# Emotional Design in Multimedia: Does Gender and Academic Achievement Influence Learning Outcomes?

**Jeya Amantha Kumar [1] , BalakrishnanMuniandy [2], Wan Ahmad Jaafar Wan Yahaya[3]**

**[1] Centre for Instructional Technology and Multimedia, Universiti Sains Malaysia, Pulau Pinang, Malaysia**
**Email: jeya.amantha@gmail.com**

**[2] Centre for Instructional Technology and Multimedia, Universiti Sains Malaysia, Pulau Pinang, Malaysia**
**Email: mbala@usm.my**

**[3] Centre for Instructional Technology and Multimedia, Universiti Sains Malaysia, Pulau Pinang, Malaysia**
**Email: wajwy@usm.my**

## ABSTRACT

This study was designed as a preliminary study (N = 33) to explore the effects of gender and academic achievement (Cumulative Grade Point Average-CGPA) on polytechnic students' learning outcomes when exposed to Multimedia Learning Environments (MLE) designed to induce emotions. Three designs namely positive (PosD), neutral (NeuD) and negative (NegD) had similar contents and narrations but differed visually based on colors, images and font (size and style) in depicting the intended emotions. The learning outcomes evaluated are learning achievement, perceived intrinsic motivation and satisfaction. Overall, there was no significant difference between gender and CGPA when students were exposed to the emotionally designed MLE. However, male students were significantly more motivated and satisfied with the NegD design compared to the female students. A significant positive relationship was observed between intrinsic motivation and satisfaction and between gender and design. In addition, female students were found to prefer PosD design and male students, NegD design. Users of PosD and NegD design showed strong relationship between perceived intrinsic motivation and satisfaction. For learning achievement, high academic achievers performed better in the PosD design compared to other designs. No significant relationships were found between any of the variables for the NeuD design.

**Keywords:** *Emotional design, gender, academiz achievement, learning outcomes*

## INTRODUCTION

Multimedia elements are integrated in instructional tools to engage users and fulfil pedagogical needs. They have a distinct role in increasing aesthetic appeal as design attractiveness can influence user engagement, satisfaction and motivation in using e-learning systems (Dong, 2010). Aesthetics and emotions go hand in hand; to design for emotion is also to design for aesthetics. It has been found that "emotions connect a multimedia design to multimedia learning and also the designer to the user" (Dong, 2007, p.125). However, a persons' perception of aesthetics is also influenced by how they relate and bond their emotions to a prior experience related to the objects' appeal. As an example, the color black is associated with death and some might say it is a color of sophistication. What is important is to understand how users experience these elements and design in accordance to their needs and promote positive interaction.

Multimedia-based learning that manipulates the influence of aesthetics of essential multimedia instruction is defined as emotional design in multimedia learning. This field of study is fairly new and is related to the design and integration of emotional factors to promote positive learning by exploring user experience.

In this study, two main aspects that diversify users were selected; gender and academic achievement. The focus is to identify if these user characteristics influence how emotional design is perceived. Firstly, gender is referred to as sexual identity that defines an individual's masculinity or femininity (Leblanc, 2012). According to Sánchez-Núñez, Fernández-Berrocal, Montañés, and Latorre (2008), the influence of gender on perception is not really apparent for "digital natives" as education and culture has played a great role on generalizing this generation. However, how true is this especially for an Asian country were cultural and gender segregation is still apparent? In addition, research on gender influence on emotional design in multimedia learning is still scarce. Secondly, academic achievement is usually linked with emotional competence in handling negative emotions while learning. Positive relationship was also found between academic achievement and emotions (Fayombo, 2012) because academic achievement relates to how individuals manage their emotions and simultaneously identify with their emotional intelligence (EI) while learning (Stamatopoulou, Kargakou, Konstantarogianni, & Prezerakos, 2015). Therefore, persons with high academic achievement could be perceived as emotionally sensitive to their environment and therefore the researcher questions if it influences how they perceive an emotionally designed MLE.

**Literature Review**

Students experience a variety of emotions ranging from positive to negative emotions (Pekrun, Götz, Titz, & Perry, 2002). Emotions can be defined based on valence (positive, neutral and negative), activation (excited, neutral and calm) or dominance (weak, neutral and strong) (Yan, Bracewell, & Ren, 2008). The most common method used for educational based studies are by using valence (Park, 2004). Positive emotions are emotional states such as enjoyment, pride and satisfaction whereas negative emotions are emotional states such as anger, anxiety and frustration (Pekrun, 2011). Positive emotions creates curiosity, creativity and improves learning however, it could also deter focus (Um, 2008). On the other hand, negative emotions although thought to be detrimental to learning could actually aid in focusing the mind (Norman, 2004). Thus, it can be concluded that emotion irrespective of its valence is important in learning (Moridis & Economides, 2008) and if neglected the outcome could be disadvantageous to the whole learning process itself (Hinton, Miyamoto, & Della-Chiesa, 2008).

In e-learning, emotions can be induced or integrated through multimedia (Knautz, 2012). Martinez (2002) claims that e-learning tool design influences users' motivation, satisfaction, and how they emotionally feel toward the tool. However, multimedia elements have different emotional impact on different users because emotions are formed based on individual perception or appraisal (Nezlek, Vansteelandt, Van Mechelen, & Kuppens, 2008). By appraising, a person defines if they like or dislike an object thus emphasizing why aesthetics is important. Aesthetics defines how we perceive our environment through our senses (Anderson, 2011). According to Norman (2004), any aesthetically pleasing design could change an emotional state, perception and how one relates to the product.

By understanding the interrelationship between emotion and design, designers will be empowered to influence the user's emotional state (Miller, Veletsianos, & Hooper, 2006) which will subsequently influence their interaction. Dong (2010) explained that the interface design of an e-learning system can induce emotions and activate cognitive activities. Dong suggested the use of multimedia aesthetics such as by integrating colour, graphics, text, audio, and video to induce positive emotion in e-learning. As emotions and cognition are closely associated (Norman, 2004), empirical research in emotion design in multimedia learning seeks to redefine this relationship (Dong, 2010; Ghali & Frasson, 2010). The theory that defines this relationship is called *emotional design*.

Emotional design is based on Donald Norman's theory claiming that pleasing designs are designs that can influence the user based on the visceral, behaviour, and reflective levels (Norman, 2004). The visceral level is the first impression the user has on the physical attributes of the product such as color and smoothness (Ho & Siu, 2009). Behavioural level is based on the product's usability and efficiency and lastly the reflective level is based on how the user relates to a product. Emotional design implementation in multimedia learning is not about adding new decorative elements to the learning tool to persuade the user, but to redesign essential multimedia elements such as color or images to create positive interaction (Heidig, Müller, & Reichelt, 2015) thats promotes generative processing (Mayer & Estrella, 2014).

A study done by Um, Plass, Hayward, and Homer (2012) reported that designing a Multimedia Learning Environment (MLE) to induce positive emotion increased understanding and knowledge transfer. Their study compared two design types; positive and neutral. Positive designs are designs that induce positive emotions such as happiness and joy. Negative designs are designs that portray negative emotions such as sadness and dullness, whereas, neutral designs are designs that induce neither positive nor negative emotions. The question raised here is whether induced negative emotion through multimedia elements could have significant positive impact on learning. According to Moridis and Economides (2008), negative emotion has a positive quality that could improve learning. Dong (2007) and Tractinsky (2013) also expressed a need to investigate the impact of visual aesthetics especially online.

Haron, Mustafa, and Alias (2010) claim that emotion regulation is different between genders. Simultaneously, in e-learning, the difference between genders in how they perceive colours or visual stimuli is physiological and believed to be shaped by their culture (Plass, Heidig, Hayward, Homer, & Um, 2013). Thus, based on these identifications, user preference of aesthetics in a product can be defined by their cultural acceptance of what defines their sexuality. For instance, female users prefer colourful, female-designed websites and aesthetics above usability (Leblanc, 2012). Bright and warm colours such as yellow and orange are much preferred by female users whereas male users prefer cool dark colours such as grey and blue (Ellis & Ficek, 2001; Mahzari & Ahmadzadeh, 2013). However, empirical research found these preferences are predictable as some colours can induce the same response regardless of culture or society (King, 2005; Mahzari & Ahmadzadeh, 2013). For example, warm bright colours usually create a sense of happiness and are not perceived as sad or dull. Conversely, male students have also been found to benefit the most from e-learning compared to female students with regard to test achievement (Rodgers, 2008).

Test achievement differs from academic achievement where academic achievement is the overall achievement in the whole course or program and is cumulated throughout the semester. Academic achievement is defined as Cumulative Grade Point Average (CGPA) (Fayombo, 2012) in this study. Jasper et al. (2012) claimed that high achievers (CGPA > 3.0) performed better than low achievers (CGPA < 3.0) in e-learning environment due to higher confidence and motivation. However, in the context of emotional design, are high achievers partial to a certain kind of design? Do they prefer more aesthetically pleasing design as it has an emotionally relationship with satisfaction? Hence, based on these statements it can be suggested that there might be a relationship between gender, academic achievement and emotion in the e-learning environment. Thus, in this study we will investigate the effect and relationship between gender and CGPA on learning outcomes when induced with positive, neutral and negative emotion through multimedia.

The learning outcomes measure will consist of learning achievement, perceived intrinsic motivation and satisfaction. According to the Commonwealth Educational Media Centre for Asia it is important to evaluate learning achievements to measure success of the learning activity (Naidu, 2006). Motivation and satisfaction are another two factors that should be considered as they relate to the concept of emotional design (Norman, 2004) and are relevant to emotion integration in an e-learning environment (Martinez, 2002). Which conforms to the fact that intrinsically motivated students will be able to learn based on their own satisfaction and enthusiasm irrespective of any grade or reward (Jung & Lim, 2009).

## RESEARCH OBJECTIVE

The purpose of this study is to investigate the effect of gender and academic achievement on student learning outcome (achievement, perceived intrinsic motivation and perceived satisfaction) when exposed to a Multimedia Learning Environment (MLE) that was designed to induce either positive, neutral or negative emotions. This study also explores the relationship between these variables.

### Research Questions

This study plans to answer the following research questions:

1. What is the difference between gender on student learning outcomes when students are exposed to a MLE designed to induce positive, neutral or negative emotions?
2. What is the difference between levels of CGPA on students learning outcomes when students are exposed to a MLE designed to induce positive, neutral or negative emotions?
3. What is the relationship between gender on students learning outcomes when students are exposed to a MLE designed to induce positive, neutral or negative emotions?
4. What is the relationship between levels of CGPA on students learning outcome when students are exposed to a MLE designed to induce positive, neutral or negative emotions?

## METHODOLOGY

### Design and development of the MLE

The designs are categorized as Positive (PosD), Neutral (NeuD) and Negative (NegD) Design. The PosD was developed to induce positive emotion (happiness, joy, etc.), thus the multimedia elements (color, font and images) were developed to portray such emotion. The NegD was developed to induce emotions such as sadness and dullness. Lastly, the NeuD was designed as a neutral design (neither positive nor negative); where the color choices were limited to neutral type of colors such as black, white and gray scale. Selection of these multimedia elements are aligned with empirical studies on emotional design in multimedia learning done by Dong (2010), Mayer and Estrella (2014), Plass et al. (2013) and Um and Plass (2009). However, their studies explored the difference between positive and neutral design whereas this study will include the negative perspective. The designs of colours are based on the findings by Tharangie, Kumara, Jayasinghe, Marasinghe, and Yamada (2008) and Zettl (2010). For fonts, the font type and size were used to establish differences between the designs. For the PosD - Kristen ITC (15-24 pt); NeuD– Arial (14pt) and NegD – Impact (10-13pt and >24pt) which is based on the findings by Dong (2010), Shaikh (2007), Tsonos and Kouroupetroglou (2011) and Zettl (2010). Lastly, images and graphics which are also related to their colors and affect are based on the studies by Dong (2010), Wang and Yu, (2005), Knautz (2012) and Um (2008). It is important to highlight that the use of these multimedia elements is also based on the commonly used elements for e-learning for the sample.

In all cases the target is still to create a positive learning environment cognitively and affectively as per the definition of emotional design in multimedia learning described by (Heidig et al., 2015). The PosD and NegD multimedia learning system was found to reduce negative affect scores based on the Positive and Negative Affective Schedule (PANAS) significantly in e-learning (Kumar, Muniandy, & Wan Ahmad Jaafar, 2014). All three designs have the same content and were developed based on the Malaysian Polytechnic syllabus of EE503: IC Fabrication and Packaging Technology for the topic of silicon fabrication. The screenshots for the designs are represented in Figure 1.

| Positive Design (PosD) | Neutral Design ( NeuD ) | Negative Design (NegD) |
|---|---|---|

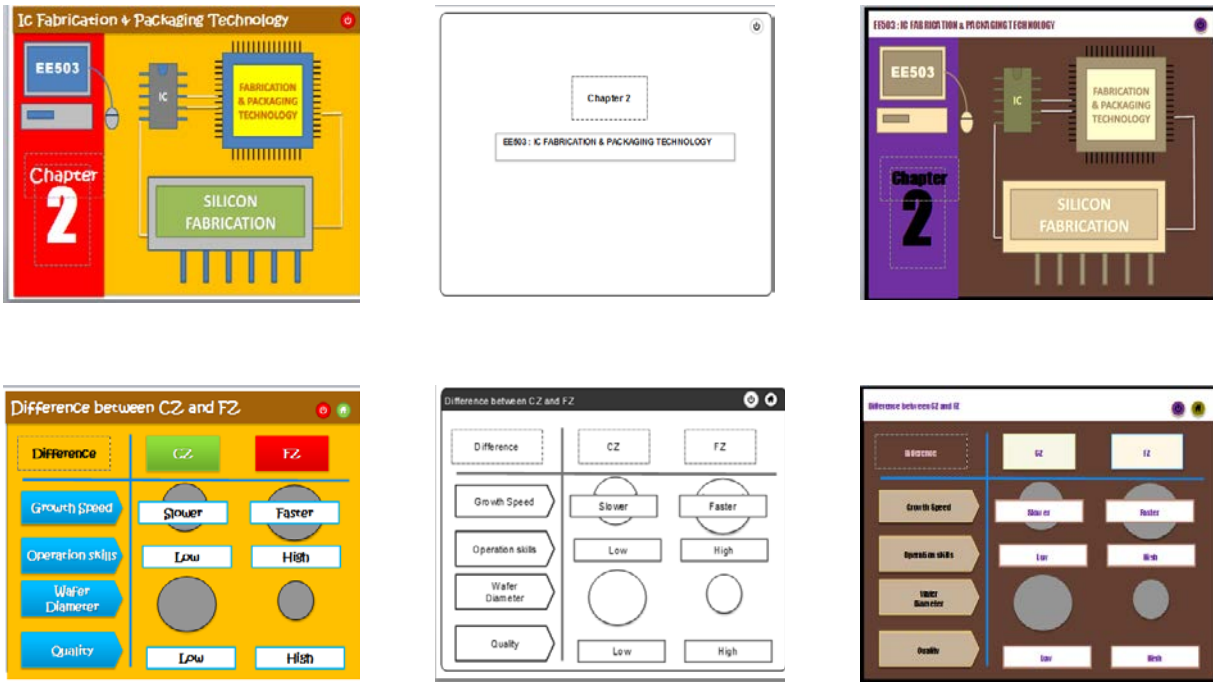


**Figure 1**: Screen shots of the as Positive Design (PosD), Neutral Design (NeuD) and Negative Design (NegD)

**Instruments**

In this study, four instruments were used to identify students' demographic profile and learning outcomes. Student demographic profile was collected based on information such as student identification number, age, gender and Cumulative Grade Point Average (CGPA). The instruments used to evaluate the learning outcomes are the Pre and Posttest learning achievement test, Post-Experimental Intrinsic Motivation Inventory (IMI) and E-Learning Satisfaction (ELS) Inventory.

The Pre and Posttest measured the difference between student learning achievement before and after the intervention. The items were developed based on the objectives of the IC Fabrication and Packaging Technology (EE503) syllabus from the Department of Polytechnic Education of Malaysia. Twenty (20) objective questions were developed for the pre and posttest measurement. The second instrument measured the perceived intrinsic motivation through the Post-Experimental Intrinsic Motivation Inventory (IMI). The instrument has a reliability value of .71 (Manal Mohammad Asif, 2011). The last instrument measured the students' perceived satisfaction by implementing the E-Learning Satisfaction (ELS) Inventory developed by Wang Yi-Shun (Wang, 2003) to measure satisfaction based on interface design and content of an e-learning environment. Prasanna Ramakrisnan, Azizah Jaafar, and Noor Faezah Mohd Yatim (2013) found the ELS to have a reliability value of .92 based on their study involving 86 undergraduate students of Universiti Teknologi MARA (UiTM). All instruments used in this study excluding the pre and posttest are measured based on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The categorization is based on the mean score, where students scoring below the calculated mean will be classified as "Low" and those scoring above will be classified as "High".

**Participants and Procedures**

As this is a preliminary study, 33 students from the Diploma of Electronic Engineering course at a polytechnic in the northern region of Malaysia were selected. These students were enrolled in the EE503: IC Fabrication and Packaging Technology course. Before being exposed to the MLE, the students were required

to answer 20 objective questions (pretest questions). After completing the test, students randomly selected their stations before being exposed to the type of MLE designs (positive, neutral or negative design). They were allocated 45 minutes to go through the MLE. After the intervention, students were given the Post-Experimental Intrinsic Motivation Inventory, E-Learning Satisfaction (ELS) Inventory followed by posttest questions. Lastly, students were thanked for their co-operation.

## FINDINGS

Based on the findings, 63.6% of the respondents were male and 36.4% were female students. Some 72.7% of students were between 18- 20 years old and the remaining were between 21-25 years old. The highest percentage of students based on CGPA possessed points between 2.50 to 2.99 (60.6%) followed by 3.00 to 3.49 (27.3%), 2.00 to 2.49 (9.1%) and lastly below 2.00 (3%). There were no students in the 3.50 to 4.00 point category. As students were categorized based on High CGPA (>3.0) and Low CGPA (<3.0), 72.7% of the students were in the Low CGPA group.

Overall, male students were more intrinsically motivated (Mean = 5.46, *SD* = .36) than female students (Mean = 5.35, *SD* =.39) to use the MLE irrespective of design type . They were also more satisfied (Mean = 6.20, *SD* = .39) to use the MLE compared to the female students (Mean = 5.97, *SD* = .55). However, female students had slightly higher learning achievement scores (mean = 3.09, *SD* = 2.70) compared to male student (Mean = 3.05, *SD* = 2.30). Nevertheless, based on an independent-sample *t*-test conducted no significant difference was found between gender and all learning outcomes and the results were similar for high and low CGPA groups.

However, to understand the effect of emotional design in multimedia learning on gender, an independent *t*-test was performed to differentiate the results of the learning outcomes on the courseware designed to either induce positive, neutral or negative emotion. Gender distribution for each design (PosD, NeuD and NegD) is shown in Table 1. As this study was designed as a quasi-experiment; there was no control on the number of male and female students in each group. For perceived intrinsic motivation, significant difference between male (Mean=5.63, SD = .27) and female (Mean = 5.00, *SD* = .34) students based on the conditions; $t(9) = 2.92$, $p = .02$, $d = .32$ were observed. Whereas, for perceived satisfaction, significant difference in the score between male (Mean = 6.35, *SD* = .33) and female (Mean = 5.42, *SD* = .60) students were based on the conditions; $t(9) = 3.24$, $p = .01$, $d = .45$.

**Table 1: Percentage of Male and Female Students based on Design Type**

| Design Type | Male (%) | Female (%) |
|---|---|---|
| PosD | 36.4 | 63.6 |
| NeuD | 72.7 | 27.3 |
| NegD | 81.8 | 18.2 |

In the context of analyzing the students based on CGPA; it was found that there was a significant difference between CGPA groups for PosD design for learning gain based on the conditions of $t(9) = 2.76$, $p = .02$, $d = 2.06$. Overall, students with high CGPA (Mean = 4.33, *SD* = 1.53) achieved higher scores than students with low CGPA (Mean = 1.38, *SD* = 1.60). No other significant relationships were found in other designs.

According to Pallet (2007), small sample have low chances of fulfilling statistical significance standard value of $p < .05$. Tong and Klecun (2004) suggested using correlation as a method of observing gender differences as a means to understand how gender influences a variable. Thus, it was suggested to report the strength of the relationship to further understand it. A Pearson correlation analysis was performed between gender, CGPA, learning outcomes and design type. Table 2 shows the strength of the correlation between the variables. Two significant correlations were found; (i) perceived intrinsic motivation and perceived satisfaction ($r = .56$, $p = .00$) (ii) gender and design type ($r = -.39$, $p = 0.03$). The results indicated that female students showed preference for positive design and male students showed preference for negative design. Other factors were not affected by the increase and decrease of other variables.

**Table 2 Means, Standard Deviation, and Correlations between Variables**

| Factors | Mean | SD | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| 1. Gender | | | .33 | -.39* | .02 | -.15 | -.21 |
| 2. CGPA | | | - | .24 | .12 | .08 | .01 |
| 3. Design type | | | | - | .30 | .14 | .04 |
| 4. Learning achievement | 2.76 | 2.50 | | | - | .05 | .12 |
| 5. Perceived intrinsic motivation | 5.41 | .36 | | | | - | .56* |
| 6. Perceived satisfaction | 6.00 | .64 | | | | | - |

*Note*. *SD* = standard deviation, CGPA = cumulative gross point average. *= $p < .05$.

The analysis was further directed toward the effects of different design types (PosD, NeuD and NegD) on other variables. Table 3 portrays the strength of the relationship between genders, CGPA, the learning outcomes for the PosD design. There was a significant, positive relationship between CGPA and learning achievement ($r = .68$, n = 11, $p = .02$) and there was a strong positive relationship between perceived intrinsic motivation and satisfaction ($r = .80$, n = 11, $p = 0.01$). Whereas, for the neutral design, no significant relationship were found in all conditions (Table 4). Lastly, for the NegD, three significant relationships were found from the analysis (Table 5). Student's gender seems to have a negative relationship with perceived intrinsic motivation ($r = -.70$, n = 11, $p = 0.02$) and satisfaction ($r = -.73$, n = 11, $p = 0.01$). A strong positive relationship was found between perceived intrinsic motivation and satisfaction ($r = .79$, n = 11, $p = 0.01$) was also found in the NegD design.

**Table 3 Means, Standard Deviation, and Correlations between Variables for the PosD design**

| Factors | Mean | *SD* | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1. Gender | | | -.04 | .07 | .18 | .11 |
| 2. CGPA | 3.18 | .60 | - | .68* | .23 | .24 |
| 3. Learning achievement | 2.18 | 2.04 | | - | -.33 | -.30 |
| 4. Perceived intrinsic motivation | 5.40 | .38 | | | - | .80* |
| 5. Perceived satisfaction | 6.12 | .43 | | | | - |

*Note*. *SD* = standard deviation, CGPA = Cumulative Grade Point Average. * = $p < .05$.

**Table 4 Means, Standard Deviation, and Correlations between Variables for the NeuD design**

| Factors | Mean | *SD* | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1. Gender | | | -.39 | .07 | .01 | -.30 |
| 2. CGPA | 3.27 | .65 | - | 0.15 | .27 | .06 |
| 3. Learning achievement | 2.09 | 2.21 | | - | -.21 | .28 |
| 4. Perceived intrinsic motivation | 5.32 | .33 | | | - | .29 |
| 5. Perceived satisfaction | 5.68 | .84 | | | | - |

*Note*. *SD* = standard deviation, CGPA = Cumulative Grade Point Average.

**Table 5 Means, Standard Deviation, and Correlations between Variables for the NegD design**

| Factors | Mean | *SD* | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1. Gender | | | -.39 | .26 | -.70* | -.73* |
| 2. CGPA | 4.00 | 2.90 | - | -.17 | -.18 | -.18 |
| 3. Learning achievement | 2.09 | 2.21 | | - | .32 | -.03 |
| 4. Perceived intrinsic motivation | 5.52 | .37 | | | - | .79** |
| 5. Perceived satisfaction | 6.19 | .51 | | | | - |

*Note*. *SD* = standard deviation, CGPA = Cumulative Grade Point Average. * = $p < .05$.

## DISCUSSION

Overall, based on the findings, it can be deduced that multimedia-based learning outcome is not differentiated by gender or academic achievement. According to Yukselturk and Bulut (2009), there is no significant difference in gender when users interact with an e-learning environment. Similar findings were also found for online interaction (Miche & Noirhomme-Fraiture, 2009) or in e-learning in higher learning institutions (Macharia & Nyakwende, 2011). Bruestle et al. (2009) and Suri and Sharma (2013) claimed that gender does not affect e-learning as both female and male students' perception and attitude towards e-learning are almost similar in this aspect. In addition, Yukselturk and Bulut claimed that male and female students have the same motivational beliefs and level of achievement where e-learning is concerned. However, Bruestle et al., (2009), added that in e-learning gender plays an important role especially when students assess their e-learning competence.

When students perceive e-learning as a beneficial tool for teaching and learning, their attitude and requirement to fulfil the 'technology gap' matures. Kumar, Muniandy, and Wan Ahmad Jaafar Wan Yahaya (2012) found that polytechnic students in Malaysia found learning with computers to be beneficial regardless of gender and CGPA level. However, there are concerns if e-learning is only beneficial to certain groups of achievers. A study done on 110 undergraduates in Malaysia revealed that there is no relationship between e-learning achievement and CGPA levels (Jasper et al., 2012) and this fact is also true in this study. Thus, there is no difference between groups of CGPA in the context of e-learning outcome.

Nevertheless, to further understand the relationship of these variables, the correlation analysis revealed the following:-

*i. There is a relationship between gender and design type*

Female students' preferred PosD design and male students preferred NegD design. According to Passig and Levin (2000), the relationship between gender and satisfaction of using an e-learning tool is dependent on the interface and Leblanc (2012) described the main differentiating factor between genders are their colour preferences. As the colours used in the PosD design were warm colours, the female students' preferences are justified by Ellis and Ficek (2001). According to them, male undergraduates prefer cool colours (NegD) whereas female students prefer warmer colours such as yellow and red which were used in the PosD design.

*ii. There is a relationship between perceived intrinsic motivation and perceived satisfaction*

According to Jung and Lim (2009), high levels of intrinsic motivation encourage students to learn to fulfil their satisfaction and interest. Intrinsic motivation and satisfaction are found to be co-dependent factors in the learning process, even in e-learning. The positive relationships between perceived intrinsic motivation and perceived satisfaction were also extended when students were exposed to the PosD and NegD but not the NeuD design.

Findings also revealed that male students were more satisfied and motivated with the NegD design compared to female students and this was educationally significant (Wolf, 1986). According to Mahzari and Ahmadzadeh (2013), the gender difference in the context of online aesthetics is not differentiated by aspects such as font or shapes but by the colours applied. In addition, the difference between genders could also be determined by preference between warm or cool colours (Ellis & Ficek, 2001). It has been reported that female online users prefer colourful interface whereas male users favour less saturated colours (Harrison, Reinecke, & Chang, 2015). Leblanc (2012) described adult male computer users are more prone to colours portraying professionalism such as dark, cool colours; in contrast, female users prefer more vibrant colours of yellow or pink. Nevertheless, a review done by Miche and Noirhomme-Fraiture (2009) on online preferences of user interface elements based on gender revealed that the relationship between colour and gender could be dominated by their psychological characteristics as determined by the femininity or masculinity.

Students that used the PosD and NegD designs confirmed that there is a relationship between satisfaction and intrinsic motivation; concluding that both genders were equally satisfied and motivated by the emotionally designed MLE. It was also found that students having high levels of CGPA achieved better

score through PosD design compared to other designs and the findings had a large practical effect in education research (Wolf, 1986). This is supported by a study conducted on Malaysian polytechnic students by Kumar et al., (2012) that concluded that high CGPA students have positive perception when dealing with computers. Fayombo (2012) claims that academic achievement is positively correlated with positive expressivity and in this study it was portrayed in the PosD design.

However everything comes back to the question: is it important to design for gender differences? The perception of undergraduates on e-learning design has been found to be unrelated to the gender, age, computer skills nor education levels (Parizotto-Ribeiro & Hammond, 2005). According to Leblanc (2012), to design a neutral user experience for human computer interaction is to most probably design based age groups because the design for "digital natives" is not affected by gender but by their culture and technology transformation. In addition, Rodgers (2008) doubted if higher learning institutions could implement e-learning technology that caters to different characteristics of students simultaneously. Nevertheless, by understanding how users experience a system and clustering the designs based on user groups' personality might potentially be a design solution. In addition, much more research on emotional design in multimedia learning that reflects on the use of Cognitive and Affective Theory of Learning with Media also emphasizes exploring motivational and metacognition aspects of the user. As this was just a preliminary study with small sample size, further research on this area might shed some light on designing e-learning that has the maximum positive impact cognitively and emotionally.

## CONCLUSION

Overall, there was no difference between gender and CGPA groups on the learning outcomes. However, significant differences emerged in some learning outcomes when students were exposed to different types of designs. It was found that female students preferred PosD compared to the male students. Male students were more motivated and satisfied with the NegD design. In both emotionally designed MLE (PosD and NegD) there seem to be a strong relationship between intrinsic motivation and satisfaction. With regard to CGPA, students with high CGPA performed better in the PosD design; no difference, however, was found in the NeuD and NegD design for other learning outcomes.

One of the major limitations of this study is that participants were engineering students and were limited to 33 respondents. The personality and preference of engineering students might skew toward negative design as it accommodates their introvert personality (Kirkham, Farkas, & Lidstrom, 2006) or it can always be that male students prefer more dark or cool colours for MLE. Nevertheless, it was observed that gender does play a role in how students perceive their e-learning environment affectively but it did not affect their learning achievement. Broadening the study to cover a more general topic might portray different findings on how emotional design could influence learning outcomes where gender is concerned.

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