Online Individualized Multimedia Instructional Model For Engineering Commuincation Skills

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ABSTRACT: Student centered learning environment has proven to be a solution and can be met with (i) multi-sensory approach to teaching, (ii) increased student activity, to help student internalize their learning, and (iii) sufficient time to overcome student weaknesses. Within this needs, this study aimed at designing, developing and implementing a new online individualized multimedia instructions (OIMI) framework for engineering communication skills (ECS). The OIMI framework was used to deliver the ECS courses in 2012-2013. The framework was subsequently tested to generate a two-stage model for ECS course. The theoretical framework guided development of a questionnaire to measure all measurement scale in the OIMI model. The questionnaire has three sections to assess (i) Individualized Instruction, (ii) MI and (iii) OL. Overall reliability using Alpha Cronbach test and the Rasch Model analysis together with expert reviews for the content validation, suggested that the questionnaire is reliable and valid to measure OIMI model. Data collected from 166 engineering learners were tested with CFA using AMOS 21.0 to obtain three best-fit measurement models from the three latent variables. Subsequently, the SEM was applied to test the hypotheses. The results showed (i) evidence of a three-dimension measurement model for Individualized Instruction, (ii) evidence of a five-dimension measurement model for MI, (iii) evidence of a four-dimension measurement model for OL, (iv) a strong relationship between OL and MI, (v) a positive relationship between Individualized Instruction and OL, and (vi) a negative relationship between Individualized Instruction and MI.

Keywords: Individualized instructions (II); Online learning(OL); multimedia instructions(MI); engineering communication skills(ECS)

INTRODUCTION: The conventional engineering curricula strongly focus on technical knowledge and skills. However employers have increasingly acknowledged the need for a wide range of written and spoken communication skills to engage with members of other professional groups and with the broader community. In recent years identification of the significant role of communicative competence in professional success within the engineering industry has, as a result, led to a number of universities developing curricula to address these needs (Missingham 2006). Riemer (2007) emphasized that ECS are necessary component in the education of engineering students to assist students' education and to prepare students' future careers. According to Normaliza Abd Rahim (2012) ECS have important roles in providing engineering students with the required skills of writing and presenting of technical reports, and providing students with an understanding of their duties and responsibilities as professionals through improving their communication skills in workplaces.

STATEMENT OF THE PROBLEM: Engineering educators and industry leaders recognized the growing importance of ECS in the engineering profession (Corrello 2012). However, engineering education traditionally rely on technical skills, more than ECS (Corrello 2012). Corrello added, "Changes in the engineering profession have prompted industry leaders and educators alike to reassess the preparedness of new graduates entering these evolving roles. There is overwhelming evidence that proficiency in communication behaviors can make any engineer more versatile and thus more competitive in today's job market". Thus, engineering graduates require ECS to maintain relevance with the global environment of the new millennium.

As for ECS within engineering curricula, Al al-Bayt University engineering faculty presents three courses for the development of ECS, ECS course, the provisions of the building and skills practice of the profession course, and writing technical skills course. These courses are compulsory courses for all engineering students (Al al-Bayt University Study Plans for Undergraduate Students 2011).These courses provide learners with the required skills of writing and presentation of technical reports. Moreover, ECS are needed within each engineering course such as written assignment, laboratory reports which have to be well organized and should be presented individually or in a group. Indeed, engineers in workplace also need to communicate with low or no engineering knowledge based employers. This situation in workplace needs special communication skills from the engineer to simplify the technical concepts and to apply the knowledge of engineering science to increase the production. In reality, engineering instructors teach ECS with deficient or inappropriate teaching and lack of opportunity for engineering students to practice ECS. According to Mehra and Virgandham (2013), methods of teaching ECS are considered as insufficient. Ford and Riley (2003) added, “Many research studies, report from industrial recruiters and anecdotal evidence by engineering educators highlight students’ lack of development in their communication skills”.

A gap between learning and practicing ECS demand in engineering education do exist. Understanding the main reasons for this gap, universities should adopt an integrated approach to enhance ECS. Learners’ need an individualized system that may let them learn and practice ECS using alternative delivery method and instructional content so learner can learn at their own pace according to their learning style differences, and instructors have more time for helping students in interpretation, connections and integration of materials learned. Obviously, learners can have more time for ECS practice. Deliberation or intention to govern pace, method, and contents may insure the knowledge acquisition. Student learning styles are the pace; the method includes the instruction design to base on specific learner characteristics, which implies alternative instruction methods for student with different learning styles. Furthermore, content includes different levels of material to be learned. These three variables define the II approach to instruction (Abu Samah at el. 2011; U.S. Department of Education 2010).

Nowadays, information technology allows effective interaction in term of both time and distance. The utilization of MI in teaching and learning is growing rapidly. The combination of various media assists educational reform, and is important to the improvement of education outputs. Utilizing MI is rising in education and since we lie under its effect in the 21st century, graduate students must attain, at least, its basic skills (University of Texas, USA 1995). Online MI has the ability to increase learner motivation by providing both greater learner autonomy and increasing options for support. Its benefits may vary from simple e-mail lists, through multifunctional virtual learning environment, to totally adaptive learning environment (Moore et al. 2011). These processes enable creating individual courses and perceiving in analogous with learning objects and according to the demands of the learner’s preference and performance as well as the market needs.

Despite the large volume of research published at this time, neither had tried to develop a model to individualize learning connecting OL, II, and MI models together specifically in ECS. Applying the developed model, that caters for learners with diverse pace of learning and practicing ECS will improve the quality of engineering graduates. In the light of the argument above, this study is needed to develop and validate an online individualized MI model for ECS. This study took advantage of previous researches results to stand for the lack of any kind of correlation between OL, MI, and II models specifically for ECS.

PURPOSE OF THE STUDY: The main aim of this study is to develop and validate the online individualized MI model for ECS. This study investigates the relationships among the variables within a multivariate model of II, OL, and MI for ECS.

RESEARCH QUESTIONS

RQ1. Are the measurement scales for the developed online individualized MI model for ECS construct-valid?

- RQ1.1 Is the measurement scale for individualized instruction (II) construct-valid?
- RQ1.2. Is the measurement scale for MI (MI) construct-valid?
- RQ1.3. Is the measurement scale for OL (OL) construct-valid?

RQ2. Does the MI (MI) influence individualized instruction (II)?

RQ3. Does OL (OL) influence MI (MI)?

RQ4. Does a relationship exist among individualized instruction (II), MI (MI), and OL (OL)?

Audience and Sample: A number of different audiences are referred to in this study; Architecture engineering students, Civil engineering students and Surveying Engineering students at Al al-bayt University.

The sample of this study is Al Al-Bayt University Engineering students/Learners who are registrant in the communications skills course in the first semester of the academic year 2012-2013.

THEORETICAL MODEL: As illustrated in Figure 1.1, there are three unobserved variables also known as latent or dependent variables. The variables are II, MI, and OL indicated by circle. The observed variables or indicators represented by boxes, indicated by arrows from the dependent variable.

The II theoretical model is consequential from FSLSM (Felder & Silverman 2002, 1988) and United States Department of Education definition of II (United States Department of Education, U.S.A 2010). FSLSM was adopted in this study to establish the OIMI model. FSLSM classifies students according to the ways they receive and process information on four categories of learning style (sensing and intuitive, visual and verbal, active and reflective, sequential and global). Furthermore, FSLSM model proposed a parallel teaching-style model which classifies instructional methods to address each learning style component. Moreover, the United States Department of Education in its National Education Technology Plan (2010) stated that, “Individualization refers to instruction that is paced to the learning needs of different learners. Learning goals are the same for all students, but students can progress through the material at different speeds according to their learning needs”. Therefore, varying the pace of instruction, method of instruction and learning content to cater for learners preferred learning styles is the individualization of instruction. FSLSM intended to be particularly applicable to engineering education. The pace of instruction for each student was determined based on the index of learning style, and the method of instruction was defined based on the proposed teaching-style model. The content was varied based on student need. II is the first dependent variable, II is assumed to cause variation and co-variation between the three observed variables or indicators represented by boxes on its left, indicated by arrows from the dependent II variable as shown in Figure 1.1.

The MI theoretical model is derived from Mayer’s Cognitive Theory of Multimedia Learning (Mayer 2010, 2009, 2005, 2004, 2003, 2001; Mayer et at 2004; Mayer & Moreno 2002, 1998) to construct the MI model. Mayer proposed design principles for MI, these principles are theoretically grounded based on the processing limitations of the working memory to handle the cognitive load associated with multimedia learning content (Mayer 2010; Ibrahim 2013). According to Sorden (2012), “The principles of multimedia learning should be viewed as instructional methods”. Thus, MI for ECS courses was designed based on these indicators. MI is the second unobserved dependent variable. As a latent or unobserved variable, MI is also assumed to cause variation and co-variation between the six observed variables or indicators represented by another six boxes on the right side, indicated by arrows coming from the dependent MI variable as shown in Figure 1.1.

Moreover, the OL theoretical model is derived from Moore’s Transactional Distance Theory (Moore et al. 2011; Moore, 1997, 1993, 1991, 1989, 1986) to design the OL environment. Moore had defined his Theory of Transactional Distance, as “the context of interaction in an instructional program, as a function of dialogue, structure, and learner autonomy”. The concept of distance in Moore’s theory is more than a geographic separation between instructors and students. It is a distance of perceptions and understandings that exists in every educational transaction in spite of delivering the instruction at distance. Suitable balance of dialogue, structure, and learner autonomy can bridge this distance (Benson & Samarawickrema, 2009). The Dialogue dimension refers to instructor-learners, among learners, and learners’ contents interaction to support the learning process (Moore 1997). Learner autonomy is determined by students' scope and capacity which independently govern their own learning in courses with varying degrees of structure and dialogue (Östlund 2008). The last dimension is the structure dimension, for this study it was assumed to be constant. Thus, all learners had the same course structure. Furthermore, OL is the third unobserved dependent variable. As a latent or unobserved variable, OL is also assumed to cause variation and co-variation between the four variables represented by boxes on the bottom side, indicated by arrows coming from the unobserved OL variable. As shown in Figure 1.1, this model indicates that measuring the latent variable, OL, by four observed variables.

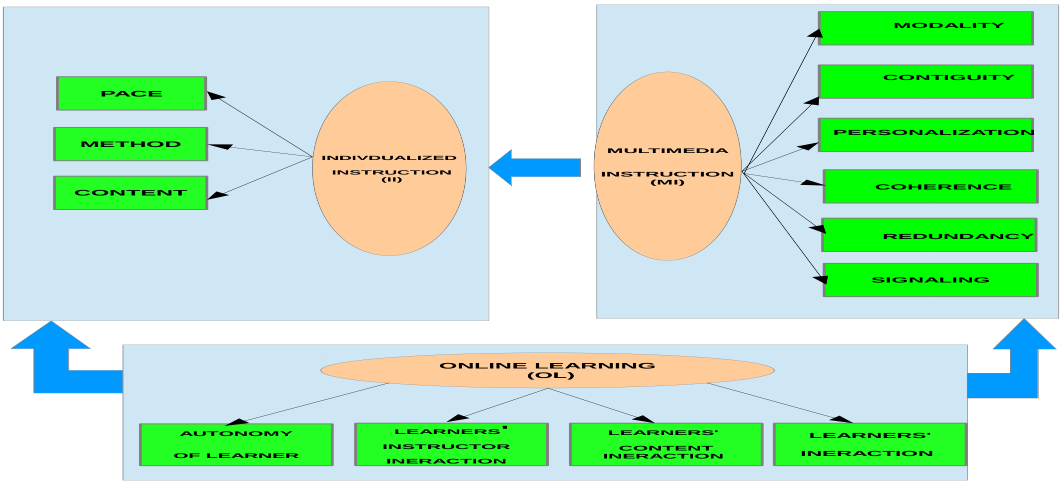
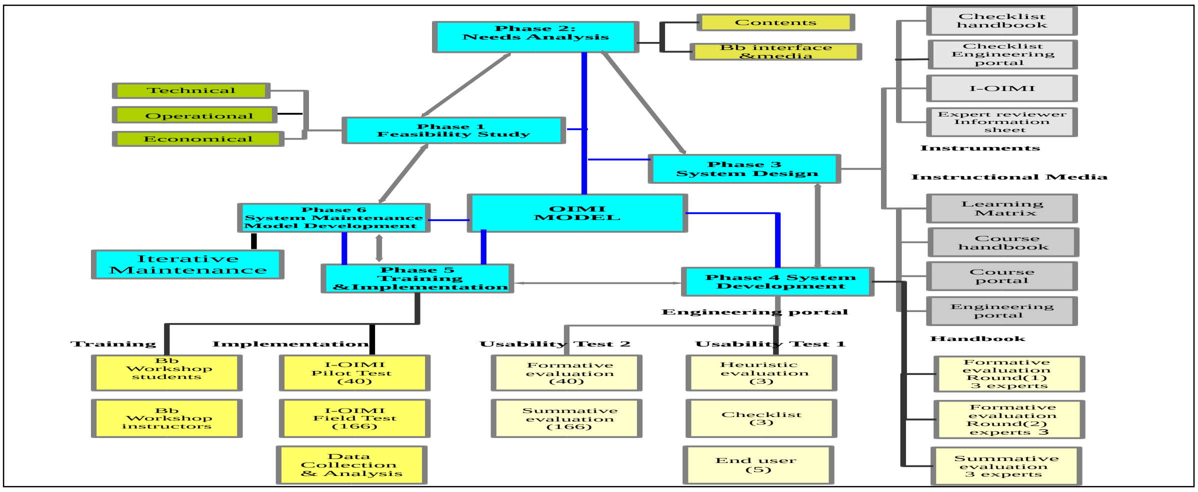
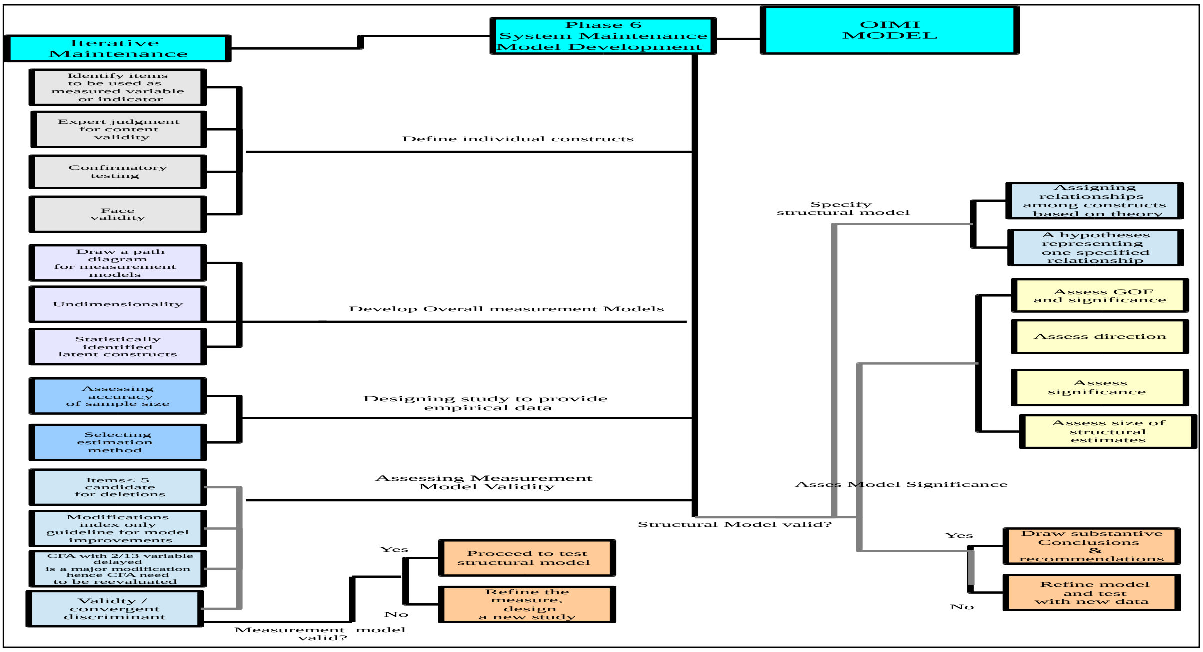


Figure 1.1 Theoretical Model

Moore's Transactional Distance Theory is the base of OL. It has the ability to adapt instruction based on Mayer Cognitive Theory. According to Hodges (2009), MI has the ability to create the needed interactions between learners, learners and instructor and between learners and content in the OL. Individualizing ECS can be achieved using the OL environment, which has a flexible adoption of learner pace in the form of learning style. Individuals with different learning styles may use different materials to study similar content. MI can be an excellent way to achieve this, which is useful with a variety of learning styles (Densing 2010). This environment also gives learners more time and options for supports which increase learner autonomy. Moreover, within the MI learners can have more contents format options as well as difficulty level of content learned based on learners need. This can be achieved without over harmed learner memory as indicated by the cognitive load theory of multimedia learning. The creation of ECS lessen plan and instructional action plan, the Dynamic Instruction Design (DID) model (Duffy et al. 2010) were used because it is flexible and adaptable to continual changes in the strategies that support OL. To conclude, these three unobserved dependent variables (II, MI and OL) made up the hypothesized confirmatory factor models. The theoretical model, as illustrated in Figure 1.1, describes the narrative part of the research novelty, the research objectives and also the scope of the research.

Method: The focuses of this research is on the development and modeling of an OIMI model for ECS. Before getting to the model developmental process, the study designs various types of testing and evaluation instruments for ECS as well as various types of instructional media and interface. Before the implementation process take place, the validation of the instrument to measure the variables are conducted. This is done in order to come up with a measurement model to ensure measurement for the factors are measured correctly accordingly. This study adopts the quantitative research method. According to the adapted approach Din (2010) Figure 3.1-3.2 illustrates the overall picture of the design, development and validation of the OIMI model for ECS using participative design and validation method.





INSTRUMENT AND DATA: This research used two main instruments to develop the OIMI model for ECS

Learning Styles Questionaire: The research adopted the Index of Learning styles (ILS) questionaire, It is an online instrument used to assess preferences on four dimensions of learning styles model (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) (Felder & Silverman 1991, 2002).

OIMI Model Questionaire (I-OIMI): Survey questionaire was developed and used as the major instrument in this study to check empirically all three hypothesized relationships. I-OIMI contains three sections, Section A for II measure, Section B for MI measure, and section C items for OL measure. Overall Cronbach Alpha Reliability Coefficient equals (OL=.960, MI=.927 and II = .933).

EXPERT REVIEW OF OIMI MODEL: After conducting the task analysis to come up with a handbook and an ECS portal various expert review and evaluate the ECS handbook and Engineering Education portal. A number of instruments were used to guide the development of the OIMI Model; Feasibility Study, Expert reviewer list of ECS course handbook formative and summative evaluation, Content validation of OIMI questionnaire. Expert reviewer information sheet of the research, Expert reviewers for usability test: Engineering Education Portal: for ECS.

Empirical results: This section presents the empirical results of the measurement model and structure equation modeling testing, the CFA and SEM for testing the hypothesized models and to validate them. The CFA was conducted to answer RQ1. CFA is represented by Stage 1-Stage 4 of the overall structural equation modeling process and SEM was conducted to answer RQ2-RQ4. SEM is represented by Stage 5-Stage 6 of the overall structural equation modeling process. AMOS [21] model-fitting program was used. The program adopted maximum likelihood estimation to generate estimates in the full-fledged measurement model. To assess the fit of the measurement models, the analysis relied on a number of descriptive fit indices; Table 3.14 below summarized the fit indices and the results of CFA and SEM

Table 3.14 Fit Indices and Results of CFA and SEM

Fit Indicators Used for CFA and SEM Analysis	Criteria	II	MI	OL	OL and ML	MI and II	II-MI-OL
Normed chi square =chi square/DF	< 5	1.270	3.971	1.233	4.	1.16	2.16
comparative fit index CFI	>0.9	.998	.997	.998	.943	.991	.957

Tucker lewis index TLI	>0.9	.9994	. 986	.993	.902	.987	.938
Root mean square error of approximation	Lower is batter < 0.1	.042	.72	.039	.141	.043	.088
propriety P	> 0.05	.260	.182	.292	.00	.187	.00
Magnitude of factor loadings/ Regression weights	> o.5 is acceptable > 0.7 is ideally	.66 to .81	.72 to. 99	.56 to .96	.93	.22	.31 to .99
Cronbach alphas for the sub-constructs		.72 to .933	.814 to .879	.814 to .909			
Cronbach alpha for the whole Model		.933	.927	.96			

Overall result indicates that the test failed to reject the hypothesized models thus, the procedures established that the models were a validated confirmatory measurement models which answer RQ1. Moreover, the results showed that the SEM procedures supported the theoretical framework, The OL→MI, II →MI and OL-MI-II relationships in the full-fledged SEM model.

DISCUSSIONS AND CONCLUSIONS

Measurement Models: The study was able to validate the II model, which is measured by three observed variables pace, method, and content as proposed in the literature. Also the study was able to validate the MI model, which is measured by five observed variables modality, contiguity, personalization, redundancy, and signaling. Likewise the study was able to validate OL model, which is measured by four observed variables autonomy of the learner, students' instructor interactions, students' content interactions, and students' interactions. The study offered evidence that the new measurement models did generate the data collected from Al al-Bayt University engineering learners. The result did not establish any basis, which can be used to claim that the three models are incorrect which can be used to claim that the models are incorrect.

II Measurement Model: This result was consistent with the literature of II. The pace of instruction was consistent with learners' needs in term of their learning style. Okeakwa (2011) emphasized, II motivates learners in the course and it reduces the incidence of failures. Moreover, the II method meets the diverse learning needs and encourages maximum utilization of available human resources. Besides, Graf (2007) provides evidence, showing that, "adaptive courses which fit the students' learning styles helps students to learn more effectively and therefore facilitated better learning for them". In line with Graf (2007), Felder (2002) developed the FSLSM to classify students according to the ways they receive and process information on a number of scales pertaining. FSLSM intended to be particularly applicable to engineering education. In addition, a parallel teaching-style model classifies instructional methods to address each learning style dimension.

The method and content of instruction were consistent with learners learning style. Felder and Silverman (2002) and Graf (2007) proposed teaching techniques to accommodate for each learning styles dimension in OL environment according to the FSLSM. Ustati and Hassan (2013) emphasized that instructors' awareness of preparing learning materials that could address learners learning styles will enable them to build effective and attractive learning environment.

MI Measurement Model: This result was consistent with the literature of MI. Mayer (2003, 2004, 2005, 2009, 2010) had proposed a framework within his Cognitive Theory of Multimedia Learning, based on dozens of experiments that describe the benefits of combining visuals and verbal information. He used the term multimedia principles for these finding. The main principles of Mayer Cognitive Theory of MI design are specifically, modality principle, contiguity principle, personalization principle, redundancy principle, coherence principle, and signaling principle. These theoretically grounded and evidence based principles are the base of any effective MI design. Sorden (2012) stated that "the principles of multimedia learning should be viewed as instructional methods whose primary goal is to foster meaningful learning". These principles were consistent with Mayer Cognitive Theory of MI. Harskampa et. al. (2007) found that "the illustrations-and-narration group outperformed the illustrations-and-text group on subsequent transfer tests for students who required less time to learn but not for students who required more time to learn." Moreover, Gerjets et al. (2013) confirmed that the modality principle, which maintains that the presentation of pictures with auditory texts lead to better learning outcomes than the presentation of pictures with visual text. In addition, Srinivasan et al. (2006) showed that "participants in the contiguous condition recalled significantly more feature-related facts than those in the non-contiguous condition". Moreover, Fazioli concluded that "Participants in the study had diverse opinions and perceptions about personalized narration, and were also able to explain aspects and factors of their motivation". Furthermore, Wolfson (2010) indicate that instructional coherence significantly improved the learning performance of both older and younger adults. In addition, the redundancy principle was consistent with Mayer Cognitive Theory of MI. Yavuz (2012) showed that "adding on-screen text to a multimedia presentation with animation and narration helped students to learn new vocabulary in a previously unfamiliar foreign language". Moreover, Ozcelika et al. (2009) suggested that the signaled group outperformed the non-signaled group on transfer and matching tests.

OL Measurement Model: This result was consistent with the literature of OL. Moore's (1993) Transactional Distance Theory provides techniques of analyzing the learning and teaching environment by screening it in terms of the separation between learners and between teacher and learners. Burgess (2006) emphasized that distance-education programs should allow learners to make decisions on the strategies of learning that fit their needs based on their capacities and individual learning style. Alhawiti (2013) concluded that the Transactional Distance Theory provides a constructive conceptual framework that helps educators recognize distance education and provides many hypotheses for future studies. The idea is that the psychological distance between learners and the teacher is bridged through the suitable balance of dialogue, structure and learner autonomy (Benson & Samarawickrema 2009). The dialogue and structure variables denote pedagogy and the last variable is learner autonomy (Duc 2012).

Students Instructor Interaction, Students Content Interaction and Students interaction were consistent with Moore's Theory of Transactional Distance. Moore (1989) and Moore and Kearsley (1996) emphasized that, effective and successful learning in a distance learning environment must plan and implement three forms of interaction mainly learners'-content interaction, learner-learner interaction, and learner-instructor interaction. Beside, Hao Huang (2010) found that peer individuals interactions enhances the learning experience, while, learner-instructor interactions according to Keng-Soon and Bonk (1998), helps the learner construct new understanding of the content. According to Usun (2004), "High levels of interaction are possible despite the physical separation of the instructor and the learners. Technologies, which are available today, allow a high degree of communication between the instructor and the learners and among the learners".

Autonomy of the Learner was consistent with Moore's Theory of Transactional Distance. Fladd (2007) found Significant positive relationships existed between all formats of interaction and satisfaction in online formats of instructional delivery.

Relationship between OL and MI: The results as showed that OL was related to the MI. Online MI can contribute to provide students with options regarding their learning. Moreover, online MI provides students as well as instructors a systematic framework to implement, use, repeat, and redevelop the pace of instruction, methods, and contents to individualize the instruction (Genden 2005). According to Junaidu (2008) students systematically perform far better in queries related to the demonstration of understanding and the application of algorithms that have been carefully animated. Students' comments have typically been that they found the course a lot easier when the first major examination happen and as they study the rather more heavily animated parts of the course subsequently. In addition, instructors in King Fahd University of Petroleum & Minerals find it easier to teach using animations courseware. Moreover, students master the algorithms which are being illustrated by reviewing it over and over. In other words, MI can improve the online experience and improve the ability to learn and retain information. The quality of the online MI depends upon the use of good design principles; students can improve test performance and improve the transfer of learning if they are exposed to well design MI (Genden 2005). Thus the result of this study was consistent with the literature of MI and OL that using MI in OL can help to create a student centered learning environment providing students an opportunity to be more active in the learning process.

Relationship between II and MI: The results as showed that II was related to the MI, however the relationship of .22 only indicates a moderate relationship between MI and II exists. No single method can be said to be globally effective because learners differ in preferences and interest. Combining the II method with other methods such as MI will increase the possibility for instructors to approach the needs of more students and to help them develop and reach their learning goals (Okeakwa 2011). Thus the result of this study was consistent with the literature of MI and II that the MI help create a student's centered learning environment which provides students with an opportunity for more individualization in the learning process.

Relationship among II, MI and OL: The results as showed that II, MI, and OL models were strongly correlated in ECS learning. The II and the OL appeared to be correlated, with regression coefficient .31, while II and MI appeared to be negatively correlated with absolute regression coefficient value of .48. As for MI and OL they had a strong correlation with regression coefficient .99. Electronic forms analysis showed how the learning and teaching process occurred in the OIMI model interactive environment. This rich environment decreases the transactional distance between learners, learner-instructor and learner contents, as well as, increasing the learners Autonomy.
Individualized ECS instruction is student centered. It focuses all action on the needs of each student in his efforts to realize predetermined exact objectives. It responds to individual student abilities in three ways (i) Multiple sensory approaches to teaching, (ii) increased student activity, which helps him internalize his learning, and (iii) enough time to overcome student weaknesses. ECS course format required active role of all engineering learners. As an investigational course, course format also is structured around discussion and group activities. Thus, all engineering students were required to keep up with the readings and actively contribute in course online site. Engineering students were asked to discuss the content of the readings in relation to ECS. They were allowed to ask questions for explanation, investigation, or discussion using discussion board, chat, and email as well as making effective use of online office hours. In order to meet the needs of diverse learning styles and needs, the course uses instructional methods via Blackboard Learning Management System technologies. These methods include, instructor-guided presentations (i.e., lectures assisted by PowerPoint or other visuals such as web and blog links), student-guided presentations, multimedia presentations, facilitated discussions that promote critical thinking, cooperative learning (i.e., small group structure emphasizing learning from and with others), and collaborative learning (i.e., varied groups). Each Learner was expected to show the ability to write engineering communication presentation outline in the first assignment. Moreover engineering virtual team oral presentation was the second assignment. Virtual team was required to develop a model of engineering communication process. In defining and analyzing a written or spoken situation, developing a logical, clear response to that situation, the team wrote and presented orally a response that is comprehensible to and suitable for a specific audience.

Through OIMI model students learned and practiced ECS via sharing of ideas, thoughts, opinions as well as personal experiences about material, posts and assignments through desiccation board and responding to emails. Students often feel that they can actually listen to the comments made by other students. Because everyone gets a chance to contribute, students are less upset with those that "over contribute" and can ask for clarification of any comments that are unclear. Having class discussions on was easy to accomplish, and it made student more fully interact with the course content. In addition OIMI model offer "chat rooms" for informal conversation between students, where student non class discussions can take place, there appears to be an increased bonding and friendship over traditional class environments. Furthermore opportunity for reflection time; students can think about their responses before posting and even during posting. This is very different from the "instant' response time in a face-to-face class where student have the pressure to respond within a few seconds. Moreover student accessed to the course site with a flexible time frames. The highlighting in individualized instruction is on the learners, the instructors' roles are more challenging. Individual learning activity was arranged for each student in line with his pace. The instructor was more professional and assumes the role of learning guide and professional. Moreover immediate responding from instructor to each student after an assignment submission let the student know that instructor had received the work, as well as, returned assignments within schedules motivate students to take what was learned on each assignment and apply it to the next assignment. Likewise supplement of different instructional materials, different types of instructional multimedia elements (audio, video, animations) and links to external websites and resources to appropriately facilitate engineering learners learning and communication throughout the course for the same contents. During the experiment period each learner can move on in his effort to learn the content with a freedom to interact with others and to give opinions to each other, and to instructors. Furthermore learners can edit their portal and create groups as preferred. These socialized learning environments promote the learning and practicing ECS through OIMI model.

This research took advantage of previous researches results to stand for the lack of any kind of correlation between OL, MI and II models. This was done by developing and validation of OIMI model for ECS at AL-aL Bayt University in Jordan. Overall conclusion was that the result of this study was consistent with the literature of II, MI and OL that the individualization is the key of OIMI model effectiveness.

IMPLICATIONS OF THE STUDY AND FUTURE RESEARCH

The contribution of this research stems from its establishment; integrated and logical proposed OIMI model, which is based on Mayer's Cognitive Theory of Multimedia Learning (Mayer 2003, 1997), FSLSM (Felder & Silverman 2002, 1988), DID model (Duffy et al. 2010) as a foundation to develop an effective lesson plan and instruction action plan, and Din (2010) theoretical empirical based design and development approach. These bases establish a strong rich and powerful Web based learner centered for the individualization of learning environment.

Theoretical Contributions and Implications of OIMI Model for Practitioners and Policy Makers

The most significant theoretical contribution of the study are the development and validation of; (i) II model, (ii) MI model, (iii) OL model, and (iv) OIMI model -an empirically validated multidisciplinary model- through integrations of learning theories and knowledge management system into ECS instruction. Combining theoretical grounded base with empirical validation evidence of OIMI model is a significant theoretical contribution to the felid of II, MI and OL.

Moreover, the main practical contribution of this study for practitioners is to bring to their attention the relationship among OIMI variables. Curricula development is a continuance process; therefore, with the flexibility of OIMI model for ECS, the use of OIMI may have positive implications for institutional performance in terms of the outcomes achieved and improve productivity for systems and improve learning opportunities for all engineering students. Finally, the use of OIMI model for ECS may motivate learners due to greater autonomy in decision-making.

Contributions of OIMI Model for Future Research: First, futures studies can further examine the direct and delayed achievements OIMI model for ECS. The second research thrust can expand the notions of the relationships of learning style preferences and direct and delayed achievements, and perceptions of learners in the OIMI model environment. The final, is to examine the relationships among many demographic properties of the participants in OIMI model environment.

This study has thus provided the basis for future research in many directions; (i) Providing the ability to evaluate the collaborative interaction of the learners, (ii) Enhancing and empowering blackboard learning management system with a Facebook environment to create more social profiling feature for the joined learners, (iii) Extending blackboard learning management system to identify the pace of learners automatically to support the learner-centered approach, (iv) Examine the relationships between learners' computer skill level; English language skill level; Internet skill level and the use of OIMI model, (v) Measuring the structure component of the online model, (vi) Finally, Examining the application of empirical evidence such as time and tracked website hits to potentially expose some problem areas (e.g. student email). As designers expand learning management system capabilities, researchers should guide them toward useful indicators.

CONCLUSION

Success in applying the science of learning occurs when good basic research and good applied research is the same thing. Understanding how people learn helps researchers identify instructional design features to be tested for effectiveness, and evidence concerning effective. (Mayer 2008). ECS needs more active and individualized instructional environment, based on learners pace. Students in OIMI model settings are doing more than they did in conventional systems. Experience is the best teacher, and a student's activity is the experience by which he learns. II is attained through the socialized learning environment. Establishments of interactive communications to overcome the distance between learners themselves and with instructors, often is so accurate. Embedding more technology in learning and teaching ECS can lead engineers to be part of the contemporary globalized world.

The objective of this dissertation sought to establish a theoretical framework that validly and reliably represent the OIMI model for ECS. The theoretical framework based on the methodology and data analysis provided empirical support for the conclusion that OIMI model is practical for ECS learning. These findings are associated with an integrated learning and teaching environment that allow for more socialized interaction. This study assisted engineering learners with differentiated learning style preferences to learn and practice ECS knowledge by integrating; OL, II and MI theories into the learning environment via Blackboard Course Management System. This conception represents a major adjustment in the way engineering faculties have usually developed ECS. Overall, the OIMI model will not replace, eliminate, or displace formal learning. Teaching institutions will still need to create, deliver, provide, set learning outcomes, prepare course outlines and reports on official recognition and conformity initiatives.

The results of the present study are relevant to give insights for theorists, learners, academic staff and knowledge management system designers and developers towards the goal of achieving effective learning and teaching environment for ECS. In addition, the present study expands the existing body of knowledge in several ways. Firstly, the positive of OIMI model for ECS learning to reach predetermines learners' objectives. Secondly, the learners appear to be enhanced to use new technology. To sum up the model is projected to be able to fit the data from other similar courses with the same characteristics offered by any other university in the world. In addition, when using SEM, all output can be generalized to other respondents with the same characteristics. Hence, the model can be generalized to the other courses having common characteristics.

"My Rabb! (Lord) increase me in knowledge." Surah Ta Ha

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