Research Trends related to Keller's ARCS Model: A Review of Literature in Japan

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Abstract: This research reports on research trends in Japan related to Keller's ARCS Model by reviewing literature. Thirty-four (34) articles were located in CiNii, which were categorized by two independent raters into five categories suggested by Suzuki (1995). Both descriptive and prescriptive studies were found more frequently than analytic and evaluation studies. No research was found to be categorized as Learning Strategy Study. The trends have been strong in applying the ARCS model in various areas of inquiries from various perspectives.

Introduction

The ARCS Model of motivational design was first introduced to Japanese research community in 1987 (Suzuki, 1987). Since then, various researchers have incorporated the Model into their research in different ways. Suzuki (1993) reviewed such early trends and concluded that the adoption process could best be interpreted not as introducing the ARCS Model per se, but as advocating the importance of considering "appeal" of instruction as the third outcome variable of instructional design after "effectiveness" and "efficiency." Likewise, the ARCS Model has been one of the major frameworks in research and practices of motivational design worldwide. There have been research studies, reported in English, from more than 50 countries, which shows the multi-nationality of the ARCS Model (Keller & Suzuki, 2004).

When discussed about the framework of designing and developing "appealing" instruction, using the ARCS Model, Suzuki (1995) proposed a framework of categorizing research activities into five areas with some examples for each: (1) Analytical Research, to analyze motivational characteristics of instructional materials and learning environment using the ARCS framework, (2) Descriptive Research, to find out which of the ARCS elements are being used as motivational strategies in classroom instruction as well as online environment, (3) Prescriptive Research, to design and implement motivational enhancement with existing or new educational interventions using the ARCS framework, (4) Evaluation Research, to establish assessment methodologies of learner motivation in various instructional settings using the ARCS framework, and (5) Learning Strategy Research, to use the ARCS Model as instructional content to teach self-study skills or cognitive strategies.

Research Question

The purpose of this study was to analyze the trends in Japanese research community as to how the ARCS Model had been used. A framework of research categories by Suzuki (1995) was used to depict the characteristics of the trends. It aimed to provide basic data of research activities, mainly reported in Japanese, for possible comparative studies to depict commonalities and differences of trends in Japan, when compared with those of other countries.

Research Design and Methods

A literature review was conducted through searching the databases of academic writings of CiNii (NII Scholarly and Academic Information Navigator, http://ci.nii.ac.jp/) and KAKEN (Database of Grants-in-Aid for Scientific Research, http://kaken.nii.ac.jp/) provided by National Institute of Information, using keywords "ARCS Model" and "ARCS Motivation Model" in Japanese and English. Also conducted was a Web search on Google (http://www.google.co.jp/) with the same keyword to locate other articles that were not included in the above mentioned databases. This report deals only with the

first of the above mentioned three sources, i.e., CiNii.

After locating writings on the ARCS Model, two researchers (second and third authors of this paper) read each of the writings independently to judge the categories of each research based on Suzuki (1995). Out of 40 studies found in CiNii, two sets were regarded identical, although listed as separate studies. Three others were considered to be three parts of one study, thus counted as one. Another study used ARCS in its keywords, described the Model, but never used it in the study, thus excluded from the analysis. One more study excluded from the analysis was the literature review by Suzuki (1995), resulting a total of 34 studies in the analysis. Two collaborators agreed on the categories of 27 out of 34 research studies, thus the inter-rater reliability was .76. The remaining categories were determined by discussing with the first author.

Results

There were 34 studies on the ARCS Model found in CiNii. The authors and titles of these writings were listed in Appendix 1. The categories of research studies are shown in Figure 1, and the publication year is summarized in Figure 2. Both descriptive and prescriptive studies have been conducted most frequently (13 studies, or 38% each), which was followed by analytical studies (5 studies, or 15%), and evaluation studies (3 studies, or 9%). No learning strategy studies were found in this survey.

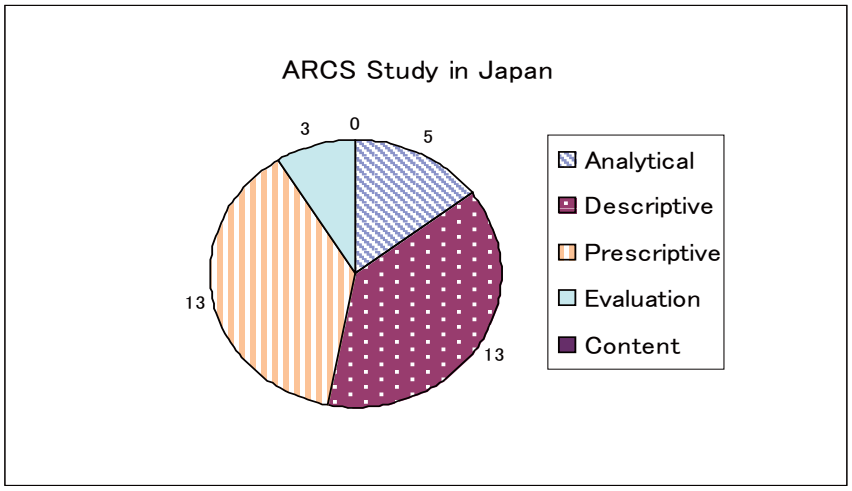

Figure 1: ARCS Study in Japan by Categories

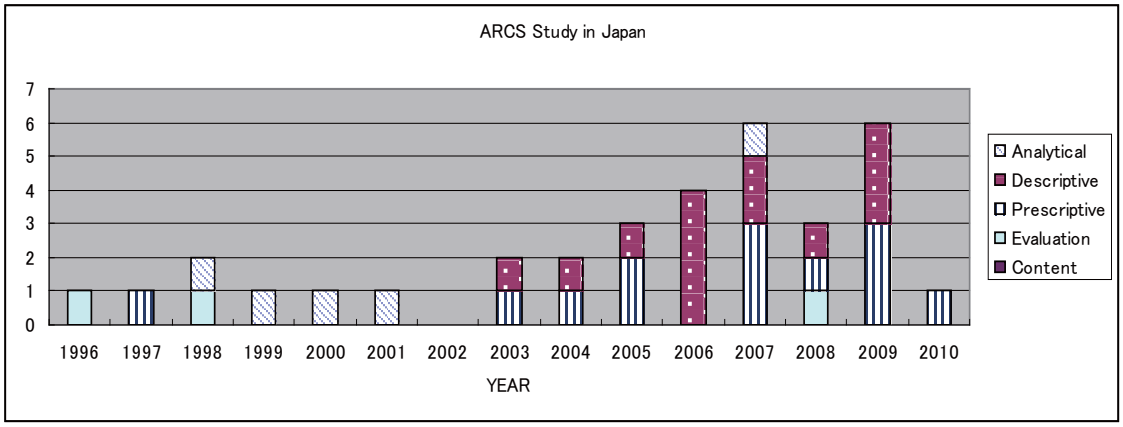

Figure 2: ARCS Study in Japan by Publication Years

Examples of ARCS Studies

Analytical study
Ishikawa (2000) conducted a study, in which 40 junior college students evaluated 79 pieces of material for English listening skill improvement. The aim of this study was to obtain criteria for selecting such materials for the future uses. Questionnaire created based on ARCS four categories with 5-point Likert scales revealed higher scores for Relevance and Satisfaction than the other two scales, and the two scales (Relevance and Satisfaction) are highly correlated to each other, but not so with Confidence. Further analyses of how the nature of learning activities were related to high scores on Satisfaction, such activities as seeing pictures and graphs, layout with matrix formats, using concrete persons, and writing were found to be positively related to the Satisfaction score.

Descriptive study
Matsuzaki, et.al (2007) designed and conducted a two-credit e-mail writing class for nursing students, utilizing portfolio as instructional tool. They used the ARCS framework for evaluating their class, using 4 item 5-point Likert scale, revealing high scores in Attention, Relevance, and Satisfaction. From an analysis of free-response questionnaire, 85 out of 118 sentences the students produced were related to one of the ARCS. The quantities of positive statements were bigger in those categories than Confidence, which supported the higher scores in the Likert scale.

Prescriptive study
Wang et.al (2007) reported a study of revising a programming training self-study material in a university. They created a motivationally enhanced material, by mainly altering the order of traditionally used material based on the ARCS model and Gagne's nine events of instruction. Sixty students who were randomly assigned to the motivationally enhanced group studied and completed significantly more than those who used the traditional material. There also were significant differences in the posttest average score and expressed more positively in the questionnaire on their subjective understanding level and enjoyment level. They concluded that "the motivationally enhanced material with its example program and execution result at the very beginning of the material aroused the users' perceptual interest and mind of inquiry, which may have led to their motivation for learning (p. 354)".

Evaluation study
Sugimoto and Kogo (1996) created and tested a questionnaire to evaluate computer-assisted instruction (CAI) materials based on the ARCS Model. They first created 23 items of 5-point scale of pairs of opposite adjectives (e.g., old vs. fresh) with 4 to 5 items for each of the ARCS categories and added 6 more items of generic evaluation aspect of instruction. They then asked 114 university students to evaluate 28 kinds of CAI materials, using the 23 item scale. Factor analyses were conducted to eliminate items from the scale, resulted in fair sets for Attention and Relevance. They suggested that more items may be needed to obtain better fits for Confidence and Satisfaction for further analyses.

Discussion

It is natural courses of action, when one would try to utilize a conceptual model such as the ARCS Model, to first try to analyze the nature and possibilities of current situation (i.e., analytical study), then try to evaluate the status-of-quo of an instructional practice (i.e., descriptive study). Then, one would try to improve the situation by applying the model for designing and implementing better intervention (i.e., prescriptive study). This study found that such a natural courses of action have been taken in Japan, when the ARCS Model has been the issue of research activities. On the other hand, when one tries to evaluate the effect of the introduction of such a model, then it would be necessary to come up with a specific method to measure the motivational enhancement. Such research studies to invent new instruments regarding the ARCS Model (i.e., evaluation study) were found at earlier stages (1990's), which then were utilized in the following studies as evaluation instrument. However, no study was found that uses IMMS or CIS, assessment tools created by Keller (2010) himself.

The inter-rater reliability was not very high in this study (.76), partly due to difficulties to distinguish analytical study from descriptive study. Discussion among three authors of this paper resulted in deeper

understanding of the distinction in that analytical studies are more general and to try to speculate not only actual characteristics of the given environment (e.g., online learning), but also possible characteristics of future implementation. On the other hand, descriptive study would focus specifically on an actual example of educational practice, where certain motivational characteristics may or may not present, even when it is possible to include such strategies. Further refinement may be in order to make clearer the distinction between these two categories.

Although Suzuki (1995) argued that there could be the fifth categories of ARCS research being learning strategy study, this study found no such example in the CiNii database. Only possible example, or the closest one, was done by Yamamoto, et al (2003), in which not students but teachers were to be taught the strategies and categories of the ARCS when they were faced with how to come up with the ideas to improve their teaching plan based on students reaction data formulated in terms of the ARCS. It was regarded a prescriptive study, because the teachers were at an initial stage of revising their instructional plan for the next implementation. However, the emphasis seemed to be placed in learning the ARCS categories, in order to prioritize motivational enhancement based on the weakness of their current teaching. It was not counted as an example of learning strategy study, because students were not to be taught the ARCS. However, the category itself may be expanded to include teacher training aspect of ARCS application, such as this study, in order to show the difference among studies within the prescriptive study category.

As the next phase of this study, not only CiNii, but other sources of research indexes and Web search should be done to further analyze the research trends of the ARCS model in Japan. There are more studies that have been done, which are not included in this analysis. This is just the first piece of report on this issue, and the follow-ups should be in order. When that will be done, similar search can be done in other countries, including the literature written in English in other countries, for a comparison study. It is our hope that by making clear about what have been done with the ARCS Model, we may be able to utilize the Model more wisely and from wider perspectives by learning from each other.

References

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Appendix 1: Research on ARCS Model found in CiNii

1996	SUGIMOTO,Y. KOGO, C.	Making an Evaluation Sheet for CAI Courseware Based on ARCS Motivation Model
1997	SENDAI DAI-ICHI JUNIOR HIGH SCHOOL	Educational Practices using the ARCS Model in Instructional Design: A practical report
1998	SUZUKI,K.	Development of Drill Shells for HyperCard: Adopting Evaluation Phases Using Instructional Design Models and Usability Enhancement
1998	KOGO,C. SUZUKI,K.	Making an Evaluation Sheet for Courses and Learning Materials Based on ARCS Motivation Model
1999	ISHIKAWA,T.	A Study of Learners' Attention to Listening Tasks : In Relation to Their Relevance, Satisfaction and Confidence
2000	ISHIKAWA,T.	A Study of Learners' Satisfaction in Listening Tasks : Evaluation of Junior College Students Based on ARCS Model
2001	ISHIKAWA,T.	A Study of the Relevance of Listening Tasks : Evaluation of Junior College Students Based on ARCS Model
2003	YAMAMOTO,M. ISHIBUCHI, A. SUZUKI, K.	Formative evaluation of website "Check-and-Revise your motivational design" based on the ARCS model
2003	KIJIMA,H.SUZUKI,Y.	A Study on the Support of Self-directed Learning in Japanese as a Second Language : Procedure and Evaluation using the ARCS Motivation Model
2004	NAGAHASHI,T. L.	Rationale and Strategies for Motivating Students to Learn
2004	SEKI,Y. ITO,T.	Improving a Lecture on Natural Sciences to Humanities Majors
2005	HOSHINO,Y.	About the Change of the Learning Motive by the ARCS Model in the English Learning
2005	MITSUNAGA, F.	Instructional design and practice of high school math using blackboard and e-materials: GRAPES and Mathematica for Math C.
2005	OYAMADA,M. IWASAKI, S. MOGAMI, T. et al.	The Development and the Practice of the Ex-Physics Class for High School Students Using an Accelerator within the Collaboration between University and High School Promoted by the Instructional Design Theories and Information and Communication Technologies
2006	KIKUCHI,H.	Motivation in E-learning for Adult Learners : A Japanese Context (Educational Technology and Communication)
2006	MATSUZAKI,K.NAKAYAMA,M. HOJO,R.	A Case Study on Simplification of Portfolio Conferencing Documents
2006	SAEKI,A. UJIIE,A.	1B1-E2 Transformation of students' interest, enthusiasm and attitude of learning the differential equation
2006	MATSUZAKI,K. NAKAYAMA,M. HOJO,R.	Investigation of the Meetings of Teachers' Practice Reports as In-school Training at J. H. S.
2007	HISHINA M., OKADA R., SUZUKI K.	Measuring the effects of human relations on willingness-to-learn for CMC-based one-to-one instruction
2007	OHE, H.	Business management theory and practice report: ARCS Model for evaluating corporate training (1-3)

Appendix 1: Research on ARCS Model found in CiNii (Continued)

2007	HOJO,R. MATSUZAKI,K.	Investigating the 'show and tell' method for the learning of English expressions (English composition and speech) utilizing portfolios as an instructional tool for Japanese nursing school students
2007	KISHIDA,K. SHIOZAKI, Y. IGARASHI, J.	Toward Lessons where Students feel the Values of Learning Mathematics
2007	MATSUZAKI,K.HOJO,R.	Investigation of Instructional Design for Portfolios Using as an Instructional Tool : A Case Study of EFL Writing at K Nursing School
2007	WANG,W. IKEDA, M. LI, F.	Proposal and Evaluation of the "Motivation-Oriented" Teaching Method in Programming Education
2008	FUJITA, M.	Characteristics of self-educational ability and motivation of 3rd year Nursing Students: Student evaluation of the classes
2008	SUGAWARA R., SATO K., MURAKI E.	A practice in "information" class based on learning mix blended objectivism and constructivism and its evaluation: a blended learning example utilizing typing software
2008	MATSUZAKI,K.	Designing portfolios as an instructional tool and investigating their effects: for the purpose of enhancing motivation and lessening writing apprehension
2009	UMEDA Y., MIZUTA S., SUZUKI Y.	Hiragana for young Korean learners: memory strategies, the ARCS model and the association method
2009	SAITO,N. ONDO,T. NAGANUMA,S. et al	Development and improvement of an e-learning training course for adult learners aimed for enhancement of their learning motivation
2009	SUGAWARA R. SATO K., MURAKI E.	Practice and evaluation in "information" class based on learning mix blended objectivism and constructivism: example of blended learning utilizing typing software to high school student
2009	TASAKI,T. WATANABE, S. OZAKI,K.	8-211 Development of Control Teaching Material that causes Sensibility
2009	YAMAKAWA Y. Mackin, K. J. MATSUSHITA K.	Development a programming learning support system "CAPTAIN"
2009	IZUHARA,K. KOGO, C.	Effects of Using Student Review Sheet on e-Learning Course Evaluation
2010	TAKAHARA, K. NAKANO, M., KAJIWARA, T.	Communication Education for Students in the Science and Engineering Majors based on the Process of Value and Attitude Changes of Students by Debate