

Does Aesthetics Affect the Users' Perceptions of VLEs?

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Abstract. This article presents the results of an empirical study about the role of aesthetics on screen layout design of Virtual Learning Environments (VLEs). There are many theories about what aesthetics is and how it can be achieved. However, the application of aesthetic aspects into interactive computer systems is just showing its first results (e.g. Automatic Teller Machines, web pages and VLEs). This study involved 98 participants who navigate on the environment to carry out two tasks using a simulation of a VLE interface. They evaluated the environment aesthetics, usability and hedonic characteristics. The results showed significant relationship between aesthetics and usability. The comparison between different screens layout suggests that perception of aesthetics are not directly related with the participants' background, schooling, computer literacy, gender or age.

1. Introduction

The use of Virtual Learning Environments to deliver online learning is becoming a well established practice used by Educational Institutions and private companies. Nowadays, computer programs such as VLEs have much higher usability than before. However, the concerns with the aesthetic aspects of its interface are at an early stage and there are many important issues to be addressed in order to motivate the learning process as well as users' perception of pleasure and affect.

Results from various studies suggest that a new approach for interface design, including VLEs, is no longer a matter of achieving beauty or fashion but giving motivation and satisfaction, affecting the user perception of the environment. A recent book 'Emotional Design – Why we love (or hate) everyday things' [1] gives a new perspective to products based on affective design, emphasizing their aesthetics and pleasure of use. The theory proposed presents three levels of emotional design: i) visceral design is concerned with appearance and it doesn't depend on cultural aspects, ii) behavioural design deals with pleasure and effectiveness of use and iii) reflective design considers the message, meaning of the product and it is culturally dependent.

This theory can also influence computer interface design, especially to VLEs, where the users may need additional motivation to be fully engaged on a distance learning course.

2. Computers and Aesthetics

The literature reports several studies related to learnability and aesthetics. It was found that aesthetically pleasing layouts have a definite effect on the student's motivation to learn [2] and that good graphic design and attractive displays contribute to the transfer of information [3]. In

other words, good design helps the user to comprehend the information in a better and easier way.

In a study conducted by [4], subjects who used the lesson with good design principles completed the lesson in less time and had a higher completion rate than those who used the lesson with poor design principles and [5] indicated that organization and visual interest are important criteria in judging the readability and studyability of the real screens. Screens that are plain, simple, unbalanced, and bare are perceived as undesirable.

Recent research on the visual aesthetics of computer interfaces suggests that aesthetics is a strong determinant of users' satisfaction and pleasure [6] and that visual attractiveness of the site affects users' enjoyment as well as perceptions of ease of use [7]. This is supported by [8] who found that careful application of aesthetic concepts can aid acceptability, learnability, comprehensibility and productivity. Acceptability was investigated by [9] and [10] where the studies showed very high correlations between users' perceptions of interface aesthetics and usability.

3. Previous Studies

The empirical study conducted by [11] using a VLE found a positive relationship between interface aesthetics and perceived usability. Another of our studies tested the importance of five design principles (unity, proportion, homogeneity, balance and rhythm) as a simple way to achieve aesthetics of computer interface [12].

The results showed to be statistical significant for all five design principles. This gives evidence that the users prefer the screens that apply the design principles. It also tried to find if aesthetics (achieved through applying the design principles) were related to the users' perceived usability of the environment. The stimuli material used comprised three different sets of screens (home, content and e-mail) each one with four different layouts. Therefore, a total of 12 screens had been evaluated on their aesthetic aspects and after, on their perceived usability.

The results were statistical significant and showed a positive correlation between aesthetics and perceived usability in all three sets and also in all four different screen layouts.

4. Empirical Study

The present study was conducted to: (i) confirm previous study results and (ii) verify if the results would have major differences after the user's interaction with the proposed VLE. Participants interacted with the interface, performing two tasks, before evaluating the aesthetics and usability of the interface used. It was made necessary to develop a prototype of a VLE environment to be the stimuli material so that the participants could interact with the VLE in order to perform the tasks.

The aesthetic aspects had two different sets of screen layouts, one that had all the design principles applied (high aesthetics) and other that violated all of them (low aesthetics). The usability aspects had on set with delays and error messages (low usability) on another without delays (high usability). The four conditions (Table 1) generated by aesthetics and usability aspects were the following:

- condition 1 (1A): high aesthetics and low usability;
- condition 2 (1B): high aesthetics and high usability;
- condition 3 (2A): low aesthetics and low usability;
- condition 4 (2B): low aesthetics and high usability.

4.1 Method

4.1.1 Design

The experiment had a 2 x 2 between-subjects design. The aesthetics factor had two levels (high and low aesthetics) and the usability factor with two levels (high and low usability). It gave four conditions as shown in Table 1. Each participant took part in just one condition and the tasks were performed using the Latin square design to counterbalance the order effect.

4.1.2 Participants

The experiment was completed by 98 participants enrolled or working at a Higher Education Institution in Brazil. The participants had different backgrounds, schooling, computer literacy and age. The study was controlled for gender (49 male and 49 female) and the mean age of the participants was 27.9 years.

4.1.3 Material and Apparatus

The study was carried out in a controlled environment. . It was used three PCs, allowing three participants to take the experiment at the same time. Each PC had 17'' monitors calibrated to display the same colours values, contrast and brightness. They were positioned in such a way that did not allow sight of other participant computer screen.

The stimulus materials intended to simulate the most common parts of an interactive VLE environment in four different conditions for aesthetics and usability (Table 1). There were three main screens: the homepage which the participant would see first, the content material which they would navigate and the email where they would read and write the messages. Also, they were shown a slide with two thumbnails, one with high aesthetics and the other with low aesthetics to rate the overall impression of the layout.

Table 1: Study conditions.

		Aesthetics	
		High	Low
Usability	Low	Condition 1 (1A)	Condition 3 (2A)
	High	Condition 2 (1B)	Condition 4 (2B)

The last part of the experiment was done on paper questionnaire and intended to collect information regarding the hedonic characteristics of the interface design. The questionnaire used the bipolar verbal anchors. It was used 12 out of 21 hedonic characteristics proposed by [13] to better suit the needs of the present study.

4.1.4 Procedure

As part of the ethics procedure, each participant read a letter of information about what kind of study they were about to participate in and that they had the right to withdraw from the study at any moment. They also received verbal information about the aim of the study before signing

the consent form allowing the data collected to be used for scientific and academic purposes. The data collected was anonymous and the identity of the participant was removed. Once the participants started the experiment, there were intermediary screens with instructions guiding them from the beginning to the end. The tasks were designed with the objective of getting the participant to navigate through the environment and, at the same time, getting them involved with it. The VLE prototype was developed to assure that they would follow the same path and just perform the task asked by this study, by enabling just one link at a time.

On the first task the participant played the role of a student taking an online course who had received email from a friend asking his or her opinion about a particular topic of the content material. She or he was asked to go to the content material to find the answer and then reply to the email based on their aesthetic opinion.

For the second task, the participants were told that they were tutors of online courses who had received an email from a group of students asking about the content of weeks 6 and 8. They were asked to go to the calendar and reply to all the students with the correct answer.

The interface used 'Previous' and 'Next' buttons to advance and return pages. They could navigate through the material and spend as much time as they needed to complete the task. When answering the emails, it was possible to return to the content material or calendar if they forgot the answer or wanted to check it again.

After they finished the two tasks they were asked to evaluate the environments' aesthetics and usability using a five-point Likert scale. First, they evaluated the aesthetic aspects, varying from (1) Unattractive to (5) Attractive, and then the usability aspect, varying from (1) Difficult to use to (5) Easy to Use.

To verify if the participants would have different opinions when both screens layouts were presented together they were shown two layouts (Figure 1) with two thumbnail each of the screens used in the study, screen A (applying all the principles) and screen B (violating all of them). They simply had to choose between screen A or B in terms of their preference for the aesthetic aspects and on the second slide do the same in terms of usability. It gave the participant a chance of comparing them before rating the one they perceived to be more attractive and then, the one they found easier.



Figure 1 – Thumbnails of screen A (high aesthetics) and screen B (low aesthetics).

Finally, they would evaluate 12 the hedonic characteristics of a given screen on a 5 point scale paper questionnaire. The closer to 5 was the participants' ratings the stronger was the affect caused by the screen layout.

4.1.5 Results

There was a positive correlation ($r = .446$, $N = 98$, $p < .001$) between ratings of aesthetics and of usability, after using the environment. The correlation were even higher between the ratings of aesthetics and usability ($r = .679$, $N = 98$, $p < .001$) when the participants had the opportunity to compare between good and bad screen layouts. Figure 2 presents a graph with the mean ratings using a five-point Likert scale.

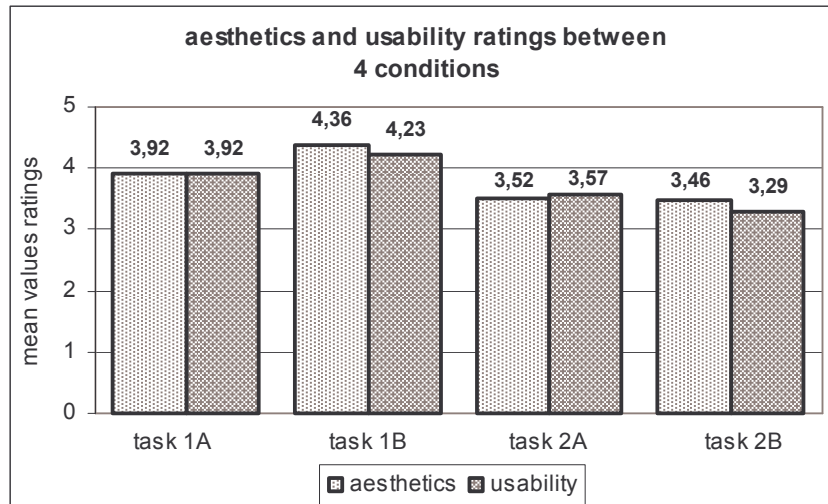


Figure 2: Mean ratings for aesthetics and usability on 4 conditions.

Figure 3 shows a graph of the users' aesthetics and usability preferences when comparing the two screen layouts, one that had applied all the principles (good layout) and the other that had violated the design principles (bad layout). These final evaluations were done independently of the conditions that the participant had been submitted.

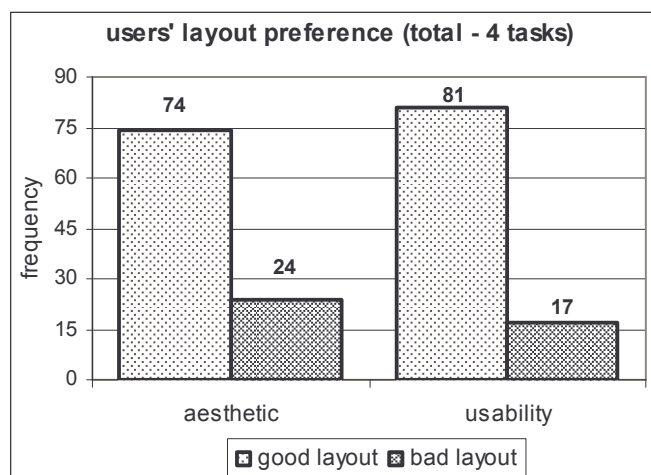


Figure 3: Users' perception of aesthetics and usability based on good or bad layout.

Figure 4 shows the mean value of participants' perception towards the hedonic characteristics taking into account the screens layouts. It had 3 main factors: identification, stimulation and pragmatic.

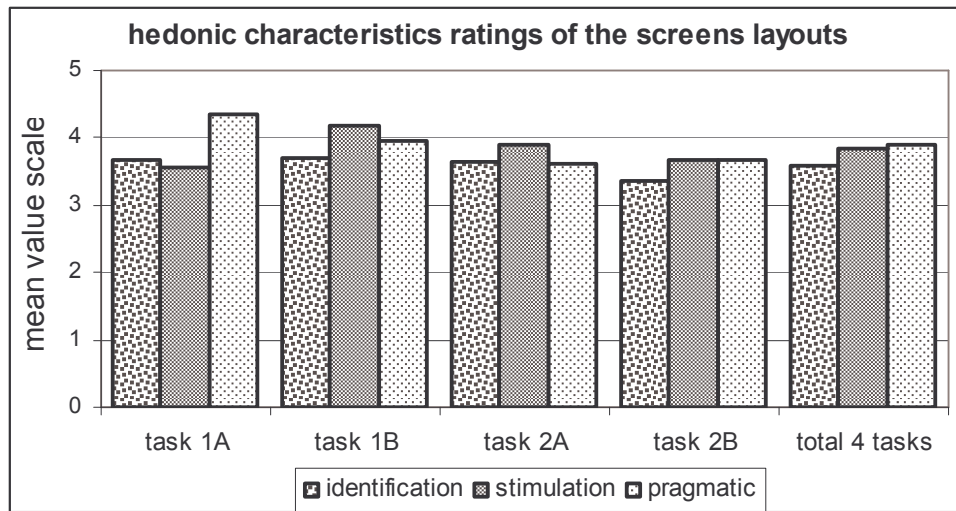


Figure 3: Users' perception of hedonic characteristics of the screens layouts.

5. Discussion

Our previous study [11] showed that the five design principles (unity, proportion, homogeneity, balance and rhythm) are perceived by the users as important aspects of the screen layout design. These gave indication that they could be used as a measure for achieving aesthetics.

The static screens layouts study also found a positive correlation between aesthetics and perceived usability in all 3 different sets and in all 4 different layouts. However the difference between groups were not statistical significant corroborating the findings from [10] and giving indication that at the visceral and behavioural levels of emotional design theory [1], the perception of aesthetics and its relation to usability do not depend on culture. The visceral level is first level of emotional design, what nature does. It is concerned with appearance and does not depend on cultural aspects. The behavioural level relates to the brain process that processes and control everyday behaviour. It deals with pleasure and effectiveness of use.

The present study used an interactive environment and the participants evaluated the screens layout aesthetics (developed using the design principles) and the usability of an interactive environment after they completed the tasks.

The positive correlation found between aesthetics and usability shows the participants' preference for screens layouts that apply the design principles giving evidence that those screens were perceived as aesthetically pleasing and as having better usability. It also implies that the design principles are a good measure for aesthetics.

We also found a positive correlation between aesthetics and usability in the four different conditions. The variance between different groups was not statistically significant. This suggests that the perception of aesthetics and usability may not be dependent upon culture.

The correlation between aesthetics and usability were higher when the participants could compare between different screen layouts. The big difference on the frequency of participants' preference gives clear evidence that they were able to distinguish good from bad interface screen layout. It was not related with computer literacy, age or gender. Although the

results were similar for schooling and cultural background, further investigation needs to be done. Finally, the hedonic characteristics suggest three factors that may have influence on users' perception the screen layout towards the environment.

6. Acknowledgements

I, R. Parizotto-Ribeiro, express my thanks to CNPq (Brazil) for sponsoring this PhD research and those who helped to have this study done. I much appreciated my supervisor's valuable corrections and comments on this article.

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