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Understanding Interface Design Role in Facilitating Teaching and Learning Process: A Conceptual Framework

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Abstract

Effective learning experiences requirements effective user interaction, information design and interface design. Interface design therefore is an important aspect of interaction design. From education view, as the context through which users control different activities, interfaces serve as an explanation for interaction. Within this context, a literature review on several scholars was conducted to understand the role of interface design in facilitating teaching and learning processes. The key objective is to provide opportunities to discuss the important of interface design role in development of teaching and learning tools.

Keywords Interface design, Teaching and Learning.

Abstrak

Pengalaman dalam prosess pembelajaran yang berkesan memerlukan interaksi pengguna, reka bentuk dan reka bentuk antara muka yang efektif. Namun demikian, reka bentuk antara muka adalah satu aspek penting dalam sesebuah interaksi. Dari sudut pandangan pendidikan, yang mana telah dikenalpasti bahawa pengguna mengawal aktiviti dalam bentuk yang berbeza, antara muka berkhidmat sebagai penjelasan bagi interaksi tersebut. Mengambil kira pandangan ini, kajian literatur terhadap beberapa cendekiawan telah dijalankan untuk memahami apakah peranan sebenar reka bentuk antara muka dalam memudahkan proses pengajaran dan pembelajaran. Objektif utama perbincangan adalah untuk menyediakan peluang dalam membincangkan kepentingan dan peranan reka bentuk antara muka dalam pembinaan sesebuah alat pengajaran dan pembelajaran.

Kata kunci *Reka bentuk Antara Muka, Pengajaran dan Pembelajaran.*

INTRODUCTION

The broad international literature on interactive courseware explains that an effective learning experience is achieved when students are engaged and involved in the learning activities (Biggs, 2003; Sambrook, 2003) and that interactive courseware should therefore motivate students to learn by encouraging them to actively participate (Mayer, 2002). That is, it should enhance the learning experience by facilitating users' interaction and experience. While it also has been argued that the level of engagement and courseware use depends on teachers' and students' attitudes towards the interactive courseware, the performance of the interface design of the interactive courseware and its implementation. In example, it has been established that various factors influence its effectivity, which are range from the availability of the necessary technology, accessibility, interaction design and interface design (Mayer, 2002). In particular however, the uptake and effectiveness of the interactive courseware depends on aspects of interface design and the extent to which it accommodates students' needs, encourages students' interaction (Yang & Cornelius, 2004) and contributes to an effective interactive learning experience. And, it is broadly accepted that poor interface design and interactivity affect user interaction and can diminish the learning experiences of users. Thus within this view, a few books and some journals been reviewed to gaining in-depth understanding on role of interface design in facilitating teaching and learning process.

Interface Design: A Brief Understanding

Put simply, interface design is defined in the literature as the aspect of software that allows humans to interact with a machine. As Soren (2005) describes it, interface design bridges the gap between users and machines, so that data is arranged in a systematic way to make it easier for users to navigate, access information efficiently, and understand the product. Interface design may be regarded as the 'front-end' of the product, which enables the users to interact, communicate and have conversations with the machine while code and data from the 'back-end' (Galitz, 2002). In information communication technologies (ITCs) interface design refers to the overall screen-presentation of the application, which allows the user to access and understand the information required or sought. Borchers (2001), argues that interface design does not just pertain to aesthetic values, or the look and feel that is produced by the design elements such as colour, font size, images and layout (i.e. the positioning of title, menus, keys etc.) but that it is a communication tool that mediates between users and computer systems.

From the perspective of interaction design, interface design is defined as a specific approach to component arrangement, in which the designer facilitates access to content, activities, collaborations and so on. Preece, Rogers and Sharp (2002) believe that the interface design of an application determines how users feel about the communication process, and Cooper and Reimann (2003) similarly suggest that interface design is the primary aspect that determines users' satisfaction. Thus, to ensure that users of computer systems are satisfied and access to the content is maximized, a designer of an interactive system must create an appropriate and effective interface.

In 1993, Weiss mapped the inter-related components of the interface which, he argued, consists of four main categories with separate features. These can be summarized as follows:

a) *Presentation interface,* which impacts on the way the user feels about information and is produced through the elements of screen design, such as graphics, menu, layout, colour and so on.

b) *Conversation interface,* which controls how the system communicates with the user of the system and mediates between the user and the system (as a form of communication).

c) *Navigation interface,* which controls the way in which the user can move from one piece of information to search for other information (for example, in movement from one page to another page).

d) *Explanation interface,* which controls the way in which the system supports the user's different activities by providing guidance and explanation (through, for example, text and visual cues such as icons, bread crumb trails etc.

That is, interface design should not only be appealing and establish a look and feel that users will respond to positively, it must also help users to find and remember information, and support them in the tasks that they need to perform.

Interface Design in Facilitating Teaching and Learning Process

Interface design therefore is an important aspect of interaction design. As the context through which users control different activities, interfaces serve as an explanation for interaction. For example, interface design should mediate tasks by providing direction for interaction through text, images or icons, they should link between activities, and they should enable the provision of appropriate feedback as an encouragement to the user to continue using the software. That is, an interface produces tangible effects in facilitating and encouraging interaction between users and systems. As Nielsen (2000) argues, an effective interface design gives users control over the interactive courseware. Moreover, key authors in the field have established that graphical presentations through interface design can provide users with the confidence that they can find what they want without wasting their time (Norman, 2002; Nielsen, 2000), and can support end-users in the tasks they must perform. As explained by Galitz (2002), if the interface is well designed, users will not only perform well, but their experience will be enriched.

On the other hand, poor interface design can lead to stress (Balinsky, 2006). From a users' point of view then, effective interface design is a major factor that contributes to the degree of pleasure and agency of interaction and this has a flow on impact on the enjoyment and effectivity of learning experiences. Besides these broad functions and principles, it is also important to note that interfaces must accommodate the varying contexts and needs of users. Norman (2002) has argued that, because user experience

is the key to the quality of the end product, the development of interface design should therefore begin with an understanding of the user and the reasons they are using the product. Therefore, the process of interface design should first include an investigation of the target demographic, needs and the level of experience with technology.

However, designing an interface may involve a complex creative process that accommodates several target end-users with different needs, levels of experience and so on. As Nielsen (2000) argues, an effective interface design blends user experiences and needs. As Galitz (2002) have pointed out, interface design that is developed without a clear understanding of the software's target users and the context of use, may not be usable, effective or pleasurable. This is not to say that all interface design for computer software must be designed to accommodate all user's needs, but that it must be designed for the needs and abilities of the users for whom it is intended.

Interface design therefore must be understood as a key factor in interacting with a software system in a meaningful way. Therefore, any evaluation of the effectiveness and appropriateness of the interface design of an application should include observing user interactions with it to establish access, usability and engagement. The use of technology alone does not automatically translate into effective learning experiences. There are a number of inter-connected factors that are important to ensure this. Savery and Duffy (1995) argued early on that learning is optimized when the process of learning is active and many education specialists have since gone on to argue that effective learning requires a degree of participation and involvement in the learning environment (Boud & Prosser, 2001;Preece, Rogers & Sharp 2002). Oliver and Herrington (2003) extend this argument by suggesting that it is a combination of the nature of the interactive learning material, the level of learner engagement, and the forms of learning support offered that is required to provide quality of learning experiences. Biggs (2003) and Sambrook (2003) concur but frame these three factors differently as: effective learning material presentation, effective engagement with tasks, and effective engagement with content.

These three types of effectivity can be facilitated through three design elements: interaction design, information design, and interface design. Numerous researchers have established the importance of these three components of interactive courseware. For example, Ben-Ari (1998) argues that interaction is one of the key factors in effective learning, and that different kinds of interaction promote different degrees of learning. Van Duyne, Landayand Hong (2003) claim that learning experiences are influenced more by interface performance and instructional design strategies associated with the learning materials than by the type of technology used to deliver the instruction. And Thurmond, Wambach and Conners (2002) propose that the mode of content delivery influences user interaction, while interface design can enhance the active participation of the user. Yang and Cornelius (2004) also affirm that in order to produce quality learning experiences, effective user interaction and interface design are essential. In addition, Paluch (2006) and Shedroff (1994) established that it is the combination of interaction, information and interface design that is the key to effective user experience design. This interconnected relationship is shown in Figure 1.

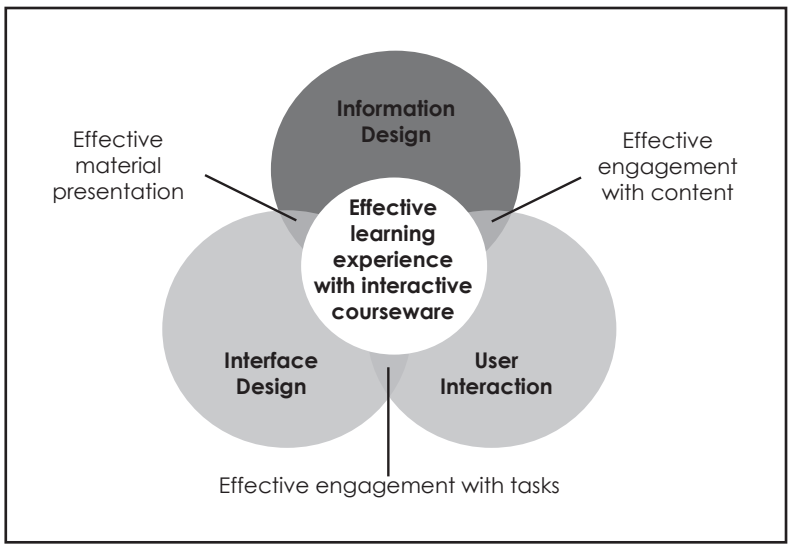

Fig. 9.1 Relationship of design factors for creating effective learning experiences.

What can be drawn from this diagram is that it is necessary to consider the three elements (interaction design, information design and interface design) as inter-related factors in any research on students' learning experiences and the potential learning outcomes that can be gained from interactive courseware. And, to improve students' learning experiences and outcomes, these three elements must to be understood in concert. However, there is a case for focusing on interface design performance in an analysis of the effectivity of interactive courseware. This position is strongly supported by Raskin (2000) who argues that interface design is the essential factor in the quality of learning experiences, because an interface must inherently cater to learners'' possible and expected interactions.

Furthermore, Shedroff (2005) argues that interface design is the primary factor that affects users' understanding and whether the user misunderstands or misinterprets the material presented. While interaction design is an important structural factor that impacts on engagement, it is interface design that acts as a filter of information (Johnson, 1997), as it determines the information that users can access, what they can do with the content, how they perceive tasks and how they interpret information. In addition, interface design contributes to the motivation of the learner to continue using the application. And, as Balinsky (2006) asserts, a well - designed interface can excite user interest, demonstrate concepts clearly with interactive examples, and allow learners to manipulate, play with, and develop ownership of concepts.

From a pedagogical perspective, this is particularly important as it relates to access, as well as to the interpretation and value of incorporated learning material. In addition, for the user to become actively involved in the learning process through interactive courseware, the interface design must not only respond appropriately and meaningfully to user actions, it must enable the user to control his/her own pace and mode of learning. That is, interface design is an integral part of an entire product, and

it determines experience and enhances interaction. It therefore impacts the most on the use of interactive courseware in the learning process as well as its effectiveness.

Further, as part of the computer or electronic device that can be seen and interacted with, interface design performed as a bridge connecting the interface's appearance to users' experience. According to Mayer (2002), a well-designed interface of an educational courseware can enhance learning experiences and further adds to the satisfaction of the students and increases motivation and engagement (Kamaruddin, 2010). Therefore, the development of an interface design is distinguished at two levels: the conceptual and the physical. Barlex (2007) defines the conceptual design as the usability of a design solution, referring to making a product such as a website easier to access or use. He also explains that physical design is a more refined level that defines the aesthetic or visual appearance of a product.

Interface design moreover has a commercial value and is judged by what it does, how it works, what it looks like, who it is for and how it fits together (Barlex, 2007). Here is where physical part comes in place. According to Precel *et al.,* (2009), designing an interfaces, particularly for teaching and learning, requires implementation of pedagogical approaches. Laurillard (2002) similarly emphasizes three aspects that must be considered when developing technology-based learning applications. These are: the user interface, the design of learning activities, and assessment of whether learning objectives have been met. This means that designers will have to seek a suitable learning principles, know how to apply the principles in the interface design process and able to investigate their effectiveness. Thus it shown that both levels, conceptual and physical, are a key determinants of the success or failure of the technology-based learning applications**.**

On top of this understanding, Greenberg (1996) was suggested that it is necessary for users to be involved in the process of developing interface design for teaching and learning product. In doing this, designers are able to gain a richer understanding of user requirements. It is proposed that this process should be highly iterative in order to gain users' feedback and approval (see Figure 9.2). In this way, as stated by Hoadley and Cox (2009), users are involved as co-constructors of the design process.

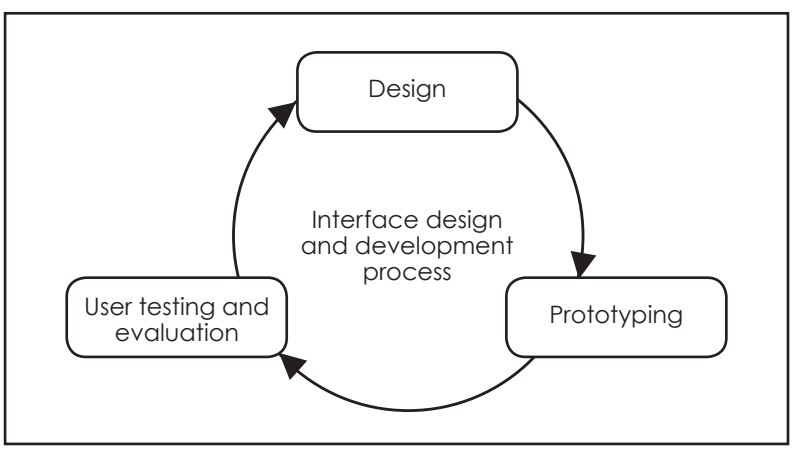

Fig. 9.2 The iterative process of user interface design (adapted from Greenberg, 1996).

Users' active participation in the design process helps achieve the goals of producing an interface design that is useful and usable (Norman, 2002). The difficulties of implementing this method however involve identifying and recruiting appropriate users (Kamarudin, Park & Nam, 2009). Users' involvement in the design process can also be expensive. Thus it clearly defined that the effectiveness of interface design is required involvement of both stakeholders: the developers and the end-users.

Conclusion

Over the past few years, interface design has become one of the most important criteria for judging any software in terms of usability, functionality and user experience. The user interface design, therefore, becomes the primary factor in a user's decision to use the application in the long term. Active participation of users therefore is depending on the quality of interface design. Thus, in summary, the interface design is play an important role in ensuring the quality of user interaction and effective learning experiences among the users.

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