A conceptual framework for effective learning engagement towards interface design of teaching aids within tertiary education

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Abstract

Interactive teaching aids have replaced the role of lecturer on how lesson content is being delivered in the current tertiary learning environment. Consistently, this implementation gives the challenges in complex information delivery method within the tertiary learning environment. Towards this, lecturers basically have become interface designer in the development of these interactive multimedia teaching aids. Therefore, in designing an effective teaching aid as a communication tool, it should be well-designed and developed by the lecturers. With challenges towards effective learning engagement in the current set of tertiary education environment, despite interaction design has been researched over the last decade, focus on the contribution of interface design principles towards learning engagement is still lacking. As interface design performed as a medium that communicates between user and the computer system through effective principles and elements of design, this paper empirically discusses the importance of lecturers’ and tutors’ understanding on how does interface design play a role in the process of designing their teaching aids. This paper focuses on exploratory study through existing literature review on the applicability of the principle and elements guidelines of interface design fundamentals through clear and effective visual communication towards effective learning engagement. Further this paper extensively proposed a framework on how do the applicability and ability of the interface design principles in teaching aids contribute towards the effective learning engagement in tertiary education level.

Keywords: Interface Design, Interactive Teaching Aids, Interaction With Interface, Interactive Courseware

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INTRODUCTION

The rapid growth of technology for the past twenty years reshaped the teaching and learning environment. Internet usage and computers have already become common for students at present as a source of reference in completing their daily assignments. The availability of this technology would enable all students to exploit various information sources. In accordance with that, many lecturers in higher learning institutions are using interactive multimedia teaching material in their classes to assist students in gaining more knowledge, to motivate students to learn substantially by engaging them more in their learning process (Mayer and Moreno 2002), to improve students’ learning outcomes and performance and to help students build new knowledge and skills related to learning goals (Alessi and Trollip 2000). The extensive technology advancement moreover has been resulting in the importance of E-learning (Faghih et al. 2014) in supporting the process of teaching and learning (Heise et al. 2015). In order to meet the rising challenges of educators in higher learning institutions in improving teaching and learning experience, most researchers advised that there should be consideration towards the user interface within teaching material (Yang et al. 2012). Therefore, evaluations towards the research of the overall acceptability of an interactive multimedia teaching material, which has been emerging and could be rated either from the instructional design theories perspective, in which this is associated with the pedagogical value of courseware systems and interactive learning or are there broader focuses on interface design of interactive learning material as well.

In a simple definition, interface design as described by scholars is a section in a software component which allows human interaction with a computer system. Interface design is also regarded as the product’s ‘front-end’ in which it enables the user interaction through communication and conversation. Digitally, interface design is

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shaped from manipulated multimedia elements such as text, graphics, images, animation, videos and audios controlling any content delivered through an interactive element that blends together (Vaughan 2014). Furthermore, in developing a successful user interface according to Shneiderman (2010) there are three principal guidelines namely: (1) Determine users’ skill level; (2) Identify the task and (3) Choose an interaction style. In a previous research, Kamaruddin (2012) further summarized that the types of interface design consist of four main categories with separate features which is explained in Table 1 below.

<table>
<thead>
<tr>
<th>Table 1: 4 Main categories of interface (Kamaruddin 2012)</th>
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<tr>
<td>Presentation interface</td>
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<td>Conversation interface</td>
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<td>Navigation interface</td>
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<td>Explanation interface</td>
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Borchers (2001) and Kamaruddin (2012) both claimed that interface design itself is a medium that communicates between the user and computer system. It does not just consist of the aesthetic sense of design value towards the appearance of images, icons, title and text but it also involves with interaction, engagement and participation value. In reference to this, (Oh and Moon 2013) in their research have discovered that user interface design should provide a direct interaction with the user and be more compelling. To constrain these relationships, Kamaruddin (2012) further established that the effectiveness of teaching and learning experience does not solely depend on the technology usage but is facilitated by three elements namely: ‘interaction design’, ‘information design’ and ‘interface design’. The interconnection of the three relationships is shown in Figure 1. Furthermore, in regards to improving the learning experiences and outcomes among students, these three elements must be collectively understood.

Gao, Coldwell-Neilson, and Goscinski (2013) explained that teaching aid is accomplished as a communication tool for the present teaching and learning activities. In relation to this, each teaching aid should be well-designed and developed where student engagement will absolutely improve. As claimed by Stoop, Kreutzer,
and Kircz (2013), the content is not only being consumed by the students as the receiver, which on the other hand should be able to be internalized and replicated. This further increases the need to ascertain the ability and applicability of the principles and elements of design on interface value enhancement in delivering complex technical education material. With the rapid development of technology in the tertiary learning environments with different cohorts of students’ capabilities of technology advancement, arise the demanding challenges among lecturers in designing their multimedia teaching aid. As asserted by Saritepeci and Cakir (2015), the students learning engagement level in a learning and teaching process is regarded as one of the indicators for teaching activities’ quality. Despite the existence of substantial frameworks of approaches and models in designing quality online learning environment (Czerkawski and Lyman 2016), they concluded in their research that students’ learning engagement has substantially inclined towards issues which are getting more complex which raised the need to explore in further research. With regards to this, it is critical to explore to what extent are the effectiveness of the multimedia teaching aid’s interface design principles and elements contributing towards an effective learning engagement, as it is one of the three components that contributes towards effective learning experience (Kamaruddin 2012), within the tertiary education.

BACKGROUND LITERATURE

Process of teaching and learning where the delivery of a teaching and learning content takes place requires both a Lecturer and students. Various techniques and approaches are being applied by educators that involve various digital media and technologies to encourage the students’ participation (Taylor and Statler 2014; Chadyiwa and Mgweshi 2015; Taher et al. 2016). In the current tertiary learning environment, interactive multimedia teaching content has replaced chalk, black boards and papers in delivering teaching content and it offers opulent convenience in meeting the learning requirements (Kim, Kim, and Whang 2013) and is capable of elevating teaching and learning process where according to Ferrarini and Mateer (2014) is “a connection between students’ knowledge and learning objectives bridged together” through students’ learning engagement.

The digital content in education has been around for the past thirty years with the rapid advancement of Information Technology (IT) that transferred reading from paper to digitized screen display (Huang, Chen, and Ho 2014). This rapid advancement involving media, content and technology moreover has developed and shaped the current tertiary learning environment. In relation to this, the students involved are identified as ‘Generation Y’ or also described as “digital natives” where they grow up with boundless capacity of technology using various IT gadgets (Steenkamp and Rudman 2013). In addition to the development, a tertiary education institution receives different cohorts of students yearly with new level of technology advancement capabilities. In order to improve students’ learning engagement, Gao et al. (2013) have reported that it is important to promote a well-established teaching aid because it is one of the two-way factors together with students, lecturers, peers and learning environment. Zapke, Leach, and Butler (2009) further supported this by claiming that lecturers in tertiary institutions are now in the central position of the outlook. Toward this, Handal, MacNish, and Petocz (2013) further emphasized that lecturers are required to review their teaching and learning material that can accommodate the forth-coming education. Salmon and Wright (2014) stressed that academicians in tertiary institutions are required to revolutionize their method of delivering the teaching content.

Human Computer Interaction (HCI) according to Rosinski and Squire (2009) occurs in intersected fields of science computing, design arts and social sciences where its goal should improve the human experience interaction with a device (Rosinski and Squire 2009). During the process, Wu and Guan (2011) describe this dynamic relativity as ‘behavior sequence’ in human behavior towards interaction design which involves human reaction towards the multimedia product. In addressing this issue, Chase (2012) in her research furthermore emphasized the importance of providing a well-functioned user interface, which meets the learning curve. As revealed by Thomassen and Ozcan (2010) interaction design is comparably a developing area as proposed by Bill Moggridge and broadens into digital media information design. As content and information is being displayed in an interface, it is important to have certain guidelines in organizing the content in an interface according to its design principles for displaying design in Human-Centered Interaction (Eskridge, Still, and Hoffman 2014). In teaching and learning, educators are able to practically design and develop their teaching aid with the intention to increase the efficiency of teaching and learning content. As content and information are being displayed in an interface, it is
important to have certain guidelines in organizing the content in an interface according to its design principles for display design in Human-Centered Interaction (Eskridge et al. 2014). Chase (2012) in her research furthermore emphasized the importance of providing a well-functioned user interface, which meets the learning curve. In relation to the importance of teaching and learning material in ensuring students’ engagement, it is found that there is lack of literature existing in regards to teaching aids development. This is mentioned by Tomlinson (2012) where there is lack of literature documenting the actual effect of various types of teaching aids. He further reported that Richards (2015) stresses, “there is very little research into the design and effects of materials” which further suggest further investigation to be carried out towards teaching aid development.

Although the increasing focus on arguments towards students’ engagement at tertiary institution can be seen over the last decade (Vaughan 2014), focus on the contribution of interface design principles towards learning engagement which may add to on-going students’ outcome is still lacking (Mulqueeny et al. 2015). With regards to this, it is important to identify what are the principles and elements of effective interface design for a teaching aid, how it is being developed and how does it affect the learning engagement in an effective teaching and learning process.

**Theoretical and Practical Implications**

The active role of information technology in the education environment as emphasized by (Li 2016) identified the existence of interactivity feature being promoted. This further changed the role of educators towards facilitating students through encouragements in exploration from just solely an information provider. In order to achieve the active involvement of students in a learning process through interactive multimedia teaching aids, a meaningful and appropriate response to student’s action towards the learning process is required. This will enable the students to control their own pace and learning mode. In addition, by interacting directly with the interactive teaching aid, interface design becomes a part of an entire product that provides experience and enhances interaction in the learning process. Thus, an interface design in interactive teaching aids is critically necessary to ensure the effectiveness of interactive teaching aids. Thomassen and Ozcan (2010) revealed that interaction design is relatively a new field as proposed by Moggridge and Atkinson (2007). It has been expanding through a growing process which currently outgrows areas such as digital media design, information design and media design. However, the current increasing popularity of technology with various screen platforms over the past few years has prompted the acceleration of screen reading within the changes of the people’s digital lifestyle (Wang and Huang 2015). They reported from ‘The Nielsen Norman Group’ usability testing which has proposed the term ‘mental modes’. This paper focuses on exploratory study through existing literature review on the applicability of the principle and elements guidelines of interface design fundamentals through clear and effective visual communication towards effective learning engagement. The reviews reflect the continuing evolution of interface in general and learning engagement in education specifically. What becomes evident from these discussions in the literature is that lecturers must understand students’ needs and in the context of E-learning, this includes expertise on how students learn and how technology can be meaningfully integrated into that learning process. With that, to create appropriate teaching aids for educational contexts, lecturers must apply learning theories and focus particularly on the interface design as fundamental aspects of the design process.

**A CONCEPTUAL FRAMEWORK FOR EFFECTIVE LEARNING ENGAGEMENT TOWARDS INTERFACE DESIGN OF TEACHING AIDS**

The design of an effective interface design arises from a careful analysis of the proposed user’s tasks and environment. It requires an understanding of at least three components: (1) the users who will interact with it, (2) the capacity of the computer systems and software, and (3) the interactions between users and the computer systems. To further the understanding of these three elements, a variety of methodologies, guidelines and principles have been established. Early on, Schneiderman (1998) suggested three pillars for successful user-interface development from the perspective of HCI (human-computer interaction). They are: (1) guidelines and process (using both theory and a model), (2) user interface software tool (arising from a prototype), and (3) usability testing and expert review (conducted with a representative user group). This is illustrated in Figure 2.
The international literature makes it clear that understanding of student needs and involvement are the key factors for the development of effective interaction and interface design in teaching aids. From this understanding, we might conclude that if the teaching aids were developed with a deep understanding of the students’ needs, requirements and involvement, along with pedagogical knowledge, instructional design and interface design theories identified in the literature, the existing teaching aids then would not face any barriers to be adapted in classrooms.

Accordingly, the conceptual framework shown in figure 3 explains the primary components of an effective learning engagement for both students and lecturers as the user of interactive teaching aids. The effectiveness of learning engagement with teaching aids is also consisting of the principles and elements of interface design and interaction design. Essentially, critical exploration should take place on the applicability and ability of the interface design principles and elements in teaching aids within the tertiary education in ensuring the effectiveness of learning experiences. In particular, focus should be given specifically towards the relation of the principles and elements of interface design as an important component contributing towards effective student-learning engagement.

Figure 2. The three pillars of successful user-interface development (Source: Schneiderman 1998)

Figure 3. A conceptual framework for effective learning engagement towards interface design of teaching aids
This conceptual framework will also allow the identification of interface design roles of teaching aids within the tertiary education. This is to sustain the effective learning engagement of the Gen Y in the tertiary institutions as it contributes to the growth of challenges among lecturers in developing a good interface design for teaching aids.

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CONCLUSION

Development of ICT has contributed to the changes in teaching and learning process with advancement in multimedia for the past that is capable of elevating teaching and learning process within tertiary education. Teaching aid as a communication tool should be well-designed where student engagement will absolutely improve. However a tertiary education institution receives different cohorts of students yearly with new level of technology advancement capabilities. Toward this, lecturers are required to review their teaching and learning material and revolutionize their methods of delivering the teaching content. Although there are increasing focuses on arguments towards students’ engagement at tertiary institution over the last decade, very few researches focus on interface design principles’ contribution in learning engagement. Even though interaction design has been researched for quite some time, existing literature is found lacking of sources in regards to interface design principles and elements on teaching aids for tertiary education. This paper proposed a conceptual framework for effective learning engagement towards interface design of teaching aids within tertiary education. By focusing on the importance of understanding principles and elements of multimedia interface design of the teaching aids, it shall further improve the effective engagement of Gen Y students. It is hoped that this study can further suggest future research on identifying the principles and element guidelines in regards to multimedia teaching aids towards an effective learning engagement for various education levels of studies.

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