

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

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Abstract

Aim: This paper aims to draw attention to the value of pedagogical aids and to analyze how well they facilitate active learning at the tertiary level through the application of interface design principles.

Methodology: In this paper, we conduct an exploratory literature review to determine whether interface design fundamentals' principles and elements guidelines can be applied to improve learning engagement through clear and effective visual communication.

Findings: This research delves into the fundamentals of how interactive teaching tools can foster meaningful learning experiences for students and instructors.

Implications/Novelty: The proposed model will further enhance the efficient engagement of Gen Y students by emphasizing the significance of understanding the principles and elements of multimedia interface design of the teaching aids. It is hoped that this research will point the way to additional studies to determine the principles and element guidelines for multimedia teaching aids toward an effective learning engagement for a wide range of educational levels of study.

Key Words: Interface Design, Interactive Teaching Aids, Interaction With Interface, Interactive Courseware

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INTRODUCTION

Over the past two decades, advancements in technology have dramatically altered classroom dynamics. Today's students increasingly rely on digital resources like the Internet and personal computers to help them complete their daily coursework. If this equipment were universally accessible, students could better utilize a wide range of resources for their research projects. Accordingly, many professors in higher education use multimedia interactive teaching materials in their classrooms to help students learn more, to motivate students to learn substantially by engaging them more in the learning process, to improve student's learning outcomes and performance, and to help students build new knowledge and skills related to learning goals (Mayer and Moreno 2002). (Alessi and Trollip 2000). More importantly, E-significance learning's in facilitating the educational process has been growing due to the rapid development of technological tools (Faghih et al., 2014). (Heise et al. 2015). Most researchers have recommended that the user interface within educational materials be taken into account to help professors in higher education institutions deal with the increasing demands placed on them to improve the quality of the education they provide their students (Yang et al. 2012). Therefore, evaluations of the research of the overall acceptability of an interactive multimedia teaching material, which has been emerging, could be rated either from the perspective of instructional design theories, where this is associated with the pedagogical value of courseware systems and interactive learning or from a more general focus on the interface design of interactive learning material.

Interface design, according to academics, is a part of the software that facilitates communication between a human and a computer. The user can interact with the product through communication and conversation thanks to interface design, also known as the "front-end" of the product. Digitally, interface design is created from manipulated multimedia elements like text, graphics, images, animation, videos, and audio that control any content

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delivered through an interactive element that blends in (Vaughan 2014). In addition, Shneiderman (2010) identifies three main guidelines that should be followed when creating a successful user interface. You must first (1) establish the proficiency of the users, (2) specify the nature of the task at hand, and (3) select an appropriate mode of interaction. Cording to a previous study by Kamaruddin (2012), there are four distinct types of interface design, each of which is described in Table 1 below.

Table 1: 4 Main categories of interface (Kamaruddin 2012)

Presentation interface	Impacts the way users feel about information. It is produced through the elements of screen design, graphics, menu, layout, color and so on.
Conversation interface	Controls how the system communicates with the user of the system and mediates between the user and the system (as a form of communication).
Navigation interface	Controls the way in which users can move from one piece of information to search for other information (for example, movement from one page to another page).
Explanation interface	Controls the way in which the system supports users' different activities by providing guidance and explanation (for example, text and visual cues such as icons, bread crumb trails etc.).

Interface design is a medium for two-way communication between the user and the computer system, according to Borchers (2001) and Kamaruddin (2012). It's not just about how pretty things look; it's also about getting people to interact with each other and take part. In light of this, (Oh and Moon, 2013) found that user interface design should be more compelling and allow for more direct user interaction. Kamaruddin (2012) further established that the success of the teaching and learning experience does not solely depend on the technology used but is facilitated by three elements: the design of the interface, the design of the information, and the design of the interaction between the two. Figure 1 illustrates the network formed by these three connections. Also, these three components must be grasped to improve student learning experiences and outcomes.

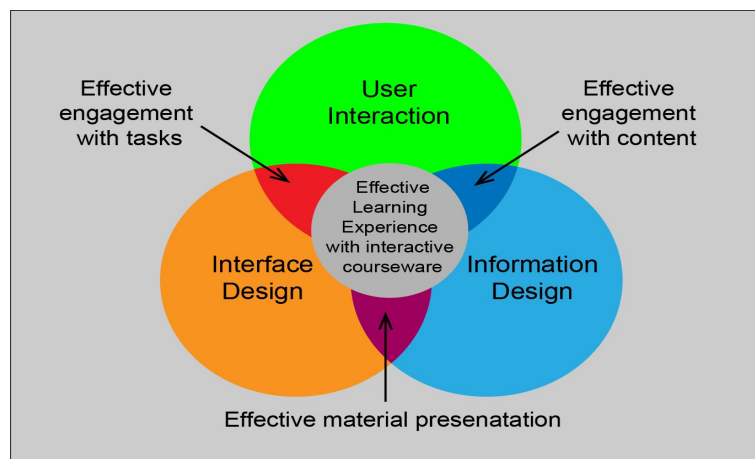


Figure 1. The design relationship approach to create effective learning experiences (Kamaruddin 2012)

The term "teaching aid" was coined by Gao, Coldwell-Neilson, and Goscinski (2013) to describe a communication tool used in modern classrooms. Every tool used in the classroom should be created with the knowledge that it will increase student involvement. Students are not simply acting as passive recipients of the material., Stoop, Kreutzer, and Kircz (2013) claim that it should be possible for students to internalize and replicate the lessons they learn. Because of this, it is even more important to evaluate the impact of design principles and elements on improving the interface value at which complex technical education is being disseminated. Because students in

different classes may have varying levels of familiarity with and comfort with using new technologies, professors face formidable obstacles when creating multimedia instructional materials. According to Saritepeci and Cakir (2015), one measure of a class's effectiveness is the degree to which its students actively participate in the material being taught. Czerkowski and Lyman's (2016) research found that even though there are robust frameworks of approaches and models in designing quality online learning environments, students' learning engagement has substantially leaned toward issues that are getting more complex, which raised the need to explore further research. In this context, it is important to investigate the extent to which the principles and elements of the interface design of multimedia teaching aids contribute to an effective learning engagement, as this is one of the three components that contribute to an effective learning experience in higher education (Kamaruddin, 2012).

LITERATURE REVIEW

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 Mgutshini 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.

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.

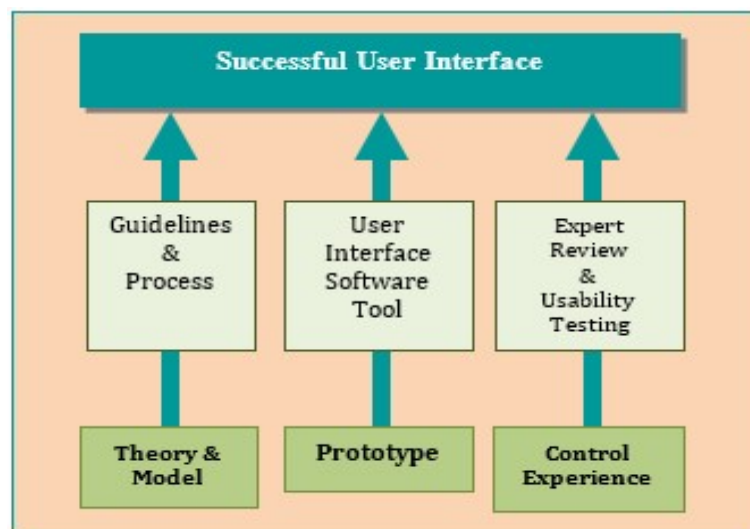


Figure 2. The three pillars of successful user-interface development (Source: Schneiderman 1998)

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.

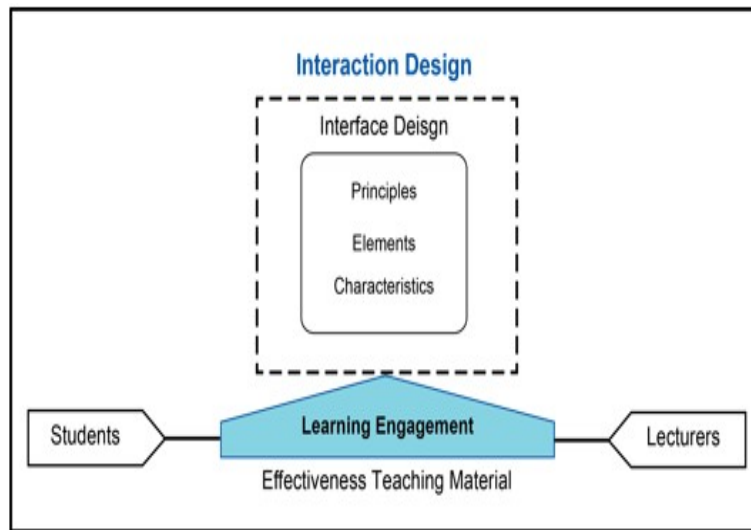


Figure 3. A conceptual framework for effective learning engagement towards interface design of teaching aids

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.

RESULTS AND DISCUSSION

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.

CONCLUSION, RECOMMENDATIONS AND IMPLICATIONS

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.

Limitations and Future Research Directions

This study is limited in scope; 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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