Aesthetics in E-Learning Websites Interface Design using Kansei Engineering Method

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Abstract— **This paper presents the emotion responses between genders towards educational web design interfaces. The design concepts were categorized into three sections, text-based design, layout design and color design. The response was measured through Kansei Engineering approach in order to measure the emotion reaction towards educational web design interface between male and female students.**

Keywords—Aesthetics, E-Learning, Kansei Engineering, Interface Design

I. INTRODUCTION

E-learning is an advance digital education used as a method to deliver education and tutorials through global network. It is essential for higher education institutions in Malaysia itself comprehensively using the ICT technologies since the ICT constitution has a major influence in Malaysia's economic growth [1]. As a result, e-learning applications are increasing over time in accordance to the growing technology advancement.

Regarding the design contents, [2] mentioned that if the multimedia design contents are not organized wisely, it may leads to difficulty to find, boredom and feeling lost, the viewer might just stop using and close the program. Therefore in retrospect to this statement, the aesthetical appealing on web interface should be given consideration in order to avoid users to stop or discontinue from using the educational web sites.

Aesthetics preference can be classified based on gender aspect. [3] mentioned that preference aesthetics especially for educational purpose is important since the impacts will be on teaching and assessment. In addition, combining the elements of multimedia in a meaningful way by taking advantage of each medium's unique characteristics is required in order to make an effective multimedia for learning but the media adding needs to be mindful and considered [4].

Foremost, gender issue can effect on how user interact with the design interface and visual screen elements [7]. Thus, this might decreased user interest to browse the web if the interface has no appealing, no attraction and does not reach to their design preference aesthetics. There are three problems that might subsequently leads to user feeling deflated when browsing the site – the user preference and interactivity based on gender; and aesthetical value for visual appearance.

Web-based learning for college level needs to be attractive to students in order for them to keep on browsing and using the sites as their secondary method to studies. Therefore, the ideology of different gender tendency on web design and the consideration on media elements arrangement on web-based learning has lead this research in finding the exact sensibility of design interface that can attract college students' interest to keep them browsing on web-based learning.

The idea of finding the exact sensibility of design interface which can attract college students' interest to use the e-learning web sites could be done by using the Kansei Engineering Approach. Referring to [6], kansei is a Japanese term that refers to human's psychology feelings that derived from stimulus responses in which will evoked a reaction and thus will influences either positive or negative judgement of a person. Kansei Engineering (KE) is a methodology that absorb and assimilates human emotions and psychological feeling into design elements to create products and designs in order to obtain satisfactions from the users or consumers [6].

According to [8], Kansei Engineering refers to technology that expresses human psychological feeling into design criteria. Technically, Kansei Engineering can determine sensory attributes that can evoke particular responses which influenced by personal feelings from people, then using the attributes in designing the products, in which can elicit a desired responses from people [5].

Therefore, the kansei methodology is used in order to discover the correlation between human feeling and web interface. The design interface divided into three division; Text Based Design, Layout Design and Color Design. Consumers' feeling could be different according to their gender distinctive characteristic and that is the major substance for this research.

II. METHODOLOGY

The experient was carried out in computer lab with twenty five male and twenty five female college students as

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respondents. Three educational web sites – technologyuk.net/computing (text based design), dhar.weebly.com (colour based design) and sglearnonline.com (layout design), were used as samples in this experiment to derive the actual feelings response with the measurement of 0 to 5 for each emotion to indicate how they felt about the design aesthetics on educational web interface as shown in Figure 1 below. The data collected from the test was then compiled and analyzed by using the SPSS Descriptive Statistics (Frequencies), Factor Analysis (KMO), PCA Extraction Method (Communalities Analysis) and Mean Paired Samples T-test.

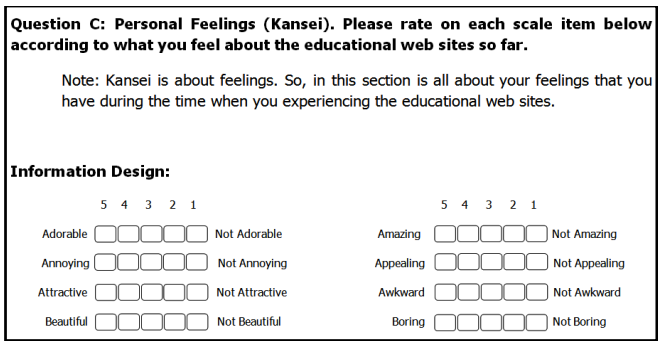

Figure 1: Example of Kansei Measurement in Kansei Methodology

III. Data Reduction and Group of Data for Potential Emotion Factors

Kaiser-Meyer-Olkin (KMO) measurement in Factor Analysis: Descriptive was used to sampling the adequacy values within variables. The measurement could be explained by factors wherein if the KMO value is 0.5, the value denoted as poor; KMO values exceed 0.6 is acceptable; and when the KMO value is closer to 1.00, the value can be defined as better. Therefore, if the KMO value is 0.5 or less, the variables should be drop from exploratory factor analysis.

In order to find the potential important emotion which can be used for enhancing the aesthetics values on information design, navigational design and visual design interface; a measurement and analysis have been conducted to accumulate the potential emotion factors using the Communalities Factor Analysis in Data Reduction SPSS. Communalities indicates how much variance in every variables explained by analysis. Communalities contains 2 parts, Initial, assuming that all common variables are 1 and Extraction, roughly calculating the number of variance in common variable using the Principal Component Method in which indicates that the extraction of variable are made. And so, if the variable value of extraction is 0.5, the value is considered as low communalities and should be drop from analysis.

A. Potential Emotion Factors for Information Design

Referring to Table 10 below, the KMO measures the variable value that closer to 1.0 as better. Since the KMO for this test is 0.855, therefore, the feelings variables used for the test are adequacy.

Table 10. KMO and Barllett's Test for Imformation Design

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.855
Bartlett's Test of Sphericity	Approx. Chi-Square	5.779E3
	df	1653
	Sig.	.000

Any variables that have 0.5 or less were described as having low communalities, thus should be removed from the analysis. Therefore, the feeling of 'lost' is not suitable to be put together with emotion factors and should be drop from factor analysis.

Table 11 below indicates overall feelings that stimulated and conjured during the lab test sessions. The variety of feelings responses perceived and received from Color Design, Layout Design and Text-based Design were combined together under the category of Information Design to bring about the potential emotion factors using PCA.

Table 11: List of potential emotion factors under Information Design

Potential Emotion Factors					
PCA Communalities (≥0.8)	Attractive	Comfortable			
PCA Communalities (≥0.7)	Adorable	Amazing	Appealing	Beautiful	Boring
	Charming	Chic	Childish	Classic	Convenient
	Comprehended	Confusing	Creative	Crowded	Elegant
	Futuristic	Gorgeous	Impressive	Interesting	Lively
	Lovely	Messy	Modern	Natural	Necessary
	Old-Fashioned	Plain	Pretty	Professional	Refreshing
	Relaxing	Simple	Sophisticated	Stylish	Surreal
	Troublesome	Unique	Updated	User-Friendly	
PCA Communalities (≥0.6)	Annoying	Awkward	Calm	Cool	Cute
	Feminine	Fun	Irritating	Light	Luxury
	Masculine	Mystic	Neat	Satisfied	Sexy
	Waste of Time				
PCA Communalities (≥0.5)	Lost				

B. Potential Emotion Factors for Navigational Design

Referring to the Table 12 below, the KMO measures the variable value that closer to 1.0 as better. Since the KMO for

this test is 0.829, therefore, the feelings variables used for the test are adequacy.

Table 12: KMO and Barllett's Test for Navigational Design

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.829
Bartlett's Test of Sphericity	Approx. Chi-Square	2.930E3
	df	595
	Sig.	.000

Any variables that have 0.5 or less were described as having low communalities thus should be remove from the analysis. Therefore, the feeling of 'classic', 'natural', 'plain' and 'professional' is not acceptable and should be removed from exploratory factor analysis.

Table 13 below indicates overall feelings that stimulated and conjured during the lab test sessions. The variety of feelings responses perceived and received from Color Design, Layout Design and Text-based Design were combined together under the category of Navigational Design to bring about the potential emotion factors using PCA.

Table 13: List of potential emotion factors under Navigational Design

Table 13 Potential Emotion Factors					
PCA Communalities (≥0.7)	Amazing	Attractive	Awkward	Beautiful	Calm
	Creative	Interesting	Messy	Old-Fashioned	Refresh-ing
	Sophisticated	Surreal	Troublesome		
PCA Communalities (≥0.6)	Annoying	Appealing	Boring	Convenie-nt	Comfort able
	Comprehend-ed	Crowded	Irritating	Light	Lost
	Neat	Necessary	Relaxing	Satisfied	Simple
	Unique	User-Friendly	Waste of Time		
PCA Communalities (≥0.5)	Classic	Natural	Plain	Professio-nal	

C. Potential Emotion Factors for Visual Design

Referring to the table 14 below, the KMO measurement measures the variable value that closer to 1.0 as better. Since the KMO for this test is 0.878, therefore, the feelings variables used for the test are adequacy.

Table 14: KMO and Barllett's Test for Visual Design

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.878
Bartlett's Test of Sphericity	Approx. Chi-Square	5.972E3
	Df	1596
	Sig.	.000

Any variables that have 0.5 or less were described as having low communalities thus should be remove from the analysis. Therefore, the feeling of 'irritating', 'lost' and 'natural' is not acceptable and should be removing from exploratory factor analysis.

Table 15 below indicates overall feelings that stimulated and conjured during the lab test sessions. The variety of feelings responses perceived and received from Color Design, Layout Design and Text-based Design were combined together under the category of Visual Design to bring about the potential emotion factors using PCA.

Table 15: List of potential emotion factors under Visual Design

Table 15 Potential Emotion Factors					
PCA Communalities (≥0.7)	Adorable	Amazing	Appealing	Attractive	Beautiful
	Calm	Charming	Chic	Comfortab le	Comprehe nded
	Creative	Cute	Elegant	Feminine	Futuristic
	Gorgeous	Impressive	Lovely	Luxury	Mystic
	Neat	Necessary	Old-Fashioned	Plain	Pretty
	Simple	Surreal	Troubleso me	Unique	User-Friendly
PCA Communalities (≥0.6)	Annoying	Awkward	Boring	Childish	Classic
	Convenient	Confusing	Cool	Crowded	Fun
	Interesting	Light	Lively	Masculine	Messy
	Professional	Refreshing	Relaxing	Satisfied	Sexy
	Sophisticated	Stylish	Updated	Waste of Time	
PCA Communalities (≥0.5)	Irritating	Lost	Natural		

IV. SUPPORTING HYPOTHESIS

Paired Samples T-test, *P-value* is probability of something would occur frequently and 0.05 is a standard amount of *sig.* value. *Sig.* is equivalent to *p-value*. If *p-value* is > 0.05 then there is no statistically significant difference between two groups which conclude that the difference Mean value is likely to change due to chance and not by manipulation. Whilst, *if p-value* is ≤ 0.05 then there is a statistically significant difference between two groups which conclude that the difference Mean value is likely to change due to manipulation and not by chance. For hypothesis review, $H0_x$ is Null Hypothesis while $H1_x$ is Alternative Hypothesis.

A. Hypothesis 1: Information Design

$H0_1$: Variances of students' feelings based on genders were not affected in response to the Information Design on e-learning site interface.

$H1_1$: Variances of students' feelings based on genders were affected in response to the Information Design on e-learning site interface.

	Sig. (2-tailed)
Pair 1 Male Students – Female Students (Colour Design)	0.043
Pair 1 Male Students – Female Students (Layout Design)	0.141
Pair 1 Male Students – Female Students (Text-based Design)	0.391

According to the analysis results presented above, the p = 0.043 is less than p = 0.05 of standard significant level. Thus, the test concludes that there is a statistically significant difference between the Mean number of feelings for male students and female students. Therefore, Null Hypothesis [$H0_1$] is rejected and Alternative Hypothesis [$H1_1$] is used wherein under the Colour Design category, the variances of students' feelings based on gender were affected in response to the Information Design on e-learning site interface.

B. Hypothesis 2: Navigational Design

$H0_1$: Variances of students' feelings based on genders were not affected in response to the Navigational Design on e-learning site interface.

$H1_1$: Variances of students' feelings based on genders were affected in response to the Navigational Design on e-learning site interface.

	Sig. (2-tailed)
Pair 1 Male Students – Female Students (Colour Design)	0.075
Pair 1 Male Students – Female Students (Layout Design)	0.386
Pair 1 Male Students – Female Students (Text-based Design)	0.302

According to the analysis results presented above, the p = 0.075 is greater than p = 0.05 of standard significant level. Thus, the test concludes that there is no statistically significant difference between the Mean number of feelings for male students and female students. Therefore, Null Hypothesis [$H0_1$] is used and Alternative Hypothesis [$H1_1$] is rejected wherein the variances of students' feelings based on gender were not affected in response to the Information Design on e-learning site interface.

C. Hypothesis 3: Visual Design

$H0_3$: Variances of students' feelings based on genders were not affected in response to the Visual Design on e-learning site interface.

$H1_3$: Variances of students' feelings based on genders were affected in response to the Visual Design on e-learning site interface.

	Sig. (2-tailed)
Pair 1 Male Students – Female Students (Colour Design)	0.023
Pair 1 Male Students – Female Students (Layout Design)	0.302
Pair 1 Male Students – Female Students (Text-based Design)	0.274

According to the analysis results presented above, the p = 0.023 is less than p = 0.05 of standard significant level. Thus, the test concludes that there is a statistically significant difference between the Mean number of feelings for male students and female students. Therefore, Null Hypothesis [$H0_1$] is rejected and Alternative Hypothesis [$H1_1$] is used wherein under the Colour Design category, the variances of students' feelings based on gender were affected in response to the Information Design on e-learning site interface.

V. CONCULSION

In conclusion, male and female students have different emotion reactions towards any design based on gender natural characteristic. Designing the web interface in accordance to gender tendency shows a different emotion response from both genders to user interface. The design is divided into three types namely Information Design, Navigational Design and Visual Design and each of these designs are then subdivided into three perspectives, Text-based Design, Layout Design and Color Design. Using the Kansei Engineering Approach, it helps to assented that the human feelings are triggered and responsive in inclination to gender attributes towards these designs wherein at the end, the results study concluded the majority students eventually inclined to show the most responsive feelings upon Color Design theme. In total of twenty-five male students; seven male students are neutral, fourteen male students are almost using and another four male students are definitely using the educational websites. Same goes for female students, the response can be considered as positive where in totality of twenty-five female students; eleven female students are in neutral sentiment, another eleven female students in almost using and three female students are definitely using the web educational sites.

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