

An Investigation of Multimodal Metaphors in E-Book Assessment Interfaces

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Abstract. This paper investigates the role of some multimodal metaphors in e-book assessment interfaces using avatar, images, visual text, and earcons in terms of efficiency, effectiveness and user satisfaction as well as learning performance. This experimental approach was evaluated using two different versions (one for a control group and another for the experimental group) of an e-book examination interface. The experiment was contacted by 30 users. The first version (VOEBT) that was based on text only to present the test questions and another version (VMEBT) that used avatars, images, text and earcons to present the same questions to users. The results of the experiment showed that the approach taken was effective to communicate additional supportive information for questions connected to the learning material and could indeed assist to enhance the usability of e-book assessment interfaces. It was observed that users taken less time to successfully complete tasks in a manner that facilitated ease of use and user enjoyment as well as making the interface more satisfactory. Furthermore, the use of images and avatars made the information communicated more memorable.

Keywords: avatar, e-learning, images, earcons, multimodal, virtual text e-book assessment.

1 Introduction

Nowadays, most of e-learning applications focus on the visual channel to communicate information in its interfaces. Multimodality is the natural method to human to communicate automatically using all diverse information and using dissimilar channels each day. Such as human can speak, write, listen and move at the same time [1 and 2]. However, other senses could be incorporated in a multimodal approach in order to communicate a larger volume of learning material either on their own or simultaneously. For example, combining graphics and diagrams with earcons has the potential to provide a richer user learning experience. This investigation therefore explores unique combinations of visual and auditory metaphors that are particularly applied in the communication of learning material. Research literature highlights the positive effects of images and avatar on the usability of interfaces in

several domains including education.” Some of these studies suggest that the use of multimodal metaphors such as speech sounds, non speech sound and avatar could improve the usability of computer interfaces in many different ways including e-learning application” [3, 4, 5 and 6]. However, more research is needed in order to the full capabilities and potential of multimodal metaphors in e-learning applications. The aim of this empirical study is to examine the impact of amalgamating and integrating different modalities using earcons, and avatars, images, visual text within an e-book assessment framework. This investigation was carried out by evaluating effectiveness, efficiency and user satisfaction of the multimodal designs introduced. Finally, a discussion of the obtained results and conclusion are provided.

1.1 Overall Aims and Methodology

The overall aim of this empirical study was to enhance the performance of e-book assessments as part of an e-learning system and to measure efficiency for learning tasks by measuring the time spent by users to perform the required task. This was achieved by measuring the effectiveness of the approach by counting the number of correctly completed learning tasks that in effect provide an indicator of the users’ learning performance. User satisfaction and overall learning experience was also measured.

The methodology used for this research project comprised of a literature review and three experimental platforms. The data collection procedure was based on the experimental observations and questionnaires. The empirical measurements produced objective and subjective data. The objective data resulted from the observations and measurements such as effectiveness and efficiency. The subjective data were primarily user provided views and resulted from the questionnaires that were used to evaluate the user satisfaction and experience.

1.2 E-Learning

From an abstract point of view, e-learning could be defined as the learning material that can be offered, circulated, and accessed at anytime and anywhere by utilising electronic technology such as computers, networks and communications [7]. In (2007) e-learning uses new electronic media and gear and extends learning environment to personal computers and the internet. The growth has not yet ended and perhaps we will see cell phones and TV satellites as components of learning environment in the very close to future [9].

In addition scheduled delivery platforms such as video broadcasting, remote libraries, and virtual classrooms imitates real learning environments but with time and place limitations. This technology has been enhanced by the on-demand delivery platforms that facilitate anytime and anywhere learning in the forms of interactive training CD ROMs and web-based training. In comparison with the traditional learning, e-learning offers more flexible learning in terms of time and location that allows a better adaptation to individual needs [8].

There are several different views of definitions of e-learning one of these definitions in (2009) e-learning is a type of training or learning in which instructors and student interact at different times and different space gap and allowing learners to access training at their own pace and with methods that are convenient for them [2]. Another definition states that “e-Learning is defined by the programme itself as Learning facilitated and supported through the use of information and communications technologies (ICT)” [10].

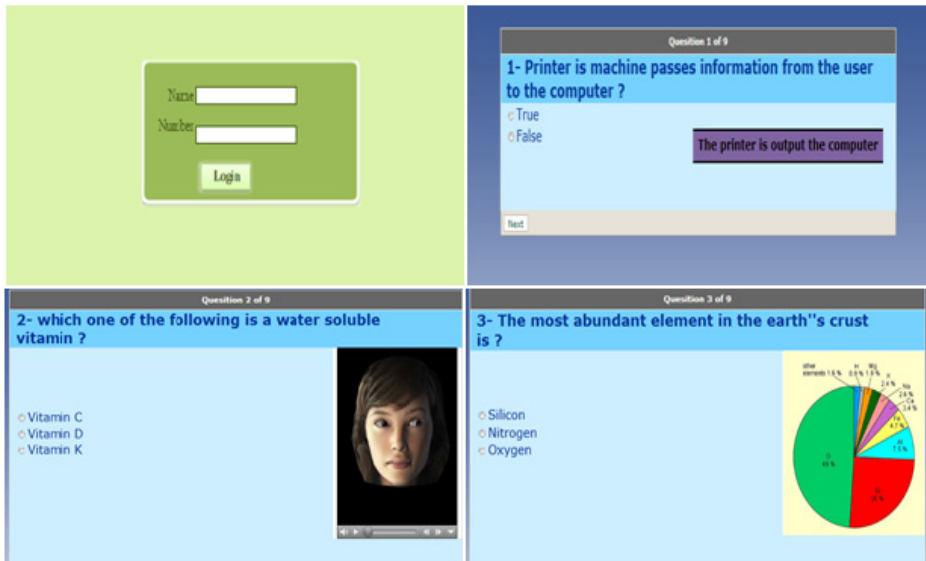


Fig. 1. Visual examples of the experimental platform of the e-book assessment

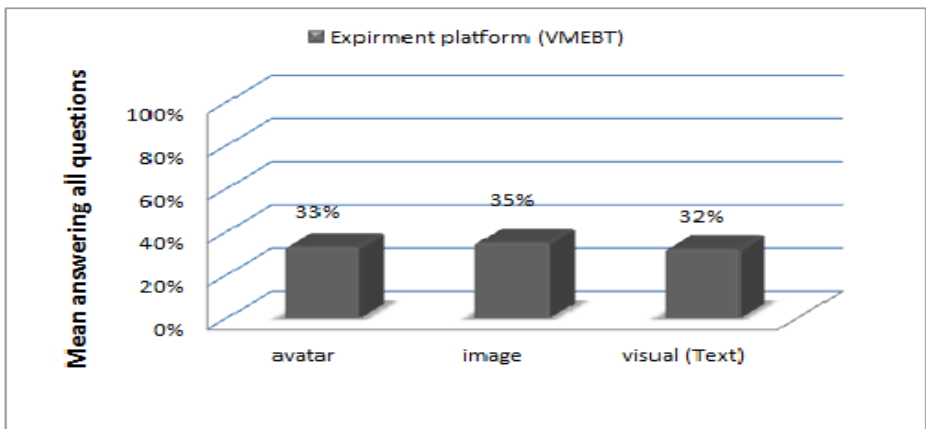


Fig. 2. Correct answers of all questions taken by users for each experimental condition

Two different versions of the experimental e-learning tool (see Figure 1) were tested by a group of 30 users for the first experimental work. The non-multimodal interface (VOEBT) is the text only version. It is the e-book assessment interface but with no multimodal communication metaphors. However, it provides the same functions in terms of examination and assessment, chapter order and level of questions. The second version used in the assessment interface introduces multimodal metaphors in terms of utilising avatar (sound and human-like expressions) with text, images and earcons as in a way that various parts of information are simultaneously presented to the users.

Figure 2 shows the variation of user performance for the different experimental conditions (avatar, images, and text) in terms of the number of correctly answered questions. The images scored highest. This indicates that images communicated information to users in an easier manner than the approach of avatar and text.

The results gathered indicate that the multimodal metaphors enhance the usability of e-book assessment interfaces as users taken less time to correctly answer questions. Users also reported that the learning experience was enjoyable and they also noted their learning improvement. In addition, users reported to be satisfied with the interface approach taken. There was an overall contribution towards enhancing the users' learning performance and the usability of e-book assessment in terms of efficiency, effectiveness and user satisfaction. Therefore the multimodal approach taken provides a set of prima facie evidence that can provide a major contribution in the design and development of interfaces e-learning and e-book assessment applications.

Figure 3 illustrates the total time spent via each user in the experimental group VMEBT to answer all questions, it can be shows for each multimodal (avatar, images and text) including three questions for each multimodal, the images time observed was slightly lower (815 seconds) compared with visual text and Avatar in the experimental group. The multimodal answering times were the avatar (966 seconds) and the difference between images and avatar were 151seconds.

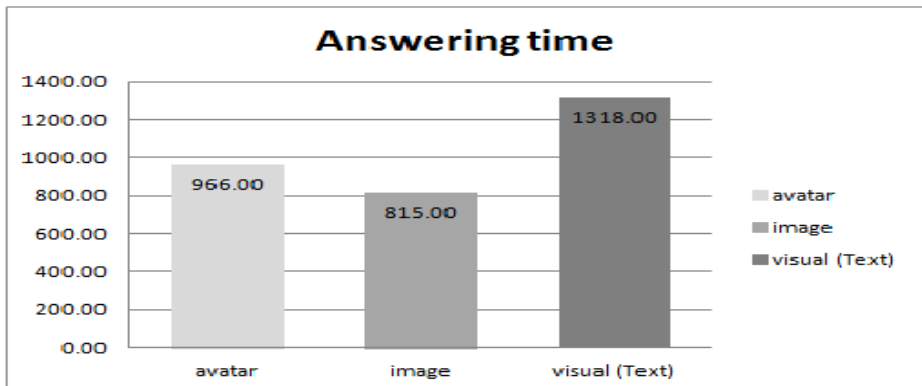


Fig. 3. Mean values of total time taken by users in multimodal to answer all questions

Finally, the textual approach was higher with 1318 seconds that were taken by users to answer and complete tasks among the conditions. In short, the images of the VMEBT were 815 seconds lower than textual and avatar approach in the VMEBT in terms of time taken by users to find the relevant information, answer the questions and complete their tasks.

2 Conclusion

This paper presented an overview of empirical experiments that aim to investigate the role of multimodal metaphors in interfaces for e-book assessment. This evaluation was focused on usability in terms of efficiency, effectiveness and user satisfaction. The obtained results showed that images and avatars are effective in communicating supportive information related to the presented learning material. Static images were also memorable by the users and provided an increased degree of user satisfaction.

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