



Towards Applying ARCS Model for a Blended Teaching Methodologies: A Quantitative Research on Students' Motivation Amid the COVID-19

Usman Durrani¹  and Muhammad Mustafa Kamal² 

¹ College of Engineering and IT, Ajman University, Ajman, UAE

² School of Strategy & Leadership, Coventry University, Coventry, UK

Abstract. A well-reputed course prepared according to sound instructional design principles and successfully delivered multiple times in a traditional face-to-face classroom mode failed to stimulate students' motivation to learn in an online delivery mode amidst the COVID-19 outbreak. Therefore, a motivational framework developed according to the processes outlined in the ARCS model, implemented, and tested using a single-case study. A cohort of seventy-five undergraduate students aged between 24 to 29 years from different program majors enrolled in a six-week mandatory IT in Business course participated in this research. A blend of a traditional flipped classroom and gamified teaching methodologies were applied in alignment with the ARCS model's four motivational factors: attention, relevance, confidence, and satisfaction, associated process, and strategies. Before, during, and after treatment surveys based on the original Instructional Material Motivation Survey (IMMS) with 36 questions were conducted to determine the effectiveness of blended teaching methodologies on students' motivation. As a result, the teaching resources of the selected course were systematically aligned as required. We found that the blended teaching methodologies based on the ARCS model, process, and strategies have enhanced and/or sustained students' motivation and kept the subject interesting in an online environment, and ultimately improved their learning.

Keywords: Gamification · Flipped classroom · Blended learning · ARCS model · COVID-19 · Online education · Digital education · Higher education

1 Introduction

We know the year 2020 for its disastrous COVID-19 outbreak and its global impact on every aspect of human life. In education, it has created significant challenges for the global education community. It is a test of organisational agility [21], where institutes initially focused on shifting their program delivery to online environments, not necessarily on online pedagogy [5]. Researchers have conducted studies to analyse the responses

taken by different education providers globally, with solutions varying from no response through to an online offering [5, 17].

In the mid of March 2020, we had to suspend our regular face-to-face classes under the emergency policy by the UAE government. In these unfamiliar circumstances, there was uncertainty and disparity between what to teach, how to teach, where to teach, how to assess and grade, the workload of lecturers and students, the teaching environment, and the implications for education equity [22]. The University faced several challenges under the newly introduced online policies included: the weakness of the e-learning infrastructure, the lack of lecturers' experiences in conducting online classes, the complex environment at lecturers' and students' homes, and so forth.

Out of these challenges, one of the key academic challenges, our well-reputed courses prepared according to sound instructional design principles and successfully delivered multiple times in a traditional face-to-face classroom environment, failed to stimulate students' motivation to learn in an online delivery mode. A fundamental question, "How to motivate students in an online environment?" and "How to have a sustainable motivation throughout our courses?"

Exploration of such questions leads to considering holistic models such as the time-continuum model [20], and Keller's ARCS model [10]. For this study, we followed the approach of the latter. The ARCS model represents four categories of motivational factors; attention, relevance, confidence, and satisfaction. The model includes sets of motivational enhancement strategies and a motivational design process with application to any instructional design models [10]. The ARCS model with its basis in the macro-theory of motivation and performance [8, 9] and grounded from the expectancy-value theory [16] has been validated from various aspects in many studies [12, 19].

Past studies have applied the ARCS model in instructional design models by combining it with a flipped-classroom approach [1] to determine the effect on the achievements, motivation, and self-sufficiency of the students [4]. These studies have found a flipped classroom as a positive contributor towards enhancing the motivation and self-sufficiency of the students. In a flipped-classroom instructional design model, the lecturer provides resources to the students for reading before class and then uses class time to engage students in various learning activities such as discussions on lecture specific topics, and collaboration tasks among peers [3].

Moreover, Toussaint and Brown [18] in their study have shown how to increase students' motivation in their course by applying the ARCS model and concepts of gamification [14] to develop Serious Games for mathematics learning. Another study identified the lack of the use of innovative teaching materials such as building simulation performance tools as key reasons for students' demotivation as they felt they could not able to compete with other professionals [6]. In line with the latter, Burke [2] highlighted on using game mechanics and experience design to digitally engage and motivate people to achieve their goals.

For this study, we have used the ARCS model, process, and strategies, blending it with traditional, flipped classroom and gamified teaching methodologies (from here now referred to as blended teaching methods - BTM) to deliver an online course. This paper aims to present a method to enhance and/or sustain students' motivation by systematically

aligning the teaching resources of a selected course based on the three-staged students' feedback analysis (before-course, during-course, and after-course).

The hypothesis for this study is:

H1: ARCS model and strategies positively affect an online course delivery through BTM to enhance and/or sustain students' motivation.

- **H1a:** ARCS model and strategies positively affect an online course delivery through traditional teaching method with a difference in the students' motivation
- **H1b:** ARCS model and strategies positively affect an online course delivery through gamified flipped classroom teaching method with a difference in the students' motivation
- **H1c:** ARCS model and strategies positively affect an online course delivery through BTM with a difference in the students' motivation

This paper begins with an overview of the method that formed the basis of this study in Sect. 2. Section 3 then describes the research findings and discussion. Finally, we provide the conclusion, examine the study's ramifications, and explore potential areas for future research in Sect. 4.

2 Methodology

The participants for this study were 75 undergraduate students aged between 24 and 29 from different educational programs. We divided these participants into two classes taught by the same IT lecturer. Out of these, 35 were female and 40 were male students. The 26 participants were from Accounting and Finance programs, 17 from IT/IS programs, 28 from management programs, and four from the marketing programs. These participants represented the overall diversity in the university, except that there were no participants from groups with special needs.

We chose a mandatory IT in Business course to cover participants from a broad range of educational programs. This was the convenience sampling with the intention for it to be representative. Like [7], the sample selected with a concern to uncover a range of students in various programs experience unconventional learning approaches. The course represented three credit hours with four two-hour lectures per week for six weeks. We divided the delivery of the course into two phases. In Phase 1 (first three weeks), we delivered two lectures each week through a traditional teaching method using the Blackboard Collaborate and Moodle. At the end of each of the lectures, dedicated questions and answers time was provided to the students. In Phase 2 (last three weeks), we used a gamified flipped classroom teaching method for the same participants using the same tools above, followed by in-classroom tasks and activities. Figure 1 presents a BTM along with the assessments.

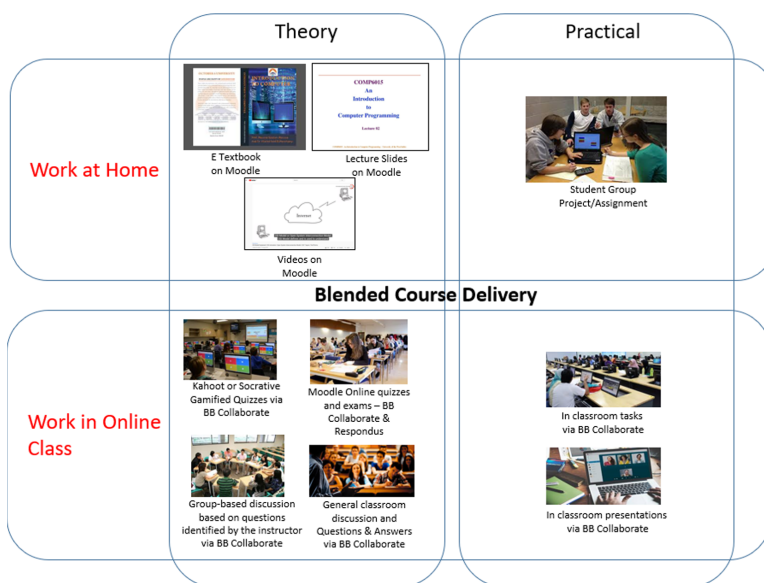


Fig. 1. Blended teaching methodologies (BTM)

The seven assessments performed along with their weightage during the BTM included: (1) one online formal midterm exam via the Moodle and the Respondus lockdown browser and monitoring tool – 20%, (2) one online formal quiz via the Moodle and the Blackboard Collaborate (Phase 1) – 10%, and (3) a team project and online presentation via the Moodle and the Blackboard Collaborate – 30%, (4) one gamified online quiz via the Kahoot or the Socrative and the Blackboard Collaborate (Phase 2) – 10%, (5) out-of-the-class activities per lecture (Phase 1), (6) in-class activities per lecture (Phase 2), and (7) one online formal final exam via the Moodle, the Respondus lockdown browser and monitoring tool – 30%.

A customised version of the Instructional Material Motivational Survey – IMMS (Table 1) measured students' motivation [9, 10], specifically learners' reactions to the motivational features of instructional material in terms of attention, relevance, confidence, satisfaction, and overall motivation. These questions were aligned with tools and techniques of flipped classroom and gamified teaching methodologies applied for this study. Internal consistency estimates for the IMMS total score and subscales are between 0.81 to 0.96 [15]. The IMMS used all 36 items from Keller's original 36 items, with twelve items for attention, nine for confidence, nine for relevance, and six for satisfaction. A five-point Likert-scale was used with a response choice of 1 (not true), 2 (slightly true), 3 (moderately true), 4 (mostly true), and 5 (very true). The responses were collected from the students at three stages of delivery: before-course, during-course, and after-course.

Table 1. IMMS survey 36 questions on ARCS motivational factors

Variable	Questions
ATTEN1	There was something interesting at the beginning of this course that got my attention
ATTEN2	Course delivery mode - is eye-catching
ATTEN3	The quality of the resources helped to hold my attention
ATTEN4	This course was so abstract that it was hard to keep my attention on it
ATTEN5	The design of formal and gamified assessments looks dry and unappealing
ATTEN6	The way the information is arranged in this course helped keep my attention
ATTEN7	This course has things that stimulated my curiosity
ATTEN8	The amount of repetition in this course caused me to get bored sometimes
ATTEN9	I learned some things that were surprising or unexpected
ATTEN10	The variety of classroom activities helped keep my attention
ATTEN11	The style of delivering lectures and conducting the assessments is boring
ATTEN12	There are so many words on each lecture slide that it is irritating
RELE1	It is clear to me how the content of this course is related to things I already know
RELE2	There were examples that showed me how this course could be important to people
RELE3	Completing flipped classroom activities during the sessions were important to me
RELE4	The content of this course is relevant to my interests
RELE5	There are explanations or examples of how people use the knowledge in this course
RELE6	The content and style of assessments used in this course convey the impression that its content is worth knowing
RELE7	This course was not relevant to my needs because I already knew most of it
RELE8	I could relate the content of this course to things I have seen, done or thought about in my own life
RELE9	The content of this course will be useful to me
CONF1	When I first looked at course, I had the impression that it would be easy for me
CONF2	The course was more difficult to understand than I would like for it to be
CONF3	After reading the introductory information, I felt confident that I knew what I was supposed to learn from this course
CONF4	Many of the slides had so much information that it was hard to pick out and remember the important points
CONF5	As I worked on this course, I was confident that I could learn the content
CONF6	The activities and assessments in this course were too difficult

(continued)

Table 1. (continued)

Variable	Questions
CONF7	After working on this course for a while, I was confident that I would be able to pass all course related assessments
CONF8	I could not really understand quite a bit of the material in this course
CONF9	The good organisation of the content helped me be confident that I would learn this material
SAT1	Completing the activities in this course gave me a satisfying feeling of accomplishment
SAT2	I enjoyed this course so much that I would like to know more about this topic
SAT3	I really enjoyed studying this course
SAT4	The feedback after the assessments, or of other comments in this course, helped me feel rewarded for my effort
SAT5	If felt good to successfully complete this course
SAT6	It was a pleasure to work on such a well-designed course

3 Findings and Discussion

For this study, we received 125 online survey responses from 75 students before-course, during-course, and after-course delivery. To decrease the chance of missing data, the Moodle learning management system was used to collect data from the enrolled students using a web-based questionnaire and set the required option for all the 36 questions (Table 1). The before-course responses were 35 out of 75 (total population), with a response rate of 47%. The during-course responses were 46 out of 75, with a response rate of 61%. For the after-course, 44 students responded with a response rate of 59%. The sum of average scores against each of the variables was then calculated and used to perform a test of normality and a paired t-test to their compared means.

To test the hypothesis that the results of before-course ($M = 2.57$, $SD = 1.232$), during-course ($M = 3.07$, $SD = 0.364$), and after-course ($M = 3.07$, $SD = 0.289$) were equal, we performed a paired t-test. Before conducting further analysis, we examined the assumption of normality distributed among different scores. The assumptions considered satisfied, as the skew and kurtosis level are estimated at -0.221 and -0.793 , respectively, which is less than the maximum allowable values for a t-test (with skew $< |2.0|$ and kurtosis $< |9.0|$) [13]. For H1a, the null hypothesis of equal means between before-course and during-course rejected, $t(35) = -2.314$, $p < 0.05$. Conversely, for H1b, the null hypothesis of equal means between during-course and after-course accepted, $t(35) = -0.154$, $p > 0.05$. The null hypothesis for H1c, with the equal means between before-course and after-course, was rejected, $t(35) = -2.381$, $P < 0.05$. Table 2 presents the adjusted 95% confidence intervals of the three pairs along with mean and standard deviations.

Table 2. Descriptive statistics of the three pairs in the study

	95% Confidence interval of the difference			Mean	Std. deviation
	Lower	Upper			
Pair 1	-0.942	-0.062	Before-course	2.57	1.232
			During-course	3.07	0.364
Pair 2	-0.062	0.053	During-course	3.07	0.364
			After-course	3.07	0.289
Pair 3	-0.937	-0.074	Before-course	2.57	1.232
			After-course	3.07	0.289

Before the course delivery, the students were very concerned and demotivated about the online mode of delivery and assessments. This was because of unfamiliarity with the e-learning education paradigm, weakness of the e-learning infrastructure, the complex environment at lecturers’ and students’ homes. Based on the before-course students’ evaluation, in Phase 1, the lecturer selected customised strategies aligned with the ARCS model such as Blackboard Collaborate polling for student attention, taking examples from students’ areas during lecture delivery to promote relevance, clearly identifying the rubrics for online assessment and publishing it on Moodle to boost students’ confidence, and real-time projects based on students’ choices with guidelines for the satisfaction. Because of these strategies, students’ motivation shown visible improvement in terms of motivation (pair 1).

At the end of Phase 1, the same students went through during-course evaluation to assess students’ motivation. There was a significant improvement in the students’ motivation in terms of attention, relevance, confidence, and satisfaction. As a result, in Phase 2, the lecturer has used a distinct set of customised strategies aligned with the ARCS model to sustain students’ motivation. This included using gamification tools for in-class MCQ assessments using the Kahoot and/or the Socrative tools for attention, scenario-based tasks during flipped classroom group breakout sessions to encourage relevance, multiple gamified assessments, and the selection of the best attempts towards final grading to boost confidence, and immediate feedback during the flipped classroom session for formal assessments. This sustained students’ motivation is clear from pair 2 in Table 2.

At the end of the course delivery, the lecturer evaluated the students one last time to assess if the blended delivery (Phase 1 + Phase 2) of the course has positively affected the overall students’ motivation. The overall effect of BTM was positive on the students’ motivation (pair 3). Figure 2 illustrates the four categories of ARCS motivational factors and systematic alignment based on the analysis of the students’ motivation before-course, during-course, and after course delivery.

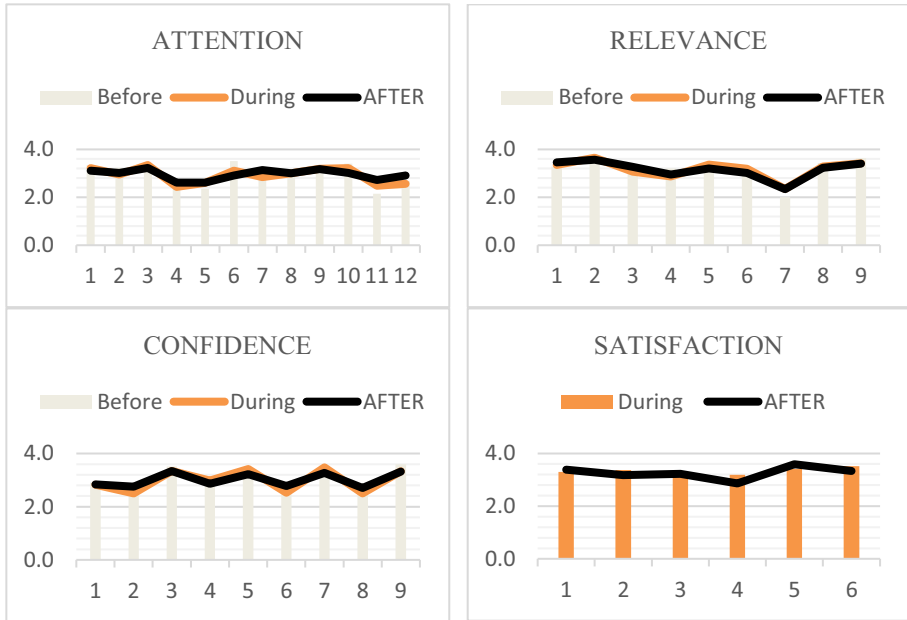


Fig. 2. Measurement of ARCS motivational factors - before, during and after the study

4 Conclusion, Limitations and Future Work

As a lecturer or designer, if motivational challenges or deficiencies arise, as it did in our study because of the COVID-19 outbreak, then it is necessary to first plan a motivational approach that will overcome these problems [11]. Students' motivation requires enhancement only when they are de-motivated [15]. However, if students' overall motivation is already high, then the lecturer or designer only requires sustaining students' motivation by using variety in teaching approaches [11] rather than exposing them to any unnecessary enhancement motivational tactics [9, 10]. In this study, we have shown the blended use of traditional, flipped classroom and gamified teaching methodologies in alignment with the ARCS model, process, and strategies with an adaptive implementation based on students' feedback before-course, during-course, and after-course delivery.

Based on the analysis of 125 responses collected from 75 students during three stages of the course delivery (before-course, during-course, and after-course), we conclude that an adaptive implementation of BTM aligned with ARCS models, process, and associated strategies can enable the enhancement and/or sustainability of students' motivation. The lecturers or designer should identify the right combination of BTM and activities through iterative motivational feedback of the students during course delivery.

The limitation of this paper is its convenient sampling through enrolled undergraduate students of the Business in IT course. It does not consider different courses, programs, colleges, institutes, and educational levels. As a result, the authors cannot generalise the findings of this paper to other research contexts.

Future work will focus on applying the recommendations presented in this paper to enhance courses in different programs in other colleges and educational levels. Besides, we are also planning to apply virtual reality technology in a project management course by applying the same BTM as followed in this paper. This will further support investigating the effects of BTM on the motivation of students to developing their skills in areas other than IT in Business.

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