



AENSI Journals

Australian Journal of Basic and Applied Sciences

ISSN:1991-8178

Journal home page: www.ajbasweb.com



Learning Motivation Assessment Model: A Review

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ARTICLE INFO

Article history:

Received 20 November 2013

Received in revised form 24

January 2014

Accepted 29 January 2014

Available online 5 April 2014

Keywords:

Motivation, Learning, Assessment

ABSTRACT

In order to evaluate the success of e-learning, motivation assessment model will be used to improve the level of motivation among novice learners. Motivation assessment models may include MSLQ, IMMS and CIS. The purpose of this study was to evaluate the motivation assessment models that used in teaching and learning by previous authors. This study found that, among IMMS, CIS and MSLQ, it can be said that IMMS is widely implemented and was proven by previous authors. This research found that variety of motivational assessment models were used for various purposes including self-pack online learning, distance education, medical education and learning language and mathematics. The best model will be proposed for the use of constructivism learning through e-learning.

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To Cite This Article: Y. Azliza, A. Noraida, Y.M. Hafiz Yusoff, M.S.M. Yazid, A.N. Sukinah, S.N. Suhana., Learning Motivation Assessment Model: A Review. *Aust. J. Basic & Appl. Sci.*, 8(4): 163-169, 2014

INTRODUCTION

According to (Walasek and Kucharczyk, 2011), distance learning is becoming a new way of gaining knowledge, as an alternative to traditional education and the existing educational structures. Thus, higher education's institutions face the task of incorporating the e-learning as a new model and solution of modern education. The objective of this paper is to conduct a study on the teaching and learning by identifying several motivation assessment models that were used by previous studies. It aims to improve the student's performance and motivation toward learning among novice.

This paper is organized as follow: Introduction in section one, literature review in section two, which contains with the constructivism learning theory, learning and motivation and motivation assessment model. Meanwhile, implementation of motivation assessment models will discuss in section three, and finally conclusion for this work will be presented in section four.

2. Literature Review:

The successful use of technology in the classroom depends on the teacher's attitudes towards technology (Yuen *et al.*, 2003). Teachers' attitudes have not been emphasized in the implementation of ICT into the classroom, though studies stated that teachers' attitudes as well as knowledge and skills in using computers are major affecting their acceptance of computer technology (Serrano *et al.*, 2003).

Motivation can be used to enhance learning. Relationships between motivating factors and learning have been a prominent research topic in the field of higher education. Students do face problems in connecting the knowledge they have learned into their practical work if no proper activities are given.

According to (Ramasamy *et al.*, 2010), teaching a student to understand a concept for each subject is easier than to apply it. In teaching, some lecture, demonstrate or discuss; some focus on principles and others on application; some emphasize memory and others on understanding (Bonilla *et al.*, 2008).

Some researchers agreed that motivation factors may come from intrinsic and extrinsic factors (Yacob and Md Saman, 2012; Srivastava *et al.*, 2011; Lai, 2011; Law *et al.*, 2010). Based on literature review, it showed that low motivations among students were found in studying programming (Ibrahim, 2011a; Rahmat *et al.*, 2012; Franchi, 2012; Williams, 2009; Norwawi *et al.*, 2009; Ibrahim, 2011b; Law *et al.*, 2010; Santos *et al.*, 2010; Ramasamy *et al.*, 2010) and in learning mathematic (Zaini *et al.*, 2010; Yahong *et al.*, 2011; Ridhuan *et al.*, 2011; Mahmud, 2009; City, 2010).

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Based on (Zaini *et al.*, 2010; Mahmud, 2009; Chen, 2012), integrating courseware and thematic video-based instruction in learning will motivate student in learning. As found by (Hu, 2008), interface design with both usability and motivational design applied showed the highest level of motivation.

According to (Burguillo, 2010), game-theory and competition-based learning also help to stimulate motivation and increase student's performance. Meanwhile, as proved by (Takemura *et al.*, 2007), there were a relation between teaching material and motivation to learn among student.

Constructivism Learning Theory:

According to (Wei, 2010), a traditional class assumes that teaching and learning are two totally different steps. Firstly teacher introduces basic theory and concept, and then students practice and try to answer different kinds of questions. Constructivism learning using Web-based environment is the most powerful model when considering more of improving student's learning interest, creativity and learning skills. The advanced multimedia and online technology are very helpful and efficiently collaborate in building constructivism learning environment. Teachers should use effective methods to motivate students in learning. During class, (Yahong *et al.*, 2011) had applied the constructivism for teaching discrete mathematics that emphases to the real scenario to discover the problems. This strategy affects the students' learning interests, helps them to understand the course better and can motivate the collaboration among students. Through Online Collaborative Examinations, (Shen *et al.*, 2008) found constructivism is able to reduce surface learning in exam study, enhance interactions and the sense of an online learning community, and increase perceived learning. Regarding to (Schreurs and Al-huneidi 2011), constructivism based learning will improve learning outcome by facilitating collaboration, communication, interaction and knowledge construction and sharing. This also affects the shift from teacher-centered to learner-centered learning, causes an effect to being active in creating knowledge and also improves the learning outcomes.

Many of the traditional instructional-design theories focus on simple, domain-dependent, cognitive learning. As mentioned by (Snyder, 2009), using constructivism, learner construct their own learning by combining new information with existing knowledge and experience. Constructivism helps in developing skills through teaching methods as group-based and cooperative work, problem-based activities, and discovery learning (Roblyer, 2006). As found by (Min *et al.*, 2009), the constructivism has been accepted by many educators and it was widely applied at China in variety of modern teaching practice like Classroom Teaching Mode, Individualized Learning Mode, Network Classroom Mode, Distance Education Mode and Virtual Reality Mode. As stated by (Solvie and Kloek 2007), technology used in class session as a collaboration tool in mediating and negotiating learning for both instructor and students. Based on (Hu, 2008), e-learning has become an increasingly important delivery format in workplace training. It effects on the highest level of motivation. Also, (Kim, K.-J. and Bonk 2005) has predicted that e-learning would become the dominant form of training within organizations in the near future. As mentioned by (Wei, 2010), web-based learning model is able to improve student's learning interest, creativity and learning skills.

Learning and Motivation:

There are three domains of educational activities: Cognitive (mental skill/knowledge), Affective (feeling or emotional/attitude) and Psychomotor (skill). According to (Arachchi *et al.*, 2010), learning material should contains all three learning domains. The motivation for learning has been widely discuss by many researchers. Different authors have their own definition regarding to learning and motivation. According to (Zaini *et al.*, 2010), current courseware do not enhance the student's motivation in learning mathematic. An alternative should be taken on the multimedia courseware that can improve student motivation such embed the courseware with Pedagogical Agent (PA). According to (Wenhao Huang *et al.* 2004), when developing an instructional materials, ARCS model can be applied as a cycle for continuous improvement. It was originally designed for developing motivating instructional materials in traditional instructional settings and later on was apply in the computer-based or web-based instructional environment. As stated by (Turner *et al.*, 1998), the relation between attitude and motivation for learning has been actively studied in psychology. As found by (Pekrun, R. and Titz, 2002), attitude of students toward learning were correlated to achievement, motivation to learn, and self-regulated learning. Motivation also can be used to enhance the strength among learners. Time Continuum Model and ARCS model are two motivation models that apply motivation principles and theories to instructional design (Hu, 2008). Many of the same strategies recommended by them, and readily apparent in e-learning design (Hodges, 2004).

Time Continuum Model:

The Time Continuum model was developed by Raymond J. W., (1985) to increase the motivation among novice (Hodges 2004). It was derived from techniques in linguistics, cognitive psychology and motivation research. There are three important factors in instruction: 1) value of the learning materials, 2) the degree of stimulation provided by the learning, 3) Perseverance-How students sustain their interest in the learning

material. According to (Sommersemester and Tr an, 2008), using time continuum model, learning process will be divided into three periods: beginning, middle and end of learning process. Each of those periods concentrates on different aspect. Regarding to (Smith 2008), at the beginning of the period, it focuses on attitudes and needs, which may include icebreaker activities and stating clear objectives among learners. In the middle period, it will focus on stimulation and affect, which will include the learner participation like questions, presentation, humor and discussion. Lastly, competence and reinforcement will be concentrated at the end of the period through frequent feedback and communicating.

ARCS:

The ARCS Model of Motivational Design was created by John Keller (1984), used in designing, developing, and evaluating instructional materials. The model consists of four main areas: Attention, Relevance, Confidence, and Satisfaction. According to Keller's ARCS motivational theory, attention and relevance are essential to learning and can be considered the backbone of the ARCS theory. ARCS model can be used to encourage, promote, and increase student motivation. ARCS model can be summaries through table 1 below (Poulsen *et al.*, 2008). ARCS motivational model is used in computer-assisted instruction program and online learning environments. As reported by (Hu, 2008), ARCS can be used to reduce attrition rate in distance learning program and improved learners 'self-directed learning. It also was attested about its reliability and validity in many different learning and design environments (Huett, 2006).

The first ARCS component, attention refers to the interest displayed by learners in taking in the concepts being taught. This component is split into three categories: perceptual arousal, inquiry arousal and variability. According to Keller, relevance must be established by using language and examples that the learners are familiar with. The 3 major strategies Keller presents are: goal orientation, motive matching, and familiarity.

Table 1: Descriptions about the ARCS Model

Items	Components	Strategy
Attention (Refers to the interest displayed by learners in taking in the concepts/ideas being taught)	Perceptual arousal	Using surprise or uncertain situations.
	Inquiry arousal	Offering challenging questions to answer.
	Variability	Using a variety of resources and methods of teaching.
Relevance (Refer to the learner's need, interests and motives that the learners are familiar with.)	Goal Orientation	Describe how the knowledge will help the learners today and future.
	Motive Matching	Assess the learner's need and reasons for learning and provide choices in their learning methods that are conducive to their motives.
	Familiarity	Tie instruction into the learner's experience by providing examples of that relate to the learner's work.
Confidence (Develop positive expectations towards the learning task)	Performance Requirements	Provide learning standards and evaluative criteria to establish positive expectations and trust with learner.
	Success Opportunities	Present multiple, varied challenges for learners to experience success.
	Personal Control	Use techniques that allow learners to attribute success to personal ability or effort.
Satisfaction (To provide reinforcement and reward for learners)	Intrinsic Reinforcement	Encourage and support intrinsic enjoyment of the learning experience.
	Extrinsic Rewards	Provide positive reinforcement and motivational feedback
	Equity	Maintain consistent standards and consequences for success.

The third of ARCS model, confidence focuses on establishing positive expectations for achieving success among learners. The level of learners' confidence is often correlated with motivation and the amount of effort put forth in reaching a performance objective. Meanwhile the last component, satisfaction is based upon motivation, which can be intrinsic or extrinsic. It serves to increase learner motivation by creating learning experiences about which the learner can feel positive.

According to (Huett, 2006), ARCS model firstly has been applied to traditional classroom and it then applied to computer-assisted instruction, blended learning environments, and also in distant, web-based classrooms and e-learning design. This model explains about the motivation construct, a systematic motivational design process and series of motivational tactics.

Motivation Assessment Model:

Assessing motivation has been an important aspect for researchers to understand the operation of motivational processes and to find ways to optimize learner motivation. As reported by (Hu, 2008), motivation assessment approach may come from direct observation, self-reported and judgment rating. Direct observation is

an observation made by using senses (hear, see, touch, taste, feel). The observer records directly what they are seeing. A Self-reported is a method used to ask a participant about their feelings, attitudes, and beliefs. It also can be through questionnaires, interviews, stimulated recalls, think-aloud and dialogues. Meanwhile, judgment rating is used to assess the level of motivation that is not attainable through direct observations. It is considered as more objective than self-reports and also has disadvantages due to the selective memory of learners' behavior. This study is focused on self-reported questionnaire which contain with the MSLQ, IMMS and CIS.

Motivated Strategies for Learning Questionnaire:

Motivated Strategies for Learning Questionnaire (MSLQ) was developed in 1991 by Pintrich and his colleagues. It is used to determine learner motivation using 7-point Likert scale (1 = not at all true of me and 7 = very true of me). According to (City, 2010), MSLQ scale contains two sub-scales: Motivation and learning strategies. Motivation scale composes 31 items of six motivation scales measuring value, expectancy and affective component. Meanwhile learning strategies scale consists of 50 items measuring cognitive and metacognitive strategies, and resource management strategies. Table 2 below summarize about all five sub-scales contains in MSLQ.

Table 2: Description about MSLQ Model

Sub-scale	Factor	Description
Motivation (31 items)		
Value	Intrinsic goal orientation	Inner reasons
	Extrinsic goal orientation	Outer reasons
	Task value	Perception or the awareness
Expectancy	Control beliefs	Lead to positive result
	Self-efficacy for learning and performance	Ability to complete the task and the confidence
Affective	Test anxiety	Negative emotion
Learning strategies (50 items)		
Cognitive strategies and Meta-cognitive	Rehearsal	Reciting or naming the learning materials
	Elaboration	Summarizing, generative note-taking, or paraphrasing
	Organization	Clustering, or outlining
	Critical thinking	Strategies to make purposeful or reflective judgment or decisions
	Self-regulation	Contain planning, monitoring and regulating
Resource management	Time and study environment	Scheduling, planning and managing one's time
	Effort regulation	Commitment to completing one's goal
	Peer learning	Strategies to cooperate with others
	Help seeking	Strategies to manage and use the support from others

Instructional Materials Motivation Survey:

According to (Zaini *et al.*, 2010; Huett, 2006), Instructional Materials Motivation Survey (IMMS) was develop by Keller with 5 Likert- type scale responses. It gauges the motivational effect of instructional materials based on 36 related questions (Cook *et al.*, 2009; Wenhao Huang *et al.*, 2004) where 10 items are reverse items. It can be used to assess the four components of the ARCS: Attention, Relevance, Confidence, and Satisfaction. It was designed for self-directed instructional materials and could be used to improve a course design or adapt a course to an individual's motivational needs. As stated by (Cook *et al.* 2009), 36 statement from IMMS were contains 12 Attention items, 9 items for Relevance, 9 items for Confidence and other 6 items for Satisfaction where the minimum score of the IMMS survey is 36, and the maximum score is 180 (Allison, 2012). Table 3 below shows the description of IMMS model.

This research found that IMMS have been used worldwide for many years in a variety of disciplines (Hu, 2008; Huett, 2006; Zaini *et al.*, 2010; Cook *et al.* 2009; Wenhao, H, *et al.* 2004; Allison, 2012; Chen, 2012; Mahmud, 2009). Example of disciplines that use IMMS are Online Learning, distance education, Learning Mathematics using Multimedia Courseware, Web-Based Course, computer-based instructional tutorial, Classroom Performance System-Based Instruction With Peer Instruction, thematic video-based instruction and CAI Courseware for mathematics learning. According to the (Keller, 2010), IMMS can be adopted to fit specific research needs in various situations. No matter what, some researchers have changed the minor verb of original IMMS to fit with the specific research they have done and support its reliability and validity (Huett, 2006). At the end of research, IMMS was distributed to the control and treatment groups to determine either it was a statistically significant difference in motivation between both groups or not using MANOVA and t-test for multiple independent sample. According to authors' of IMMS, the value for reliability and validity are important to evaluate the Cronsbach's alpha for each ARCS component (attention, relevance, confidence and satisfaction).

Table 3: Description about IMMS Model

	ARCS	Items
IMMS	Attention	12
	Relevance	9
	Confidence	9
	Satisfaction	6

Course Interest Survey:

Course Interest Survey, CIS was developed by Keller and used to measure student motivation related to the Classroom instruction or course being taught. It corresponds to the four categories of the ARCS model, with 34 Likert-type scale of 1 – 5 where nine items are reverse items (Hu, 2008). The minimum score is 34, and the maximum is 170 with a midpoint of 102. The minimums, maximums, and midpoints for each subscale vary because they do not all have the same number of items. Therefore, CIS's questionnaires have been through psychometric testing in terms of reliability and validity. Prior reliability testing of the CIS instrument using Cronbach's alpha measure resulted in all 5 components (Attention, Relevance, Confidence, and Satisfaction subscores and ARCS total score) greater than 0.80 (Gabrielle, 2003).

3. Implementation of Motivation Assessment Model:

The motivation for learning has been widely discussed by many researchers. As found by (Dag and Geçer 2009), learning styles are not unique factor that affects to improve the academic achievements in online learning environments. Other factors like demographics factors, learners' motivation and teaching strategies should be included in the researches. According to (Zaini *et al.*, 2010), current courseware do not enhance the student's motivation in learning mathematic. An alternative should be taken on the multimedia courseware that can improve student motivation such embed the courseware with Pedagogical Agent (PA). According to (Wenhao, H, *et al.* 2004), when developing an instructional materials, ARCS model can be applied as a cycle for continuous improvement. It was originally designed for developing motivating instructional materials in traditional instructional settings and later on was apply in the computer-based or web-based instructional environment.

As stated by (Turner *et al.*, 1998), the relation between attitude and motivation for learning has been actively studied in psychology. As found by (Pekrun, R. and Titz, 2002), attitude of students toward learning were correlated to achievement, motivation to learn, and self-regulated learning. Meanwhile, (Takemura *et al.*, 2007) studied on the relationship between teaching material and motivation for art's students. It was found that, teaching materials were designed in accordance with the ARCS model and SIEM assessment standard was used to evaluate the students' motivation levels to learn programming.

Table 4: Implementation of Motivation Assessment Model

Ref.	Description
(Hu 2008) IMMS	To test the effects of usability and motivational design on learners' motivation and learning performance in self-paced online learning environments. To investigate the associations between usability measures and motivation measures.
(Huett 2006) CIS, IMMS	To manipulate the component of confidence found in Keller's ARCS model to enhance the confidence and performance of undergraduate students enrolled in an online course at a Texas university using SAM 2003 software delivery.
(City 2010) MSLQ	To understanding senior high and vocational school students' mathematics learning motivation and strategies.
(Stoffa <i>et al.</i> 2011) MSLQ	To examined the potential of utilizing the MSLQ and the Strategy Inventory for Language Learning (SILL) as instruments in measuring Generation 1.5 students' motivation and their use of language learning strategies.
(Zaini <i>et al.</i> 2010) IMMS	To investigate the weaknesses of the Multimedia courseware in terms of motivation in learning mathematics.
(Cook <i>et al.</i> 2009) IMMS	To evaluate the validity of IMMS scores and compare scores between standard and adaptive Web- based learning modules (medical education).
(Haron & Shahraroun 2011) MSLQ	To investigate through statistical data analysis how Self-Regulated Learning (SRL) affects students 'understanding of Statics concepts and performance in the course.
(Wenhao Huang <i>et al.</i> 2004) IMMS	To evaluate a computer-based tutorial, M-Tutor for the purpose of proposing effective instructional interventions for learning MATLAB (self-checking).
(Koorssse <i>et al.</i> 2010) MSLQ	To identify factors related to learner achievement in programming and the IT subject. The two areas that this paper investigates are learner motivation towards programming and the learning preferences of IT learners.
(Allison 2012) IMMS	To determine the impact of student use of a CPS technology supported with a PI strategy, on the academic achievement and motivation of eighth grade math students.
(Chen 2012) IMMS	To develop and evaluate the effect of thematic video-based instruction on learning and motivation in e-learning.
(Mahmud 2009) IMMS	To develop and evaluate a CAI courseware 'G-Reflect' on students' achievement and motivation in learning Mathematics. The 'G-Reflect' was developed based on the ADDIE instructional system design model and using the Geometer's Sketchpad (GSP) software.

Conclusion:

This paper has reviewed and investigated three motivation assessment models, involved in the process of teaching and learning: IMMS, MSLQ and CIS. It was found that, among IMMS, CIS and MSLQ, it can be said that IMMS is widely implemented and was proven by previous authors. All 36 items in IMMS which contains the aspects of attention, relevance, confident and satisfaction, looks greatly suitable to use in motivational research. Because of that, it proposed to used, to measure the motivational for constructivism learning through e-learning. The implementations of all models also had been reviewed. This learning theory hopefully will help to improve the level of motivation among novice.

ACKNOWLEDGMENT

We would like to extend sincere appreciation to TATI University College and to all members of IT Education Research Group at Computer Science Department, University Malaysia Terengganu, for all the supports and encouragement.

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