

Integrating the ARCS Model with Instruction for Enhanced Learning

Amarpreet Singh Arora¹, Archana Sharma²

¹Faculty of Science, Marwadi Education Foundation Group of Institutions, Rajkot, Gujarat, India

²Environmental Science Engineering, Institute, Marwadi Education Foundation Group of Institutions, Rajkot, Gujarat, India

¹amarpreetsingh.arora@marwadieducation.edu.in

²archana.sharma@marwadieducation.edu.in

Abstract: This paper provides an overview of Keller's ARCS Model of Motivational Design and explores two case studies of the faculty integrating the model into their teaching practices for improving student motivation during the classroom sessions. Case studies described how instruction in the traditional classroom can be structured in order to improve student motivation and attention span. Findings of the studies indicated ARCS as a valuable tool for improving student engagement for a particular topic taught or instruction delivered. It works well alongside principles and techniques of instructional design. This paper fills a gap in literature on practical applications of motivational design in regular instruction and suggests best practices for teaching and assessment using the ARCS Model for Motivational Design.

Keywords: ARCS Model, Motivational Design, Case Study, Environmental Science Course, Chromatography

Amarpreet Singh Arora

Faculty of Science,
MEFGI Rajkot, Gujarat, India

amarpreetsingh.arora@marwadieducation.edu.in

1. Introduction

According to the Attention, Relevance, Confidence, and Satisfaction (ARCS) theory of motivation postulated by John Keller, a learner's motivation can be stimulated through instruction by developing conditions that will arouse the learner's desire to get interested in order to achieve their goal (Keller, 1987). In education, there has been a lack of attention and resources in developing the motivational aspects of learning (Hess, 2015; Chang and Chen, 2015). Therefore, he introduced a systematic approach for integrating motivation into the instructional design in answering the question of "how to develop a learning environment that will stimulate and sustain learners' motivation" (Keller, 2010; Wah, 2015). Keller (2010) provided extensive descriptions of the ARCS components and their related psychological constructs, corresponding examples of instructional strategies, and checklists to guide planning and evaluation processes.

The Motivational Delivery Checklist, developed by Keller and Armstrong, helps instructors plan for and evaluate the motivational aspects of instruction. The paper suggests best practices for instructors interested in exploring the ARCS Model in their teaching and makes recommendations for future research in the use of motivational strategies.

2. Literature Review

Motivation is an important aspect of human

behaviour, and it plays a key role in student learning and in helping, the students learn better (Pintrich, 2003). ARCS model is one such motivational model whose four components fall under the recommended steps to improve student's motivation (Hodges, 2004). Instructional text with videos were chosen most frequently to embed the ARCS strategies as a single course component. Verbal instructions (Ocak & Akçayır, 2013), quiz questions involving feedback (ChanLin, 2009) and lab activities (Feng & Tuan, 2005) were some examples where planning and integrating strategies into more than one course component was practiced. An intrinsic motivation of the participant in the subject area was one factor while the motivational enhanced learning materials were the other factor taken into account by most of the studies (Chang & Lehman, 2002). In studies of the ARCS model application, the Course Interest Survey (CIS) (Keller, 2010) and the Instructional Material Motivation Survey (IMMS) (Keller, 2010), designed specifically for the ARCS model, were frequently used to measure participant's motivation. Some studies used other tools to measure motivation, such as the Science Motivation Questionnaire by Aşıksoy and Özdamlı (2016). A self-designed tool/strategy measuring motivation was used in Astleitner and Hufnagl (2003). It is important to note that different studies can reach different results even though they all involved using the ARCS model in an educational setting. Thus, the authors encourage further research to continue exploring the effects of the ARCS model under different settings, in order to enhance and consolidate the effective implementation of the strategies involved.

3. Methodology

Keller's ARCS model provides four categories of motivational concepts based on a comprehensive review of the literature on motivation. The acronym ARCS refers to an overview of the major dimensions of human motivation: Attention, Relevance, Confidence, and Satisfaction. Table 1 depicts the definitions and process questions of the ARCS model.

4. Implementation Strategies: Case Studies

Case Study 1

In class of Environmental Science and Engineering having a total strength of 50 students, the topic entitled 'Chromatography' was structured to use

Table 1: ARCS model categories, definitions, and process questions

S. N	Major Categories	Definitions	Process Questions
1	Attention	Capturing the interest of learners; stimulating the curiosity to learn	How can I make this learning experience stimulating and interesting?
2	Relevance	Meeting the personal needs/ goals of the learner to effect a positive attitude	In what ways will this learning experience be valuable for my students?
3	Confidence	Helping the learners believe/ feel that they will succeed and control their success	How can I via instruction help the students succeed and allow them to control their success?
4	Satisfaction	Reinforcing accomplishment with rewards (internal and external)	What can I do to help the students feel good about their experience and desire to continue learning?

Source: Adapted from Keller (2010)

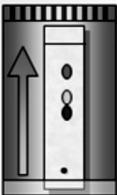
ARCS Model of Motivation with purpose to investigate the effects of instruction using ARCS model. An intended outcome was to measure and visualize how the change in the strategy of delivering instructions will motivate and influence the learning of the students. Following were the steps followed while delivering the lecture:

Component 1: Attention

Two back-to-back lectures of 55 minutes each with 5 minutes of break in between were conducted in order to complete this activity. Lecture was started with Inquiry Arousal (Participation) – by giving students hands on experience.

Thin Layer (and Paper) Chromatography

TLC plates are inert supports (glass, plastic, aluminium) with a thin veneer of chromatographic media (silica, etc...)



- Apply a concentrated drop of sample (•) with a capillary or dropping tube to bottom of plate (origin pencil line)
- Stand plate in a sealed vessel.
- carefully add solvent (keep solvent level below sample).
- Allow solvent to adsorb up the plate, drawing the sample with it.

5

Figure 1: Slide related to the lecture

Instructor brought 5-6 beakers, thin plates coated with silica gel, solvent n-Hexane and Chlorophyll extract to the Classroom. The following slide (Figure 1) was displayed on the board.

As per the procedure in slide, students had to see Chlorophyll being separated in Chlorophyll a and b components. Then they were asked what could be the reason behind separation of a homogenous mixture against a mobile phase.

This initiated a healthy discussion. Instructor then build on their curiosity by explaining various factors accounting to this such as difference in affinities, charge, molecular size etc. An Analogy was used to support this and for easy understanding.

It is narrated as ... Imagine there are two kids returning home after school riding their respective bicycles. On the way, there is an ice cream shop. One is fond of ice-cream and other is not. So as a result one kid will stop for ice-cream and other will continue and reach home early.

On similar lines, the two components of Chlorophyll got separated because of their preferential affinity to the mobile phase and stationary phases just like affinity of that kid for ice-cream hence they get separated and eluted out at different intervals.

Component 2: Relevance

This addresses the importance of studying a particular topic. Instructor addressed that this Chromatographic principal forms the basis of highly sophisticated instrumentation techniques that can be used widely for quality control check of food items and other materials. Then relate it with real life experience by asking the students whether they have heard about doping or dope test of Athletes?

GC (Gas chromatography) and HPLC (High Performance Liquid Chromatography) are the instruments used for performing the test and identifying the banned substance in blood by analysing the blood sample through these Chromatographic techniques.

After that detailed construction and working was explained with the help of videos.

Component 3: Confidence

Building a confidence in a particular subject is not that difficult, in fact, it is very enjoyable and essential if taught with specific strategy.

So the Instructors added that there are experiments in their curriculum in which the various components will be separated by the students using thin layer and column chromatography. When they well understood about the components, then they will run one sample in HPLC. Use of virtual lab assessed through vlab.co.in under Amrita Vishwa Vidhapeetham was incorporated to give them the experimental feel in the class. The simulation of the Chromatography was assessed under the topic of Chemical Sciences.

Component 4: Satisfaction

Feeling of having learnt something new and useful give an inner satisfaction to students and also the principles learnt by them stay lifelong with them. A short quiz was given to the students to assess their learning outcome.

The assessment instruments could be designed according to the level of difficulty.

Evaluation of the Success: A short feedback was taken from the students after the lecture delivered, to rate their learning experience. Total of 46 students were present on that day. Table 2 indicates the percentage of students rating a particular aspect.

Table 2: Evaluation of Success (Case Study 1)

Aspect	Excellent	Very Good	Fairly Good	Unsatisfactory
Deepening the understanding of the Concept	35	50	15	-
Promoting Motivation to learn more about the concept/subject	70	30	-	-
Encouraging class participation	10	60	30	-
Building confidence	20	52	13	5
Contributing to the Joy of Learning	85	10	5	-

Performances of the students in quiz related to the concerned topic can give direct measurement to the success of the activity conducted.

Case Study 2

Another study was conducted with the different set

of students for subject Water and Waste Water Engineering on the Topic 'Coagulation and Flocculation in Water Treatment'.

Following were the steps followed while delivering the lecture:

Component 1: Attention

Lecture was started by introducing importance of coagulation and flocculation, its brief history indicating the age-old techniques used by the common people to clean water in their homes (by use of alum i.e. Fitkari-local name) and current applications in various industries was explained to get the attention of the students.

Component 2: Relevance

Instructor related the topic with the real time applications of the use of the concept of coagulation and flocculation for wastewater treatment

Component 3: Confidence

Instructor builds the confidence of the students by providing them hands on experience on Jar test experiments and by explaining the applicability of the subject discussed.

Component 4: Satisfaction

Inner satisfaction of both the students and the teacher delivering the lecture is very essential for achieving the intended goal. Hands-on experience gave the students a sense of satisfaction. Further, an elaboration on how the learning of the lecture could

help the students in finding out solutions to real world problems of water treatment was illustrated.

Evaluation of the Success: A short feedback was taken from the civil engineering students after the lecture asking them to rate their experience. Total of 54 out of 60 students were present on that day. Table 2 indicates the percentage of students rating a particular aspect.

It was observed that for Case Study 2, as compared with the other evaluation parameters, least effective result was obtained for aspect related to building student confidence. Probably a quiz to test their learnings or hands on session wherein the students themselves would have treated the textile/other industrial wastewater would have been useful in addressing this important measure.

5. Conclusions

The results of these two case studies provide support for the comprehensibility and utility of the ARCS Model as a means of assisting in the motivational design of instruction, and they illustrate some of the requirements for its successful use. The encouraging experience of enjoyment as reflected by the majority makes a strong case for using these two instructional methods in regular teaching. ARCS is a problem solving model, and it does require some time to acquire an understanding of the basic strategies and concepts included in it. If a potential user has never learned to work with a systematic instructional design model, then the concepts of problem identification, solution design, and implementation must be learned in conjunction with the content and processes of the ARCS Model. The current study had more than 90% students providing a very good feedback on the effectiveness of the lectures delivered to them. This type of research can have a strong influence on the outcomes. Given the initially positive responses to the model, more controlled studies of its critical attributes and areas of effectiveness appear to be warranted.

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Table 3: Evaluation of Success

Aspect	Excellent	Very Good	Fairly Good	Unsatisfactory
Deepening the understanding of the Concept	5	75	20	-
Promoting Motivation to learn more about the concept/subject	10	75	15	-
Encouraging class participation	55	45	-	-
Building confidence	-	50	40	10
Contributing to the Joy of Learning	70	30	-	-

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