

# Research Design on Visual Perception of Interface Design of E-Learning

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**Abstract.** Various researches have been conducted to improve the quality of e-learning courseware. Other than user experience, user interface design is also one of the most important aspects in system usability. It allows users to interact with a system. In the development of user interface design, users are given the utmost priority. Therefore, every development should consider users throughout the process. Developers need to understand the requirements of the end user. The user interface design of an e-learning courseware helps them to conduct activities such as learning, exercise and evaluation. The wrong selection of visual can lead to misunderstanding among the users in interpreting the intended meaning. Furthermore, it is quite tedious for designers to choose the right sign to represent interaction. This paper discuss about research design that needs to be implemented to investigate how users perceive visual elements in interface design. The research design contains five sections; which is setting, sample or participants, measurement instruments, data collection or procedures and data analysis. The sections will be explained through data obtained from the research, underlining the user visual perception aspect. The findings can help improving the quality of e-learning materials for children. Other than that, this research is also significant to providing the designers and developers with useful guides to enhance the understandings in producing good interface design for e-learning. Excellent quality of e-learning is essential towards serving the students with the best education. This paper could provide a good reference for researcher to conduct a research that relates to visual communication in information technology.

**Keywords:** Research Design, Visual Perception, e-learning, Interface Design.

## INTRODUCTION

In visual communication, there is an area called visual perception which relates to how human perceive visuals. People have different perceptions towards things they perceive and react to it. Visual elements that appear on interface design become the subject of this research. Every e-learning material that has interactivity requires interface design. The performance of interface design can contribute to the quality of e-learning materials. E-learning is still a part of government's initiative to serve students with the best education. Presentation of interface design becomes one of the reasons why students are not interested to use e-learning material. (Kamaruddin, 2010). Despite its early introduction in 2001, the problem is still lingering until now. The Ministry of Education (MOE) offers 1BestariNet to provide access to a cloud-based Virtual Learning Environment (VLE) known as the FROG VLE and high-speed

connectivity by June 2014 to all the 10,000 fully-aided government schools. The FROG VLE is a web-based learning platform which provides virtual equivalents of real-world learning (Frog Asia, 2014). Recent report by the Auditor-General (National Audit Department, 2013) revealed that 1BestariNet project is still suffering due to its lack of usage even though RM336 million was spent. Therefore, it is significant for the researchers to keep working on this area with the purpose to improve it. Students' engagement with e-learning is minimal due to many factors and interface design is a part of it (Nordin, 2017). Systems developers and telecommunication companies should also improve their product reliability by making them more user-friendly and useful.

Shen et. al (2017) quoted as saying that the main criteria for evaluating Frog VLE e-learning platform have focused on usability and acceptance. The sensory dimension of e-learning platforms is non-existent enough due to the rapid emergence of the ideals of 'hyper-functionalism' nowadays. Therefore, in order to accommodate the future needs of the e-learning platforms, focus needs to be put into aesthetic perspective instead of mainly addressing usability and function. Hence, there is a need to produce pleasurable design and aesthetic model of e-learning platform in order to increase the usage of the Frog VLE.

This paper explains about research design which is a part of research methodology that researcher utilises to gather information about visual elements and its contribution to aesthetic and usability of interface. All sections of research from research setting, sampling, instruments, data collection and data analysis are reported. Both quantitative and qualitative approach will be implemented through instruments of survey and observation. Data collected from the research could help developers to decide the suitable visual element to be applied into their projects in order to improve the presentation of interface design.

## **VISUAL PERCEPTION**

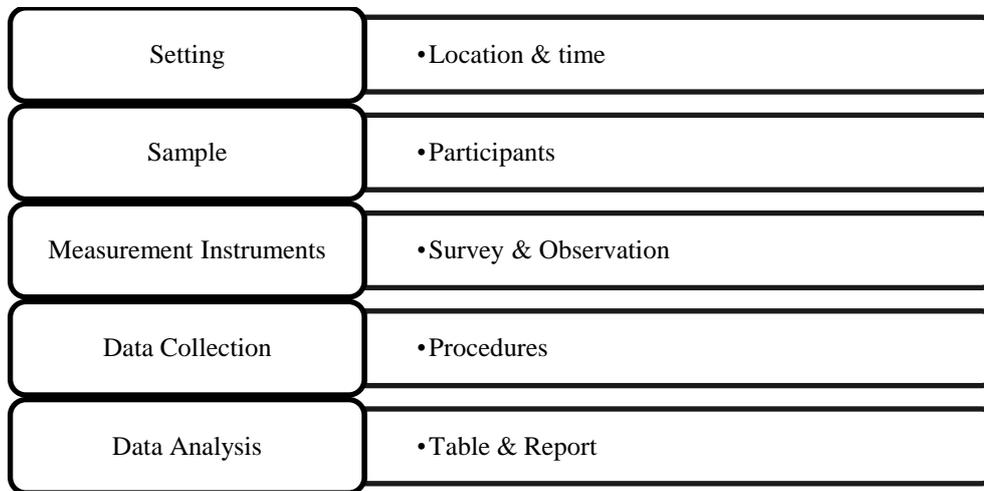
Interaction Design Foundation (2018) defines visual perception as the ability to perceive our surroundings through the light that enters our eyes. The visual perception of colours, patterns, and structures has been of particular interest in relation to graphical user interfaces (GUIs) because these are perceived exclusively through vision. An understanding of visual perception therefore enables designers to create more effective user interfaces. Different attributes of visual perception are widely used in GUI design. Many designers apply gestalt principles to the design of GUIs to create interfaces that are easy for users to perceive and understand. The visual perception of affordances is another example of how the understanding of visual perception is a critical item in any designer's toolkit. Affordance is a concept introduced by perception theorist J.J Gibson as the range of possibilities that an object or environment appears to offer in order to perform an action upon it (Nobel & Bestley, 2005). Image of common physical objects and environments can enhance the usability of a design. A three dimensional button on computer screen leverages user knowledge of physical characteristics of button that it can be pressed (Lidwell, 2010).

Edwards (2016) assumes perception as a set of skills that can perceive edges, spaces, relationships, lights and shadows and finally the perception of gestalt. Even though his point is based on teaching students to draw with perception, it is still related to the way users perceive what they see and how they react to it. Perception is one of valuable capabilities of the human brain, apart from intuition, imagination and

creativity. Brain has a superior level of performance for recall and image recognition compared to word recognition. Therefore, label or button that combines icon and text is much easier to understand and recognize (Kraljevic, 2014).

## RESEARCH DESIGN

In this study, researcher applied the research design of five sections which consist of setting, sample or participants, measurement instruments, data collection or procedures and data analysis (Yvonne, 2009). The research questions will determine where the research will be done, who will be involved in the surveys, what type of instruments to be applied and what procedure need to be conform. The qualitative and quantitative data will be collected and analyzed through data analysis.



**FIGURE 1.** Five Sections in Research Design.

### Research Setting

The location of survey was at Terminal Sejahtera (Figure 2). The centre provides e-learning facilities to students around Kuala Lumpur. There were 205 students at Sri Sentosa, 37 year five and 31 of year six. It was one of six centres available under Terminal Sejahtera e-learning programme. Other locations were at Sri Labuan, Sri Kota, Desa Rejang, Sri Pahang and Kg Bharu.



**FIGURE 2.** Terminal Sejahtera Tuition Centre.

### **Sample/Participants**

Students at Terminal Sejahtera were selected as purposive sample as they meet the criteria of study which focus on users of 10 and 12 years old (Figure 3). They were also selected as convenience sample as they were accessible and available. The respondents were 20 students that having use the e-learning courseware. A survey and observation were conducted for data collection. They have the ability to use the system as the centre was accessible from 9am to 6pm every day. The participants are also the target group that could use the e-learning courseware in the future.

### **Measurement Instruments**

Researcher applied attitude scale to conduct survey. Attitude scale is a technique to measure response of the respondents such as feeling, perception and preferences ("Attitude Scale", n.d). The survey provides closed-ended questions to children as they were having difficulty to answer questions in likert scale. Furthermore, the survey could also consume more time for its completion. Through this survey, respondents were required to choose any text and image they prefer or agree to represent the navigation button. Score was extracted upon endorsement made for each statements in which a sufficient total for each item is total up. Researcher decided to employ visual as a part of the questionnaire to allow respondents answer directly based on the graphics. This would answer the questions about user preferences on visual elements in terms of aesthetic value and meaning. (Chanwimalueng, et.al., 2013). As for usability, researcher did an observation on students' activity. They were instructed to perform certain activities on the prototype. This process can only be done after the prototype was developed based on the findings. Their reactions were recorded based on structured questions to identify how useable the courseware to the children. This requires researcher to be involved in the observation, recording every activities.



**FIGURE 3.** Students at E-Learning Centre.

### **Data Collection/Procedures**

The procedure to conduct the survey was as followed. Researcher obtained the consent from Terminal Sejahtera administrator. Respondents were selected from year four, five and six students who have been registered at the centre. The participants will be given the questionnaire through administrator, in order to make them comfortable to answer the questions, without any pressure. The quantitative data were collected at the end of survey. The observation needed to be scheduled earlier to allow the administrator to arrange the session with the students. More visitors came to the centre during school holiday. The observation was done among the students one by one, where three to five students were selected. A tablet computer was used for this observation. A narrative report of qualitative data was written out to record this observation.

### **Data Analysis**

The numerical data from survey is presented in the form of table and chart. The data was accumulated to find out how students perceive visual elements. The questionnaire was designed to cover as many visual elements available on interface. All questions were analyzed to obtain the findings. The percentage of each answer selected determines the visual or sign they prefer to represent the interaction button. Data from observation were compiled as a report of students' reactions.

### **Survey and Observations**

A questionnaire consists of 10 questions were asked to the respondents in this survey. They were given a set of questionnaire in a piece of paper. Researcher provided guide for them to answer the questions. Content of the questions are related to visual elements where they need to choose the font, icon, symbol, image, shape and colour combination they prefer. The visuals or graphics used in the questionnaire were design based on secondary data that has been planned to be included in the development of prototype. The objective of this survey was to find out which elements they like, considering which symbols and images they were familiar with,

and which sign they could understand better. The questions for this survey were designed to measure the perception of the respondents about the text and images that appeared on the interface. Given a total of two to four choices, they need to choose only one choice that they prefer the most.



**FIGURE 4.** Respondents Answering Questionnaire.

## **RESULTS AND DISCUSSIONS**

Selected visual elements were appeared on the questionnaire. Each elements was given consideration to be applied on the prototype of e-learning product. The elements being used in the survey consists of typeface, text, image, icon, shape and colour. Based on the survey conducted to the 20 respondents, there were few findings achieved. The results are as followed:

### **Typeface**

Question about typeface was designed to identify the preferable type among the students. Based on the result, it was found that 45% of the respondents chose sans serif and script font, 10% chose serif and none for slab serif. Arial is used to represent sans serif, Times for serif, Cooper Black for slab serif and Segoe for script. The options given were based on application on title page. It can also be applied on navigation button.

### **Text and Image**

Text and image were applied on enter, menu, info and sound button. The multiple choice question provides options of text, image and both. As for enter button, 60% chose text, 30% chose both text and images and 10% chose image. 90% of respondents chose text to represent menu and 10% chose both. The findings were slightly equal for both text and images, with the percentage of 55% and 45% respectively. The sound button received a majority 90% for image as the symbol was quite universal compared to 10% text. From this questions, it is found that students prefer to have text or word for enter and menu button. For information and sound,

icon is preferable, even though it is just a slight difference on info button. This is to prove that a familiar icon to the user can be easily identified.

**TABLE (1).** Text and Image.

Button	Image %	Text %	Both %
Enter	10	60	30
Menu	0	90	10
Info	55	45	na
Sound	90	10	na

### Traditional and Contemporary Icon

To choose between traditional icon and contemporary icon, researcher consolidated the menu into three images. The first to represent learn, second to represent activity and the third to represent quiz. These questions are intended to know whether the icons can be the signifier. The traditional icons are represented by book, pencil and paper. As for contemporary icons, they are represented by the shape of tablet which consists of lines, box, hand, finger and question mark. The line and box is represented to signify text and picture for learn; hand and button to signify activity; while line and question mark to signify quiz. The results showed that students prefer traditional icon. 95% of respondent prefer to use book for learn, pencil and paper for activity (60%) and paper with question mark for quiz (65%).

**TABLE (2).** Traditional and Contemporary Icon.

Button	Traditional %	Contemporary %
Learn	95	5
Activity	60	40
Quiz	65	35

### Shape

This question was intended to investigate how students perceive shapes. The symbol is placed inside the shape except for the triangle. There were four type of shapes, namely the circle, triangle, rectangle and oval. The shape were planned to be applied as navigation of next and previous button. Shapes can actually help users to recognise the activity. Applying a standard shape of button throughout the system may help improving the usability. Based on the survey, 45% of the respondents chose triangle, 55% chose rectangle and only 5% chose oval. However, is quite surprising to figure out that none of them choose circle.

**TABLE (3).** Shape of Button.

Shape	%
Circle	0
Triangle	45
Rectangle	55
Oval	5

### Colour

There were four colour schemes provided as choices to the students, applied on interface design. All of the schemes contain white content area except for four colours which has light green background. The colour scheme were chosen from secondary data, stating blue as the main colour. From this survey, it was hard to determine which

colour scheme was the most preferable. Based on the findings, both the maximum and minimum colours obtained a high percentage. 40% of participants prefer four colour scheme and 35% chose one colour that used tones of blue. However, it was obvious that they did not like neutral colour as part of the combinations.

**TABLE (4).** Combination of Colour on Interface.

Colour	%
One Colour (blue)	35
Two colour (blue, grey)	5
Three Colour (blue, light blue, orange)	20
Three Colour (blue, green, orange)	40

## CONCLUSION

Research design helps researcher to run a smooth research. Organizing a good plan can help designers and developers to achieve the objective; and save the cost and time of a design project. In visual research, there are many areas of study. The field of this study determines the direction of the research. Based on the survey conducted to the respondents, it can be concluded that they prefer the interface to be presented with text and image. They are able to understand better with the use of traditional image like book, paper and pencil instead of tablet and hand icon to represent learn, exercise and quiz. The perception that they have in their mind has proven to be the reason why they prefer the image they see in their everyday life. As for image and text, it depends on what sign or symbol developer wants to use. There are many signs or symbols that can be easily interpreted as they are considered universal like the sound and play button. Shapes can also help to improve usability when it appears consistently on the interface. The colour of interface not only can attract user but it can help to improve learning if used correctly. The interface colour should not distract the user from focusing on the content of the e-learning courseware. Grey colour is not perceived as attractive to the children. The finding from this research is not a complete research to cater all issues related to interface design but it can at least contribute some ideas about how the respondent perceive visual elements. It could not only attract them to use the courseware but to help them to learn better.

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