Developing Scale for Assimilate the Integration between Learning Theories and E-learning.

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Abstract—**As e-learning tend to get more and more significant for all kind of universities, researchers and consultants are becoming aware of the fact that a high technology approach and Blackboard do not guarantee successful teaching and learning. Thus, a move to pedagogy-based theories can be observed within the field of e-learning. This study describes the procedure of the development of an empirically-based psychometrically-sound instrument to measure instructional model for e-learning system at Middle East universities. In order to accelerate the acceptance of e-learning and implementation of institution-wide adoption of e-learning, it is important to understand students' perceptions with instructional model for e- learning. The 19-item scale developed shows a high probability of differentiating between positive and negative perceptions and the methods which can be used for embedding the traditional learning theories into e-learning.**

Index Terms—**constructivism, cognitivist, behaviorism, exploratory factor analysis, e-learning theories**

I.   INTRODUCTION

Roberts et al. (2000) identified four models of e-learning: (a) Naive model is the most broadly used. It may be characterized as notes on the web. It provides no chance for communication or comment, (b) Standard model which attempts to operate the advantages of the technology to allow a significant degree of communication and interaction between students and staff, (c) Evolutionary model which allows a response mechanism to give beneficial comment on how the subject is succeeding, and (d) radical model which dispenses where students are formed into groups to learn by interacting amongst themselves by using the enormous amount of existing web based resources.

Hewitt-Taylor (2003) highlights that Transferring lecture notes to web based system or any e-learning tools may be a good way to display course material without dependence on mass lectures, enabling teachers to focus their time on answering inquiring, discovery and critical thought, resulting in strength of learning. However, if the role of the teacher is not made obvious it is likely that teachers will become a not essential facility and education reduced to the presentation of materials in a potentially uncoordinated way.

Chou and Liu (2005) suggest model for e-learning which called Technology-mediated Virtual Learning Environment (TVLE) this model addresses the relationship between the learner control and learning effectiveness.

Partridge and Edwards (2005) have developed an on line learning system which called Reflective Online Searching Skills (ROSS), that response to the need for student learning environments which support the progress of generic online searching skills achievement through reflective practice.

In the same context, Leitch and Warren (2008) provided a new realistic system called Method for Educational Analysis and Design (MEAD) designed for the development of e-learning and learning systems based upon students' participation approach.

Web based virtual learning environments (VLE) is the subject of a study carried out by Piccoli et al. (2001), who found Learners in the e-learning environments reported higher computer self-effectiveness. Chou and Liu (2005) agree and go on to say that the students in the technology-mediated virtual learning environment (TVLE) have higher computer self-efficiency.

In Middle East universities the decision to develop e-learning system is not one to be taken half-heartedly. Nor should it be considered solely for reasons currently mooted in university settings, reasons which include attracting students, delivering courses more efficiently and effectively, and generating additional resources. A more important reason is that e-learning provides the right medium for content delivery, attracting students for self-paced learning (learn how to learn) and the appropriate teaching and learning environment for prospective students. Moreover, educational research and development into e-learning in Arab countries mainly focuses on the inclusion of new technological features without taking into account psycho-pedagogical concerns that are likely to improve a student's cognitive process in this new educational category.

Thus, this dimension explores students' perspectives about combining behaviorist, cognitivism and constructivist learning theories into e-learning. Therefore e-learning can best be understood in the broader context of using technology to meet students' psychological and cognitive needs for learning. It also requires Middle East universities to understand that students have psychological needs that e-learning must address. Also, this dimension discusses established and emerging learning theories, the relationship between these theories and technology, and ways to help teachers to develop personal educational philosophies that guide their selection, implementation, and utilization of classroom technology.

Even though numerous studies have been conducted on e-learning models, hardly a few studies have integrated Cognitivism, Behaviorism and Constructivism theories to evaluate which theories have impacted upon students.

Yet there is no standardized instrument to measure which learning theories embedded into e-learning. When planners and managers understand how students react to a

new tools and features available in e-learning and what the new experiences mean to them, then their planning becomes more effective and the decisions made might be more acceptable to the students. If students are not comfortable with the technology, students may suffer leading to a poor reputation for the program and the university. Positive attitudes can help teachers to deal with the new technology with less anxiety and so enable them to take steps appropriately in tune with the need of the students and the university.

The goal of the present study was to offer e-learning policy makers and researchers a psychometrically sound and powerful method of assessing e-learning model. While the development of a questionnaire based on literature review and secondary data are a necessity, it is not sufficient for defining the mechanisms of a measurement tool. Therefore, a succeeding step is to determine the internal consistency of the items for determining future predictability of the instrument. For this purpose, we followed the scale development guidelines and steps suggested by DeVellis (1991). In this research, we report the sequence of steps followed in the development of the scale to assess e-learning model by students in a campus based Middle East University, starting from generation of an item pool to optimization of the scale. The stages followed were as follows:

- Stage1. Creating an item pool
- Stage2. Defining the arrangement for measurement
- Stage3. Content validity
- Stage4. Management of the items to a development sample
- Stage5. Analysis of the scale
- Stage6. Optimization of the scale

II. METHOD

While following the above steps identified by DeVellis (1991), the study followed review of the relevant literature to generate a pool of items, followed by in-depth interviews of students at five universities in Oman to develop a reliable and valid scale. The universities are a recent in e-learning with many online projects being carried out at the time of the study. At the time of the study in early 2012, there were 500 students at the university, who were requested to respond to the questionnaire. As described in more detail in Step 4 below, the response rate was 90%. Among the respondents 80% were female and 20% were male. The average age of the sample was 18 years with the mean falling in the 18-22 year age group. The average learning experience of the sample was 2 years with the mean falling in the range of 2-4 years. The respondents were experienced in the Blackboard system with an average of 2.5 years. It may be noted here that although many online projects were going on in the universities at the time of the study, there was no current strategic policy on e-learning.

A. Stage1. Generating an Item Pool:

In order to generate a pool of items related to measure how learning theories could be embedded into e-learning at Middle East Universities , a comprehensive review and analysis of the available world literature, covering measure pattern of e-learning models (Clark, 1993; Siaciwena, 1989), students' perceptions about barriers to web-based instructions (Berge, 1998 ; Daugherty & Funke, 1998 ; Berge & Mrozowski, 1999 ; Schifter, 2000 ; Pajo & Wallace, 2001 ; Newton, 2003 ; Jamlan, 2004 ; Naidu, 2004 ; Lee & Busch, 2005) and numerous publications on students' perceptions of e-learning was undertaken (see for example, Keller & Cernerud, 2002 ; Graff, 2003 ; Paris, 2004 ; Muilenberg & Berge, 2005 ; Drennam et al, 2005 ; Thompson & Ku, 2005). At this stage, a list of 19 items was identified that reflected a potential correlation with the concept of e-learning models.

B. Stage2. Defining the Format of the Scale

At this stage, different scaling options were investigated. From this, the Likert scale was chosen for its simplicity, wide use in behavior measurement, higher reliability coefficients with fewer items, and method of summated ratings (Edwards & Kenney, 1946). Thus, for each statement we used the following five-point agreement / disagreement scale given with the numerical values assigned to each point ; 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, and 1 = strongly disagree.

C. Stage3. Content Validity

Content validity is defined as the extent to which a set of items is relevant and representative of the concerned attitudinal domain content (Anastasi, 1968; Cronbach, 1984). In order to review the items, the method followed by Biner (1993) as adapted from Lawshe (1975) was followed by us.

The list of 19 items was given to nine e-learning experts to rate how relevant the items were to measure attitude towards e-learning. A three-point scale (1 = not necessary, 2 = useful, but not necessary, and 3 = essential) was used by them to rate the items. These responses were analyzed to calculate the Content Validity Ratio (CVR) for each item. The 19 items with a CVR greater than zero were included in the scale for administration. Table 1 shows the CVR scores of these 19 selected items.

D. Step4. Administration of the Items to a Development Sample:

The scale with 19 items was distributed to a sample of 500 students in the universities; since for scale development a large sample would eliminate subject variance (DeVellis, 1991). Tinsley and Tinsley (1987) suggest a ratio of 5 to 10 subjects per item, i.e. up to a sample size of about 300 for factor analysis. Thus, distribution of the questionnaire containing 19 items to a sample size of 500 was considered satisfactory.

III. RESULTS:

In Steps 5 and 6, the results of the analyses of the responses by the students to the 19 items in the scale are presented. Factor analysis revealed three underlying factors in the scale; - behaviorism, cognitivist and constrctivism. The reliability test of the scale showed a high intercorrelation among the items: the value of the alpha coefficient equal .92 making the scale robust and reliable.

A. Step5. Analysis of the Psychometric Properties:

The reliability alpha coefficient for the scale with 19 items was 0.92, which indicated that the items in the scale were highly intercorrelated and were all measuring the

TABLE I.
ITEMS WITH A CONTENT VALIDITY RATIO GREATER THAN ZERO

Item		The Item Statement	CVR
1	MBeh1	All materials have explicit objectives with respect to the student behaviour when accessing web pages.	.99
2	MBeh2	I can use self-assessment questions as interactive activities in the learning materials	.89
3	MBeh3	I found the step-by-step description of learning materials in small chunks.	.96
4	MBeh4	The syllabus being presented in a deductive way by means of starting with a rule, category, principle, formula or definition and giving positive examples to reinforce understanding.	.98
5	MBeh5	I have control over the learning process.	.85
6	MCog1	It is straight forward for me to find the annotation and notes in the course web site.	.77
7	MCog2	It is straight forward for me to find instructions for how to learn.	.59
8	MCog3	It is straight forward for me to find information by using a search engine.	.68
9	MCog4	I found learning materials include activities for the different learning and cognitive styles.	.97
10	MCog5	Most of learning materials connect with different real-life situations.	.93
11	MCon1	I usually Use the discussion forums and chat (both synchronous and asynchronous techniques) with my instructors and colleagues.	.87
12	MCon2	Usually the instructor responses quickly to students' e-mails	66
13	MCon3	I usually connect with my colleagues through email	.97
14	MCon4	The web site helps me to accomplish the Group projects	.88
15	MCon5	The web site supports me by Streaming media.	.92
16	MCon6	The social activities on the net increase my course interaction.	.68
17	MCon7	I found different learning views provided via website	.99
18	MCon8	The website support Self-learning concept	.85
19	MCon9	Most of electronic materials depend on critical and creative thinking	.92

TABLE II.
THE 19 ITEMS OF E-LEARNING MODELS

Item	Behaviorism	cognitivism	constructivism
MBeh1	.922		
MBeh2	.912		
MBeh3	.889		
MBeh4	.877		
MBeh5	.869		
MCog1		.978	
MCog2		.966	
MCog3		.851	
MCog4		.798	
MCog5		.797	
MCon1			.996
MCon2			.995
MCon3			.991
MCon4			.989
MCon5			.981
MCon6			.977
MCon7			.976
MCon8			.974
MCon9			.971

nine items in factor 3 had loading from 0.971 to 0.996. Thus, we could identify three factors – Factor 1 involving 5 items that were related to behaviorism and therefore this Factor 1 was described as the Behaviorism factor, Factor 2 involving 5 items that were related to cognitivism and factor 3 involving 9 items that were related to constructivism.

B. Step6. Optimization of the Scale:

The factor analysis identified 19 items in three groups, as Factor 1, Factor 2 and Factor 3, and the Cronbach reliability alpha coefficient for the 19-item scale was 0.92. We then investigated further optimization of the instrument by examining the reliability coefficient of each factor independently. We then found that the 5-item Factor 1 had a reliability coefficient of 0.88 thereby indicating high inter-item correlation within this Factor 1, Factor 2 had a reliability coefficient of 0.91, Factor3 had a reliability coefficient of 0.95 and indicating that these factors could be used to comprise an instrument to measure the embedding between traditional learning theories into e-learning.

IV. CONCLUSION:

The behaviorism scale of Factor 1 alone consisting of the 5 interrelated items termed the behaviorism factor showed satisfactory psychometric properties. The behaviorism characteristics construct was tested using 5 scale items (MBeh1-MBeh5), the five items were adopted from literature review, secondary data and in-depth interviews. The five items assessed the role of the behaviorism theory into e-learning. The cognitivism construct (Factor 2) was measured by five items (MCog1-MCog5). The five items were measured how e-learning strategy could enhance the learning process. The constructivism construct (Factor 3) was measured by nine items (MCon1-MCon9). The nine items were measured how e-learning strategy could convert the learning process to active process. Moreover, learning theory includes philosophies that aim at explaining changes in human performance, providing a set of instructional approaches, tactics and techniques from which to select, as well as, the foundation for how and when to select and combine the strategies. Furthermore, it

same attribute, i.e. pattern of use of a typical e-learning system. With this, we were interested in understanding how many constructs or latent variables underlay the set of 19 items in the scale. Therefore, we performed exploratory factor analysis on the sample.

Table 2 shows the factor loading of the items with a loading of 0.50 or greater. Interestingly, 5 items in Factor 1 had a loading ranging from 0.869 to 0.922, while the 5 items in Factor 2 had a loading from 0.797 to 0.978 and

forecasts the results of using the strategies (Yang 2004). In the same context, in the *behaviorist learning model*, students rely on instructors for knowledge at the beginning of any learning activity. From a behavioral perspective, educators operate and adjust the learning environment depending on the preferred outcome (Skinner 1971). On the other hand, *Cognitivism model*, instructors place the objectives of the learning process and the students are expected to attain these objectives. During the input process, the instructor breaks the content to smaller pieces, steps, and designs in advance, which is a device used to more efficiently perform each step. In the output process, the instructor assesses the student to see whether they achieved the learning objectives (Vrasidas 2000). But *Constructivist learning theory* has sought to create learning environments that come closer to actual life environments. As a result, constructivist educational methods have long been applied particularly in Information Systems (Franck 2005). Many educational researchers argue that the constructivism theory offers a theoretical and practical foundation for E-Learning procedures, especially the online type of E-Learning (Bransford 2000; Weigel 2002).

Most of previous studies investigating e-learning but have not attempted to address which instrument can be used to measure to what extent the traditional learning theories could be embedded into e-learning for that reason this study contribute to knowledge in this area.

The study has the following limitations and future research extensions:

1. There is a need to explore and introduce more factors to increase the explained variance of e-learning methods.

2. This study considered the acceptance of e-learning methods as perceived by learners, there is a need for other studies to consider instructors' perceptions of e-learning.

3. The sample of learners used in this study was taken from Oman Universities. More representative sample could have been taken from other countries, because learner perceptions might differ across all colleges.

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