1987) and have been validated in numerous studies (e.g., Farmer, 1989). Various strategies have been proposed based on this ARCS framework (e.g., Keller & Suzuki, 1988 in courseware design; Keller, J. M. & Keller, B. H., 1991 in multimedia products). Using this framework, one can generate motivational tactics that are appropriate for the audience and the subject matter based on an analysis of course goals and audience characteristics. This process leads to more sustaining motivational tactics than the relatively more transitory attention-getting effects of novelty.

One way in which the design element of the ARCS model could be improved is to provide more detailed support to teachers for the process of generating tactics based on an analysis of the learners and the learning environment. A critical requirement of such an analysis and design support tool is that it help teachers select tactics that are appropriate for the given audience and situation. While it might seem intuitively obvious that any tool which helps a teacher add motivational tactics to a course will improve learner motivation, such is not the case. Adding too many or inappropriate tactics will reduce learner motivation, and this is what tends to happen with motivational enhancements without prior motivational analysis (Farmer, 1989). The challenge in the present study was to develop and test an analysis design support tool based on an examination of a) how effectively it was used, and b) whether the teachers believed it to be useful and valuable.

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## Method

The computer project team consisted of 25 teachers in 8 subject areas. The designs of learning units (3 - 9 hours) were prepared by subgroups of teachers in each subject and then discussed by all team members plus an outside advisory board of which the first author was a member. Computer courseware was then either selected from commercially available software or developed by graduate and senior student majors in computer science at Tohoku Gakuin University.

During this process the teachers created eight ARCS motivational design matrices. An example of such a matrix is shown in Table 1. Each column of the matrix represents one of the four basic categories of the ARCS Model. The first three rows represent components of the learning environment that have a primary effect on the motivational characteristics of the unit: (1) The Learning Task: its characteristics as perceived by the learner, (2) The Learner, (3) The Media: its characteristics perceived by the learner. The last two rows describe motivational strategies in the unit: (4) Courseware Characteristics, and (5) Lesson Motivational Tactics. For those units that incorporate existing software, instead of developing new courseware, interpretations of motivational characteristics of the software are stated in the fourth row.

Table 1. ARCS motivational design matrix 1: elective unit on using international e-mail

Factors	ATTENTION	RELEVANCE	CONFIDENCE	SATISFACTION
LEARNING TASK (learners' perception of)	New, attractive, adventurous (+)	-High public interest to the Internet (+) -Useful in future (+)	-Seems difficult (-) -First exposure (-)	-High applicability of acquired skills (-) -Exciting outcome (+)
LEARNERS	Elective course, High interest (+)	High commitment (+)	Low skills in typing and in conversational English (-)	Newly formed group of students (-), but familiar teacher (+)
MEDIA Computer in this lesson (learners' perception of)	Novel as a networking tool (+)	Familiar as a stand alone learning tool (+)	Unstable network connection may make students worried (-)	Immediate feedback (+)
COURSEWARE CHARACTERISTICS (E-mail software)			English usage (-)	Participatory for every students (+)
MOTIVATIONAL TACTICS FOR THE LESSON	not needed	not needed	-Set objectives cumulatively from low to high -Team teaching with an Assistant English Teacher - Use translation software	not needed

After the first author described aims and processes for creating such a matrix, each subgroup prepared a matrix by putting motivational strengths and deficiencies in the first three rows. Because this example uses existing software for teaching Internet, the fourth row also contains a summary of motivational characteristics. The fifth row contains motivational suggestions. These matrices were used to describe the unit's motivational characteristics to the larger group. This discussion led the subgroup to adopt motivational tactics in both the courseware and the lesson plan. The entire team then discussed the unit plan to verify the motivational analysis of the unit. The matrix was then revised if necessary. In the present example (Table 1), there were sufficient attention, relevance, and satisfaction elements already in the unit of work.

## Data sources

The two data sources were the design matrices and the 25 project teachers who responded to a questionnaire. The first author examined the matrices to determine whether a) the content of each column accurately reflected the four major concepts of the ARCS model and b) the tactics listed in Rows 4 and 5 were tied to deficiencies listed in the first three rows. After being translated into English, the matrices were

examined by the second author. At the end of the design process, the teachers responded to a questionnaire that included two major topics: the ARCS Model itself and the use of the matrix.

## Results

Inspection of the design matrices indicated that they were used correctly. Fewer than 10% of the entries could be considered to be in the wrong ARCS category. All tactics were supported by an indication of a motivational problem in the learning task, media, or learners. With respect to the questionnaire, over 90% answered positively to such statements as, "Student's motivation is well-captured in the ARCS model," and, "The model was useful in lesson planning." Regarding questions that asked about the teachers' motivational reactions to the ARCS Model, 84% regarded that the model was attractive (A) and 92% said it was meaningful/important (R). But, only 60% agreed that they were confident (C) in and satisfied (S) with using the Model.

Regarding the use of the matrix, 92% agreed it was helpful in designing the unit. Positive comments included that the matrix helped to clarify the weak aspects of the unit plan and to identify which aspects of the motivational strategies were NOT necessary. However, more than 80% indicated that they had some degree of difficulty with the process of analysis, probably because this was a first effort, and there were no examples to use as guidelines.

## Discussion

The ARCS model itself and the newly proposed ARCS motivational design matrix were both successfully integrated into the design process in this study. The model and the matrix helped the teachers clarify motivational characteristics of the unit being designed from the viewpoints of the learning task, the learner, and the media. Motivational strategies, but only those that were necessary, were then adopted based on the analysis of the unit's characteristics. It is especially noteworthy that it helped to communicate among teachers in various subject areas so that they could discuss motivational strategies outside of their specialized areas. Such discussion had been a part of the computer project team's strengths, which was furthered by adopting the ARCS framework.

Further study is in need to seek ways to make the design process easier. The team expressed that many teachers felt some difficulty during the design process. Since this was a pioneer effort without preceding examples of the matrix, providing some examples from this study may result in a better perception of confidence and satisfaction by teachers in subsequent efforts in using the matrix.

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