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Using Eye-Tracking as a Means to Evaluate Visual and Content Design Choices in Web 2.0 – An Initial Finding from Livemocha

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Abstract: In the evaluation of Web 2.0 language learning websites, various aspects to be evaluated are often distinguished, such as the visual design, the pedagogical content, and the involvement of multiple technologies (Liu et al., 2011). In order to make the evaluative judgments, the methods commonly used include expert judgment by inspection of the website, or user judgment obtained from surveys of learner attitude (Chwo, 2013). This study aims to add to this range of evaluation methods by exploiting a relatively new research tool, eyetracking (Reichle et. al, 2013), to help establish what options are in fact better. We took as an example the instructions presented on screen for various tasks and, based on the types given in the *Livemocha* website (Chwo et al., 2012), devised webpages allowing us to measure how four eye movement related effects differ with nine binary webpage choices ranging from visual design (e.g. dark or light background) to pedagogical content (e.g. presence or absence of a picture). Six Taiwanese learners of English major student participated. Results show that the titles, background colors and highlighted prints will increase our EFL (English as Foreign Language) learners' fixation frequency and the focal browsing time. However, the opposite result goes to the illustration relevant to the reading text. Moreover, the increasing number of the word count in the text will shorten the fixation frequency and focal browsing time. Lastly, the location of the illustration will not affect the browsing behaviors. The interpretation and the potential factors contributed to the findings will be discussed.

Keywords: *Livemocha*, visual interface design, website function design, eye tracking

Introduction

State of art thinking about promoting learning English as an international language highlights the urgent need for computer literacy which is considered to be an integral part of this enterprise (Alevizou & Connole, 2010; Stevens & Shield, 2009; Yeh, 2009). Following up on this, Levy (2009, 2010, 2011) cautioned that users of technology should firmly establish their focus and priorities so that genuinely viable applications of technology can be made. Hence, we see the formulation of a set of sound evaluation and assessment criteria which can be applied to our EFL learners' Web 2.0 resources as indispensable for our educational practitioners (Yang & Chan, 2007; Burston, 2003). For this purpose, in fact, Liu et al. (2011) propose the following multi-dimensional framework of areas to consider when evaluating English learning websites:

1. **Web Usability** concerns how easy the website is to use and learn from, and includes three key components: ease, user experience, and interaction design. Ease is about simplicity for use and learning, user experience concerns how satisfied a person is after using the website, and interaction design focuses on the simplicity of the interaction and how far it offers a good experience.

Learning Materials concerns the quality of tutorials, tests, games, online social networks, learning management systems, peer-supported learning, self-controlled learning, and teacher-led learning.

2. **Functionality of Assisting Language Learning** concerns how far a website functions to assist a student in learning a language, which is the key to success for learners using interactive materials on websites.
3. **Technology Integration** relates to the use of multiple technologies, such as email, Skype, and chat, in the learning materials to help learners engage in learning with ease and satisfaction.
4. **Learner Preferences** covers learner opinions about the content and the function, the ease of use, and the appearance of a website. The highest valued preference is that for the content and the function while the preference that is valued the lowest concerns appearance. The learners in Liu's study preferred websites that had useful, practical content.

Based on the above discussion, the main aim of the present study is to seek alternative instruments other than survey and interview in order to locate potential factors that might facilitate or hinder our EFL learners' learning via Web 2.0 resources. By doing so, it is hoped that an evaluation criteria which are relevant to our EFL learners can be identified so that an integrated guideline can be available when teachers and instructors would like to filter or select relevant Web 2.0 resources for their students. It is hoped that the findings of this study can serve as a stepping stone to inform the establishment of a set of useful criteria that will be usable in the selection or even the design of the Web 2.0 resources for our EFL learners. As our example, we would like to focus on Livemocha, the second largest social network Web 2.0 resource, and consider its potential benefits for our EFL learners (Liaw, 2011).

A previous study of Livemocha has already been carried out by Chwo et. al (2012) to assess our technology university EFL learners' perceptions of and attitudes to Web 2.0 informal learning with the Livemocha program, after a six month trial, and whether learning style and learning strategies affect them. A mixed method study was conducted using interviews and a questionnaire based survey to assess whether learning style and learning strategy impacted our technology university EFL learners' degree of satisfaction, learning attitude, and other general perceptions, about visual interface design and website function, with respect to Web 2.0 informal learning with the Livemocha program. The interview results showed that writing, chatting and speaking are the most attractive functions for our EFL learners. From the survey, no significant correlation was found between learning style or strategy and attitudes to Livemocha. However, significant correlations were found among the four measures of attitude to and perception of Livemocha: participants' learning attitude, degree of satisfaction and judgment of visual interface design and website function. A further analysis was again conducted by Chwo (2013). Overall attitudes were mostly very favorable, especially towards the visual clarity of the program and the usefulness of its functions supporting writing and speaking and interaction with native speakers. There was some evidence in the first study that the social networking function of the program was seen as useful for its own sake independently of value for language learning and that this served to engage students who otherwise did not use social learning strategies. On the other hand, the fact that learning attitudes and degree of satisfaction both significantly correlated with website function and visual interface design suggests that the latter are critical for the success of any program such as Livemocha. Therefore, the goal of the present study is to inform teachers and web designers by following up on this initial finding to explore potential variables relevant to visual interface design that might be instrumental in optimizing learning

achievement. Several eye tracking experiments has provided interesting findings regarding reading experience (Biedert et al., 2010; Buscher, 2010; Duggan et al., 2011; Guest Editorial 2010;Mayer, 2010). However, its application to Web 2.0 resources such as Livemocha is still yet to be explored:

2. Research Questions

1. What is the finding for Livemocha website screen design with the presence or absence of the topic?
2. What is the finding for Livemocha website screen design with a dark or light background?
3. What is the finding for Livemocha website screen design with or without the presence of the additional text in the sentence?
4. What is the finding for Livemocha website screen design with the presence of advert or not?
5. What are the findings for Livemocha website screen design with single or multiple topics?
6. What is the finding for Livemocha website screen design with the presence or absence of the relevant illustration?
7. How about the presence of relevant versus the irrelevant illustration to the text and the location of the illustration?
8. What is the finding for Livemocha website screen design with the presence or absence of the highlighted vocabulary?

3. Methodology

3.1 Participants

A total of six day-school Taiwanese English major senior students volunteered to participate in the Livemocha eye tracking experiment. They are either former participants of the Livemocha six month trial during their sophomore year, or a member of the Livemocha research team. They are all familiar with Livemocha and were paid to participate in this experiment. We adopt Arabic numbers to identify the participants.

3.2 Instruments

The eye tracker eyeNTNU-180, a software with fixation calculator, was used to record, collect and calculate eye movement data. A Chinese and English version of Livemocha website pictures was purposely designed to assess the potential variables as to how visual interface design will affect our EFL learners' browsing behavior. The design of the *Livemocha* pictures is described in Chen (2007). Due to the restriction of this short paper, we can only present partial results of English version of the experiment of which eight categories were designed to contrast the difference. They are listed in the research questions.

3.3 Procedure

The six participants were called in two by two to the self-access center. Two assistants were there to help them put on the eye tracking glasses. A visual test was carried out to ensure a focal point could be located on the screen. Brief instructions were explained verbally with an instruction page displayed on the screen prior to the main experiment. A pilot test was firstly carried out in the evening class to detect any potential flaw so adjustments could be made for the main experiment. It was found in the pilot study that students with heavy mascara or cosmetics contact lenses were not able to read clearly with the eye tracking glasses. The same went for students who wore thick glasses (poor sighted). Consequently, students in the formal study were informed to either use contact lenses or not to wear any heavy mascara make-up when participating in the experiment.

Four dependent variables were measured to gauge the effect of the different task versions that we were comparing. They are: 1. the duration of the first fixation (ffd), 2. the latency of the first fixation(ffl), 3. the number of fixations (nof), 4. the total contact time (tct). As far as the focus areas are concerned, we use the region of interest (roi) 1 ~ X to specify the focus segmental areas, when roi X was used to indicate any area outside of the roi area. An example can be seen in figure 1 & 2.

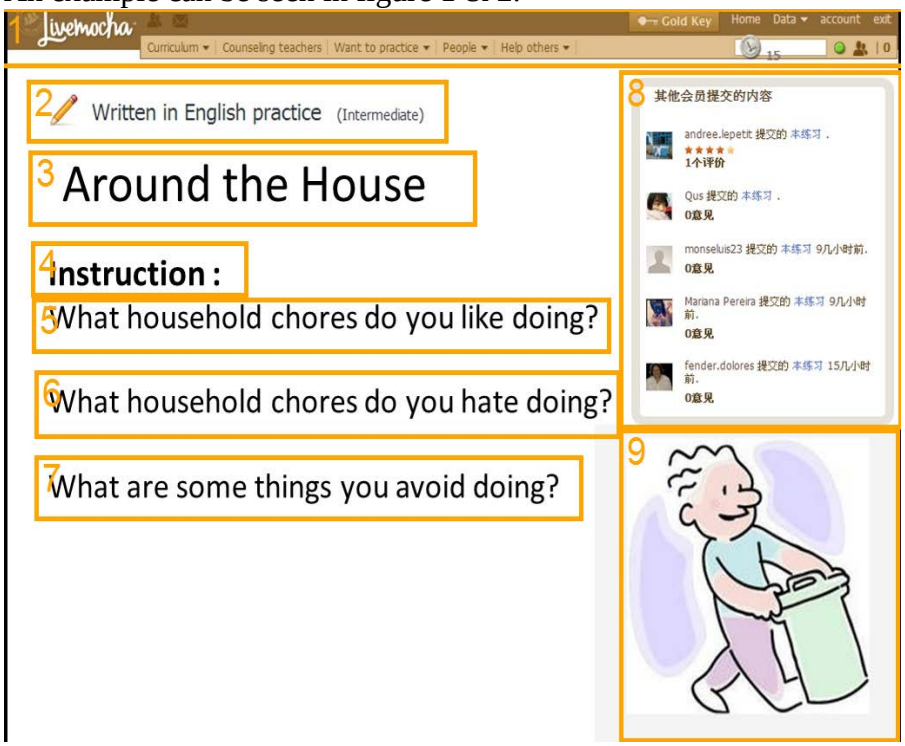

Figure 1: the presence of the advert in the visual interface design

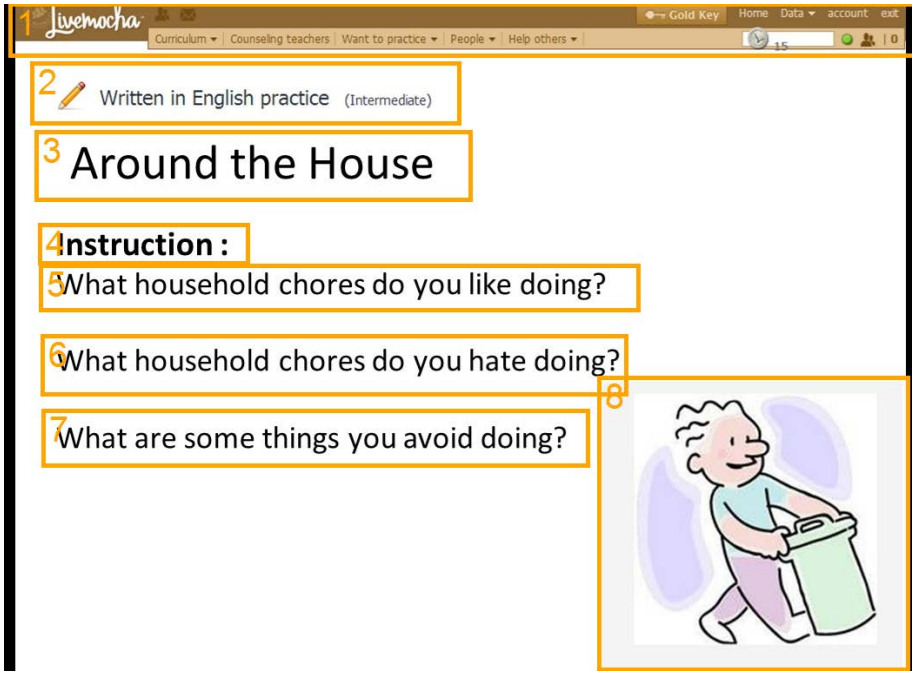

Figure 2: the absence of the advert in the visual interface design

5. Results and Conclusion

In answer to the first research question, in the absence of the topic, the students' ffd (80 $\leqq$ x $\leqq$ 292) takes a longer time and there is a greater nof (4 $\leqq$ x $\leqq$ 29) on the main text. In the presence of the topic, the students take more time on the title (topic). However, students also took longer time on the ffd (0 $\leqq$ x $\leqq$ 191) on the RX area. Probably because defining the roi area does not highlight the inaccuracy and many regions are defined in RX area.

In answer to the second research question, when the background is dark, the students notice the title first and exhibit ffd (102 $\leqq$ x $\leqq$ 266) on the title for a long time before moving on to other areas.

In answer to the third question, the ffd of the students in each area decreases when additional text is given in the sentence.

In answer to the fourth question, the presence of the advert is very eye-catching. The students have a lengthier tct (0$\leqq$ x $\leqq$ 394) when there is an advert and also have an increased nof (0 $\leqq$ x $\leqq$ 19).

In answer to the fifth question, the students spend less time on the ffd on the multiple topics than on a single topic. We can see the decreased ffd and tct.

In answer to the sixth question, because the R5 area is a much bigger space, the students took a longer time on it, so the tct (535 $\leqq$ x $\leqq$ 5466) is longer on these areas. However, with the presence of relevant illustrations students pay more attention with the ffd (102 $\leqq$ x $\leqq$ 267) on other areas.

In answer to the seventh question, the students are not interested in illustration when the text and the illustration are relevant to each other. On the other hand, the students' ffd (0 $\leqq$ x $\leqq$ 293) takes a longer time and nof (0 $\leqq$ x $\leqq$ 5) on illustrations that are irrelevant to the text. The most probable explanation is that the students do not understand the content of the text. No matter where the illustration is placed, it does not affect the student on the ffl or the ffd when reading the text.

As for the eighth question, because there is longer text in the R14 area, the ffd of the students (0 $\leqq$ x $\leqq$ 245) on the highlighted vocabulary area is higher than that on the un-highlighted vocabulary.

In a nutshell, the presence of a topic in Web 2.0 resources appears to be essential and helpful for our EFL learners, together with the dark background color where the title can be accentuated and visually appeal to our readers. These are the focal areas that our readers prefer to visit when they browse Web 2.0 resources. Moreover, highlighting can facilitate our EFL learners' reading of Web 2.0 resources. However, we also acknowledge the limitation of our eye tracking experiment since the use of the eye tracking device meant that our participants were not allowed to click browse through the website as they normally might. This is a limitation that we need to improve on in the near future so that the experiment will resemble real browsing behavior. Nevertheless, with these interesting findings, we are able to make suggestions to website designers and instructors regarding visual design and key functions to assist EFL learners' Web 2.0 learning.

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