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**PLAYER-CENTRIC EMOTIONAL DESIGN FOR DIGITAL GAMES: AN  
EMPIRICAL EXPLORATION IN VISUAL AESTHETICS**

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## ABSTRACT

The study aims to identify attributes and characteristics of visual aesthetics in order to establish a set of guiding principles of visceral level player-centric emotional design for digital games. This study is important for graphic designers in the field of game design as it may resolve the issue of commercial failure encountered by game designers in the creative industry, particularly on matters related to visual aesthetics. To achieve the research aim, a mixed methods research design was selected, incorporating two phases of research, i.e. the exploratory phase and the confirmatory phase. The exploratory phase involved a qualitative approach to explore phenomena associated to visual aesthetics through semi structured interviews, conducted with five prominent game practitioners. The findings of exploratory phase were used to direct the development of questionnaire survey in the confirmatory phase. A total of 100 graphic design students from four Malaysia public universities took part in this study to confirm or refute the findings revealed in the exploratory phase. Quantitative analysis that involved non-parametric statistical tests, six attributes and twenty-four characteristics of visual aesthetics were confirmed. Only one characteristic was rejected. Besides, sixteen guiding principles of visceral level player-centric emotional design was established explicitly for digital games. The implication, the guiding principles can be applied in game graphic design process which contributing to the theory and practice of game design.





## **REKA BENTUK EMOSI BERPUSATKAN PEMAIN UNTUK PERMAINAN DIGITAL: EKSPLORASI EMPIRIKAL DALAM ESTETIK VISUAL**

### **ABSTRAK**

Matlamat kajian ini ialah untuk mengenal pasti sifat dan ciri-ciri estetik visual untuk menghasilkan satu set prinsip panduan tahap viseral reka bentuk emosi bersentrikan pemain untuk permainan digital. Kajian ini adalah penting kepada pereka grafik dalam bidang reka bentuk permainan dan mampu untuk menyelesaikan isu yang berkaitan dengan risiko kegagalan komersil dalam industri kreatif, terutamanya perkara yang berkaitan dengan estetik visual. Bagi mencapai matlamat kajian, reka bentuk kajian kaedah campuran telah dipilih dengan menggabungkan dua fasa kajian, iaitu fasa penerokaan dan fasa pengesahan. Fasa penerokaan melibatkan pendekatan kualitatif untuk meneroka fenomena yang berkaitan dengan estetik visual melalui temu bual separa berstruktur, yang dijalankan bersama lima orang pengamal permainan digital yang terkenal. Dapatan dari fasa penerokaan telah membawa kepada pembentukan kajian soal selidik dalam fasa pengesahan. Seramai 100 orang pelajar seni reka grafik yang menuntut di empat universiti awam tempatan telah mengambil bahagian sebagai responden untuk mengesahkan atau menolak dapatan dalam fasa penerokaan. Analisis kuantitatif yang melibatkan ujian statistik matriks tak berparameter, enam atribut dan dua puluh empat karakteristik estetik visual telah disahkan. Hanya satu karakteristik estetik visual ditolak. Selain itu, enam belas prinsip panduan berkenaan tahap viseral reka bentuk emosi yang bersentrikan pemain telah dihasilkan khusus untuk permainan digital. Implikasinya, prinsip panduan tersebut boleh digunakan dalam proses reka bentuk grafik permainan yang menyumbang kepada teori dan amalan reka bentuk permainan.



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## LIST OF ABBREVIATIONS

<b>3D</b>	<i>3 Dimensional</i>
<b>APB</b>	<i>All Points Bulletin</i>
<b>HCI</b>	<i>Human-computer interaction</i>
<b>HP</b>	<i>Hypothetical propositions</i>
<b>Md</b>	<i>Median</i>
<b>MDA</b>	<i>Mechanics, Dynamic and Aesthetics</i>
<b>MMOG</b>	<i>Massively Multiplayer Online Game</i>
<b>SPSS</b>	<i>Statistical Package for the Social Sciences</i>
<b>UCD</b>	<i>User-centered design</i>
<b>UiTM</b>	Universiti Teknologi MARA
<b>UMP</b>	Universiti Malaysia Pahang
<b>UMS</b>	Universiti Malaysia Sabah
<b>UTM</b>	Universiti Teknologi Malaysia

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## CHAPTER 1

### INTRODUCTION



#### 1.0 Overview

This thesis is concerned with the player-centric emotional design for digital games. The chapter starts by depicting the background of research, which includes the justification why game design was chosen as the subject of this study. The term ‘player-centric emotional design’ was coined to denote the branch of visual aesthetics in games, and as a subset of emotional design in psychology. The brief understanding of these key concepts in this chapter are essential to comprehend the problem statement in this study. This, in turn, directs the research aim and research questions. The significance of the study is discussed in order to predict the benefits of attaining the research aim for both game researchers and game practitioners. This chapter lists the operational definition of concepts associated to the subject of the study.





## 1.1 Research background

The origin of this research arises largely from the opportunity given to expand the design capability in the Faculty of Art and Design, Universiti Teknologi MARA (Perak). The focus of the expansion is set on the field of graphic design, particularly in games.

Game design was chosen in this expansion because it includes ‘play’ as compared to other media, such as advertisement, animation, packaging, etc which involves neither players nor playing activity (Crawford, 1984). ‘Play’ in the game design serves as a mediator for interaction between players and games (Stockburger, 2006). Therefore, exploring how to design game visuals that encompasses ‘play’ is necessary for graphic designers in the field of game design. In this sense, the steps of designing for ‘play’ should be different as opposed to other media. Hence, this study would offer steps of creation for graphic designers to design graphics for games.

Game design is supposed to be player-centric in nature (Brathwaite & Schreiber, 2009). However, most of game designers tend to design games based on their personal taste, style and perspective, without considering the needs and desires of players (Sotamaa, 2007). The lack of consideration upon players’ desire would jeopardize the commercial value of the games, despite the high quality of game visuals. No doubt, the need to involve designers’ initial intention in games is unquestionable, but they should also consider the view point of players who are the decision makers in purchasing games as consumer products. Indeed, the player-centric





design approach appears to fit the context of this research as contrasting to designer-centric approach.

Most designers are aware of the substance in designing products that could elicit consumers' emotional response (Karahanolu & Sener, 2009). The emotional response is a result from the biological process of human brain that consists three levels of brain processing: visceral level, the automatic and pre-wired layer; behavioural level, the level that controls daily behaviour; and reflective level, the contemplative part of brain (Norman, 2004). In consequence, this biological process has embarked the notion of emotional design that offers pleasure when consumers own and use a product. For this reason, emotional design would be useful for this study since players are attained for pleasure in games, while giving a chance for digital games to be succeed in commercial world (Trepte & Reinecke, 2011).

## 1.2 Problem statement

There are thousands of digital games in the market, but not all of them are successful commercially. According to Nussenbaum (2004), the success rate of digital games is as low as 20%. Worse, the success rate would be driven by chance and luck. Nonetheless, most of the game practitioners do not see this phenomenon as a problem because some designer-centric approaches did yield fruitful outcomes. For example, CastleVille is a strategy game apps on facebook which produced by Zynga Inc has enormously popular to 15.8 Millions of players based on Monthly Active User (MAU) in July 2012 (Colby, 2013). According to Colby (2013), the gameplay design





of CastleVille is merely designer-centric. This is based on the framework analysis of MDA (Mechanics, Dynamics and Aesthetics) which developed by Hunicke (2004).

The reason why CastleVille has been successful because players are motivated by numerous status updates in facebook made by other players who played the game. It drives them to join the other players to play that game. This reason shows that the designer-centric design is depending to the supplementary factor, not to the game design itself. Therefore, there is a need for research-proven design that would increase the success rate of digital games and avoid wasting design and development resources. The design approach should focus on the gap of knowledge that has been ignored by many designers, which includes the obligation to design good visual. This is necessary since players always engage to appealing game visuals (Schoenau-Fog,



Another aspect that contributes to the low success rate of digital games is related to the issue of players' immersion (de Castell & Jenson, 2003). When players fail to immerse themselves in the a game world , they would neither enjoy nor engage with the games (Sweetser &Wyeth, 2005). For example, an action Massively Multiplayer Online Game (MMOG) named as All Points Bulletin or APB. This game was developed by Realtime Worlds Ltd and certainly failed to immerse players when the game development teams seem to ignore what players want in the design of games (Stuart, 2010). This is a typical designer-centric approach as opposed to player-centric design proposed in this doctoral study. As a result, the APB game server was shut down a few months after launching, leading to the closure of Realtime Worlds Ltd (Lahti, 2013).





Ashes Cricket 2013 is another digital game that failed to deliver the quality expected by players (Weber, 2013). According to Weber (2013), the failure of Ashes Cricket 2013 was due to the mismatch between choice of game engine by the developer and the standard set by publisher, licensors and players. The disappointment of players were based on the glitches in the game, i.e. showing the cricket players like dancing around and throwing balls at all directions (Lee, 2013). Nevertheless, the game design process was indeed not an instance of player-centric approach as the developer seems to ignore feedbacks given by the players (Salter, 2014). This means, the involvement of players' experience were not in place, causing the failure of this digital game in the consumer market.



This study aims to contribute to the field of digital game design by resolving the issue encountered by game practitioners in the creative industry. Several novel concepts, i.e. the notion of player-centric emotional design approach are introduced in this game design process, in which the concepts will be expanded to form a set of guiding principles especially for graphic designers to use the approach. This could support them in identifying appropriate visual aesthetics in games that could stimulate players' immediate emotional response in game playing events. Consequently, the stimulation will enhance the chances of commercial success among digital games.



## 1.4 Research objectives

Objective 1: To identify **attributes** of visual aesthetics in player-centric emotional design for digital games.

Objective 2: To identify **characteristics** of visual aesthetics in player-centric emotional design for digital games.

## 1.5 Research questions

As mentioned in the problem statement of this study, two research questions are

formulated as below:

- What are the characteristics of visual aesthetics in player-centric emotional design for digital games?
- What are the guiding principles of visceral level player-centric emotional design for digital games?



## 1.6 Scope and limitation of the study

Four attributes of visual aesthetics were chosen to be the foci of this study: line, colour, space and texture. These four attributes are adapted from the basic initial tools for analyzing visual elements in games through the notion of visual digital game literacy. Visual digital game literacy is a theoretical framework or visual grammar to analyze visual aspect of 3D digital games through the gamescape principles analysis (Nobaew & Ryberg, 2011). According to Nobaew and Ryberg (2011), visual digital game literacy has indicates four visual elements: a) Line would help players to define shape, form and styles of game objects as well as a contrasting area in the game world, b) Color would immerse players' experiences since it can transmit players' feelings of strength, power, and excitement, c) Space would generate perspective illusion of real space which make players feel the presence in the game world, d) Texture could construct the illusion of reality which elicit players' feelings of the depth dimension while in the game world.

Therefore, the characteristics and the guiding principles of visceral level player-centric emotional design to be revealed through this study are tapered into those four visual elements. However, Nobaew and Ryberg (2011) stated that visual elements are supposed to function by the grammar of visual principles. By referring to visual principles in the notion of visual game design literacy created by Nobaew and Ryberg (2011), five visual principles, i.e. balance, emphasis, rhythm, dynamics and perspective has been set as the boundary of this study (see Figure 1.1). This means the process of designing visual elements in games must be linked with the rules of those visual principles. In fact, the design of color, shape and form in game design must be



integrated with visual principles in order to create different sense of presence for the eyes of players (Nobaew & Ryberg, 2011).

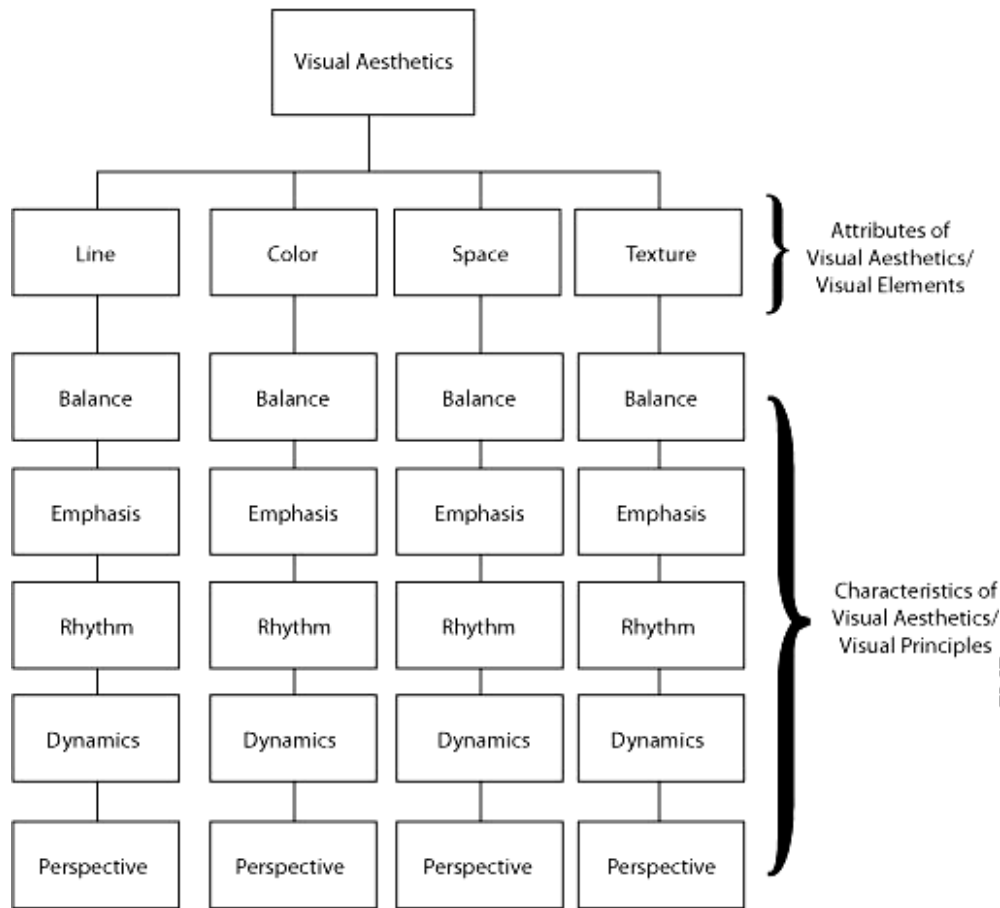


Figure 1.1. The inter-relation between the attributes, characteristics, visual elements and visual principles in visual aesthetics to be examined in this study

The scope of this study is shown in Figure 1.2 has covers the structural elements of games; the senses of perception in player-centric design; and the visceral level of emotional design. The focus of this research scope is the visual aesthetics formed through the intersection between the above mentioned coverage. In this sense, this study is neither an educational research nor a business research; instead it focuses on design research. Design research concerned with the systematic approach of



knowledge search and finding which related to design and design activity. It involves the objective to investigate the artificial made by human beings, and could beneficial to academic studies or manufacturing organizations (Bayazit, 2004).

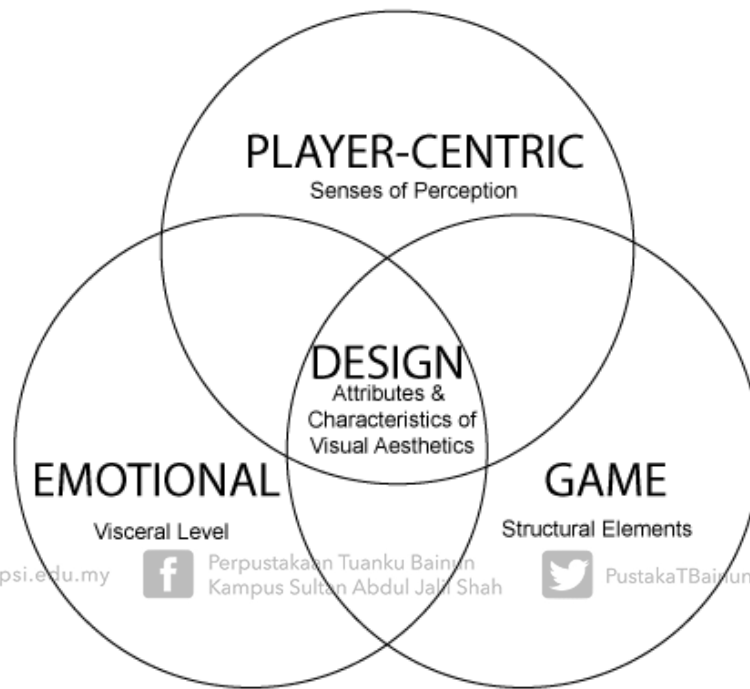


Figure 1.2.Scope of study

Prior to determining the scope of study, the establishment of a design framework was started by selecting components in affective domain of applied psychology for game design context which could stimulate players' emotional response in games. According to Norman (2004), the affective domain is connected with the visceral level in emotional design, and this is where immediate stimulation of players' emotional response occurs.



Initially, visceral level involves reaction triggered by visual appeal which fast in nature and involves physiological response that devoid of reasoning (Norman, 2004). Visual appeal comprises the aesthetics qualities that capable to stimulate human emotional response (Mahon-haft & Dillman, 2010). In the context of human-computer interaction (HCI), the term of visual aesthetics is used and constantly mentioned as an integral part for stimulating user's emotion during the interaction process (Lavie & Tractinsky, 2004). This is suitable to be imposed in the context of digital games since visual aesthetics also play a significant role for stimulating players' emotion in game playing events (Niedenthal, 2009). Therefore, in parallel with this connection, appropriate attributes of visual aesthetics would work collectively as an agent to stimulate immediate players' emotion and make the players immerse into games. Nonetheless, how all the above mentioned components and connection should be synergized for designing games is left unanswered by most if not all researchers. Hence there is a need to fill in the lacuna by establishing a set of guiding principles for visceral level player-centric emotional design for digital games.

The need for the guiding principles are crucial for ensuring the visual in games is appealing to players through precise attributes and characteristics of visual aesthetics. Further, these guiding principles would be beneficial for graphic designers to endeavour creatively in game design field. Graphic designers could use the guiding principles when designing visual within pre-production stage of game design process. Pre-production stage is an early planning stage of game development which involved a lot of design process such as conceptual design, gameplay design, game story design and design testing (Adams, 2010). Primarily, pre-production stage concerned about the look of digital games which critical to players' interest in playing games (Schultz,





Bryant, & Langdell, 2005). Therefore, the guiding principles would ensure the digital games are worth making by evoking players' emotion through their visceral level.

## 1.7 Hypothetical propositions

This study aims to examine four sets of hypothetical propositions (HP). HP are the thesis statements held in this research to show the central argumentative and analytical ideas of this study (Sharp, 2011). Each set of the HP are subdivided into two propositions in order to examine both the positive and negative emotion of players' immediate response. Herewith the HP of this research:

HP1a: In game playing events, the characteristics of **line** design principles in game design stimulate players' immediate response on **positive** emotion.

HP1b: In game playing events, the characteristics of **line** design principles in game design stimulate players' immediate response on **negative** emotion.

HP2a: In game playing events, the characteristics of **colour** design principles in games stimulate players' immediate response on **positive** emotion.

HP2b: In game playing events, the characteristics of **color** design principles in games stimulate players' immediate response on **negative** emotion.





HP3a: In game playing events, the characteristics of **space** design principles in games stimulate players' immediate response on **positive** emotion.

HP3b: In game playing events, the characteristics of **space** design principles in games stimulate players' immediate response on **negative** emotion.

HP4a: In game playing events, the characteristics of **texture** design principles in games stimulate players' immediate response on **positive** emotion.

HP4b: In game playing events, the characteristics of **texture** design principles in games stimulate players' immediate response on **negative** emotion.



## 1.8 Operational definitions

Nine key concepts were identified as the core that grounds this study. Each of the term is introduced briefly to afford further and in-depth understanding in other chapters of this study.

### 1.8.1 Game design

Game design is an iterative process, concerning to set rules, prototyping of interactive system, designing game characters, environments and animations for players' interaction with the game (Parberry, Roden, & Kazemzadeh, 2006). In the context of





digital games, game design is the process of designing games that should work properly, which involve numerous decisions from a group of game developers including game designers, artists, engineers, animators, modellers, musicians, writers and producers (Schell, 2008).

### 1.8.2 Game art

According to Sharp (2015), game art is a cultural expression of the game artist that used digital games as a medium. As a part of game design process, game art is referred to the artistic creation for establishing the game looks. It involves the cooperation between game designer, art director and game artist in early stage of game design process to ensure the design concept and artistic style of game is exceptional for the eyes of players (Bates, 2004).

### 1.8.3 Game graphic design

The notion of game graphic design is referred to the important roles of graphic design in game design process (Shannon, 1992). Besides, it is considered as one of important applications and systems in digital games (Soylucicek, 2012). Therefore, the notion of game graphic design should not be regarded as only a practise of designing the game visuals through specific software, but it is also capable to represent the game identity which drives players to determine the purpose of playing digital games (Mitgutsch & Alvarado, 2012).





#### 1.8.4 Emotional design

Emotional design is a concept introduced by Norman (2004) to explain why human beings love or hate everyday things. This concept explains the design of the product that associated with emotion would provide pleasure feelings to the user, hence embarks the emotional connection between both of them. Therefore, in this study, emotional design is defined as a design which attracts players and directs them to form an emotional connection with the games through its visual appeal.

#### 1.8.5 Visceral level in emotional design

With reference to the Norman's (2004) concept of emotional design, visceral is the automatic, prewired layer that reflects the biological origins of the human brain. This level is fast and rapid in making "judgments of what is good or bad, safe or dangerous", and sends appropriate signals to the motor system and "alerts the rest of the brain" (Norman, 2004). The visceral level is the beginning of an affective processing in response to visual and other sensory features of a product that leads human to perceive before significant interaction happened (Norman, 2004).





### 1.8.6 Player-centric design approach

Player-centric design or player-centered design approach is a concept that puts players at the centre of design and development process of digital games (Kumar & Herger, 2013). This means, players' opinion, interest and desire will be referred by game developer. This is to make sure the design and development of digital games would be functional to players.

### 1.8.7 Player-centric emotional design

Player-centric emotional design is a notion coined in this study to integrate the features of two concepts, i.e. brain processing and learning domain which are relevant to the player-centric design approach. This multilayered notion is manifested through a framework that emerged from the integration of three learning domains—cognitive, affective, and psychomotor with three levels of brain processing—visceral, behavioural and reflective. In addition, this integration recognizes the significant roles of emotion and sense of perception, in which would embrace actual players' experience in games.





### 1.8.8 Digital games

Digital games can be defined as the game-like activities that have been played by players through electronic devices, either online or standalone. The devices include personal computers, game consoles, handheld devices and mobile phones which are connected to games or peripherals of gameplay scenario (Whitton, 2010)

### 1.8.9 Visual aesthetics in digital games

With reference to the human-computer interaction (HCI) perspective, visual aesthetics is defined as the beauty or the pleasing appearance of things (Tractinsky, 2014).

Visual aesthetics has play a significant role in interaction design, i.e. computer interfaces which effects users' pleasure experienced, hence to perceive usability of system attributes. This definition is relevant in the context of digital games since visual aesthetics would affect the way games are visually perceived by players and to make sure the pleasure experienced persists (Niedenthal, 2009).







## CHAPTER 2

### LITERATURE REVIEW



#### 2.0 Introduction

This chapter presents how key concepts related to the research questions reflect the functions of emotion, perception and reason in game playing experience, while establishing a conceptual framework of player-centric emotional design for games. It also reviews the literature of previous research pertaining to the roles of emotion in game design that leads to emergence of several related frameworks. At the end of this chapter, the conceptual framework of player-centric emotional design for games on a visceral level is elaborated in details, setting the foundation for answering the research questions.





## 2.1 Describing emotion, perception and reason

People may react in different ways within similar situation on different occasions. Thus, emotion acts as a solution that guides people's reaction and feeling towards events and environment (Frijda, 1986). According to James (1884), emotion can be determined from psychological phenomena which is related to human interaction through the capability of sensory stimuli generated from the events or environment encountered. Frijda (2000) elaborated further that emotion is associated to three levels of psychological phenomena i.e. feelings, behaviours and body reaction which helps to shape people's habit, voluntary action, sensory impressions and thought. Hence, the three levels of psychological phenomena is directed to the rationalization of the concept of pleasure and pain, evaluation, priority of control, preferences and desires



(Frijda, 2000):

In addition, Izard (1993) mentioned that emotion is activated in four structural dimensions such as subjective feeling, biological reaction, purposive and social phenomena. Subjective feeling is an emotional experience of people that involves cognition and mental process. Biological reaction is a response of bodily arousal that includes neural, psychological activation and motor responses as preparation for action in facing whatever situation. In term of purposive, emotion is goal-directed in taking action and serves as an indicator of motivational state. Emotion is the communicative aspect of social phenomena that involves facial expression, postures, gesture and vocalization.





Furthermore, Ekman (1993) described that the concept of emotion through the measurement of facial expression, in which the concept reflects the basic emotion of human being such as anger, happiness, surprise, disgust, sadness and fear. This concept has been furthered established by Reeve (2009) whom proclaimed that emotion is triggered by six basic cores, i.e. fear, anger, disgust, sadness, joy and interest. In other words, the functions of emotion are merely meant for physiological arousal, expressive behaviours and conscious experience that generate human cognitive process and body reaction which affect human behaviours and thought, such as character, personality and motivation (Meyers, 2004).

Based on the concept of emotion elaborated above, this research is keen to concede emotion in two different perspectives i.e. biological and epistemological perspectives. Emotion in biological perspective is formed through neuroscience studies which involved the brain system (Dalglish, 2004). The emotional experience occurred when the dissemination process from sensory data directs the hippocampus to connects with other centre of the brain i.e. the amygdala, thalamus, hypothalamus, basal gaglia and cingulate gyrus as the functions of visceral brain and later called 'the limbic system' (MacLean, 1955). This process involves a form of neurochemical substance that triggers the brain centre to activate human body, neural, psychological and motor response (Norman, 2004). In fact, Norman (2004) indicates that biological reaction through a neurochemical process would transform human's thought, perception, decision making and behaviour.



Meanwhile, in epistemological perspective, emotion is a way of knowing that influences three other ways of knowing—intuition, reason and sense perception (Henly, 2012). Figure 2.1 states the position of emotion as one way of knowing in the theory of knowledge, alongside with sense perception, language and reason (Van de Lagemaat, 2005). Emotion works to stimulate and affect human sense perception. As mentioned in Diploma Programme Theory of knowledge—guide (2008), emotion is labeled as a spiritual dimension of human being, that can be formulated and expressed through language, which in turn can be connected to disseminate human intuition. In addition, emotion also shapes the effort of human reasoning in order to seek for arrangement and clarification of situation (Van de Lagemaat, 2005).

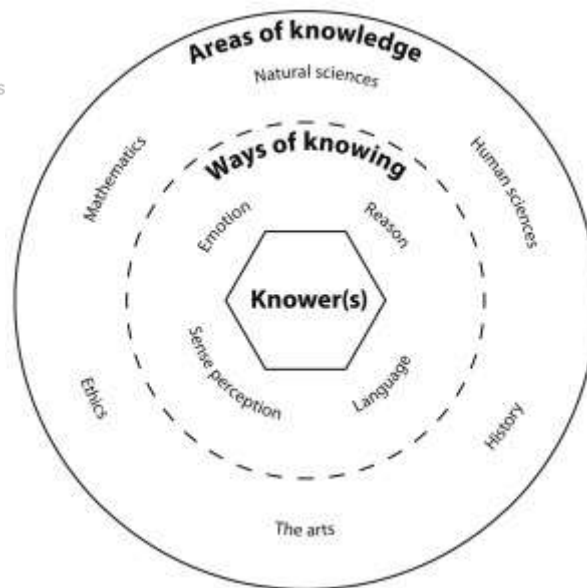


Figure 2.1. Emotion is a way of knowing in the theory of knowledge (Van de Lagemaat, 2005)

In the context of game design, in-game events as well as game environment should be carefully designed to evoke players' emotion since emotion has the capability to influence players' intuition through the use of language, reason and sense perception (Shahrel Nizar, Tan & Muhammad Zaffwan, 2014).

The gist of emotion from these two perspectives represents the ability of human brain in processing information through the sub-systems or sub-layers of psychology, i.e. affective, psychomotor and cognitive layers (Bloom et al.,1956). The affective layer involves rapid and immediate judgment made by human in response to stimuli and conditions encountered; the psychomotor layer processes and controls human behaviours; whereas the cognitive layer involves comprehension as well as interpretation of the stimuli and conditions (see Figure 2.2).

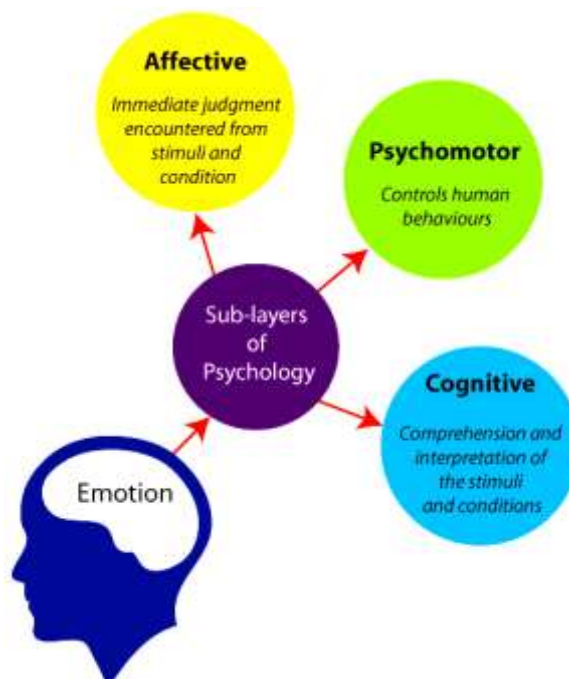


Figure 2.2. The relationship of emotion and sub-layers of psychology, originally created for this thesis

In most games, player actions are prompted by the outcomes of the affective and behavioural layers since games normally demand for a fast-pace physical coordination challenges (Shinkle, 2008). Apart from that, many games also demand players to use strategic thinking or reasoning skills to enhance in-game player actions, hence involving the direction set by the cognitive layer. This supports Grodal's (2003) argument which implicated players are actually playing games with "full experiential flow" that involves emotion, perception and cognition. Norman (2004) divided the brain system into three levels of emotional processing, i.e. visceral, behavioural and reflective levels. The division is aligned with the description of three domains of learning, which are known as affective, psychomotor and cognitive domains (Bloom et al., 1956).

From educational psychology perspective, perception is indicated as the first level of psychomotor skills by Simpson (1972) in the domain of learning. It represents "the ability to use sensory cues to guide motor activity", in which the ability is ranging "from sensory stimulation, through cue selection, to translation" (Simpson, 1972). This definition is parallel with the role of behavioural level in the emotional design proposed by Norman (2004). Apart from perception, the psychomotor domain comprises the use of motor skills and the coordination to detect non-verbal communication cues. The relation between psychomotor domain and behavioural level in terms of sense perception will be further discussed in Section 2.5.

In the sense of elaborating the gist of perception, human is capable to sample information and sensation in a specific environment through the active process of perception and the neurochemical process of brain system (Carmichael & Gibson,

1966). These processes embark human intelligence to make decision, such as whether to pursue something or not. The decision making may require five human senses—sight, hearing, smell, touch and taste to work collectively as active sensors to sample cues from stimuli and conditions. The cue sensing process happens through five perceptual systems, which are vision, auditory, haptic, olfactory and gustatory (Spence, 2010). In a word, perception is guided by human senses to control human behaviours, particularly to accomplish goals and purposes in life (Bruner & Goodman, 1947). As emotion and perception are comprised of similar functions which connect the brain system process through neurochemical substance, it is possible to establish both concurrently as a basis for human survival in the social environment (Phillips et al., 2003). This basis supports the intersected functions of emotion and perception that connect to the biological process of human brain (see

Figure 2.3).

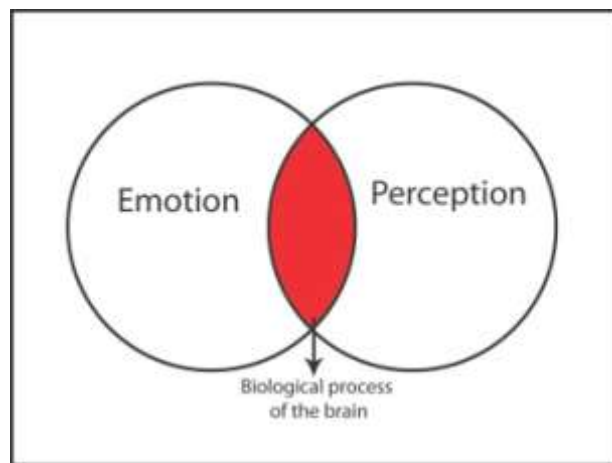


Figure 2.3. Intersection functions between emotion and perception



In the theory of knowledge, reason is the most common way for human to make sense on all things especially in decision making (Diploma Programme Theory of knowledge—guide, 2008). Reason is connected to the cognitive domain of learning and the reflective layer of emotional design. Reasoning works as specialized machinery in the brain to make sense and translate information captured by human beings. The captured information is decoded into language, which in turn will trigger the brain to refine the decoded information into neural “descriptions” (Blake & Sekuler, 2006). The description will initiate a specific human behaviour in accordance to the stimulation of objects or events in all kinds of conditions. Some of the above described interactions are immediate reactions while others allow human to plan and organize actions deliberately upon particular objects and events (Blake & Sekuler, 2006).



Damasio (1994) stated that reasoning is often directed by emotion. He claimed that any decisions made by human being are merely reflected from the bodily state which could be influenced by certain hue of emotion based on the somatic-marker hypothesis. In a typical somatic-marker hypothesis, the decision making process is associated with the 'marker' signal that influences human in immediate response, hence directing human behaviours (Damasio, 1994). For instance, when a somatic marker is associated with a positive experience, the person would act positively and motivated. However, when somatic marker associated with the negative experience, the person would act differently, leading to negative behaviour and avoidance. Indeed, human reasoning process is not purely based on logic but also influenced by emotion which is triggered from past experience for next course of action.







In the context of game playing, players would use reasoning skills when a game playing activity has come to the end. In fact, players would make decision on whether to purchase a game or not based on their emotional and perceptual experiences accumulated through past game playing experience and events (Ermi & Mäyrä, 2005a). In a word, both emotion and perception can act as a medium for players to execute reasoning process towards achieving the outcomes of designing games—to be consumed and played by targeted players. Although this study focuses on the roles of emotion and perception, the importance of reasoning will is not be neglected, and it has been included in the proposed conceptual framework under Section 2.8.



## **2.2 The roles of emotion and perception toward the design of six structural elements in games**

In this study, the concepts of emotion and perception are embedded in the design of six structural elements of games. According to Prensky (2007), games are generally structured by six elements: goal, feedback, rules, interaction, narrative and challenge. The structural elements work as the pillars that differentiate games from similar concepts, such as fun and play. In game playing events, players' emotion would be aroused in order to attain the goal of the game, overcome challenges, abide game rules, interact with the game world or other players, react to feedback, and understand game narrative. The arousal would be perceived through at least one sensory receptor, which would prompt players' behaviour to take action or give reaction. Table 2.1



below shows how emotion and perception functions in accordance to the six structural elements in games.

Table 2.1

*The roles of emotion and perception in six structural elements of games*

		Roles of emotion	Roles of perception
Structural Elements of Game	Goal	Goal arouses player’s emotion to be directed in achieving game goals and subsidiary missions.	Player identifies and relates sensory cues in the game world to accomplish missions and to achieve game goal.
	Feedback	Feedback arouses player’s emotion to learn dearly from in-game events and situations.	Player detects and reacts upon in-game feedback to try out the usefulness of a strategy, tactic or movement.
	Rules	Rules stimulate player’s emotion in strategizing in-game behaviours and actions while abiding rules.	Player detects and relates rules to the game goal to overcome challenges.
	Interaction	Interaction stimulates player’s emotion to engage with other players and in-game situation tactically or strategically.	Player detects the type and nature of specific interaction to distinguish friends and enemies, safe and danger in the game world.
	Narrative	Narrative arouses player’s emotion to transcend avatar he or she controls in the game world.	Player describes the storyline in the game world by relating narrative to other game elements.
	Challenge	Challenges stimulate player’s emotion to confront and overcome in-game challenges in order to achieve game goal.	Player detects and relates challenges to the game narrative and the attainment of missions and goal.



### 2.3 Player-centric approach in digital game design

As depicted in the research background (see Section 1.2), this study supposes that players are prone towards digital games which can please their desires or needs. Therefore, game designers should design games by concerning what players want in order to provide a meaningful play experience and outcomes (Brathwaite & Schreiber, 2009). The players' in-game experience involves emotional response that is imminent to enjoyment and fun. The enjoyment and fun experience is an important aspect of game playing as it acknowledges the fundamental players' expectation towards games (Bartle, 2004). Sykes & Federoff (2006) indicated that by considering players' desires or needs in every game development stage, designers and developers would be able to produce successful digital games.



Adams (2010) has coined the term of “player-centric game design” in order to empathize players' experience by involving them in the game design process. He has proposed to apply player-centric approach explicitly at the early stage of game design by segregating the process into three iterative stages: concept, elaboration and tuning. Ideally, this design approach would diminish the normal practice of designing games which evades players' desire for playing games. Although game can be considered as a form of artwork, game designers should not design games based entirely on their personal interest without fulfilling players' desires and demand in commercial game market (Sotamaa, 2007).





The idea of player-centric game design is indeed adapted from a concept known as user-centered design (UCD). In the context of game design, UCD highlights the methodologies employed for improving interaction in game playing through the use specific principles and evaluation techniques (Pagulayan et al, 2003). However, existing UCD approach could not fulfill or meet the criteria set in designing and testing games due to the difference in expectation between users and players. Although UCD is typically applied in user-centered research for productivity software through usability, this application failed to underline the playability which required the players to have full range of options from the games (Charles et al., 2005). Thus, players seek challenges voluntarily in games. Therefore, they seek more effectiveness, efficiency and satisfactory from the games which more than usability context ((Kumar & Herger, 2013).



A typical commercial game production process involves three stages, i.e. pre-production, production and post-production (Kerr, 2006; Sykes & Federoff, 2006). In the pre-production stage, game designers set the game specifications. Once the specifications are set, the production stage commences in which game artists and programmers develop assets for the game to function and meet its intended purposes. In the post-production stage, the game is tested and polished before deploying to the consumer market (Kerr, 2006).

However, Vita (2014) emphasized that the current practice of the pre-production and post-production stages failed to adopt player-centric approach, resulting poor performance of commercial games. Besides, design and testing of games should involve players as early as possible, i.e. at the conceptual design phase



in the pre-production stage, rather than at the testing phase in the post-production stage, when changing any of the structural elements would be too costly to a game.

The implication of player-centric approach in game design process is significant, despite the ignorance of game designers and developers (Vita, 2014). In this sense, player-centric approach seems to be the ideal practice in the game design process, especially in the pre-production stage. As the outcomes of design engross players in making and framing their choices, the involvement of players' experience at the early stage of design process cannot be ignored by designers and developers (Kerr, 2002).

A good game design must start with the analysis of users' needs in their natural setting (Abeeel & Van Rompaey, 2006), thus evaluating and testing at the beginning of the design process is necessary to assure the quality and avoid unnecessarily failure of digital games in commercial market.

## **2.4 The essence of emotional design for digital games**

Walter (2011) has depicted emotional design by connecting the goal of designing interfaces with human needs throughout The Maslow's hierarchy of needs (see Figure 2.4).



Figure 2.4. The Maslow's hierarchy of needs (Walter, 2011)

According to Walter (2011), Maslow has accentuated that human needs are motivated from physiological needs at the hierarchy base, gradually to safety needs, then, gradually more to love or belonging needs and ever more to the self esteem needs before reaching to self actualization needs. Self actualization is indicated as a higher-level needs when all needs are fulfilled (Heylighen, 1992). Heylighen (1992) argued that self actualization is a 'growth' needs since it involves the enhancement of equilibrium state which relatively close to human personalities and potentialities improvement. Therefore, human is capable to build up their perception, behaviour and social interactions. Perception is refers to human experience of learning new things. While behaviour is refers to the spontaneity attitudes for general creativity and social interaction for creating relationship with other people in society (Heylighen, 1992).

Walter (2011) seems to connect self actualization needs with users' needs since it involves human personalities. Thus, he has translated the Maslow's hierarchy of needs to the hierarchy of users needs (see Figure 2.5). This hierarchy has shape the theory of emotional design when the user's pleasure has been indicated as superior

elements besides functionality, reliability and usability of products. Moreover, pleasure has been tailored to design personality which creates emotional connection between user and product.

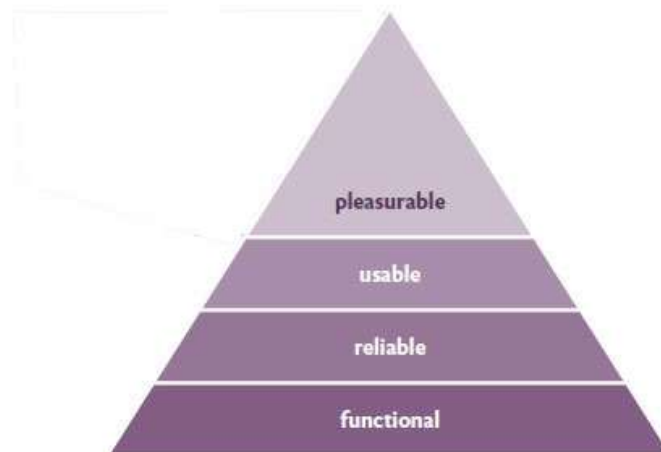


Figure 2.5. The hierarchy of users needs (Walter, 2011)

Meanwhile, Norman (2004) depicted emotional design with reference to the notion of "attractive things work better". He argued that attractive products will trigger human creativity and an expansion of mental processes in leading human to become more tolerant for minor difficulties. Besides, attractive products could influence human decision-making with ease which make products are enormously essential.

In establishing his theory, Norman (2004) argued that human cognition and emotion are interwoven and inseparable which similar to Damasio (1994) statement in neuroscience perspective. This utterly opposed to traditional psychology perspective that regards emotion as something detached from cognition (James, 1884). In this



sense, emotion appears as an important part of human cognitive process which "not simply a catalyst for reason nor inherently an obstacle to or a distraction from rational thought" (Felten, Gilchrist, & Darby, 2006). Norman (2004) also stated that human cognition and emotion are integrated in human life through different brain processing with approaches; in which cognitive processing is set to assign meaning, whereas emotional processing is meant to assign value. The integration of cognitive and emotional processing is important to reflect the results of human attributes.

Consequently, Norman's (2004) suggested three levels of the brain processing that reflect human attributes result (see Figure 2.6). The first level is visceral, which is the automatic process that elicits instantaneous human emotional response and biologically determined across different people and culture. The second level is behavioural in which it controls human daily behaviour and learning experience. The third level is reflective, that is the most sophisticated level which involves the intellectual process to control the pleasure to dispense values and meaning.

Norman (2004) transformed three levels of brain processing to form the notion of emotional design. Design at the visceral level spots on the automatic response users towards the appearance of a product. As for behavioural level design, users are dealing with the pleasure and efficiency, whereas design at the reflective level focuses on personal satisfaction and attainment of meaning towards product.





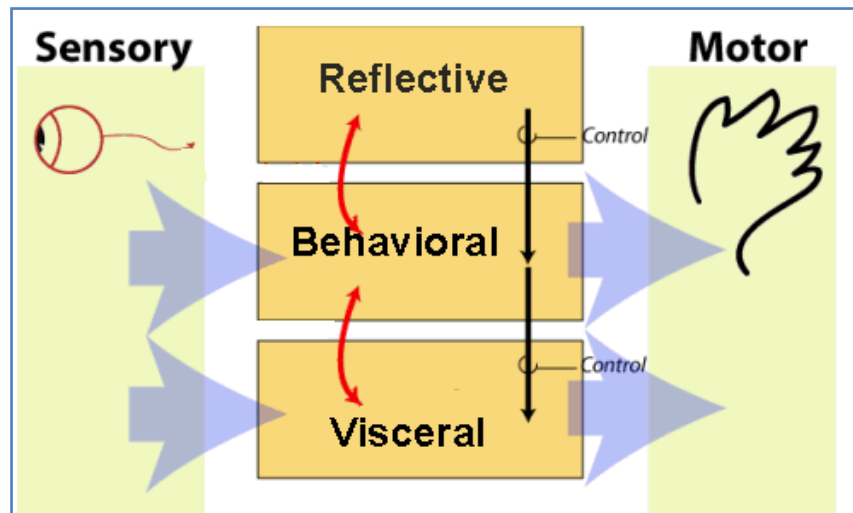


Figure 2.6. The three level of human brain processing that reflects human attributes result (Norman, 2004)

Therefore, the notion of emotional design coined by Norman (2004) would be

a practical implementation for game design since it involves the brain processing which related to biological activity of players while in game playing events (Salen & Zimmerman, 2005). Hence, digital games are considered as hedonic products where players' emotion become a fundamental matter that constructs their game playing experience (Poels, Hoogen, Ijsselsteijn, & de Kort, 2012). This is parallel to Grodal's (2003) statement that players are using “full experiential flow” in game playing events that involve emotion, perception and cognition. In this sense, the players' experience would start with the emotional processing that works as an immediate visceral response to trigger players' sensory motors and then the experience would be followed by the intellectual process for reasoning purposes. This process initiates the role of emotion in human decision making (Gutnik et al., 2006). Therefore, it shows that emotion is related to human brain processing throughout the sub-layers of psychology consisting of affective, psychomotor and cognitive layers (Bloom et al., 1956).



Although Norman (2004) has acknowledged digital games as the media that could manifest his conception of emotional design, he did not explain in details to determine how three levels of emotional processing could help in producing desirable digital games. Therefore, this study intends to fill in this lacuna according to Norman's (2004) concept of emotional design since it is comparable to the key concepts which help the improvement of player-centric approach for digital game design. Further elaboration will be presented in Section 2.7.

## 2.5 Emotion in design perspective

Since the inception of the first International Conference on Design and Emotion (Overbeeke & Hekkert, 1999), the importance of emotion has been formally discussed by many researchers all around the world. In the field of product design, emotion is identified as an element to persuade users' acceptance, and this has been seen as a part of design elements (Buchanan, 1985).

According to Buchanan (1985), design is closely related to an art of rhetoric that shapes and increases the quality of users' life through persuasive products. He argued that by creating persuasive products, designers would engage users through three elements of design: 1) technological reasoning (logos), 2) character (ethos), 3) emotion (pathos). Technological reasoning is the promise of practical usability, whereas to character element that portrays the values embedded in a product. However, emotion has been described as an element to persuade users through an aesthetic value, narrowing the actual function of emotion in design.



Emotion should be looked through a broader perspective, especially in the field of design. This is due to the fact that emotion affects users' experience; hence emotion could generate perceived pleasure in usability and fascinate users towards specific characteristics of a product (Desmet & Hekkert, 2007). This study is keen to review several concepts at their embryonic state in the context of emotional design. This review would rejuvenate the fundamental idea in creating a design framework for games.

Desmet and Hekkert (2007) proposed a theoretical framework for product experience, in which the framework focuses on individual user's affective response during human-product interaction (see Figure 2.7). This framework presents a three-level product experience: 1) The aesthetic level that explains how a product affects user senses stimulation; 2) The meaning level that explains how the expressive characteristics affects user cognitive process towards a product; 3) The emotional level that explains how the product affects user emotional response which involves evaluation, i.e. love and anger.

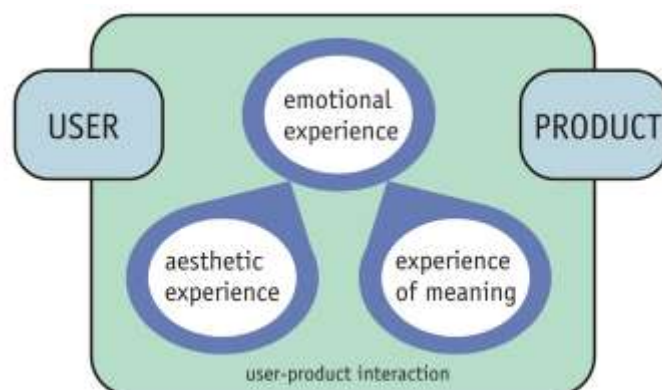


Figure 2.7. The three levels of product experiences. Proposed by Desmet and Hekkert (2007)



In general, this model is related to the gist of this study since it covers the interaction between user and product through emotional response, sensory stimulation and experience of meaning. However, in the context of digital games as product, this model overlooks the aspect of accentuating intercede factor between aesthetic level and emotional level that triggers user's immediate emotional response which suppose to involve visceral level of brain processing through sensory stimulation. Besides, the model mentioned above is supposed to direct the emergence of the role of perception in emotional level which reflecting the user's experience for getting a meaningful play. In fact, perception is driven by immediate emotional response which could lead human behaviour to act and make sense for reasoning purposes (Brosch et al., 2013). Without emphasizing the roles of perception, this model is inadequate to cover the substance of emotion within design standpoint.



## 2.6 Design frameworks related to emotion in game design

In the game industry, emotion has been recognized as an important element for crafting players' experience in the game world (Poels et al, 2007). Fun is considered as the ultimate emotional state which players expected to experience while playing games (Bartle, 2004). Therefore, "emotion is identified as an agent to cultivate players' enjoyable experience and engagement in game playing activity" (Lazzaro, 2004).



Lazzaro (2004) claimed that emotion has always be the major reason for people to be engaged with the games. She affirmed that an emotional induction in gameplay will influence players' enjoyment, attention, decision making, performance and learning. Based on a non-academic study, Lazzaro (2004) created the '4 Fun Keys' model (see Figure 2.8) that aims to be beneficial to game practitioners in the creative industry.

The first key is known as 'hard fun', which focuses on players' actions to deploy strategies, avoid obstacles and achieve goals. It also includes feeling of frustration, fiero or personal triumph and relief. The second key is the 'easy fun'; prompting players' curiosity and imagination through exploration, fantasy and creativity in the game world. The third key is the 'serious fun' where it stimulates players' excitement to collect things, repeat movement, and follow rhythm. The last key is the 'people fun' that known to amuse players to communicate, compete or cooperate with other players, both inside or outside the game world (Lazzaro, 2004).

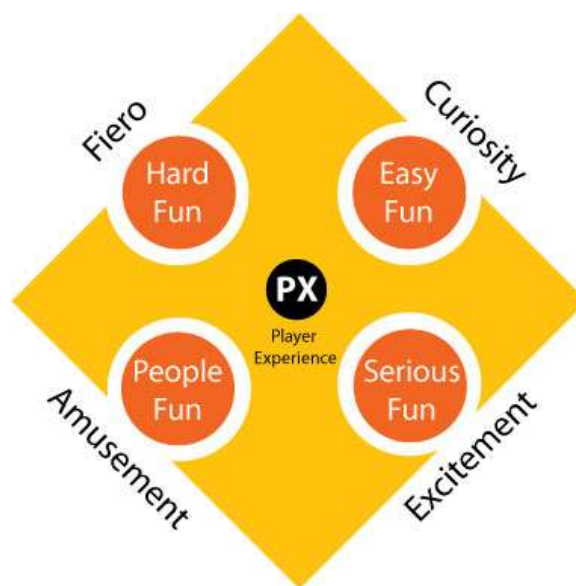


Figure 2.8. The '4 Fun Keys' Model. Adapted from Lazzaro (2004)

Apart from that, Freeman (2004) coined the term ‘emotioneering’ which incorporated emotion in game stories with over 300 techniques that are similar to film production within 34 different categories for game development. He argued that games should be enriched with meaningful stories which provide emotional experiences for the purpose of engaging players. For instance, the ‘first-person deepening technique’ requires players to reach their emotional depth, by acting decisively to shoot or not to shoot in game playing events. Through the game stories, players' emotion will be evoked, leading them to make decision.

Meanwhile, Dillon (2010) proposed a framework that represents a technique to design fun and engaging games by analyzing players' emotion and instinct. He modeled the 6-11 Framework that emphasizes on the triggering process between emotion and instinct. The triggering process is linked to the MDA (Mechanics, Dynamic and Aesthetics) framework created by Hunicke et al (2004).

The 6-11 Framework is created from six basic emotions and 11 instincts which commonly are triggered by players while playing games. In this sense, players' basic emotions will trigger their own instinct. In return, the instinct will either trigger back those emotions or triggers other branches of instinct. As shown in Figure 2.9, the fear emotion triggers the survival instinct, which sequentially triggers the aggressive instinct, in which under certain circumstances might trigger the emotion of excitement.

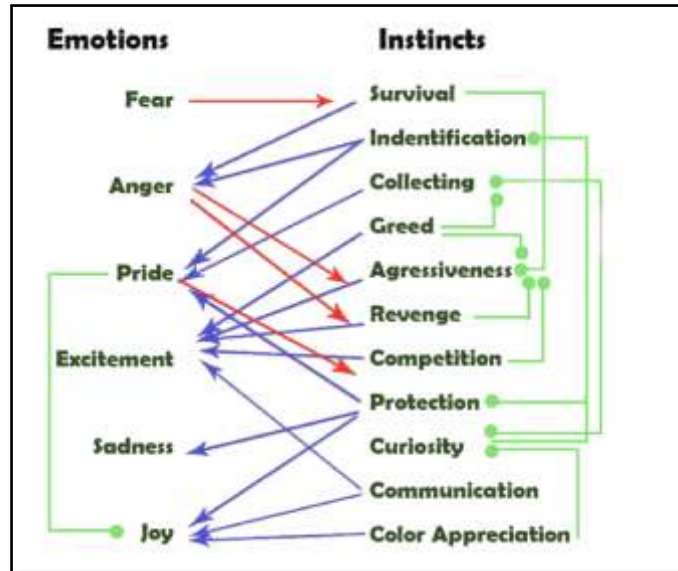


Figure 2.9. The 6-11 Framework (Dillon, 2010)

Furthermore, the 6-11 Framework is linked to MDA Framework for expansion of analysis. Initially, MDA Framework (Hunicke et al., 2004) is known to be the formal approach of game design and research which indicates mechanic, dynamic and aesthetic components. Mechanic component is referring to how players play games; dynamic is meant for players' reaction towards gameplay and aesthetic is set for players' emotional response in games. In this sense, the 6-11 Framework can be easily related to the game mechanics and dynamics as shown in Figure 2.10. Aesthetics is indicated as an outcome for players' desire prior to the 6-11 Framework (see Figure 2.11).

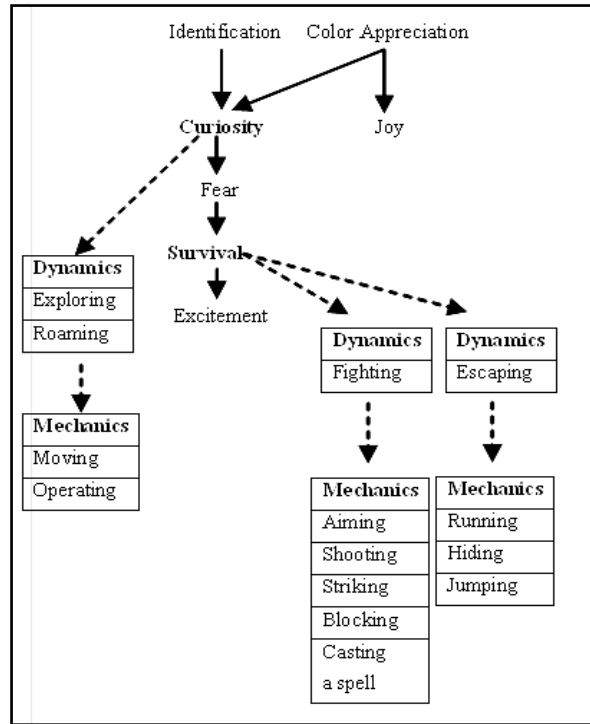


Figure 2.10. The 6-11 Framework to Mechanic and Dynamic of MDA Framework (Dillon, 2010).

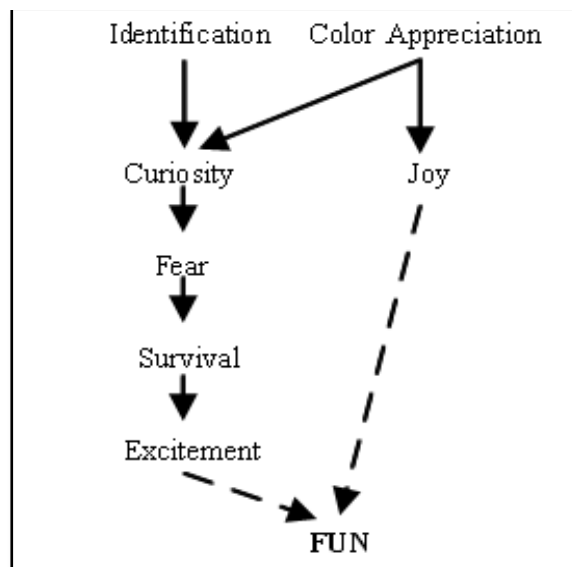


Figure 2.11. The 6-11 Framework to Aesthetic of MDA Framework (Dillon, 2010)



Nevertheless, this framework presents a guideline for game designers to design games by analyzing the interaction between emotion and instinct towards game components, allowing them to find an effective solution. In other words, game designers should analyze the complexity of games in multifaceted layers within each triggering processes in order to produce fun digital games.

Based on the three frameworks mentioned above, emotion has been established as an important medium to activate players' emotional response for engagement purposes. However, these frameworks regarded emotion as an element of persuasion which works for an adaptation in MDA components. This is similar to Buchanan's (1985) idea that limits the function of emotion, as discussed in Section 2.5.

## **2.7 A conceptual framework of the player-centric emotional design for digital games**

This study has structured a conceptual framework for game designers to visualize the importance of emotion in game design (Shahrel Nizar, Tan, & Muhammad Zaffwan, 2014). The framework connects Norman's three levels of emotional design with Blooms' three domains of learning as well as Prensky's six structural elements of game.

The act of playing involves acquisition of knowledge, skills and attitude, which are regarded as cognitive, psychomotor and affective domains in the field of educational psychology. Each of these domains can be aligned to one level of

emotional design, in order to meet player’s aesthetic, functional, socio-political and economic requirements in games (see Table 2.3). In this sense, the conceptual framework helps game designers to generate guiding principles in designing a specific game element or integrating several elements to form a game.

Among the learning domains, the affective domain is the most relevant to game design process since players’ affective responses in game playing process is the most important matter to designers and developers. This is because players are becoming more and more unpredictable when buying or consuming digital games (Hunicke et al., 2004). Normally, the determining factors for purchasing remain mysterious until the end of an initial playing session (Hunicke et al., 2004). Therefore, capturing their interest at the first sight is crucial, at least to enable a game to be considered as a potential option to purchase.

Table 2.2

*The connection between three levels of emotional design - three domains of learning - six structural elements of game*

Level of emotional design	Relation to the structural elements of games	Domains of learning
Visceral (Aesthetic)	The emotional reflex happens upon the sense perception towards the appearance of game elements. The affective processing triggers rapid judgement on what is good or bad, safe or dangerous. Game elements for the automatic prewired visceral level is biologically determined.	Affective (Attitude)

(Continue)

Table 2.2 (Continued)

Level of emotional design	Relation to the structural elements of games	Domains of learning
Behavioural (Functional)	The pleasure occurred due to the effectiveness of using game elements. The behavioural level contains the brain processes that control in-game behaviour	Psychomotor (skills)
Reflective (Socio-political and economic)	The rationalization and intellectualization of game elements. The reflective thought does not have direct access neither to the sensory input nor the control of behaviour.	Cognitive (knowledge)

As discussed in Section 2.2, the player-centric approach is a form of innovative game design that could hold players' emotional engagement throughout the game playing experience (Fullerton, 2008). The approach would meet an infinite combination of players' emotional and perceptual needs, and subsequently enhance the originality and variety of commercial games (Ermi & Mäyrä, 2005b). In brief, understanding the roles of emotion and perception is essential for designing immersive games which could direct players to enter the flow state (Csikszentmihalyi, 1990) and eventually purchase the game as first-time players.

The player-centric approach plays a significant contribution for the development of a player-centric emotional design approach for games. This approach is an adaptation of the emotional design concept proposed by Norman (2004). It emerges from the integration between three learning domains and three levels of human brain processing. (see Figure 2.12). The reason for choosing the learning domain in educational psychology (Anderson & Krathwohl, 2001) is to establish

learning as a continuous process for human development which can be connected to game playing process (Ginsburg, 2007). In addition, games are a subset of both play and fun elements which enhance players' learning development (Prensky, 2007).

In brief, the affective domain of learning involves people's emotional process and attitude which correspond to the roles of emotion within the visceral level of the brain. The psychomotor domain comprises of motor-skills and users' coordination, and they are suitable to represent the roles of perception which falls under the behaviour level in emotional design. As for the cognitive domain, it is believed to be signifying to the development of people's mental skills and the acquisition of knowledge; hence resembling the reflective level in emotional design.

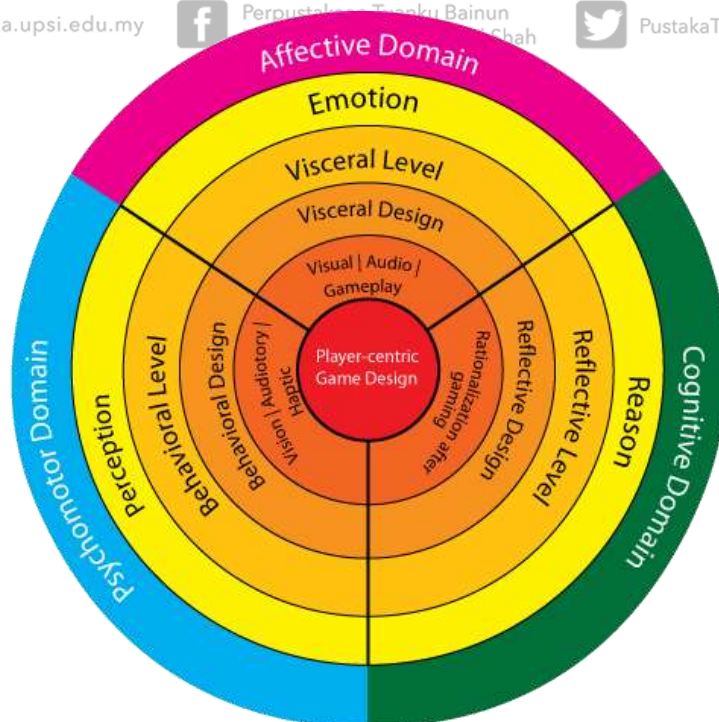


Figure 2.12. A conceptual framework of player-centric emotional design for digital games



Looking at the context of game design, game designers should emphasize on players' emotional design at visceral level through their physical features such as look, feel and sound (Norman, 2004). The implementation of effective design at visceral level is compulsory for the appearance of games which it has been divided by three major categories, i.e. visual, audio and gameplay.

At the behaviour level, game designers should be aware with players' usability in games by focusing on the perception of players. This is because the perception would guide players to use their psychomotor skills to perform designated tasks required in the game they played. The guideline for players' behaviour design would assist game designers to design games through players' vision, auditory and haptic modals which can lead them to sense the ease of use during the game playing process for efficiency, effectiveness and satisfaction (Garcia-ruiz, Marie, & Santana-mancilla, 2015).

At the reflective level, players would use their intellectual ability for reasoning in the game process. This process mostly happens at the end of a playing activity, in which players use their cognitive abilities to rationalize the outcomes of the game (Saethang & Kee, 1998). Thus, this can be regarded as an opportunity for game designers to implement reflective design for players to experience pride and ownership towards the game (Norman & Ortony, 2003).





## 2.8 Issues of designing emotion for games

In the context of game design, players' cognitive ability which related to emotion has been identified as a focus area in game design research. In view to this, the cognitive game design is recognized as an important aspect for the game research agenda besides infrastructure and immersion aspects (Zyda, 2005).

The cognitive game design research appears as an apparatus for game developers in enhancing the functions of digital game through the computer-generated technology to complement various components in the game design process (Zyda, 2005). The components involved the modeling and simulation of human emotion which essential for network games as well as simulation games, hence becoming the future of game playing (Zyda, 2005).

This idea has guides this study to emphasize on a visceral level of emotional design (Norman, 2004) since it is related to human cognitive and affective processing in searching for meaning and value. Moreover, it also provides significance to players' game experience as game playing required continual interaction which develops multifaceted cognitive, affective and behavioral response (Yannakakis et.al, 2013). The study of visceral level embarks a wider view of aesthetics in design field, in which involves certain design principles in the creation of emotional products for users (Wrigley et al., 2008).





The visceral level of emotional design definitely triggered human visceral reaction (Morgan & Chuck, 2013). Visceral reaction is recognized as guts feeling which beyond our control and negating the process of deep thinking for reasoning purposes (Kahneman, 2011). In games, visceral reaction is called 'juicy feedback' where players obtain the wonderful experience and satisfaction when they exceed the challenges in each game level (Morgan & Chuck, 2013).

The visceral reaction occurs when human received emotional signal from the event or environment that guides human capability to automatically interpret at their visceral level (Norman, 2002). Human will interpret based on interesting and attractive views that demonstrate the same agreement across people and cultures. It requires physical features such as look, feel and sound that dominate humans' interpretation process (Norman, 2004, p. 67). This surely provides an opportunity for designers to make use of the advantage of these three physical features by implementing visceral level of emotional design especially in the game design context.

Players' sight sense or vision is dominating other senses in game playing events (Shinkle, 2008). According to Masuch & Röber (2005), 70% of human perceives information from various visual cues, thus they suggested five graphical elements for designing visual cues which related to the attributes of visual aesthetics. These five graphical elements are dimensionality, perspective, color, presentation, and realism.





In addition, the study of Masuch and Röber (2005) has opened an opportunity for researchers and game practitioners to indicate visceral level of emotional design by establishing visual aesthetics through graphic design. Graphic design for visceral approach is necessary since it ought to be more than just a look and acquire user's attachment for feeling good (Morgan & Chuck, 2013).

Initially, visual aesthetics in digital games involves the appearance of novel graphics that affects the way games are visually perceived (Niedenthal, 2009). Novel graphics in games comprise of a range of elements, i.e. interface design, character design, game world environmental and animation design. The graphics were developed either as static or moving elements, according to creative stylization or realistic design (Westera, Nadolski, Hummel, & Wopereis, 2008). Players would perceive visual aesthetics through the sensory phenomena that they encountered during game playing by using the sense of sight which can be regarded as the vision of perception (Niedenthal, 2009). This is aligned with the etymological roots of the word in Greek 'aisthesis' that means sensation or perception for leading players' sensory knowledge and ways of knowing (Niedenthal, 2009).

In contrast to perception, visual aesthetics in digital games would triggers players' emotion through visceral response. According to Lynch (2010), visceral response offers quick sub-conscious thought which inclined to find aesthetics as a functional element to cognizant user's behavioural and reflective level process, certainly applicable to visual aesthetics. Therefore, visual aesthetics would not only reflect to players' immediate response, but also revealing the usability aspect of game that leads players to play and purchase the digital games.







## 2.9 The studies of visual aesthetics

Most of researcher presumed visual aesthetics related to positive effects of users toward visual design. Hence, visual aesthetics is always associated with interaction design of the website in the field of human-computer interaction (HCI) (Tractinsky, 2014). According to Moshagen & Thielsch (2010), they have discussed the interaction design of the website related to visual aesthetics should be measured through four characteristics; simplicity, diversity, colour and craftsmanship. However, it is relatively difficult to determine the specific characteristics of visual aesthetics specifically for games due to its diverse applications and functions (Bahrin, Abubakar, & Yaakub, 2015).



based learning' stated that the role of aesthetics in games involved the design of visual materials which embrace the discussion of principles of graphic design. This should include the art fundamentals that constitute to the characteristics of visual aesthetics. Although art and aesthetics are closely related, but Palmer, Schloss, & Sammartino (2013) indicated that both of it are conceptually discrete. They saw art as limited subject akin to appraise painting and sculptures in museum and gallery but aesthetics involved experience in response to see any sort of object, scene and events. Besides, art engrosses positive aesthetic experiences, while aesthetics involved the wide range of responses from positive to negative. For that reason, based on the scientific research, they depicted the characteristics of visual aesthetics for human preferences encompass the preferences on specific colours schemes i.e. single colours, colour combinations, and colour harmony with spatial structure i.e. low-level spatial





properties, shape properties, and spatial composition within a frame. Nevertheless, it can be seen that they certainly regarded art fundamentals as the foundation of scientific research, underlying specific visual elements and design principles.

Therefore, this study reveals the potential to discover the appropriate visual aesthetics especially for digital games. By identifying the right attributes and characteristics of visual aesthetics in the course of art fundamentals, certainly, it could trigger the visceral level of players while in game playing events. Since there is no specific guidance available, the researcher has to endure exploration of research with a suitable research method which will be discussed in the next following chapter.





## CHAPTER 3

### RESEARCH METHODOLOGY



#### 3.0 Introduction

This chapter demonstrates the research design which is focusing to explicit research area in the framework of player-centric emotional design for digital games. The explicit research area has occurred in the affective domain which connected to visceral level and consequently to visual aesthetics. This study is prone to explore the research questions; (a) what are the characteristics of visual aesthetics in player-centric emotional design for digital games and (b) what are the guiding principles of visceral level player-centric emotional design for digital games. Indeed, these two research questions required the appropriate philosophical and theoretical stance. So, the pragmatist paradigm has been identified since this theoretical perspective offers more complete analysis for research problem and questions (Tashakkori & Teddlie,





1998). The pragmatist paradigm embraces the mixed methods approach comprise of qualitative and quantitative methods for exploratory and generalization of research questions (Tashakkori & Teddlie, 2010). Therefore, the exploratory sequential mixed methods design will be used to explore the research questions. The findings from the research questions will be informed the development of a survey instrument for collecting quantitative data. The quantitative data will be analyzed and expected to generalize the qualitative findings.

This chapter on research methodology is generally works in chronological sequence. It started with the overview of philosophical stance of this study that leads to theoretical perspectives and reaching the implementation of mixed methods research design. For better explanation and understanding, the mixed methods research design will be divided into two phases: exploratory phase and confirmatory phase.

### **3.1 The philosophical stance of the study**

Different views of ontology and epistemology in philosophical stance would leads to a diverse philosophical stance of a research design. These two philosophical stances will influence researchers' theoretical perspective, which in turn will determine the underlying research methodology and the research methods applied in an academic research (Crotty, 1998).





Ontology is the study of being (Crotty, 1998), in which the assumptions consist of what constitutes reality with the question of "what is". Reality is the view that objects exist independently to the knower (Cohen, Manion, & Morrison, 2007). Apart from that, the assumptions towards realism is made related to the nature of social reality that involves multiples questions of "what exists, what does it look like, what units make it up and how these units interact with each other" (Blaikie, 2000). Therefore, ontology can be depicted as the study of "what we mean when we say something exists" (Mack, 2010).

Meanwhile, epistemology sets the assumptions of how knowledge is created, acquired and communicated with the question of "what it means to know?" (Scotland, 2012). Furthermore, epistemology also raised the question of "how we know what we know?" (Crotty, 1998), in which engrosses the relationship between the knower and possible knower to depict what can they know (Guba & Lincoln, 1994). Hence, the process of inquiring knowledge must involves philosophical grounding that contributes to knowledge legitimacy and adequacy (Grey, 2009). Subsequently, epistemology can be described as the study of "what we mean when we say we know something" (Mack, 2010).

According to Mack (2010), the researchers' assumptions of ontology informed epistemology assumptions and consequently informed the methodology which this sequence provides the method of collecting data. Crotty (1998) suggested the complete relationship between ontology and epistemology, leading to the theoretical perspective, research methodology and methods (See Figure 3.1). In fact, this study would implement Crotty's (1998) suggestion in order to develop the research design.



Initially, ontology and epistemology are related with the notion of reality (Crotty, 1998). Crotty (1998) also added that, reality exists outside of mind and complements particularly to the objectivism in epistemology that implies meaning appeared in objects independent of any consciousness. Moreover, Grix (2004) also defined the relationship that has occurred since ontology is related to what researchers "think can be researched", and linked to epistemology of "what researchers can know about it" that acquires further methodological approach. Therefore, ontology can be mentioned as a subset of epistemology which is unitary and holistic in nature (Grey, 2009).

As Figure 3.1 shows, Crotty (1998) has stated three positions lie beneath the epistemology that embarks the initial research process such as objectivism, constructivism and subjectivism. Objectivism is remarkable for objective research that discovers the truth without considering other elements beside reality, for instance researchers' feeling and value (Grey, 2009). Inquisitive for meaning is only situated in objects discovery and turns into researchers' aim in the research process (Scotland, 2012). However, objectivism also has a leniency towards subjective research which involves people's value, attitudes and beliefs, but with an objectively scope (Grey, 2009). In contrast, constructivism involves relativity in research which implies truth is not utterly to enquire meaning but also consider the other relation of subject with the world. Hence, the truth or reality is subjective and differs from person to person who involves human senses and consciousness (Guba & Lincoln, 1994). For that reason, the constructivism approach in inquisitive meaning is not involves discovery process but more to constructive process since the research subject creates reality in many way, biased to individuals in various phenomenon (Grey, 2009).

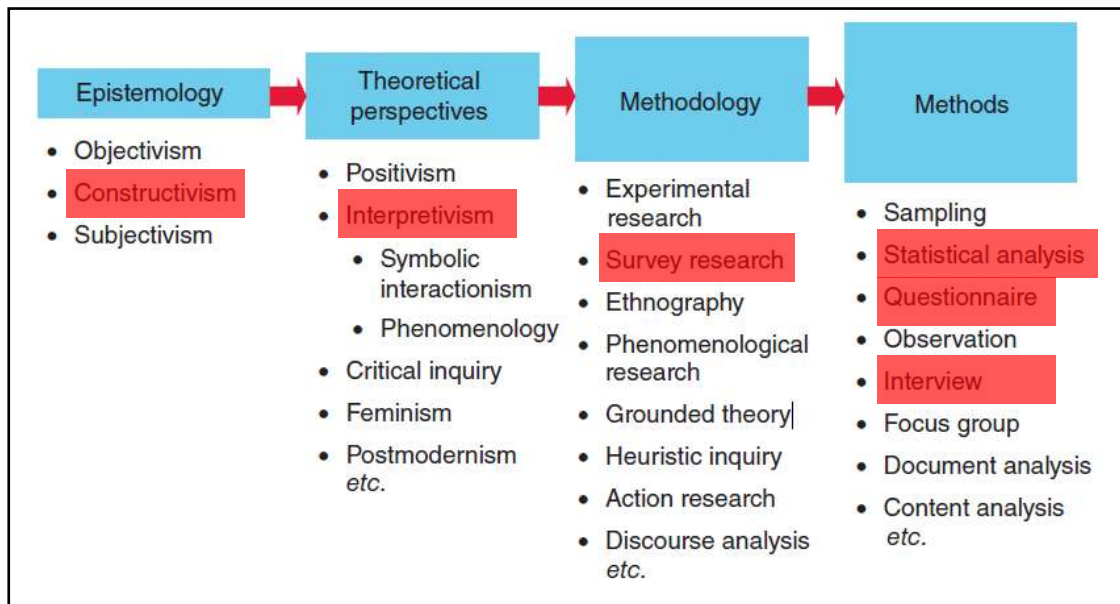


Figure 3.1. Relationship between epistemology, theoretical perspectives, methodology and methods for this study research design. Adapted from Crotty (1998)

Instead, the subjectivism is related to real world phenomena which close to societal ideology that construct the social knowledge and influenced by power relation of society (Scotland, 2012). Thus, the inquisitive of meaning is not exits from interaction between the subjects and the world, but is forced on the object by the subject. Initially, the subject created meaning within collective unconsciousness which obtained from dream, religious beliefs, etc. (Grey, 2009).

Nevertheless, the ontology and epistemology philosophical stance would lead to theoretical perspectives; consist of various research paradigms as shown in Figure 3.1. Indeed, when researchers are linking their own philosophical stance with theoretical perspectives, ultimately it will influence them on how to explore and examine the research problems and issues more precisely (Teddle & Tashakkori, 2009). Therefore, the next section will be discussed the theoretical perspective held particularly for this study.



### 3.2 The theoretical perspectives held in this study

Before discussing theoretical perspectives held in this study, it is better to describe what constitutes in theoretical perspectives especially in research. As mentioned from the previous section, theoretical perspectives consist of various research paradigms. The word "paradigm" is conceived as "a basic set of belief that guides action" (Guba, 1990). It is also known as worldview (Creswell, 2007), besides philosophical assumptions, epistemologies, ontologies (Crotty, 1998) and research methodology (Neuman, 2006). However, for the purpose of this study, only four research paradigms will be discussed. The four research paradigms are positivist paradigm, postpositivist paradigm, constructivist paradigm and pragmatic paradigm. Positivist paradigm is referred to objectivism characteristics in epistemology that embraces scientific inquiry in the research process, in which reality exists external to the researchers (Grey, 2009). Besides, the scientific outcomes will offer intrinsic knowledge to people (Creswell, 2003). Positivist paradigm also indicates the scientific inquiry that involves experimental research are purely objective, free of value, hypothesis driven and measurable (Mertens, 2005). This is relatively close to quantitative research methods in collecting data (Creswell, 2003). However, positivist paradigm showed rigid and rigorous research approach which only accentuate the objectivity in order to determine the truth (Plack, 2005).

After the World War II, postpositivist paradigm has replaced the positivist paradigm with a softer approach especially for human behavior research which not too rigid in research inquiry (Mertens, 2005). According to Plack (2005), the research inquiry for human behaviour is comes from a number of different perspectives, in





which more ecological valid and relevant result. Since then, the postpositivist paradigm becomes a leading philosophy by using quantitative research methods in the human sciences research (Teddlie & Tashakkori, 2009).

Moreover, postpositivist paradigm is formed with four characteristics i.e. a) Determination; cause-and effect thinking, b) Reduction; narrowing to select variables for interconnection, c) Empirical measurement and observation; details in process, d) Theory verification; the refinement of theories (Creswell & Clark, 2011, p.40). These four characteristics illustrate quantitative research methods that work as deductive reasoning in gaining the knowledge. Hence, deductive reasoning holds conclusion that is necessarily true if the premises are true and related to confirmatory approach that employed formulation of hypothesis from theory and the collection of numerical data is to test this hypothesis (Mukherji & Albon, 2014). In addition, confirmatory approach also work as "top down" scientific methods that instigates "from theory to hypotheses to data to add to or contradict the theory" (Creswell & Clark, 2011, p.41). Therefore, the quantitative data involves the analysis of variables from hypothesis, in which the results are mainly statistical and the goal is to generalize the results (Roberts et al, 2006).

In contrary, the interpretivist paradigm is created to oppose the positivist and postpositivist paradigm (Crotty, 1998). Interpretivist paradigm is closely related to constructivist in epistemology which emphasizes the ability of the individual to construct meaning through hermeneutics; the study of meaning and interpretation in historical texts and phenomology and consider human being for subjective interpretation and perception (Mack, 2010).



The interpretivist or constructivist paradigm also formed with four characteristics i.e. a) Understanding; phenomenally formed through participants and subjective views, b) Multiple participant meanings; leads from participants understanding, c) Social and historical construction; leads from participants understanding, d) Theory generation; from individual perspectives to broad pattern-broad understanding (Creswell & Clark, 2011, p.40). Hence, these four basic characteristics engross qualitative research methods that researchers are engaged with participants and construct the multiple realities (Creswell, 2007). Qualitative research methods that works as inductive reasoning that holds conclusion is probability true in enquiring knowledge with exploratory approach. Hence, the exploratory approach acquired the research to find patterns from observation and make a generalization or conclusion from the pattern (Mukherji & Albon, 2014). Besides, the exploratory approach works with "bottom up" methods which involves primarily purposes of description and exploration towards the understanding of people knowledge and experiences as Creswell & Clark (2011, p.41) stated that the "bottom up" methods comprises of "using the participants' views to build broader themes and generate a theory interconnecting the themes". On the other hand, the qualitative data analysis is examined for patterns, themes, and holistic features. As a result, a narrative report is presented in generic nature which not specific for a goal, but simply focus on the local, personal and subjective (Suter, 2011).

However, the strained has lingered between these two paradigms in the context of philosophical research setting (Tashakkori & Teddlie, 1998). According to Tashakkori and Teddlie (1998), Postpositivist paradigm favours for controlled setting as opposed to interpretivist or constructivist paradigm that favours natural settings.





Therefore, the researchers are supposed to choose between these two paradigms in order to justify the research findings (Grey, 2009).

In 1990s, the evolution of social science research has produced the pragmatist paradigm, which appeared as a liberator between qualitative and quantitative disparity school of thoughts. Thus, most researchers started to realize the sensible methodological approach in pragmatist paradigm since they argued that both quantitative and qualitative approach are not absolutely "purist" (Tashakkori & Teddlie, 1998).

Pragmatist paradigm is formed with four characteristics i.e. a) Consequences of action; research question is primary than the methods, b) Problem centered; multiple methods of data collection, c) Pluralistic; knowledge driven, d) Real world practice; universal practical approach (Creswell & Clark, 2011, p.41). These four characteristics embraces that pragmatist paradigm that mainly focuses on the research questions and acquired multiple methods to understand the problem which practical to be applied by researchers in any field.

Since this study is solely to find the answer of research questions, the pragmatist paradigm is suitable to be exploited as theoretical perspectives. Hence, pragmatist paradigm is practical in problem solving and could disseminate the knowledge unanimously (Tashakkori & Teddlie, 2010). As mentioned earlier regarding the four characteristics of pragmatist paradigm, indeed, would resolve the issues of applied art especially in digital games. This is relevant to Morgan (2007) statement that pragmatic approach offers an opportunity for social science





methodologists. Therefore, the research-proven for digital game design in the scope of social science is needed to increase the success rate of digital games, as mentioned in the statement of problem in Chapter One.

In term of methodology, pragmatist paradigm embraces mixed methods which include quantitative and qualitative approach to promise solutions for the research problem (Tashakkori & Teddlie, 1998). Further, mixed methods entail abductive reasoning in acquisition of knowledge which refers to the logical connection made by researchers between data and theory, often used for theorizing about surprising “events” (Teddlie & Tashakkori, 2009, p.89). Besides, abductive reasoning required researchers to interplay between inductive reasoning (qualitative) and deductive reasoning (quantitative) by translating observations into theories and then assessing those theories through action (Feilzer, 2010). In the next section, the mixed methods approach will be discussed further as a research design.

### 3.3 Mixed methods research design

Mixed methods offer the research philosophy that focus on actions, situations, and consequences rather than antecedent conditions (Creswell, 2007). Choosing research methods is not a primary concern in resolving the research problem (Rossman & Wilson, 1985). However, choosing the right method is essential, in fact, every problem can be resolved by using pluralist approach (Patton, 2002).



The selection of mixed methods as research design is apposite for this study since the procedure for collecting, analyzing, interpreting, and reporting data were aided to answer research questions or to test hypotheses (Creswell, 2007). Besides, the adoption of mixed methods research design attained logical sequence which enable researchers capability to interpret the research findings (Creswell, 2013). Logical sequence is functioning to connect the empirical data to the research questions of the study which disclose the definitive conclusions (Yin, 2009). Indeed, the 'mixing' procedure of qualitative and quantitative methods at several stages within a single study serves the purpose of understanding research problem particularly for this study.

At the outset, qualitative and quantitative methods in mixed methods approach reveal differences of measurement and accountability. For comparison, qualitative method is focusing on trustworthiness of data for the validity of research findings. The trustworthiness of data is obtained from the conscientious manners of inquiry process through constructive questions and interviews setting (Creswell, 1998). The data gathered from inquiry process is purposeful with auditable checking through several criteria such as credibility, transferability, dependability and confirmability (Collins, 2010). Credibility is refers to triangulation in data collection, in preference to internal validity in reaching convergence of findings (Patton, 2002). Transferability is refers to external validity which the results finding are transferrable to different setting (Lincoln & Guba, 1985). Dependability is refers to the audit trail from informants in checking for reliability which close to credibility (Lincoln & Guba, 1985). Lastly, confirmability is refers for comparable concern to research objective by emphasizing the roles of triangulation (Shenton, 2004).



In contrary, quantitative method is relying on reliability and validity of research findings through numerical data that formed statistical data analysis (Mertler & Charles, 2010). According to Roberts et al (2006), reliability refers to the percentage variability in a measured score which drives variability for true score as opposed to random error. For example, reliability of a true score is 0.9 (90%) compares to 0.1 (10 %) of error. In other words, reliability of 80 % to 90% true score is acceptable for research purposes. Further, validity refers to the degree of which instrument measures what it claims to be measured. Two ranges of validity measurement are involved as same as qualitative method such as credibility for internal validity and transferability for external validity.

Nevertheless, the differences of qualitative and quantitative methods have flourished mixed methods approach with significant advantages i.e. 1) Triangulation; reaching convergence in findings, 2) Complementarity; examining the overlapping and different parts of phenomenon for better understanding, 3) Development; implementing the first method that guides the second method in term of decision for sampling, measurement and implementation, 4) Initiation; comparing and analyzing for new perspectives and insight that form new questions, 5) Expansion; increasing scope and breadth (Greene, Caracelli, & Graham, 1989).





### 3.4 The nature of exploratory and confirmatory studies

Another advantage for mixed methods research design has been referred as the nature of exploratory and confirmatory studies (Tashakkori & Teddlie, 2010). In mixed method designs, qualitative methods are used to explore a phenomenon from the generation of conceptual model along with testable hypotheses, while quantitative methods are used to confirm the validity of the model by hypotheses testing (Tashakkori & Teddlie, 2010).

By referring to this study, exploratory studies will help for further exploration of phenomenon stated in hypothetical proposition. This phenomenon is close related to acquire two key issues regarding the description of attributes and characteristics of visual aesthetics and guiding principles for visceral level player-centric emotional design for digital games. Then the findings from these two key issues will be informed the development of quantitative instrument for confirmatory purposes in validating the qualitative findings in the exploratory studies. Therefore, the nature of exploratory is set as a major part in this study. The exploratory will be applied in linear sequence, which known as exploratory sequential design of mixed methods (Creswell, 2014). This design works by prioritizing exploratory through qualitative instrument for data collection and analysis in first phase. Then, the confirmatory involves when results from qualitative data are prudent to build quantitative instrument for data collection and analysis in second phase. The results from quantitative data will be generalized, hence will be interpreted based on initial qualitative results (see Figure 3.2).





Since there is no prior evident when referring to player-centric emotional design for digital games especially in visual aesthetics, there is necessary to employ the exploratory sequential design since such design is practical to test element from emergent theory and generalized the findings to different population (Tashakkori & Teddlie, 1998). Thus, the deficient in measuring constructs for research setting or research problem could provide predicament to design a questionnaire. Therefore, the exploratory studies would giving a better chance to explore, identify and provides lucidity about what kinds of variables that supposed to need for further investigation in research (Grey, 2009).

Thus far, the mixed methods research design intended for digital games is still minuscule, especially for exploratory sequential research studies. However, the digital games research under the title of "Understanding Engagement: A Mixed-Method Approach to Observing Game Play" has been identified to embraces mixed methods research design (Dow, MacIntyre, & Mateas, 2008). The research involves in ethnographic-style observation which the authors argued that the implementation of mixed methods approach will explained players' interpretations and behaviours towards the engagement with digital games. In fact, the explanatory sequential design is seems to be implemented even though the authors didn't mentioned exclusively in their study. For information, the explanatory sequential design is contrary with exploratory sequential design which the nature of study is to explain rather than to explore. The quantitative instrument will be used for confirmatory through data collection and analysis in first phase. Then, the results of quantitative data will be informed the development of qualitative instrument for data collection and analysis in







second phase. The results of qualitative data will be interpreted and explained based on initial quantitative results (Creswell & Clark, 2007).

Nevertheless, this study has identified the thesis research which useful for references. The thesis research titled " Teaching Middle School Jazz: An Exploratory Sequential Mixed Methods Study" (West, 2011) obviously used mixed methods research design, hence employed the exploratory sequential design procedure. Initially, the thesis research is related to social sciences, in which to relate between one's perceived ability to teach jazz in middle school with listening to jazz and playing as a professional jazz musician from the previous experiences. Indeed, West (2011) research design is suitable to be referred since his thesis research emphasized on exploratory and confirmatory studies which similar with the nature of this study.



### **3.5 The unit analysis of participants**

The focus of this study is to identify the understanding of participants in designing visual aesthetics, besides their understanding of visceral level player-centric emotional design for digital games. The individual participants are expected to describe their understanding and would thrive more ideas based on their life experience. Therefore, in the exploratory phase, the five prominent game practitioners are suitable to be selected as participants. Moreover, the five prominent game practitioners are actually resided and work in Malaysia.



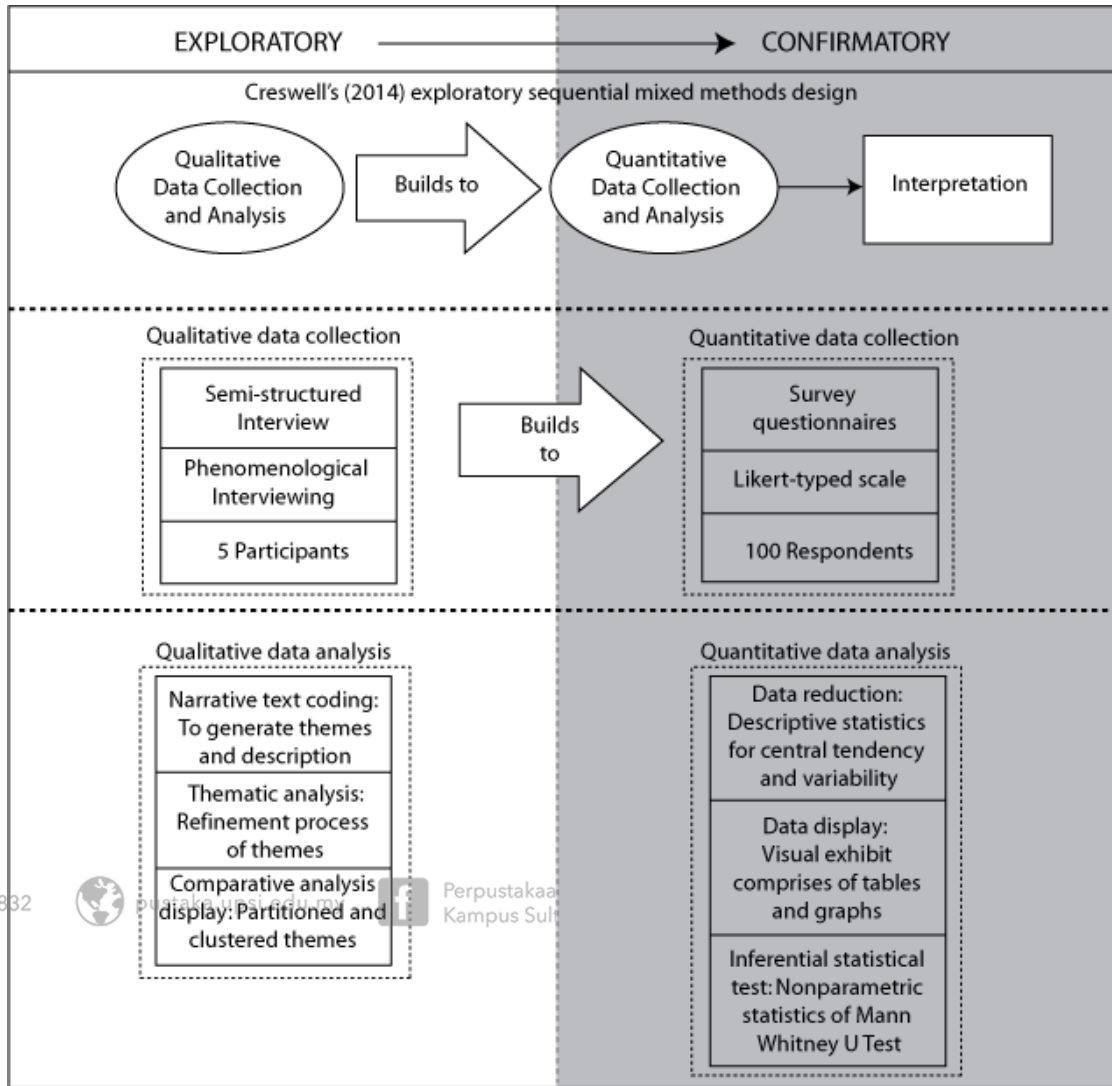


Figure 3.2. The mixed methods research design of this study

However, in the confirmatory phase, suitable questionnaire survey respondents are recruited to confirm or refute the findings gathered from semi-structured interview. The key profiles of targeted respondents are graphic design students who involve in producing visual design works. Four graphic design programmes in Malaysian public universities were identified for the confirmatory phase of this research. These programmes were chosen because the involvement of graphic design students as respondents is crucial because their perceptions would enlighten graphic



designers' knowledge and skills to design appropriate graphics for games that supposed to include the specific characteristics of visual aesthetics and several guiding principles. In fact, as students, they would not bias to give the feedbacks based on their learning experience (Hattie & Timperley, 2007).

The population of this survey is referring to Malaysia public university students who are enrolling bachelor degree in graphic design programme. The population was selected in the sense that the outcomes from this study are not only beneficial to graphic designers and game practitioners but also beneficial to the universities which involve in this study. Since this study is motivated by opportunity given by one of the Malaysia public university (UiTM), therefore the outcomes from this study by some mean would help UiTM and other Malaysia public universities to improve their programmes, particularly in graphic design. Generally, this research would support the capability of Malaysia public universities to provide a variety of programmes in diverse fields of study (Fernandez, 2010).

Furthermore, the selected population also reveals probability sampling procedure which accentuates stratified random sampling in the sense of stratifying the population by the criterion (Bryman, 2012). In this case, the total enrollment of graphic design students in Malaysia public universities will be stratified with one-twentieth calculation based on statistics provided by Ministry of Education, Malaysia (see Table 3.1). According to the statistics, the grand total of graphic design students in Malaysia public universities is 1,938. After stratified, the sample shows only 97 students to be used as respondents. For ensuring the sensible result, this sample will be rounded for 100 respondents. Table 3.2 shows the types of participants involved in



this study briefly. The next section will be further discussed pertaining to the application of instruments and data analysis in exploratory phase and followed by confirmatory phase.

Table 3.1

*Number of graphic design students' enrolment in Malaysia public universities.  
Source: Data Management Unit, Planning, Research and Policy Coordination,  
Higher Education Sector, Ministry of Education Malaysia (2014)*

Public Universities	Field of studies	Programme	Enrolment		Grand Total
			Male	Female	
Universiti Teknologi MARA (UiTM)	Art and Humanities	Sarjana Muda Seni Lukis Dan Seni Reka (Kepujian) (Seni Reka Grafik)	160	165	325
		Sarjana Muda Seni Reka Grafik (Kepujian)	475	431	906
Universiti Malaysia Pahang (UMP)	Science, Mathematics and Computing	Sarjana Muda Sains Komputer (Teknologi Grafik dan Multimedia) Dengan Kepujian	92	165	257
Universiti Malaysia Sabah (UMS)	Science, Mathematics and Computing	Ijazah Sarjana Muda Sains Dengan Kepujian (Matematik dengan Komputer Grafik)	64	118	182
Universiti Teknologi Malaysia (UTM)	Science, Mathematics and Computing	Sarjana Muda Sains Komputer (Perisian Grafik dan Multimedia)	129	139	268
<b>Grand Total</b>			<b>920</b>	<b>1,018</b>	<b>1,938</b>

Table 3.2

*The types of participants involved in this study*

Phase	Purpose	Types of participants	N	Methods
Exploratory	To identify the understanding of visual aesthetics  To identify the understanding of visceral level player-centric emotional design for digital games.	Prominent game practitioners (Reside in Malaysia)	5	Semi-structured interviews
Confirmatory	To confirm and refute the description of five prominent game practitioners.	Graphic design students in Malaysia public universities	100	Survey questionnaires

### 3.6 Exploratory phase

#### 3.6.1 Semi-structured interview

The first phase consists of exploratory through qualitative data collection by exercising interview protocol with individual participants. The participants will be presented by five prominent game practitioners. The interview protocol will be conducted in semi-structured type (Refer Table 3.3). In addition, the process of inquiring qualitative data in interview protocol relatively close to phenomenological approach for in-depth interviewing (Seidman, 2006). The selection of phenomenological questions are within a scope of game practitioners' experience according to their understanding in designing visual aesthetics as well as visceral level

player-centric emotional design for digital games. The narrative answers are expected to be delivered by participants. The key questions are related to research questions; (a) what are the characteristics of visual aesthetics in player-centric emotional design for digital games and (b) what are the guiding principles of visceral level player-centric emotional design for digital games. These two key questions have been branch out to multiple sub-questions (see Appendix A) that eventually will help to explore the phenomenon related to this study. According to Creswell & Clark (2007), the intention to explore issues surrounding the central phenomenon would lead more sub-questions to be asked for participants. In turn, participants will react with the varied perspectives or meanings and could answer the central questions. Interviews will be recorded by using a tape recorder and details field notes will be taken.

*Semi-structured interview questions*

Question type	Actual question asked
a. Experience in game industry	How long have you been working in the creative industry?  How many games have you been involved with developing?  What role did you play when you were involved in game production?
b. Understanding of visual aesthetics	What do you understand about the concept of visual aesthetics? Why?  What are the common/generic attributes of visual aesthetics for digital games? Why?  What are the characteristics of visual aesthetics for digital games? Why?

(Continue)

Table 3.3 (Continued)

Question type	Actual question asked
c. Understanding of player-centric design	What do you understand about the concept of player-centric design? Why?  How about the concept of player-centric design for digital games?
d. Understanding of emotional design	What do you understand about the concept of emotional design? Why?  How do you see visceral level of emotional design for digital games?
e. Understanding of visceral level player-centric emotional design for digital games	How about visceral level player-centric emotional design for digital games?  In your professional practice, what could be the guidelines of visceral level emotional design for digital games?

### 3.6.2 Qualitative data analysis

According to Merriam (1998), qualitative data collection should be proceeded simultaneously with qualitative data analysis. The qualitative data analysis will be started "by preparing and organizing the data then reducing the data into themes through a process of coding and condensing the codes, and finally representing the data in figures, tables, or a discussion" (Creswell, 2007). In this study, three techniques will be used to analyze the qualitative data: narrative text coding, thematic analysis and comparative analysis display.

Throughout the semi-structured interview protocol, the participants would describe in narrative according to their life experience. Then, the narrative description will be transcribed verbatim and leads to narrative text coding for making sense of the data (Lichtman, 2013). Narrative text coding is functional to generate themes and describe it with additional sub themes that could be answered by participants from interview protocol.

Then, the second technique involves thematic analysis, in which to refine the themes generated from narrative data coding. Thematic analysis is useful to discover patterns or themes within data (Braun & Clarke, 2006). According to Braun and Clarke (2006), thematic analysis is "minimally organizes and describes the data set in rich detail" and could "interprets various aspects in research topic". This means the data will be coded or categorized, described in detail, and could be interpreted as qualitative data findings.

The third technique involves the comparative analysis display which adapted from Creswell (2014) in representing qualitative data findings. The visual display is important to augment the discussion between individual participants (Miles & Huberman, 1984). For that reason, the comparison table or a matrix will be formed to compare groups on one of the themes (Creswell, 2014). In this sense, the qualitative data findings will be partitioned and clustered according to themes for further analysis (Miles et al, 2014). Indeed, the comparative analysis display would make sense of qualitative data findings, hence could be used for the development of quantitative instruments. To make sure the accuracy of data coding is according to themes, this study will be using NVivo software.





### 3.6.3 Credibility and trustworthiness

The rigorousness in research methodology is vital for data collection, analysis and interpretation especially in mixed methods approach (Creswell, 2003). Hence, the credential of mixed methods approach is related to credibility and trustworthiness in obtaining findings (Tashakkori & Teddlie, 2010). Credibility is referred to the rigor procedure of research process that provides trustworthiness of the findings (Denzin & Lincoln, 2000). This study will follow exploratory sequential design procedure in two phases (Creswell & Clark, 2011). The priority will be given to exploratory phase that involves qualitative data collection and analysis and followed by a confirmatory phase of quantitative data collection and analysis.



In establishing the trustworthiness of data collection, a "member checks" will be implemented (Guba & Lincoln, 1994). The participants will be given an opportunity to check the accuracy of data collection from interview protocol. Therefore, the participants may read the transcripts of dialogues for verification. Nevertheless, the researcher credibility is also counted. According to Patton (2002,p.14), the "credibility of qualitative methods, therefore hinges to a great extent on the skill, competence, and rigor of the person doing the fieldwork". As a major instruments of data collection and analysis (Patton, 1990), the researcher is considered himself as a experienced graphic designer and lecturer in graphic design field that capable to conduct game design research especially in visual aesthetics for digital games.





### 3.7 Confirmatory phase

#### 3.7.1 Survey questionnaires

In the confirmatory phase, the qualitative data findings would assist the development of quantitative instrument. The quantitative instrument consists of survey questionnaires which the items of response category are basically attained from the qualitative data analysis and findings. The survey questionnaires will use likert scale since it is suitable for identifying attitude statements of respondents (Collins, 2010). In this sense, the focus group of 100 graphic design students will play a major role to confirm and refute the qualitative findings based on their beliefs and attitudes.

In order to reach sample respondents to response, the survey questionnaires will be distributed by hand-deliver to them. Afterwards, the respondents' data will immediately transform to numeric data in Excel and SPSS formats for effective computation data analysis.

#### 3.7.2 Pilot testing

The pilot testing is an approach to ensure the reliability and validity of quantitative survey instrument. Reliability is refers to accuracy and consistency of data findings, which can be referred to test-retest of survey instrument in the pilot testing (Golfshani, 2003). The survey instrument is considered reliable if the same result is obtained. This is to guarantee the stability of attributes survey instrument which the results can be replicable. Meanwhile, validity is refers to the research instruments that





capable to measure exactly which it was intended to measure (Golfshani, 2003). This is referring to survey instrument that would answer the research objective. The pilot testing will be conducted randomly to a sample sampling consists of twenty game players. Indeed, the results from pilot test are expected to be used for amendments of survey items and will form a new version of survey questionnaires.

### 3.7.3 Quantitative data analysis

Since this study employed mix methods research, the analytical techniques will be used sequentially, in which qualitative data analysis will be transformed to quantitative data analysis. The transformation occurred when qualitative data findings are converted to numerical codes for statistical analysis (Tashakkori & Teddlie, 1998). In order to produce statistical analysis for data interpretation, the quantitative data analysis process is supposed to endure seven-stage conceptualization of the mixed methods data analysis (Onwuegbuzie & Teddlie, 2003). However, in this study, the quantitative data analysis will be using the concept of data reduction and data display, as well as inferential statistics for confirmatory and generalization of data findings to the larger population.

The gathered data collection will be screening first for the data errors after the data have been entered in computer file. After the data screening is completed, data reduction will take in place when the screening data collection will be reduced for descriptive computation statistics that involve measures of central tendency (mean,





median and mode) and variability (standard deviation). Then, the data display works as visual exhibit to describe quantitative data through tables and graphs.

Afterward, the quantitative data display will be generalized through inferential statistical test which also functional to examine hypothetical proposition in this study. The inferential statistical test would involve nonparametric statistics, by assuming the sample size is modest to assess normality of distribution. Therefore, the Mann Whitney U test and Kruskal-Wallis test are suitable to be used for this statistical test. Initially, the Mann Whitney U test feasible for small sample size which allows the measurement of variables in ordinal types, while Kruskal-Wallis test is to rank based on nonparametric test for determining statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable. Those nonparametric tests can be recorded arbitrarily and with imprecise scale (Nachar, 2008). As compared to t-test in parametric statistic, the Mann Whitney U test provides less erroneous of significant results due to the presence of several extreme values in the sample of study (Siegel & Castellan, 1988). Therefore, the Mann Whitney U test is expected to provide significant statistically results that could determine the attributes and characteristics of visual aesthetics for digital games. Moreover, the list of guidelines for visceral level player-centric emotional design for digital games will comprehensively produced. The statistical analysis of the quantitative data findings will be conducted with the help of Statistical Package for Social Sciences software (SPSS), version 23.0.





### 3.8 Ethical issues

This study will pursue similar ethical standard stated by Meissner et al (2011) in mixed method research. The ethical standard comprises to safeguards the identifying participant's information, the follow-up information possibility and identifies the additional burden to participants. In this sense, this study has identified the ethical procedure of implementing mixed methods research for participants; the information sheet (see Appendix B) and the consent form (see Appendix C). These two letters were created and delivered to each participant prior to data collection. Participants are anonymous and protected by numerically coding. In individual interview, the selective participants will assign fictitious names for description and results report. All study data including interview tapes, verbatim transcripts and survey files will be stored in locked cabinets and available upon participants' request. Participants also will be informed that summary data which will be disseminated for educational purposes.

### 3.9 Conclusion

The complete data analysis and findings are expected to proffer valuable outcome from the development of variant instruments (Creswell, 2013). Hence, the combination of qualitative and quantitative approach are expected to acquire an accurate data which allow for more complete analysis (Greene et al., 1989). Therefore, the mixed methods comprise of qualitative and quantitative approach is an adequate instrument to capture complex issues pertaining to design games that





stimulate players' immediate emotional response through visual aesthetics. Consequently, the data analysis and findings would offers the complete analysis to support the notion of player-centric emotional design for digital games, in which accentuate to the development of guiding principles for visceral level that can be applied in the game design process.





## CHAPTER 4

### FINDINGS OF THE EXPLORATORY STUDIES



#### 4.0 Introduction

As mentioned in previous chapter, the exploratory phase aimed to identify the attributes and characteristics of visual aesthetics, hence determining the guiding principles for visceral level player-centric emotional design for digital games. In order to gain the findings for supporting both objectives, the semi-structured interview was carried out between June 2015 and November 2015 with five prominent game practitioners who reside in Malaysia.

The findings of exploratory phase which described in this chapter are meant to be used for the development of quantitative instrument in confirmatory phase. The findings of confirmatory phase will be discussed in chapter 5.



#### 4.1 Findings of exploratory phase

The exploratory phase was conducted to explore the perceptions of five game practitioners toward visual aesthetics studies within the notion of visceral level player-centric emotional design for digital games. The Figure 4.1 shows how the findings were drawn from this study. The findings of this study were organized into five sections:

- The background of five game practitioners.
- The perceived concept of visual aesthetics for digital games.

- The perceived attributes and characteristics of visual aesthetics in digital games.

- The perceived key concepts of visceral level player-centric emotional design for digital games.
- The perceived guidelines for visceral level player-centric emotional design for digital games.



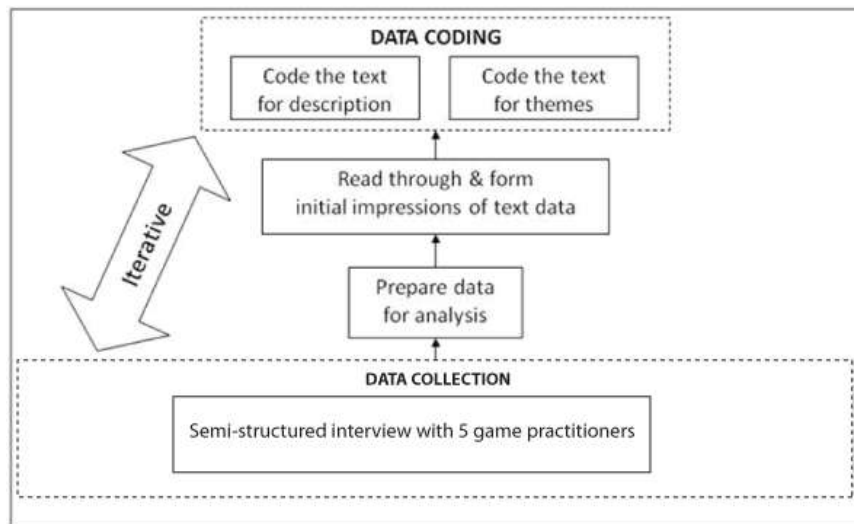


Figure 4.1. Research methods of exploratory phase. Adapted from Creswell (2012)

## 4.2 The profile of five prominent game practitioners

Five prominent game practitioners were recruited to take part in the exploratory phase. Their profiles are elaborated here to relate their professional experience and credentials in the game industry, affording them to suit the needs of this research. In order to construe the findings, each of game practitioners were referred as 'GD' and followed by 3 digit numbers.

GD001 started his career as multimedia designer and he ventured into the field of game design when he worked with reputable a UK (United Kingdom) game company which has a branch in Malaysia. After working as a 3D game artist for five years, he was given the responsibility to design 3D game art assets comprises of characters, objects, environments, and vehicles. After that, he spent several years working with Australia game company which also based in Malaysia. He played an



important role in game development as a lead artist and also technical director to assist art director in game design process.

Meanwhile for GD002, he was a graphic designer and primarily involved in animation and film production. Initially, he started to get involved in game design on part time basis. After three years of professional practice, he produced several digital games for different platforms. Some of the digital games were published in Google Play Store and Apple App Store. As a game artist, he was responsible for visual aspect in games. He also occasionally worked as a game designer. At the time when this study was conducted, he had been appointed as a lecturer in reputable private university in Malaysia, teaching modules in game art.



in the creative industry. He started his career in game design as a game writer. Afterward, he became a lead game designer, before being appointed as a project manager which was responsible to manage the whole game development process. After five years in the game industry, he joined the academia as a lecturer and teaching game design courses.

GD004 started his career in the creative industry in late 1990s. He was originally trained as an engineer but he applied his professional knowledge and skills in the production of 3D animation. When he was working with TV programme production abroad, he produced a few educational games. He also involved in film production as a visual effect artist. His first roles related to game design was a lead character animator. He took part in the production of over twenty digital game titles.



When this research was conducted, he was a technical art trainer in an international game studio to train game artists, developing their knowledge and skills in game art design process.

GD005 has been working in the creative industry since early 2000s. In fact, he started working in game design when he was still studying in high school. His roles in game design began as a 3D game artist and then became a concept artist. At the time when he was interviewed, his roles in game production were mainly regarded as a game designer. He successfully produced about eight digital game titles for the consumer market.

#### 4.3 The perceived concept of visual aesthetics for digital games

Generally, game practitioners defined visual aesthetics is related to the beauty of game visuals that appeals to the players' sight. However, GD004 gave a comprehensive definition of visual aesthetics when he associated aesthetic with the nature of visual that could please the human eyes and capable to evoke positive emotion. He added that the good design, beautiful painting and anything that have been created for pleasing human sight sense were considered as visual aesthetics.

In term of function, GD001 saw visual aesthetics could influence players' acceptance towards games. According to him, players' keen to accept and play the digital games with beautiful game visuals. He urged that "if people [players] wouldn't accept your art or visual, basically they wouldn't even bother to look at your game".



Meanwhile, GD002 argued that most of players' positive reactions come from appealing game visuals. Therefore, he saw visual aesthetics could improve players' efficiency while in game playing events. For GD005, he associated visual aesthetics with human perception as human being likes to perceive things through visual. He added that the good game visuals would enhance players' game playing experience, hence lead them to be engaged with it.

Nevertheless, GD003 saw the design approach for visual aesthetics involved the art direction which related to the artistic style of visual in the game level design. Besides, he insisted that the art direction would engross players' emotion which helps them to play games better. In similar idea, GD001 and GD002 pointed out that the design for visual aesthetics should be focused on the art styles of graphical user interface (GUI) and game characters that certainly implicate the concept and the gameplay of games. In relation to the art direction or art styles of game visuals, GD004 suggested that the design of visual aesthetics should be referred to animation movie as he claimed that "for the [game] visual look of it, they have lot of plates and reference materials from Pixar movies".

#### **4.4 The perceived attributes and characteristics of visual aesthetics for digital games**

The understanding of game practitioners toward the concept of visual aesthetics led to the revelation of its attributes and characteristics. Four attributes and thirteen characteristics of visual aesthetics were identified from game practitioners' perceptions as shown in Table 4.1.



Table 4.1

*The attributes and characteristics of visual aesthetics for digital games perceived by game practitioners*

The attributes	The characteristics	Source
1. Colour	1. Moderate colour value	GD001
	2. Colour follows the art direction, mode and art styles of the games	GD001
	3. Colour grading to stylize the game graphics	GD004
	4. Warm and cool colours to contrast the foreground from the background	GD002
	5. Warm colour (red and yellow) evokes negative emotion	GD003
	6. Cool colour (blue and purple) evokes positive emotion	
2. Shape	6. Warm and cool colours for symbolic meanings	GD005
	7. Shape with round edges evokes positive emotion	GD003
	8. Shape with sharp edges evokes negative emotion	
	9. The edges of shapes evoke the synthetic sense of players to recognize game characters sexuality, masculinity and the power abilities	GD005
3. Line	9. Distinctive shape for recognition of game characters	GD002
	10. Line as part of art direction element in game design	GD003
	11. Thin line evokes positive emotion	
4. Form	12. Sharp line evokes negative emotion	GD004
	13. The 3-dimensional art to reproduce realism	

#### 4.4.1 The characteristics of colour in games

GD001 saw colour used in games should moderate in value to ease players' eyes. He was referred to Angry Birds game as he claimed that the colour of that particular game "is not that bright, it's not that subtle". Besides, GD001 also indicated that colour used in games should follow the art direction, mode and art styles of the games. Meanwhile, GD004 emphasized the colour grading is one of important element in games. He saw the colour grading would stylize the game graphics in order to represent the concept of the games.



GD002, GD003 and GD005 equally regarded the roles of warm and cool colours in determining the characteristics of colour for digital games. GD002 saw the used of warm and cool colours would contrast the foreground from the background of game environment. Meanwhile, GD003 saw warm and cool colours could evoke players' emotion. He underlined the use of warm colour such as red and yellow evoke negative emotion, while cool colour such as blue and purple evoke positive emotion. For GD005, he saw warm and cool colour could represent the symbolic meanings for players. Although warm and cool colour can be interpreted in different ways based on the culture of players, he generally indicated that the use of those colours indeed help the players to interpret the meaning behind it.



#### 4.4.2 The characteristics of shape in games

Both GD003 and GD005 regarded the edges of shape could trigger players' emotional response. According to GD003, he saw shape with round edges evokes positive emotion, while shape with sharp edges evokes negative emotion. GD005 echoed the perceptions of GD003 when he regarded the edges of shape would evoke the synthetic sense of players to recognize game characters sexuality, masculinity and the power abilities. In relation to the design of game characters, GD002 underlined the game characters should be "designed with a distinctive shape" which supposed to constantly recognized by players, even though in silhouette shape.





#### 4.4.3 The characteristics of line in games

GD003 regarded line as a part of art direction elements in games besides colour, shape and lighting. He initially referred to the used of line in game character design where sharp line represents the antagonist character while softer line represents protagonist character. In this sense, he saw line as a visual element that capable to evoke players' emotion. Therefore, he concluded that the used of thin line in the design of game graphics could evoke players' positive emotion, while the sharp line could evoke players' negative emotion.

#### 4.4.4 The characteristics of form in games



Besides colour grading, GD004 regarded the 3-dimensional (3D) art as an attribute of visual aesthetics. He saw the 3-dimensional (3D) art is capable to 'reproduce realism' for players' eyes while in the game world. By referring to Holtzschue and Noriega (1997), the 3-dimensional is considered as a form comprised of three elements: volume, weight, and density. These three elements would give the impression of reality for the eyes of people.



#### 4.4.5 The knowledge mapping on the perceived attributes and characteristics of visual aesthetics with art fundamentals

The perceived attributes and characteristics of visual aesthetics mentioned by game practitioners relatively closed to art fundamentals which involved visual elements and design principles. In fact, game practitioners regarded visual elements used in game design comprised of line, shape, form and colour. However, the common visual elements of art should involve line, shape, form, space, texture and colour (Pentak & Lauer, 2012). Therefore, the knowledge mapping is needed to find the gaps between game practitioners' perceptions with the existing art fundamentals for further examination (Table 4.2). The darkened boxes indicate where game practitioners saw two visual elements: space and texture should have no function in game design process.

Table 4.2

*The knowledge mapping on the perceived characteristics of visual aesthetics with the existing art fundamentals*

Visual Aesthetics		Art fundamentals	
Attributes	Characteristics	Visual elements	Design principles
Line	Line as a part of art direction element in game design (GD003)  Thin line evokes positive emotion (GD003)  Sharp line evokes negative emotion (GD003)	Line	Emphasize qualities of line i.e. thin line, sharp line and directional lines for art direction

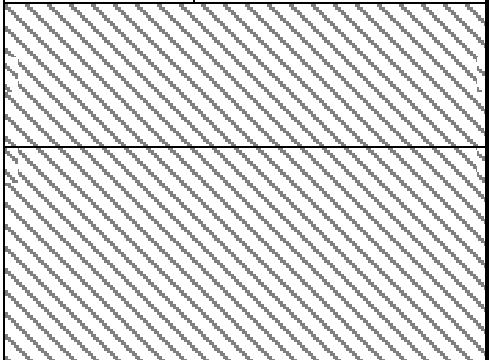
(Continue)



Table 4.2 (Continued)

Visual Aesthetics		Art fundamentals	
Attributes	Characteristics	Visual elements	Design principles
Shape	Shape with round edges evokes positive emotion (GD003)	Shape	Emphasize on the rectilinear shape of sharp edges (geometric) and the curvilinear shape of smooth edges (organic) for visual effects
	Shape with sharp edges evokes negative emotion (GD003)		
	The edges of shapes evoke the synthetic sense of players to recognize game characters sexuality, masculinity and the power abilities (GD005)		
	Distinctive shape for recognition of game characters (GD002)		Emphasize on the shape proportion related to size and scale
Form	The 3-dimensional art to reproduce realism	Form	Emphasis 3-dimensional mass for impression of volume, weight and density
Colour	Moderate colour value to ease the eyes (GD001)	Colour	Balance the hue, value and intensity of colour properties
	Colour grading to stylize the game graphics (GD004)		Enhance the hue, value and intensity of colour properties
	Warm and cool colours to contrast the foreground from the background (GD002)		Emphasize colour contrast
	Colour for art direction, mode and art styles. (GD001)		Imposes the colour harmony for uniformity of design
	Warm colour (red and yellow) evokes negative emotion (GD003) Cool colour (blue and purple) evokes positive emotion (GD003)		Emphasize on colour emotion through warm and cool colours

Table 4.2 (Continued)

Visual Aesthetics		Art fundamentals	
Attributes	Characteristics	Visual elements	Design principles
Colour	Warm and cool colours for symbolic meanings (GD005)	Colour	Employs the colour symbolism to represent conceptual qualities
		Space	Imposes the linear perspective, overlapping shapes, size gradient and texture gradient for depth perception
		Texture	Emphasize on repetition of lines and shapes to evoke sense of touch  Emphasize on rhythm of lines and shapes for sense of touch

#### 4.5 The perceived key concepts of visceral level player-centric emotional design for digital games

The exploratory study on the concept of visual aesthetics continues by commencing the extent of game practitioners' knowledge and views toward the key concepts that formed the notion of visceral level player-centric emotional design for digital games. Several key concepts will be discussed in order to secure the significant roles of visual aesthetics in games. In addition, the perceptions of game practitioners are expected to disclose the tipping points that can be used to outline the guiding principles for digital game design.



#### 4.5.1 Player-centric design for digital games

Generally, game practitioners regarded player-centric design relates to the design approach that considered the desires of the players. According to GD001 and GD004, they believed that by considering the desires of the players would enhance their interest in game playing. However, they saw that the desires of the players have evolved enormously which in line with the game technology advancement. Therefore, they argued that the design that depends on the desires of the players is hard to be fulfilled since they always want to experience the new things in games consist of gameplay, storylines, game graphics and even the music.

For GD002, he imagined all digital games are already player-centric since the design process is supposed to be focused on the interest of the players. In this sense, he wasn't sure about what kind of game design that is not player-centric. Meanwhile, GD003 totally rejected the concept of player-centric design for digital games as he saw the idea of the concept did not give any sense to him as experienced game practitioner. He stated that digital games were definitely designed for players and no need to add unnecessary term to confuse the people. In fact, he claimed that the people who embracing that particular concept are actually not a real game developer.

In contrast, GD005 saw the implementation of player-centric design for digital games is vital since it allows players to give feedbacks based on their actual experience. By comparing to simulation based design, he saw the design process only relied on the person who designed the simulation without involving the actual users' experience. Moreover, he argued that most of game developers regarded all games are





player-centric since it designed based on players' interest but in real fact, they just approximate the behaviours of the players in the game design process.

However, despite the ambiguity of understanding towards the concept, GD001 regarded player-centric design should be focused on the players' gameplay experience which connected to their desires. In this sense, he accentuated the wisdom of game designers to design such desired gameplay that enables to engage the players with the games. GD002 echoed the GD001's idea when he commenced the role of game designer as the one who designed the pathway of players' gameplay experience through the initiation of the game rules.

In contrast, GD004 regarded the approach that held the sense of player - centric design should be imposed in the user interface. Although he realized the current approach of player-centric design is more focused on the gameplay, but he argued that the players are more concerned about the design of user interface that allows them to customize the games according to what they want. In fact, he stated that without the good user interface design, players will not have pleasing game playing experience even for the game graphics or music. This will deter the interest of the players to play and buy the digital games.



#### 4.5.2 Emotional design for digital games

Norman (2003) enlightened the concept of emotional design from users and designers perspectives with intention to explain the significant roles of emotion as evident in designing products. Therefore, in this section, the perceptions of game practitioners toward the key concept of emotional design for digital games were grouped into two groups of beneficiaries: players and designers. However, the term of 'designers' is referred to game designers and game artists as they play the major roles in the pre-production stage of game design process. Nine themes were generated from the arguments and slightly more than half were referred to players (refer Table 4.3).

Table 4.3

*Themes of arguments on emotional design concept for digital games, grouped into two beneficiary groups*

Beneficiary	Themes of arguments	Reference <sup>a</sup>	Source <sup>b</sup>
Players	1. Emotion is important for players	3	3
	2. Emotion is related to players' feeling of pleasure	2	1
	3. Negative emotion enhance motivation	3	2
	4. Emotion is linked to players' psychological ability	1	2
	5. Emotion endeavours element of learning	2	1
Designers (Game designers and Game artists)	1. Emotion is a part of interaction element in games	1	2
	2. The emotional design approach should be clearly justified for better understanding	1	1
	3. Must referred to players' target market	1	1
	4. Identify the players' psychological needs	1	1

a. The number of times an argument was mentioned

b. The number of interviewees who used the argument



From players' perspective, emotion is inseparable from human life (GD004 and GD005). For that reason, it is impossible to design games without thinking of emotion (GD003). Emotion is related to what players' feel while in game playing events (GD002). Since players are expected to have fun in games, the pleasure feeling is vital for them to keep playing games (GD002). Sometimes, players might feel sad if they lose the games but certainly not impede their determination to keep playing games (GD001). In this sense, the sad feeling is not really drawn negative emotion but turn up to become positive emotion for players (GD005). The negative emotion which experienced by the players by some mean is not treacherous but more like a 'lack of empathy' (GD005).

Other than that, emotion is linked to psychological ability that influences players' cognition and behaviour for effective game playing (GD003). This in turn endeavours element of learning, where players will learn various techniques and skills in order to achieve goals in games (GD004). Therefore, the element of learning would make games are more fun to play and certainly provide entertainment for players (GD004).

From designers' perspective, they should consider emotion as a part of players' interaction element with the games besides narrative or storyline, aesthetics and the gameplay (GD003). Not to mention element of animation (GD005). Therefore, the approach of emotional design should be clearly justified to evade confusion in game design process (GD003). Moreover, designers should take into account that the approach of emotional design must be referred to players' target market (GD001). It



should begin by identifying the psychological needs of players' target market in order to produce the valuable digital games (GD001).

### 4.5.3 Visceral level of emotional design for digital games

Most of game practitioners seem to recognize the key concept of visceral level of design through their understanding towards the effects of visceral response that players' constantly experienced while in game playing events. Table 4.4 shows the 10 themes of understanding perceived by the game practitioners related to visceral response in games.

*The understanding of game practitioners related to visceral response in games*

Themes of Arguments	Reference	Source
1. Activated from sensory particles of biological human senses	1	GD003
2. Trigger various types of immediate emotional response	1	GD003
3. Direct players' instantaneous reaction	1	GD003
4. Jump scare reaction of adrenaline rush	1	GD005
5. Remarkable experience	1	GD005
6. Experiential feeling	1	GD004
7. No logical and reasoning involvement	1	GD004
8. Enforce fast decision and body response	1	GD004
9. Positive psychology	1	GD003
10. Related to 'flow' concept of motivation	1	GD003

According to GD003, he claimed that visceral response is activated from "sensory particles" which can be understood as biological human senses. He also acknowledged visceral response could trigger various types of emotional response



which immediate in nature, thus capable to direct players' instantaneous reaction. In similar idea, GD005 regarded visceral response was related to jump scare reaction which engrossed adrenaline rush for players' excitement. He saw the instantaneous reaction carved the remarkable experience to players as visceral response definitely "punctuates things" and certainly encourage them to be engaged with the games.

For GD004, he regarded visceral response as a form of "experiential feeling" concealed by emotional arousal which makes the cognitive process of the brain looks like "a bit of die" since it passes over the logical and reasoning. Therefore, he urged that visceral response is capable to activate players' prompt decision and physical reaction during game playing activities. Meanwhile, for GD003, he saw visceral response by some means could provide positive psychology for players particularly to achieve goals in games. Based on his understanding towards the flow concept introduced by Csikszentmihalyi (1990), he believed that players' visceral response would motivate players to be more focus in game playing activity, hence enhancing their skills in game playing.

#### **4.6 The perceived guidelines of visceral level player-centric emotional design for digital games**

The combination of the three key concepts: visceral level player-centric emotional design revealed the prospect for its implementation in digital game design. This is based on several perceived guidelines that were suggested by game practitioners





which worth to be explored for the preeminent visceral level of emotional design approach in game design.

Six ideas were extracted from the suggestions of game practitioners. The differences among game practitioners in term of numbers of ideas generated are shown in Table 4.5. Furthermore, six themes were generated from the suggestions and most of them related to visual aesthetics function (refer to Table 4.6).

Table 4.5

*The number of the perceived guidelines for visceral level of emotional design suggested by game practitioners*

Game practitioners (GD)	001	002	003	004	005	Total
Number of ideas	1	1	1	2	1	6

Table 4.6

*Themes of suggestions on the perceived guidelines of visceral level player-centric emotional design*

No.	The themes of suggestions	Source
1.	The integration of aesthetic elements to appeal players sight	GD004
2.	The compliance of aesthetics elements in digital game technology	GD004
3.	Direct players to react accordingly	GD002
4.	game art should be accepted by players' target market	GD001
5.	To convey information that influence players' psychology	GD005
6.	Aesthetics should function as cue to trigger players' emotion	GD003

GD004 saw the realization of the guidelines of visceral level player-centric emotional design for digital games should be involved "traditional method of aesthetics", in which he described as the integration of aesthetic elements to appeal players' sight. Since he claimed visceral level of design only effective through visual



and sound, he confirmed that the integration of aesthetics elements in game visuals would appeal players' sight and evokes their emotional response.

In addition, GD004 presumed players were leaning biases toward digital game technology for getting visceral experience in games. Therefore, he underlined the integration of aesthetic elements in game visuals must be complied with the game system, game hardware and virtual reality system. Although he claimed those technology systems not really support the tradition of what players want to enjoy in games: to see beautiful visual which make them feel something emotional, but players' also like to experience the innovative game technology for their psychological understanding.



emotional design for digital games should enable to direct players to react accordingly "whether it is from a simple click of a button to pressing the keys [of] something [and] you must show the player that they have done something and that something caused another reaction". He actually referred to the design of graphical user interface (GUI) in games that capable to interact with players and direct their reactions while in game playing events.

GD001 emphasized the guidelines for visceral level player-centric emotional design related to the game art which accepted by players. However, he argued that the acceptance of the game art "is depending on the people and its general because you have to build or design something that is accepted for [players'] target market". In order to make sure the game art is acceptable by the players, he certainly stressed that





the prospect of players should be determined first through proper study with several game testing especially in early stage of game design process.

GD005 highlighted the perceived guidelines for visceral level player-centric emotional design should conveyed information that enable to influence players' psychology in terms of their need, interest and abilities. In this sense, he saw the game developers consist of game programmer, game designer and game artist should work hand in hand to produce effective digital games which enable to communicate with the players through visual.

Generally, GD003 saw the guideline for visceral level player centric emotional design should involved the environmental input in games comprised of gameplay, narrative and aesthetics. Each of those environmental inputs should function as cue to direct players' reaction in games. However, he explicitly depicted that the environmental input of aesthetics through the artwork is supposed to be a cue to trigger players' emotion. Since players tend to experience tone, mood and atmosphere while in game playing events, he stressed that the roles of game artists were crucial to put emotion into their design work for fulfilling players' experience in games.



#### 4.7 Hypothetical propositions for the questionnaire survey

Throughout the outcomes of exploratory study, two important aspects of visual aesthetics were recognized which required for further researching:

- What are the characteristics of visual aesthetics for digital games should be like.
- What is the knowledge for visceral level player-centric emotional design should be like.

A list of 29 propositions was generated based on the findings of exploratory study (Table 4.7). These propositions were transformed into response categories in the questionnaire survey which in turn to become visual aesthetics studies in game graphic design. Therefore, the statistical findings are expected to be revealed whether the respondents confirm or refute the findings in the exploratory phase.

Table 4.7

*The visual aesthetics aspects and its hypothetical propositions*

visual aesthetics aspects	Hypothetical propositions
<p><b>1. The characteristics of visual aesthetics for digital games:</b> Graphic designers should...</p>	<p>1. ... know the characteristics of visual aesthetics are related to visual elements of line, shape, form, space, texture and colour.</p> <p>2. ... recognize characteristics of line would evoke emotional response.</p> <p>3. ... recognize characteristics of shape would evoke emotional response.</p> <p>4. ... recognize the characteristics of 3D art forms.</p> <p>5. ... recognize the characteristics of space are related to depth of perception.</p> <p>6. ... recognize the characteristics of texture are related to sense of touch.</p>

(Continue)

Table 4.7 (Continued)

	<p>7. ... recognize the cool colour for positive emotional response, whilst warm colour for negative emotional response.</p> <p>8. ... apply colour grading for emotional effects.</p> <p>9. ... acknowledge colour intensity to ease players' eyes.</p> <p>10. ... apply warm colour for foreground and cool colour for background in game environment design.</p> <p>11. ... apply colour harmony for game theme.</p> <p>12. ... employ colour symbolism for players' interpretation.</p>
<p><b>2. The knowledge for visceral level player-centric emotional design:</b> Graphic designers should know visual aesthetics...</p>	<p>13. ... capable to trigger players' immediate emotional response.</p> <p>14. ... could influence players' first impression.</p> <p>15. ... could elicit players' immediate reaction.</p> <p>16. ... should recognize movies as references.</p> <p>17. ... must be referred to philosophy of art.</p> <p>18. ... would appeal players' eyes.</p> <p>19. ... would influence player's positive psychology while playing games.</p> <p>20. ...would fulfil players' preferences.</p> <p>21. ...capable to engage players in game playing events.</p> <p>22. ...would help players' motivation in games.</p> <p>23. ... should be comprehended in the design of graphical user interface.</p> <p>24. ... should be comprehended in the design of game characters.</p> <p>25. ... should be comprehended in the design of game environment.</p> <p>26. ... works with specific target market.</p> <p>27. ... should complement with game technology.</p> <p>28. ... should consider players' feedback.</p> <p>29. ...would help players' interpretation.</p>



## CHAPTER 5

### FINDINGS OF THE CONFIRMATORY STUDIES



#### 5.0 Introduction

This chapter discusses the findings of a questionnaire survey, conducted with undergraduate students in four Malaysian public universities. These students were taking bachelor degree programmes related to graphic design. The aim of this chapter is to report the findings on whether the students agree or not with the hypothetical propositions on visual aesthetics in game graphic design, stated in the previous chapter (see Table 4.7).

Since non-parametric statistical techniques were used to analyze data collected through the survey (see Section 3.7); therefore this is worth to study for significant difference related to gender and programmes across four universities. The significant





difference found might be a result of attitude differences of the students concerning their understanding toward the characteristics of visual aesthetics as well as knowledge and skills in game graphic design. This might be contributed to the teaching and learning of graphic design. According to Felder & Brent (2005), attitude is about a nature of knowledge and how it should be obtained and evaluated. Besides, attitude is regarded as the progression of the students through curriculum which connected to their level of intellectual development. Therefore, Felder & Brent (2005) suggested that all lecturers or instructors should comprehensively understand the attitude differences for attaining the diverse learning needs of their students. In this sense, the result of significant difference related to gender and programmes would help the four Malaysian public universities to strengthen their graphic design programmes as mentioned in section 3.5.



### **5.1 Research question associated to the questionnaire survey**

The questionnaire survey was conducted to answer the following research question:

- How many respondents agree and disagree with the findings drawn from the exploratory study?



## 5.2 The Questionnaire

A questionnaire was designed and developed as the instrument to collect data in the survey (see Appendix V). This questionnaire consists of three parts. In Part A, the 'about you' question was prepared to capture demographic profile of the respondents regarding the age, nationality, gender, ethnicity and university enrolment programmes. As for Part B, the characteristics of visual elements test items were developed based on the characteristics of visual aesthetics hypothetical propositions, as shown in Table 5.1. In Part C, the knowledge and skills of game graphic design test items were developed based on the guidelines of visceral level player-centric emotional hypothetical propositions (see Table 5.1). Respondents' attitude to these categories was asked in two situations: what are the visual elements and principles in game graphic design and what are the specific knowledge of graphic designers should have in game design process. In order to measure the attitudes of respondents, a five-point Likert scale (1. Strongly disagree. 2. Disagree. 3. Neutral. 4. Agree. 5. Strongly agree) was used in the survey.

Table 5.1

*Developing test items in questionnaire based on hypothetical propositions*

Part in questionnaire	Test items	Related hypothetical propositions
Part B: Characteristics of visual elements	Line used in game design... a. ...emphasizes on thin line to evoke players' positive emotion. b. ...emphasizes on sharp line to evoke players' negative emotion. c. ...emphasizes on directional lines to lead players' eyes.	1. ... related to visual elements of line, shape, form, space, texture and colour. 2. ...should recognize characteristics of line would evoke emotional response.

(Continue)





Table 5.1 (Continued)

Part in questionnaire	Test items	Related hypothetical propositions
Part B: Characteristics of visual elements	Form used in game design... a. ...imposes the 3 dimensional for impression of volume. b. ...imposes the 3 dimensional for impression of weight. c. ...imposes the 3 dimensional for impression of density.	4. ... should recognize the characteristics of 3D art forms.
	Space used in game design... a. ...imposes the linear perspective for players' depth perception. b. ...imposes the overlapping shapes for players' depth perception. c. ...imposes the size gradient for players' depth perception. d. ...imposes the texture gradient for players' depth of perception.	5. ...should recognize the characteristics of space are related to depth of perception.
	Texture used in game design emphasizes on... a. ...emphasizes on repetition of lines to evoke players' sense of touch. b. ...emphasizes on repetition of shapes to evoke players' sense of touch. c. ...emphasizes on rhythm of lines to evoke players' sense of touch. d. ...emphasizes on rhythm of shapes to evoke players' sense of touch.	6. ...should recognize the characteristics of texture are related to sense of touch.

(Continue)





Table 5.1 (Continued)

Part in questionnaire	Test items	Related hypothetical propositions
Part B: Characteristics of visual elements	<p>Colour used in game design...</p> <p>a. ...emphasize on cool colour to evoke players' positive emotion.</p> <p>b. ...emphasize on warm colour to evoke players' negative emotion.</p> <p>c. ...emphasize on cool colour for background of game environment.</p> <p>d. ...emphasize on warm colour for foreground of game environment.</p> <p>e. ...balances in colour intensity to ease players' eyes.</p> <p>f. ...grades the colour properties for players' emotional effects.</p> <p>g. ...imposes the colour harmony for uniformity of game themes.</p> <p>h. ...employs the symbolic colour meanings for players' interpretation.</p>	<p>7. ... should recognize the cool colour for positive emotional response, whilst warm colour for negative emotional response.</p> <p>8. ... should apply warm colour for foreground and cool colour for background in game environment design</p> <p>9. ... should acknowledge colour intensity to ease players' eyes.</p> <p>10. ... should apply colour grading for emotional effects.</p> <p>11. ... should apply colour harmony for game theme.</p> <p>12. ...should employ colour symbolism for players' interpretation.</p>
Part C: Knowledge of game graphic design.	<p><b>1. Aesthetic value</b></p> <p>Graphic designers should know aesthetics...</p> <p>a. ...influences players' emotional experience.</p> <p>b. ...influences players' first impression for playing the games.</p> <p>c. ...elicits immediate visceral reaction of players while being in game playing events.</p> <p>d. ...would help players to make decision.</p>	<p>13. ... capable to trigger players' immediate emotional response.</p> <p>14. ... could influence players' first impression.</p> <p>15. ... could elicit players' immediate reaction.</p> <p>16. ... should recognize emotional scene in movies as references.</p>

(Continue)



Table 5.1 (Continued)

Part in questionnaire	Test items	Related hypothetical propositions
Part C: Knowledge of game graphic design.	<p><b>2. Design of visual elements</b></p> <p>Graphic designers should comprehend...</p> <p>a. ...the visual elements as cues to evoke immediate emotional response of players within visual representation of games.</p> <p>b. ...the organization of visual elements within visual representation of games to evoke immediate emotional response of players.</p> <p>c. ...the characterization of visual elements within visual representation of games to evoke immediate emotional response of players.</p> <p><b>3. Design principles</b></p> <p>Graphic designers should recognize...</p> <p>a. ...gestalt principles to evoke players' immediate emotional response.</p> <p>b. ...visual metaphor to evoke players' immediate emotional response.</p> <p>c. ...emotional scenes in movies as design inspiration.</p>	
Part C: Knowledge of game graphic design.	<p><b>1. Aesthetic value</b></p> <p>Graphic designers should know aesthetics...</p> <p>a. ...as a branch of philosophy that concerned about beauty.</p>	<p>17. ... must be referred to philosophy of art.</p> <p>18. ... would appeal players' eyes.</p>

(Continue)

Table 5.1 (Continued)

Part in questionnaire	Test items	Related hypothetical propositions
Part C: Knowledge of game graphic design.	<p>b. ...elicits beauty experience from sight sense.</p> <p>c. ...in games is intended to appeal players' sight sense.</p> <p><b>2. Design of visual elements</b></p> <p>Graphic designers should comprehend...</p> <p>a. ...the visual elements that captivate players' sight.</p> <p>b. ...the visual elements that represent consistency to players' sight.</p> <p>c. ... the visual elements that represent synchronization to players' sight.</p> <p><b>3. Design principles</b></p> <p>Graphic designers should recognize...</p> <p>a. ...design principles to make graphical user interface visually appealing.</p> <p>b. ...design principles to make character design visually appealing.</p> <p>c. ...design principles to make game environment visually appealing.</p>	<p>19. ... should be comprehended in the design of graphical user interface.</p> <p>20. ... should be comprehended in the design of game characters.</p> <p>21. ... should be comprehended in the design of game environment.</p>
Part C: Knowledge of game graphic design.	<p><b>1. Aesthetic value</b></p> <p>Graphic designers should know aesthetics...</p> <p>a. ...is related to human preferences.</p> <p>b. ...would accomplish players' preference in game playing events.</p>	<p>22. ...would fulfil players' preferences.</p> <p>23. ... works with specific target market.</p>

(Continue)



Table 5.1 (Continued)

Part in questionnaire	Test items	Related hypothetical propositions
Part C: Knowledge of game graphic design.	<p><b>2. Design of visual elements</b></p> <p>Graphic designers should comprehend...</p> <p>a. ... the game concept for specific target audience.</p> <p>b. ...the design creativity for specific target audience.</p> <p>c. ...the design styles for specific target audience.</p> <p><b>3. Design principles</b></p> <p>Graphic designers should recognize...</p> <p>a. ...demographic profile of specific target audience.</p> <p>b. ...design expectation of specific target audience.</p> <p>c. ...characteristics of visual elements for specific target audience.</p>	
Part C: Knowledge of game graphic design.	<p><b>1. Aesthetic value</b></p> <p>Graphic designers should know aesthetics...</p> <p>a. ...is related to flow experience of motivation.</p> <p>b. ...requires human learning experience.</p> <p>c... influences players' efficiency.</p>	<p>24. ... would influence player's positive psychology while playing games.</p> <p>25. ...capable to engage players in game playing events.</p> <p>26. ...would help players' interpretation.</p> <p>27. ...would help players' motivation in games.</p>

(Continue)



Table 5.1 (Continued)

Part in questionnaire	Test items	Related hypothetical propositions
Part C: Knowledge of game graphic design.	<p>d. ...enhances players' engagement.</p> <p><b>2. Design of visual elements</b></p> <p>Graphic designers should comprehend...</p> <p>a. ...the design of graphical user interface that easy to use.</p> <p>b. ...the design of game characters that easy to recognize.</p> <p>c. ...the design of game environment that immerse the players</p> <p><b>3. Design principles</b></p> <p>Graphic designers should recognize...</p> <p>a. ...design principles of visual literacy which support players' learnability.</p> <p>b. ... design principles of visual communication which support players' interpretation.</p> <p>c. ...design principles of visual perception that lead players to act accordingly while playing games.</p>	
Part C: Knowledge of game graphic design.	<p><b>1. Aesthetic value</b></p> <p>Graphic designers should know aesthetics...</p> <p>a ...would ensure the functionality of game technologies.</p> <p>b. ...plays an important role in the advancement of game technologies.</p>	28. ... should comply with game technology.

(Continue)



Table 5.1 (Continued)

Part in questionnaire	Test items	Related hypothetical propositions
Part C: Knowledge of game graphic design.	<p>c. ...would represent games as cultural form besides technological form.</p> <p><b>2. Design of visual elements</b></p> <p>Graphic designers should comprehend...</p> <p>a. ...the design of visual representation that complies with digital game system.</p> <p>b. ...the design of visual representation that supports the digital game hardware.</p> <p>c. ...the design of visual representation that supports the virtual reality game system.</p> <p><b>3. Design principles</b></p> <p>Graphic designers should recognize...</p> <p>a. ...design principles that incorporate with game technologies to excite players.</p> <p>b. ...design principles which are compatible the digital game system.</p> <p>c. ...design principles that function within virtual reality games.</p>	
Part C: Knowledge of game graphic design.	<p><b>1. Aesthetic value</b></p> <p>Graphic designers should know aesthetics...</p> <p>a. ...is related to the study of beauty which need evaluation process.</p>	29. ... should consider players' feedback.

(Continue)



Table 5.1 (Continued)

Part in questionnaire	Test items	Related hypothetical propositions
<p>Part C: Knowledge of game graphic design.</p>	<p>b. ... .. in games needs players' feedback.</p> <p><b>2. Design of visual elements</b></p> <p>Graphic designers should comprehend...</p> <p>a. ...the design of visual representation for the game testing.</p> <p>b. ... ..to revise the design of visual representation after the game testing.</p> <p>c. ... to come out with the new design of visual representation after the game testing.</p> <p><b>3. Design principles</b></p> <p>Graphic designers should recognize...</p> <p>a. ...that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics.</p> <p>b. ... that design evaluation process is meant to ensure the usability of players which is reflected from visual aesthetics.</p> <p>c. ...that design evaluation process is an iterative process.</p>	



### 5.3 The reliability analysis of questionnaire

A series of pilot-testing of the questionnaire was carried out with six graphic design lecturers and twenty graphic design students at different phases of the questionnaire development. The reliability analysis was imposed to see the correlation of an item and scale in the questionnaire through Cronbach's Alpha for internal consistency reliability coefficient. By convention, a lenient cut-off of 0.60 is common in exploratory research, meanwhile a least alpha of 0.70 or higher would retain an item in an 'adequate scale', and a cut-off of 0.80 shows a 'good scale' (Graham, 2006). In this study, the approach guided with lenient cut-off of 0.60 is considerate here for moderate reliability of the questionnaire.

The reliability analysis of the questionnaire was measured as presented in Table 5.2. In majority of cases, Cronbach's alpha exceeded at least minimum to 0.579, in which considered acceptable (Bowling, 2001) except one case that showed poor scale 0.287 - rating visual elements in game design. To avoid poor results, the variable of rating visual elements was dropped from the questionnaire. Then, the questionnaire was revised to collect the actual data from identified respondents.

Table 5.2

*Reliability of visual aesthetics studies for game graphic design measures*

Item	Variable	Number of Items	Cronbach's Alpha
1.	Rating visual elements	6	.287
2.	Characteristics of line	3	.579
3.	Characteristics of shape	3	.725
4.	Characteristics of form	3	.905
5.	Characteristic of space	4	.787
6.	Characteristic of texture	4	.763

(Continue)

Table 5.2 (Continued)

Item	Variable	Number of Items	Cronbach's Alpha
7.	Characteristic of colour	8	.804
8.	Aesthetic value	18	.942
9.	Design skills	18	.885
10.	Knowledge skills	18	.923

#### 5.4 The sampling and response rate

As mentioned earlier, the population of this study is under graduate students in four Malaysian public universities who were taking a bachelor degree program related to graphic design. Ideally, the initial target of 100 responses was set as sample for the survey (UiTM - 64, UMP - 13, UTM - 13, UMS -10). The survey was conducted on cross sectional basis, from 1st April to 14th June 2016. The questionnaire was distributed through face to face meeting, postal mail with a stamped address envelope, and online survey. The questionnaire distribution and the response rate are shown in Table 5.3.

The questionnaire was distributed to 156 potential respondents through a representative from each university. All representatives were approached by personal email and they agreed to distribute the questionnaire to respective respondents. Due to some reasons, two types of surveys: online survey and paper-based survey were used to get the data from UMP respondents. 19 responses were received from online survey and 21 responses from paper-based survey which make the total of 40 responses. After the cross-checking process, the respondents of online survey and the paper-based survey were not identical which the data was eligible to be analyzed.

Table 5.3

*Questionnaire distribution and the corresponding response rate*

Survey respondent s	Questionnaire distributed	Questionnaire collected	Frequency		Total response	Response rate (%)
			Valid	Invalid		
UiTM	90	84	84	0	84	93
UMS	22	22	22	0	22	100
UMP	22	21	21	0	21	95
	- (Online survey)	- (Online survey)	17	2	19	100
UTM	22	20	20	0	20	91
Total	156	147	164	2	166	95

## 5.5 Demographic profiles of respondents

There were five variables associated with the demographic profile of under graduate students related to graphic design program were examined to identify independent variables which worth using for analyzing the dependent variables—the attitudes to visual aesthetics for game graphic design. Table 5.4 shows the crosstabulation between gender and other demographic characteristics of the students.

By excluding eight unidentified gender, the majority of respondents were female (67%), represent the reality of female-dominated in the enrolment of Malaysian public university- 64.8 % of females enrolled in public universities (Ismail, 2015). Most of them were in the age range of 21 - 25 years old (87%), indicated that they have been through the diploma level with prerequisite knowledge and skills in graphic design. All respondents were Malaysian except one non-Malaysian which indicated as foreign student (Indonesia) who is studying in UTM.



Malays have formed majority with 86% compared with other bumiputras, Kadazan/Dusun (3.7%), Bajau (1.8%), Iban and Brunei (1.2%) and 0.7% for others (Tidung, Rungus, Ceylonese and Murut) including one unknown ethnicity. For non-bumiputras, only 5 Chinese (3.1%) were participated in this study. This reflecting the reality of preferential selection of malays and bumiputras toward public universities (H.A. Lee, 2012).

The majority of undergraduate students come from UiTM program (Bachelor of Graphic Design (Honors) which formed 51%, followed by UMS (Bachelor of Computer Science (Graphics and Multimedia Technology) with Honours) - 23%, UMP (Bachelor of Science with Honours (Mathematics with Computer Graphics) - 13% and UTM (Bachelor of Computer Science (Graphics and Multimedia Software), UTM) - 12%. This percentage shows UiTM program related to graphic design is popular to the eyes of school leavers since it provides diploma program which somehow promising compared to matriculation and diploma program from other public universities.

After examining the demographic profiles of the game experts, four independent variables—gender, age, ethnicity and academic program —were chosen for analyzing the students' attitude towards the visual aesthetics studies for game graphic design.



Table 5.4

*The crosstabulation between gender and other demographic characteristics*

Gender		Male	Female	Unknown	Total
		52	104	8	164
Age	20	1	1	0	2
	21	1	10	0	11
	22	4	23	3	30
	23	31	41	3	75
	24	2	9	0	11
	25	3	5	0	8
	26	2	1	1	4
	29	1	0	0	1
	34	1	0	0	1
	Unknown	6	14	1	21
Nationality	Malaysian	52	103	0	163
	Non-Malaysian	0	1	0	1
Ethnicity	Malay	45	89	6	140
	Iban	0	2	0	2
	Kadazan/Dusun	3	1	2	6
	Chinese	2	3	0	5
	Bajau	0	3	0	3
	Tidung	0	1	0	1
	Rungus	0	1	0	1
	Ceylonese	0	1	0	1
	Brunei	1	1	0	2
	Murut	1	0	0	1
	Indonesia	0	1	0	1
	Unknown	0	1	0	1
Program	Bachelor of Graphic Design (Honors), UiTM	39	39	6	84
	Bachelor of Computer Science (Graphics and Multimedia Software), UTM	5	15	0	20
	Bachelor of Science with Honours (Mathematics with Computer Graphics), UMP	4	18	0	22

*(Continue)*

Table 5.4 (Continued)

Gender		Male	Female	Unknown	Total
		52	104	8	164
Program	Bachelor of Computer Science(Graphics and Multimedia Technology) with Honours, UMS	4	32	2	38

## 5.6 Non-parametric statistical analysis

One sample Kolmogorov-Smirnov tests were carried out to check the goodness-of-fit of the sample is a normal distribution (see Appendix F). However, none of demographic characteristics showed normal distribution. Therefore, instead of analyzing the data using parametric techniques, this study employed non-parametric statistical techniques which do not assume normal distribution when analyzing the data.

Non-parametric statistical tests were carried out to compare the perception of students across four universities. The comparison covered descriptive statistics, gender differences, and the perception of respondents towards the propositions related to the characteristics of visual elements used in game design. The respondents were asked to react upon the aesthetic value in relation to knowledge and skills of game graphic design. The propositions were associated to six visual elements and twenty five characteristics of these elements. As mentioned in previous chapter, these propositions were indeed findings drawn from the exploratory study conducted with five key informants in this research.

## 5.7 Perceptions on six visual elements

The perceptions of students on six visual elements were compared across four public universities in Malaysia which offer Bachelor degree programmes on graphic design. The visual elements comprise of lines, shapes, forms, spaces, textures and colour. Table 5.5 shows the questionnaire items under each visual element.

Table 5.5

*The questionnaire items for perceptions on six visual elements*

Visual elements	Number of items	Characteristics examined in this study	Accepted as a guiding principle?
Lines	3	Thin lines evoke positive emotion.	Yes
		Sharp lines evoke negative emotion.	No
		Directional lines lead players' eyes.	Yes
Shapes	3	Round edges evoke positive emotion.	Yes
		Sharp edges evoke negative emotion.	Yes
		Shapes proportion to distinct game characters for players' recognition.	Yes
Forms	3	3D forms create impression of volume.	Yes
		3D forms create impression of weight.	Yes
		3D forms create impression of density.	Yes
Spaces	4	Linear perspective creates depth perception.	Yes
		Overlapping shapes create depth perception.	Yes
		Size gradient creates depth perception.	Yes
		Texture gradient creates depth perception.	Yes
Textures	4	Lines repetition evokes sense of touch.	Yes
		Shapes repetition evoke sense of touch.	Yes
		Rhythmic lines evoke sense of touch.	Yes
		Rhythmic shapes evoke sense of touch.	Yes
Colours	8	Cool colours evoke positive emotion.	Yes
		Warm colours evoke negative emotion.	Yes
		Cool colours for game environment background.	Yes
		Warm colours for game environment foreground.	Yes

(Continue)

*Table 5.5 (Continued)*

Visual elements	Number of items	Characteristics examined in this study	Accepted as a guiding principle?
		Balance the colour intensity to ease eyes.	Yes
		Grades the colour properties for emotional effects.	Yes
		Colour harmony for game themes uniformity.	Yes
		Symbolic colour meanings for interpretation.	Yes

### 5.7.1 Characteristics of lines used in game design

Three questionnaire items were related to characteristics of lines used in game design.

The respondents accepted two propositions but rejected one proposition. As shown in Table 5.6, 57% of the respondents (89 out of 156) across four universities regarded

lines used in game design should emphasize on thin lines to evoke players' positive

emotion. In a word, this proposition was accepted as a guiding principle. In particular, more than half of the male respondents (34 out of 58) agreed or strongly agreed with the proposition, whereas 53% (55 out of 103) female respondents echoed the male's perception.

As for item 2, 48% of the respondents (69 out of 155) across four universities were uncertain with the proposition of lines used in game design should emphasize on sharp line to evoke players' negative emotion. In conclusion, this proposition was rejected to be a guiding principle. More than half of male respondents (30 out of 52) agreed or strongly agreed with the proposition but 54% (55 out of 101) female respondents were uncertain with it.







A majority or 67% of the respondents (103 out of 154) across four universities regarded lines used in game design should emphasize on directional lines to lead players' eyes. Therefore, this proposition can be accepted as a guiding principle. More than half of male respondents (38 out of 52) and 64% female respondents (65 out of 102) agreed or strongly agreed with the proposition.

In terms of gender difference, a Mann-Whitney U test revealed a statistical significant reduction between male and female students of UTM,  $z = -1.957$ ,  $p = .050$  with a large effect size ( $r = 0.44$ ) on “lines used in game design should emphasize on sharp lines to evoke negative emotion”. The median score on the perception decreased from agree (Md = Agree) to neutral (Md = Neutral) (see Table 5.26). The uncertainty of female students of UTM on this proposition might be caused by the fact that sharp lines or also known as zigzag lines divulge the dynamic and high energy characteristics of diagonal lines which evoke the excitement and intense feelings. Therefore, they saw the characteristic of sharp lines not entirely evoke negative emotion but also evoke positive emotion (see Appendix G).



Table 5.6

*Students' perception towards characteristics of lines (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

B1. Lines used in game design should...			Perception					Mode	Md	p	Z	d	r
			SD	D	N	A	SA						
a. ... emphasize on <b>thin</b> line to evoke players' <b>positive</b> emotion	UiTM	Male	3	0	9	25	2	A	A	.824	-.223	-	.02
		Female	1	1	14	18	5	A	A				
	UTM	Male	0	0	2	1	2	N/SA	A	.185	-1.324	↓	.04
		Female	0	0	9	6	0	N	N				
	UMS	Male	0	0	3	1	0	N	N	.265	-1.115	↑	.24
		Female	1	0	6	11	0	A	A				
	UMP	Male	1	0	0	1	2	SA	A/SA	.254	-1.140	↓	.19
		Female	0	5	12	13	2	A	N				
b. ... emphasize on <b>sharp</b> line to evoke players' <b>negative</b> emotion	UiTM	Male	0	2	15	15	7	N/A	A	.379	-.879	↓	.96
		Female	0	1	22	9	7	N	N				
	UTM	Male	0	0	2	1	2	N/SA	A	.050	-1.957	↓	.44
		Female	0	1	11	3	0	N	N				
	UMS	Male	0	0	1	3	0	A	A	.245	-1.162	↓	.25
		Female	0	2	9	6	1	N	N				
	UMP	Male	1	0	1	1	1	SD/N/A/SA	N/A	.869	-.165	-	.27
		Female	0	5	13	11	2	N	N				
c. .... emphasize on <b>directional</b> lines line to lead players' <b>eyes</b> .	UiTM	Male	0	2	7	20	10	A	A	.399	-.843	-	.02
		Female	0	0	12	19	7	A	A				
	UTM	Male	0	0	2	1	2	N/SA	A	.185	-1.324	↓	.30
		Female	0	0	9	6	0	N	N				
	UMS	Male	0	0	3	1	0	N	N	.119	-1.559	↑	.33
		Female	1	0	4	12	1	A	A				
	UMP	Male	0	0	0	3	1	A	A	.319	-.997	-	.61
		Female	2	0	9	13	7	A	A				

### 5.7.2 Characteristics of shapes used in game design

As shown in Table 5.7, 67% of the respondents (103 out of 155) across four universities regarded shapes used in game design should emphasize on round edges to evoke players' positive emotion. In a word, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (38 out of 52) agreed or strongly agreed with the proposition, whereas, 64% (65 out of 102) of female respondents echoed the male's perception.



As for item 2, a majority or 60% of the respondents (93 out of 156 students) across four universities regarded shapes used in game design should emphasize on sharp edges to evoke players' negative emotion. Therefore, this proposition was accepted as a guiding principle. In particular, slightly more than half of male respondents (27 out of 52) agreed or strongly agreed with the proposition, whereas, 64% (66 out of 103) of female respondents echoed the males' perception.

A majority or 64% of the respondents (94 out of 146) across four universities regarded shapes used in game design should underline the proportion to distinct the game characters for players' recognition. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (40 out of 52) and female respondents (54 out of 94) agreed or strongly agreed with the proposition.



Kruskal-Wallis tests revealed a statistical significant difference between programmes across four universities on "shapes used in game design should emphasize on sharp edges to evoke players' negative emotion",  $X^2(3, n = 164) = 9.356, p = .025$ , with a mean rank score of 88.41 for UiTM, 78.93 for UMS, 74.26 for UMP and 72.78 for UTM as well as "shapes used in game design should underline the proportion to distinct the game characters for players' recognition",  $X^2(3, n = 164) = 9.643, p = .022$ , with a mean rank score of 87.51 for UiTM, 82.81 for UMP, 72.09 for UMS and 64.48 for UTM (see Appendix H).



Table 5.7

*Students' perception towards characteristic of shapes used in game design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

B2. Shapes used in game design should...			Perception					Mode	Md	p	z	d	r	
			SD	D	N	A	SA							
a. ... emphasize on <b>round edges</b> to evoke players' <b>positive</b> emotion	UiTM	Male	0	1	19	13	6	N	N	.321	-.993	↑	.11	
		Female	1	1	11	21	5	A	A					
	UTM	Male	0	0	1	2	2	A/SA	A	.162	-1.398	-	.07	
		Female	0	0	4	11	0	A	A					
	UMS	Male	0	0	2	2	0	N/A	N	.491	-.689	↑	.15	
		Female	0	0	6	11	1	A	A					
	UMP	Male	1	1	0	2	0	A	A	.283	-1.073	-	.17	
		Female	0	3	11	13	4	A	A					
	b. ... emphasize on <b>sharp edges</b> to evoke players' <b>negative</b> emotion	UiTM	Male	0	1	16	19	3	A	A	.798	-.255	-	.02
			Female	2	0	15	16	6	A	A				
UTM		Male	0	1	0	2	2	A/SA	A	.109	-1.603	↓	.36	
		Female	0	1	10	3	1	N	N					
UMS		Male	0	1	1	2	0	A	A	.776	-.284	-	.06	
		Female	1	0	8	9	0	A	A					
UMP		Male	1	0	0	3	0	A	A	.460	-.739	↓	.12	
		Female	0	9	14	6	3	N	N					
c. ... underline the <b>proportion</b> to distinct the <b>game characteristics</b>		UiTM	Male	0	2	5	20	12	A	A	.610	-.510	-	.06
			Female	1	0	10	16	12	A	A				
	UTM	Male	0	0	2	1	2	N/SA	SA	.315	-1.006	↓	.23	
		Female	0	0	8	6	1	N	N					
	UMS	Male	0	0	2	2	0	N/A	A	.444	-.766	↓	.16	
		Female	0	0	6	10	2	N	N					
	UMP	Male	0	0	1	3	0	A	A	.624	-.491	↓	.08	
		Female	0	2	13	3	4	N	N					

### 5.7.3 Characteristics of forms used in game design

As shown in Table 5.8, 77% of the respondents (115 out of 149) across four universities regarded forms used in game design should impose the 3 dimensional for impression of volume. In a word, this proposition was accepted as a guiding principle.

In particular, more than half of male respondents (39 out of 51) and female respondents (76 out of 98) agreed or strongly agreed with the proposition.



As for item 2, a majority or 69% of the respondents (95 out of 138) across four universities regarded forms used in game design should impose the 3 dimensional for impression of weight. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (37 out of 51) and female respondents (58 out of 87) agreed or strongly agreed with the proposition.

A majority or 74% of the respondents (116 out of 156) across four universities regarded forms used in game design should impose the 3 dimensional for impression of density. As a result, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (43 out of 52) agreed or strongly agreed with the proposition, whilst 70% (73 out of 104) of female respondents echoed the males' perception.



In terms of gender difference, Mann-Whitney U tests revealed a significant difference between male and female students of UMP on "forms used in game design should impose the 3 dimensional for impression of density",  $z = -2.452$ ,  $p = .014$  with a large effect size ( $r = 0.40$ ). This difference might be caused by the fact that male students agreed or strongly agreed with the proposition, while majority of female students simply agreed with it. Perhaps female students of UMP were more recognized the word of thickness or mass instead of density related to characteristics of 3 dimensional forms (see Appendix G).

Kruskal-Wallis tests revealed a statistical significant difference between programmes across four universities on "forms used in game design should impose the 3 dimensional for impression of weight",  $X^2(3, n = 163) = 13.050$ ,  $p = .005$ , with



a mean score of 91.73 for UiTM, 78.99 for UMP, 75.62 for UTM and 56.30 for UMS, as well as "forms used in game design should impose the 3 dimensional for impression of density",  $X^2 (3, n = 164) = 23.223, p = .000$ ), with a mean score of 98.00 for UiTM, 69.74 for UMP, 65.45 for UTM and 60.86 for UMS (see Appendix H).

Table 5.8

*Students' perception towards characteristic of forms used in game design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

B3. Forms used in game design...			Perception					Mode	Md	p	z	d	r
			S D	D	N	A	SA						
a. ... impose the <b>3 dimensional</b> for impression of <b>volume</b> .	UiTM	Male	1	0	8	19	10	A	A	.465	-.730	-	.08
		Female	1	1	5	19	13	A	A				
	UTM	Male	0	0	1	2	2	A/SA	A	.081	-1.744	-	.40
		Female	0	0	7	8	0	A	A				
	UMS	Male	0	0	1	3	0	A	A	.841	-.200	-	.04
		Female	0	0	5	11	2	A	A				
	UMP	Male	0	0	1	2	1	A	A	.762	-.303	-	.05
		Female	0	2	1	17	6	A	A				
b. ... impose the <b>3 dimensional</b> for impression of <b>weight</b> .	UiTM	Male	0	1	8	20	9	A	A	.457	-.744	-	.08
		Female	1	1	4	22	11	A	A				
	UTM	Male	0	1	1	2	1	A	A	.776	-.285	-	.06
		Female	0	0	5	8	2	A	A				
	UMS	Male	0	0	2	2	0	N/A	A	.850	-.189	-	.04
		Female	0	2	7	9	0	A	A				
	UMP	Male	0	0	1	3	0	A	A	.906	-.118	↓	.03
		Female	0	1	8	3	3	N	N				
c. ... impose the <b>3 dimensional</b> for impression of <b>density</b> .	UiTM	Male	0	1	5	22	11	A	A	.386	-.867	-	.09
		Female	0	0	3	23	13	A	A				
	UTM	Male	0	0	2	2	1	N/A	A	.655	-.447	-	0.1
		Female	0	0	6	9	0	A	A				
	UMS	Male	0	0	1	3	0	A	A	.460	-.739	-	.16
		Female	0	1	7	10	0	A	A				
	UMP	Male	0	0	0	2	2	A/SA	A/S A	.014	-2.452	-	.40
		Female	0	2	12	17	1	A	A				



#### 5.7.4 Characteristics of spaces used in game design

As shown in Table 5.9, 75% of the respondents (116 out of 154) across four universities regarded spaces used in game design should impose the linear perspective for players' depth perception. In a word, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (39 out of 51) agreed or strongly agreed with the proposition, while, 74% (77 out of 103) of female respondents echoed the males' perception.

As for item 2, a majority or 65% of the respondents (100 out of 154) across four universities regarded spaces used in game design should impose the overlapping shapes for players' depth perception. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (38 out of 52) and 61% (62 out of 102) of female respondents agreed or strongly agreed with the proposition.

As for item 3, a majority or 65% of the respondents (98 out of 156) across four universities regarded spaces used in game design should impose the size gradient for players' depth perception. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (34 out of 51) agreed or strongly agreed with the proposition, whereas, 63% (64 out of 101) of female respondents echoed the males' perception.

As for item 4, a majority or 68% of the respondents (105 out of 155) across four universities regarded spaces used in game design should impose the texture gradient for players' depth perception. To conclude, this proposition was accepted as a



guiding principle. More than half of male respondents (33 out of 52) agreed or strongly agreed with the proposition followed by 70% (72 out of 103) of female respondents echoed the males' perception.

However, Kruskal-Wallis tests showed a significant difference between programmes across four universities on "spaces used in game design should impose the overlapping shapes for players' depth perception",  $X^2(3, n = 162) = 9.169, p = .027$ , with a mean score of 88.90 for UiTM, 88.22 for UTM, 74.70 for UMS and 64.64 for UMP (see Appendix H).

Table 5.9

*Students' perception towards characteristic of spaces used in game design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

B4. Spaces used in game design should...			Perception					Mode	Md	p	z	d	r	
			S	D	N	A	SA							
a. ... impose the <b>linear perspective</b> for players' <b>depth perception</b> .	UiTM	Male	1	1	8	16	12	A	A	.883	-.147	-	.02	
		Female	0	0	5	26	8	A	A					
	UTM	Male	0	0	2	0	3	SA	SA	.337	-.884	-	.20	
		Female	0	0	5	8	2	A	A					
	UMS	Male	0	0	0	4	0	A	A	.186	-1.323	-	.28	
		Female	0	0	6	12	0	A	A					
	UMP	Male	0	0	0	3	1	A	A	.355	-.924	-	.15	
		Female	0	1	9	14	7	A	A					
	b. ... impose the <b>overlapping shapes</b> for players' <b>depth perception</b> .	UiTM	Male	0	2	8	25	4	A	A	.642	-.465	-	.05
			Female	0	2	9	20	8	A	A				
UTM		Male	0	0	2	0	3	SA	SA	.263	-1.119	↓	.25	
		Female	0	0	4	11	0	A	A					
UMS		Male	0	0	1	3	0	A	A	.579	-.555	-	.12	
		Female	1	0	6	11	0	A	A					
UMP		Male	0	0	1	2	1	A	A	.152	-1.431	↓	.23	
		Female	2	4	12	9	3	N	N					

(Continue)



Table 5.9 (Continued)

B4. Spaces used in game design should...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
c. ... impose the size gradient for players' depth perception.	UiTM	Male	0	0	14	15	10	A	A	.669	-.428	-	.05
		Female	2	1	5	22	8	A	A				
	UTM	Male	0	0	2	1	2	N/SA	SA	.392	-.855	↓	.19
		Female	0	0	7	7	1	N/A	A				
	UMS	Male	0	0	0	4	0	A	A	.241	-1.172	-	.25
		Female	0	0	5	13	0	A	A				
UMP	Male	0	0	1	1	1	N/A/SA	A	.318	-1.000	↓	.16	
	Female	0	1	16	10	3	N	N					
d. ... impose the texture gradient for players' depth perception.	UiTM	Male	0	2	13	14	10	A	A	.490	-.691	-	.08
		Female	0	1	8	22	8	A	A				
	UTM	Male	0	0	2	1	2	N/SA	A	1.000	.000	-	0
		Female	0	0	3	9	3	A	A				
	UMS	Male	0	1	0	3	0	A	A	1.000	.000	-	0
		Female	0	0	6	12	0	A	A				
UMP	Male	0	0	1	2	1	A	A	.472	-.720	-	.12	
	Female	0	2	11	13	5	A	A					

As shown in Table 5.10, 50% of the respondents (78 students out of 156) across four universities regarded textures used in game design should emphasize on repetition of lines to evoke players' sense of touch. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (28 out of 52) and 48% of female respondents (50 out of 104) agreed or strongly agreed with the proposition.

As for item 2, 54% of the respondents (84 out of 156) across four universities regarded textures used in game design should emphasize on repetition of shapes to evoke players' sense of touch. In a word, this proposition was accepted as a guiding principle. In particular, half of male respondents (26 out of 52) agreed or strongly



agreed with the proposition, whereas, 56% of female respondents (58 out of 104) echoed the males' perception.

As for item 3, a majority or 59 % of the respondents (93 out of 156) across four universities regarded textures used in game design should emphasize on rhythm of lines to evoke players' sense of touch. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (36 out of 52) and 55% of female respondents (57 out of 104) agreed or strongly agreed with the proposition.

As for item 4, a majority or 61% of the respondents (95 out of 156) across four universities regarded textures used in game design should emphasize on rhythm of shapes to evoke players' sense of touch. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (33 out of 52) agreed or strongly agreed with the proposition, whereas, 57% of female respondents (62 out of 104) echoed the males' perception.

In term of gender difference, Mann-Whitney U tests revealed a statistically significant reduction between male and female students of UMS on "textures used in game design should emphasize on rhythm of lines to evoke players' sense of touch",  $z = -2.117$ ,  $p = .034$  with a large effect size ( $r = 0.45$ ). The median score on the perception decreased from strongly agree ( $Md = \text{Strongly Agree}$ ) to neutral ( $Md = \text{Neutral}$ ). This difference might be caused by the fact that majority of male students strongly agreed with the proposition, while majority of female students were uncertain with it. Probably, female students of UMS were uncertain whether rhythm of lines could evoke players' sense of touch as it could also direct players' eyes movement.



Kruskal-Wallis tests also showed a significant difference between programmes across four universities on "textures used in game design should emphasize on rhythm of lines to evoke players' sense of touch",  $X^2(3, n = 164) = 8.288, p = .040$ , with a mean score of 91.79 for UiTM, 75.82 for UMP, 73.82 for UTM and 66.45 for UMS (see Appendix H).

Table 5.10

*Students' perception towards characteristic of textures used in game design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

B5. Textures used in game design should...			Perception					Mode	Md	p	z	d	r	
			S	D	N	A	SA							
a. ... emphasize on repetition of lines to evoke players' sense of touch.	UiTM	Male	0	4	14	15	6	A	A	.269	-1.106	-	.12	
		Female	1	0	13	17	8	A	A					
	UTM	Male	0	1	2	1	1	N	N	.963	-.047	-	.01	
		Female	0	2	7	5	1	N	N					
	UMS	Male	0	0	1	2	1	A	A	.077	-1.771	↓	.38	
		Female	0	1	11	6	0	N	N					
	UMP	Male	0	1	1	1	1	D/N/A/SA	A	.748	-.321	↓	.05	
		Female	0	5	14	11	2	N	N					
	b. ... emphasize on repetition of shapes to evoke players' sense of touch.	UiTM	Male	0	2	16	17	4	A	A	.069	-1.821	-	.20
			Female	1	0	11	17	10	A	A				
UTM		Male	0	1	2	1	1	N	N	.786	-.271	↑	.06	
		Female	0	3	4	5	3	A	A					
UMS		Male	0	0	2	2	0	N/A	A	.491	-.689	↓	.15	
		Female	0	1	11	6	0	N	N					
UMP		Male	0	1	2	0	1	N	N	.439	-.773	↑	.13	
		Female	0	3	12	13	4	A	A					

(Continue)

Table 5.10 (Continued)

B5. Textures used in game design should...			Perception					Mode	Md	<i>p</i>	<i>z</i>	<i>d</i>	<i>r</i>
			S D	D	N	A	SA						
c. ... emphasize on <b>rhythm of lines</b> to evoke players' <b>sense of touch.</b>	UiTM	Male	0	2	11	19	7	A	A	.236	-1.184	-	.13
		Female	0	0	10	18	11	A	A				
	UTM	Male	0	0	2	2	1	N/A	A	.542	-.610	↓	.14
		Female	0	1	7	5	2	N	N				
	UMS	Male	0	0	0	4	0	A	A	.034	-2.117	↓	.45
		Female	1	0	10	7	0	N	N				
	UMP	Male	0	0	1	1	2	SA	SA	.120	-1.556	↓	.25
		Female	0	0	18	10	4	N	N				
d. ... emphasize on <b>rhythm of shapes</b> to evoke players' <b>sense of touch.</b>	UiTM	Male	0	3	12	16	8	A	A	.180	-1.341	-	.15
		Female	0	0	11	16	12	A	A				
	UTM	Male	0	0	1	3	1	A	A	.224	-1.215	-	.28
		Female	0	0	6	9	0	A	A				
	UMS	Male	0	1	0	3	0	A	A	.564	-.557	↓	.12
		Female	0	0	10	8	0	N	N				
	UMP	Male	0	1	1	0	2	SA	SA	.811	-.239	↓	.04
		Female	0	2	13	12	5	N	A				

As shown in Table 5.11, a majority or 80% of the respondents (124 out of 156) across four universities regarded colours used in game design should emphasize on cool colour to evoke players' positive emotion. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (41 out of 52) agreed or strongly agreed with the proposition, while, 80% of female respondents (83 out of 104) echoed the males' perception.

As for item 2, 61% of the respondents (95 out of 156) across four universities regarded colours used in game design should emphasize on warm colour to evoke players' negative emotion. In a word, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (32 out of 52) agreed or



strongly agreed with the proposition, while, 61% of female respondents (63 out of 104) echoed the males' perception.

As for item 3, a majority or 72% of the respondents (112 out of 156) across four universities regarded colours used in game design should emphasize on cool colour for background of game environment. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (38 out of 52) agreed or strongly agreed with the proposition, while, 71% of female respondents (74 out of 104) echoed the males' perception.

As for item 4, 64% of the respondents (97 out of 152) across four universities regarded colours used in game design should emphasize on warm colour for foreground of game environment. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (33 out of 50) and 63% of female respondents (64 out of 102) agreed and strongly agreed with the proposition.

As for item 5, a majority or 72% of the respondents (122 out of 155) across four universities regarded colours used in game design should balance in colour intensity to ease players' eyes. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (37 out of 52) and 73% of female respondents (75 out of 103) agreed or strongly agreed with the proposition.

As for item 6, a majority or 79% of the respondents (122 out of 155) across four universities regarded colours used in game design should grade the colour properties for players' emotional effects. Therefore, this proposition was accepted as a



guiding principle. In particular, more than half of male respondents (42 out of 52) agreed or strongly agreed with the proposition, whilst, 78% of female respondents (80 out of 103) echoed the males' perception.

As for item 7, a majority or 78% of the respondents (121 out of 155) across four universities regarded colours used in game design should impose the colour harmony for uniformity of game themes. In conclusion, this proposition was accepted as a guiding principle. Majority or more than half of male respondents (43 out of 51) agreed or strongly agreed with the proposition, while, 77% or majority of female respondents (78 out of 103) echoed the males' perception.

As for last item, a majority or 73% of the respondents (114 out of 154) across four universities regarded colours used in game design should employ the symbolic colour meanings for players' interpretation. In a word, this proposition was accepted as a guiding principle. More than half of male respondents (42 out of 52) and 69% of female respondents (72 out of 104) agreed or strongly agreed with the proposition.

In items of gender difference, despite a tied median score ( $Md = \text{Agree}$ ). Mann-Whitney U tests revealed a significant difference between male and female students of UiTM on "colours used in game design should emphasize on cool colour to evoke players' positive emotion",  $z = -3.262$ ,  $p = .001$  with a large effect size ( $r = 0.36$ ) and "colours used in game design should grade the colour properties for players' emotional effects",  $z = -2.040$ ,  $p = .041$  with a large effect size ( $r = 0.22$ ). This difference might be caused by the fact that majority of male students simply agreed with the proposition, while majority of female students strongly agreed with it.



Perhaps female students of UiTM were more meticulous with the characteristics of colours used in game design must evokes players' emotional response (see Appendix G).

On the other hand, despite a tied median score ( $Md = \text{Agree}$ ), Mann-Whitney U tests revealed a significant difference on "colours used in game design should emphasize on warm colour to evoke players' negative emotion" between male and female students of UiTM,  $z = -2.529$ ,  $p = .011$  with a large effect size ( $r = 0.28$ ) and UTM,  $z = -2.168$ ,  $p = .030$  with a large effect size ( $r = 0.49$ ). Generally, male students and female students from both universities agreed with the proposition. Perhaps they regarded the warm colour evokes negative emotion but somehow it also conveyed the cozy feeling which enable to evoke positive emotion (see Appendix G).



Mann-Whitney U tests also revealed a statistically significant reduction between male and female students of UTM on "colours used in game design should balance in colour intensity to ease players' eyes",  $z = -2.187$ ,  $p = .029$  with a large effect size ( $r = 0.49$ ) and "colours used in game design should impose the colour harmony for uniformity of game themes",  $z = -2.040$ ,  $p = .041$  with a large effect size ( $r = 0.46$ ). The median score on the perception decreased from strongly agree ( $Md = \text{Strongly Agree}$ ) to agree ( $Md = \text{Agree}$ ). This difference might be caused by the fact that majority of male students of UTM strongly agreed with the propositions while majority of female students simply agreed with it. Perhaps male students of UTM were more particular concerning the colour balance and colour harmony used in game design will represent the visual equity which definitely eases the players' eyes (see Appendix G).



Kruskal-Wallis tests showed a significant difference between programmes across four universities on "colours used in game design should employ the symbolic colour meanings for players' interpretation,  $X^2(3, n = 164) = 11.424, p = .010$ ), with a mean score of 91.55 for UTM, 89.76 for UiTM, 77.11 for UMP and 55.86 for UMS (see Appendix H).

Table 5.11

*Students' perception towards characteristics of colours used in game design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

B6. Colours used in game design should...			Perception					Mode	Md	p	z	d	r	
			SD	D	N	A	SA							
a. ... emphasize on <b>cool colour</b> to evoke players' <b>positive emotion</b> .	UiTM	Male	1	2	6	23	7	A	A	.001	-3.262	-	.36	
		Female	0	0	2	18	19	SA	A					
	UTM	Male	0	0	1	2	2	A/SA	A	.654	-.449	-	.10	
		Female	0	0	2	10	3	A	A					
	UMS	Male	0	0	1	3	0	A	A	.857	-.180	-	.04	
		Female	1	1	6	6	4	N/A	A					
	UMP	Male	0	0	0	2	2	A/SA	A	.422	-.803	-	.13	
		Female	0	2	7	10	13	SA	A					
	b. ... emphasize on <b>warm colour</b> to evoke players' <b>negative emotion</b> .	UiTM	Male	1	5	11	17	5	A	A	.011	-2.529	-	.28
			Female	0	1	9	15	14	A	A				
UTM		Male	0	0	0	3	2	A	A	.030	-2.168	-	.49	
		Female	1	1	5	7	1	A	A					
UMS		Male	0	1	1	2	0	A	A	.614	-.504	↓	.11	
		Female	0	1	8	7	2	N	N					
UMP		Male	0	0	1	3	0	A	A	.875	-.157	↓	.03	
		Female	0	5	10	8	9	N	N					

(Continue)



Table 5.11 (Continued)

B6. Colours used in game design should...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
c. ... emphasize on <b>cool colour</b> for <b>background</b> of game environment	UiTM	Male	0	2	9	18	10	A	A	.392	-.856	-	.09
		Female	0	0	8	19	12	A	A				
	UTM	Male	0	1	0	2	2	A/SA	A	.728	-.348	-	.08
		Female	0	0	2	10	3	A	A				
	UMS	Male	0	0	1	3	0	A	A	.497	-.680	↓	.14
		Female	1	1	8	5	3	N	N				
UMP	Male	0	1	0	1	2	SA	SA	.730	-.345	↓	.06	
	Female	0	1	9	12	10	A	A					
d. ... emphasize on <b>warm colour</b> for <b>foreground</b> of game environment	UiTM	Male	0	1	11	18	7	A	A	.318	-.988	-	.11
		Female	0	0	10	17	11	A	A				
	UTM	Male	0	1	1	1	2	SA	A	.713	-.368	-	.08
		Female	0	1	5	7	2	A	A				
	UMS	Male	0	0	2	2	0	N/A	N	1.000	.000	-	0
		Female	0	1	10	2	5	N	N				
UMP	Male	0	0	1	1	2	SA	SA	.446	-.763	↓	.12	
	Female	0	2	9	11	9	A	A					
e. ... balance in <b>colour intensity</b> to <b>ease</b> players' eyes	UiTM	Male	0	2	12	15	10	A	A	.051	-1.948	-	.21
		Female	0	0	7	16	16	A/SA	A				
	UTM	Male	0	0	0	2	3	SA	SA	.029	-2.187	↓	.49
		Female	0	1	5	7	2	A	A				
	UMS	Male	0	0	1	3	0	A	A	.849	-.190	-	.04
		Female	0	1	7	5	4	N	A				
UMP	Male	0	0	0	3	1	A	A	.806	-.245	↓	.04	
	Female	1	0	6	14	11	A	A					
f. ... grade the <b>colour properties</b> for players' <b>emotional effects</b>	UiTM	Male	1	0	7	22	9	A	A	.041	-2.040	-	.22
		Female	0	0	5	16	18	SA	A				
	UTM	Male	0	0	1	2	2	A/SA	A	.851	-.188	-	.04
		Female	0	0	3	7	5	A	A				
	UMS	Male	0	0	0	4	0	A	A	.581	-.551	-	.12
		Female	0	2	5	7	4	A	A				
UMP	Male	0	0	1	2	1	A	A	.956	-.056	-	.01	
	Female	1	0	7	14	9	A	A					
g. ... impose the <b>colour harmony</b> for <b>uniformity</b> of game themes	UiTM	Male	0	1	4	23	10	A	A	.325	-.984	-	.11
		Female	0	0	5	18	15	A	A				
	UTM	Male	0	0	0	2	3	SA	SA	.041	-2.040	↓	.46
		Female	0	1	2	10	2	A	A				
	UMS	Male	0	0	2	2	0	N/A	N/A	.650	-.454	-	.10
		Female	0	1	7	6	4	A	A				
UMP	Male	0	0	1	2	1	A	A	.979	-.027	-	.0	
	Female	1	0	8	14	9	A	A					

(Continue)

Table 5.11 (Continued)

B6. Colours used in game design should...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
h. ... should employ the <b>symbolic colour</b> meanings for players' <b>interpretation</b>	UiTM	Male	0	2	6	18	13	A	A	.495	-.682	-	.07
		Female	0	0	6	18	15	A	A				
	UTM	Male	0	0	0	3	2	A	A	.503	-.670	-	.15
		Female	0	0	3	7	5	A	A				
	UMS	Male	0	0	1	3	0	A	A	.387	-.866	↓	.18
		Female	0	2	9	4	3	N	N				
	UMP	Male	0	0	1	1	2	SA	SA	.426	-.797	↓	.13
		Female	1	0	11	11	9	N/A	A				

### 5.8 Propositions on aesthetic value in game graphic design.

The perceptions of students across four universities were compared to determine whether they were agree or not with the propositions on aesthetic value in game graphic design. This statistical analysis involved five constructs: influences of aesthetics, elicitation of aesthetics, intention of aesthetics, needs and requirements of aesthetics, and functions and roles of aesthetics in games. Table 5.12 shows the questionnaire items for propositions on aesthetic value in game graphic design.

Table 5.12

*The questionnaire items for propositions on aesthetic value in game graphic design*

Aesthetic value	Number of items	Knowledge examined in this study	Accepted as a guiding principle?
Influences of aesthetics	3	Players' emotional experience.	Yes
		Players' first impression for playing the games.	Yes
		Players' efficiency while in game playing events.	Yes

(Continue)

Table 5.12 (Continued)

Aesthetic value	Number of items	Knowledge examined in this study	Accepted as a guiding principle?
Elicitations of aesthetics	2	Players' immediate visceral reaction while being in game playing events.	Yes
		Players' beauty experience from sight sense.	Yes
Intention of aesthetics	1	Appeal players' sight sense.	Yes
Needs and requirements of aesthetics	8	Players' feedbacks.	Yes
		Accomplish players' preference in game playing events	Yes
		Help players to make decision.	Yes
		Players' assurance to the functionality of game technologies.	Yes
		Represent games as cultural form besides technological form.	Yes
		Related to flow experience of motivation.	Yes
		Related to the study of beauty which need evaluation process.	Yes
		Related to human preferences.	Yes
Functions and roles of aesthetics	4	As a branch of philosophy that concerned about beauty.	Yes
		Plays an important role in the advancement of game technologies.	Yes
		Requires human learning experience.	Yes
		Enhances players' engagement.	Yes

### 5.8.1 Graphic designers should know the influences of aesthetics in game graphic design

As shown in Table 5.13, 81% of the respondents (127 out of 156 students) across four universities regarded graphic designers should know aesthetics influence players' emotional experience. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (46 out of 52) agreed or

strongly agreed with the proposition, while, 79% of female respondents (81 out of 104) echoed the males' perception .

As for item 2, 81% of the respondents (127 out of 155) across four universities regarded graphic designers should know aesthetics influence players' first impression for playing the games. In a word, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (46 out of 52) agreed or strongly agreed with the proposition, while, 78% (81 out of 104) of female respondents echoed the males' perception.

A majority or 64% of the respondents (97 out of 152) across four universities regarded graphic designers should know aesthetics influence players' efficiency.

Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (37 out of 52) and 60% (60 out of 100) of female respondents agreed or strongly agreed with the proposition.

However, Kruskal-Wallis tests showed a significant difference between programmes across four universities on "graphic designers should know aesthetics influence players' emotional experience",  $X^2(3, n = 164) = 8.676, p = .034$ , with a mean score of 90.86 for UiTM, 81.42 for UMP, 69.02 for UMS and 64.25 for UTM as well as "graphic designers should know aesthetics influence players' efficiency",  $X^2(3, n=160) = 13.211, p = .004$ , with a mean score of 90.37 for UiTM, 87.11 for UTM, 65.19 for UMP and 61.10 for UMS (see Appendix H).

Table 5.13

*Students' perception towards graphic designers should know the influences of aesthetics in game design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C1. Graphic designers should know aesthetics...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
a. ... influence players' <b>emotional</b> experience	UiTM	Male	0	1	5	19	14	A	A	.353	-.929	-	.10
		Female	0	0	6	14	19	SA	A				
	UTM	Male	0	0	0	4	1	A	A	.159	-1.408	-	.31
		Female	0	0	4	10	1	A	A				
	UMS	Male	0	0	0	3	1	A	A	.354	-.926	-	.20
		Female	0	0	6	8	4	A	A				
	UMP	Male	0	0	0	3	1	A	A	.806	-.246	-	.04
		Female	0	0	7	14	11	A	A				
b. ... influence players' <b>first impression</b> for playing the games	UiTM	Male	0	1	3	21	13	A	A	.262	-1.122	-	.01
		Female	0	0	4	16	19	SA	A				
	UTM	Male	0	0	0	1	4	SA	SA	.071	-1.806	↓	.40
		Female	0	0	3	7	5	A	A				
	UMS	Male	0	0	1	2	1	A	A	.896	-.136	-	.03
		Female	0	0	6	7	5	A	A				
	UMP	Male	0	0	0	1	3	SA	SA	.146	-1.452	↓	.24
		Female	0	1	9	9	13	SA	A				
c. ... influence players' <b>efficiency</b> .	UiTM	Male	0	1	10	21	7	A	A	.52	-1.944	-	.21
		Female	0	0	7	17	15	A	A				
	UTM	Male	0	0	0	3	2	A	A	.202	-1.276	-	.29
		Female	0	0	6	4	4	N	A				
	UMS	Male	1	0	0	2	1	A	A	.379	-.880	↓	.19
		Female	0	0	10	5	1	N	N				
	UMP	Male	0	1	2	0	1	N	N	.419	-.808	-	.13
		Female	0	2	15	7	7	N	N				

### 5.8.2 Graphic designers should know elicitation of aesthetics in game graphic design

As shown in Table 5.14, 60% of the respondents (93 out of 156) across four universities regarded graphic designers should know aesthetics elicit immediate visceral reaction of players while being in game playing events. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male

respondents (33 out of 52) agreed or strongly agreed with the proposition, while, 58% (60 out of 104) of female respondents echoed the males' perception.

As for item 2, a majority or 71% of the respondents (110 out of 155) across four universities regarded graphic designers should know aesthetics elicit beauty experience from sight sense. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (38 out of 52) agreed or strongly agreed with the proposition, whereas, 70% of female respondents (72 out of 103) echoed the males' perception.

Kruskal-Wallis tests showed a significant difference between programmes across four universities on "graphic designers should know aesthetics elicit beauty experience from sight sense",  $X^2(3, n=163) = 11.096, p=.011$ , with a mean score of 93.25 for UTM, 89.81 for UiTM, 68.51 for UMP and 64.45 for UMS (see Appendix H).

Table 5.14

*Students' perception towards graphic designers should know elicitation of aesthetics in game graphic design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C1. Graphic designers should know aesthetics...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
a. ... elicit immediate visceral reaction of players while being in game playing events	UiTM	Male	0	2	11	19	7	A	A	.610	-.510	-	.56
		Female	0	0	14	13	11	N	A				
	UTM	Male	0	0	2	1	2	N/SA	A	.425	-.798	-	.18
		Female	0	1	5	8	2	A	A				
	UMS	Male	0	0	2	1	1	N	N	.507	-.663	-	.14
		Female	0	1	9	8	0	N	N				
	UMP	Male	0	1	1	2	0	A	A	.543	-.609	-	.10
		Female	0	2	12	16	2	A	A				

(Continue)

Table 5.14 (Continued)

C1. Graphic designers should know aesthetics...			Perception					Mode	Md	<i>p</i>	<i>z</i>	<i>d</i>	<i>r</i>
			SD	D	N	A	SA						
b. ... elicit <b>beauty experience</b> from sight sense.	UiTM	Male	1	0	9	22	7	A	A	.095	-1.671	-	.18
		Female	0	0	7	18	14	A	A				
	UTM	Male	0	0	0	3	2	A	A	.295	-1.064	-	.23
		Female	0	0	4	7	4	A	A				
	UMS	Male	0	0	2	2	0	N/A	A	.685	-.406	-	.09
		Female	0	0	7	9	1	A	A				
	UMP	Male	0	1	1	1	1	D/N/A/SA	N/A	.745	-.325	-	.05
		Female	0	1	12	15	4	A	A				
		Female	0	1	13	13	5	N/A	A				

### 5.8.3 Graphic designers should know intention of aesthetics in game graphic design

As shown in Table 5.15, 66% of the respondents (104 out of 153) across four universities regarded graphic designers should know aesthetics in games is intended to appeal players' sight sense. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (38 out of 49) agreed or strongly agreed with the proposition, while, 63% of female respondents (66 out of 104) echoed the males' perception.

In term of gender difference, Mann-Whitney U tests revealed a statistically significant reduction between male and female students of UTM on "graphic designers should know aesthetics in games is intended to appeal players' sight sense",  $z = -2.135$ ,  $p = .033$ , with a large effect size ( $r = 0.45$ ). The median score on the perception decreased from strongly agree (Md = Strongly Agree) to neutral (Md = Neutral). This difference might be caused by the fact that most of male students

strongly agreed with the proposition, while most of female students were neutral or uncertain with it. These probably male students of UTM more particular concerning the intention of aesthetics in games will appeal players' sight sense (see Appendix H).

Table 5.15

*Students' perception towards graphic designers should know intention of aesthetics in game graphic design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C1. Graphic designers should know aesthetics...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
a. ... in games is intended to <b>appeal</b> players' sight sense	UiTM	Male	0	1	9	21	5	A	A	.071	-1.804	-	.20
		Female	0	0	9	15	15	A/SA	A				
	UTM	Male	0	0	0	2	3	SA	SA	.033	-2.135	↓	.45
		Female	0	0	8	4	3	N	N				
	UMS	Male	0	0	1	3	0	A	A	.820	-.228	-	.05
		Female	0	0	7	6	5	N	A				
	UMP	Male	0	0	0	4	0	A	A	.324	-.985	-	.16
		Female	0	1	13	13	5	N/A	A				

#### 5.8.4 Graphic designers should know the needs and requirements of aesthetics in game graphic design

As shown in Table 5.16, 74% of the respondents (115 out of 156) across four universities regarded graphic designers should know aesthetics in games needs players' feedback. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (41 out of 52) and 71% of female respondents (74 out of 104) agreed or strongly agreed with the proposition.





As for item 2, 67% of the respondents (104 out of 155) across four universities regarded graphic designers should know aesthetics would accomplish players' preference in game playing events. In a word, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (37 out 52) agreed or strongly agreed with the proposition, while, 65% of female respondents (67 out of 103) echoed the males' perception.

As for item 3, 68% (106 out of 154) of the respondents across four universities regarded graphic designers should know aesthetics would help players to make decision. Therefore, this proposition was accepted as a guiding principle. In particular, half of male respondents (40 out 52) agreed or strongly agreed with the proposition, while, 65% of female respondents (66 out of 102) echoed the males' perception.



As for item 4, 69% (108 out of 156) of the respondents across four universities regarded graphic designers should know aesthetics would ensure the functionality of game technologies. In a word, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (41 out 52) agreed or strongly agreed with the proposition, while 64 % (67 out of 104) of female respondents echoed the males' perception.

As for item 5, 65% of the respondents (102 out of 156) across four universities regarded graphic designers should know aesthetics would represent games as cultural form besides technological form. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (38 out 52) agreed or strongly





agreed with the proposition, while, 61% (64 out of 104) of female respondents echoed the males' perception

As for item 6, a majority or 69% of the respondents (107 out of 156) across four universities regarded graphic designers should know aesthetics is related to flow experience of motivation. Therefore, this proposition was accepted as a guiding principle. More than half of male respondents (35 out 51) and 70% (72 out of 103) of female respondents agreed or strongly agreed with the proposition.

As for item 7, 61% of the respondents (95 out of 155) across four universities regarded graphic designers should know aesthetics is related to the study of beauty which need evaluation process. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (29 out 51) agreed or strongly agreed with the proposition, while, 63% (66 out of 104) of female respondents echoed the males' perception.

As for last item, 68% of the respondents (105 out of 154) across four universities regarded graphic designers should know aesthetics is related to human preferences. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (36 out 51) and 67% (69 out of 103) agreed or strongly agreed with the proposition.

In term of gender difference, Mann-Whitney U tests revealed a significant difference between male and female students of UiTM on "graphic designers should know aesthetics would represent games as cultural form besides technological form",





despite a tied median score ( $Md = \text{Agree}$ ),  $z = -2.053$ ,  $p = .040$ , with a large effect size ( $r = 0.22$ ). This difference might be caused by the fact that most of female students agreed and strongly agreed with the proposition, while most of male students simply agreed with it. Perhaps, female students were more meticulous in distinguishing aesthetics related to culture representation without denying its functions in technological advancement (see Appendix G).

In addition, Mann-Whitney U tests revealed a statistically significant difference in the perception between male and female respondents of UiTM on "graphic designers should know aesthetics is related to the study of beauty which need evaluation process", despite a tied median score ( $Md = \text{Agree}$ ),  $z = -2.824$ ,  $p = .005$ , with a large effect size ( $r = 0.31$ ). This difference might be caused by the fact that majority of female students from UiTM strongly agreed with the proposition, while majority of male respondents simply agreed with it. Perhaps female respondents were more meticulous to determine the aesthetics in games needs to be evaluated by players (see Appendix G).

Mann-Whitney U tests also revealed a significant difference between male and female students of UiTM on "graphic designers should know aesthetics is related to human preferences", despite of tied median score ( $Md = \text{Agree}$ ),  $z = -2.824$ ,  $p = .005$ , with a large effect size ( $r = 0.25$ ). This difference might be caused by the fact that most of male students simply agreed with the proposition, while most of male students agreed and strongly agreed with it. Perhaps female respondents were more meticulous to determine aesthetics definitely gratifying human preferences toward games (see Appendix G).



Kruskal-Wallis tests showed a significant difference between programmes across four universities on four propositions: "graphic designers should know aesthetics would help players to make decision",  $X^2(3, n = 162) = 13.721, p = .003$ , with a mean score of 92.65 for UiTM, 75.54 for UMP, 72.82 for UTM and 56.57 for UMS, "graphic designers should know aesthetics would ensure the functionality of game technologies",  $X^2(3, n = 163) = 20.587, p = .000$ , with a mean score of 94.08 for UiTM, 79.90 for UTM, 76.76 for UMP and 46.59 for UMS, "graphic designers should know aesthetics is related to flow experience of motivation",  $X^2(3, n = 162) = 15.939, p = .001$ , with a mean score of 91.05 for UiTM, 87.45 for UTM, 74.62 for UMP and 50.52 for UMS, "graphic designers should know aesthetics is related to flow experience of motivation",  $X^2(3, n = 162) = 15.939, p = .001$ , with a mean score of 91.05 for UiTM, 87.45 for UTM, 74.62 for UMP and 50.52 for UMS as well as "graphic designers should know aesthetics is related to human preferences",  $X^2(3, n = 162) = 11.059, p = .011$ , with a mean score of 91.57 for UiTM, 77.28 for UMP, 69.90 for UTM and 61.14 for UMS (see Appendix H).

Table 5.16

*Students' perception towards graphic designers should know the needs and requirements of aesthetics in game graphic design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C1. Graphic designers should know aesthetics...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
<b>a. ... in games needs players' feedback.</b>	UiTM	Male	0	3	7	14	15	SA	A	.515	-.652	-	.07
		Female	0	0	7	16	16	A/SA	A				
	UTM	Male	0	0	0	3	2	A	A	.422	-.802	-	.18
		Female	0	0	2	9	4	A	A				
	UMS	Male	0	0	0	3	1	A	A	.115	-1.577	-	.33
		Female	0	1	7	8	2	A	A				
	UMP	Male	0	0	1	2	1	A	A	.771	-.291	-	.05
		Female	0	2	11	9	10	A	A				

(Continue)

Table 5.16 (Continued)

C1. Graphic designers should know aesthetics...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
b. ... would accomplish <b>players' preference</b> in game playing events.	UiTM	Male	0	2	9	20	8	A	A	.381	-.876	-	.10
		Female	0	0	10	16	12	A	A				
	UTM	Male	0	0	1	2	2	A/SA	A	.144	-1.461	-	.33
		Female	0	2	4	8	1	A	A				
	UMS	Male	0	0	2	2	0	N/A	A	.399	-.399	-	.08
		Female	0	0	7	11	0	A	A				
UMP	Male	0	1	0	1	2	SA	SA	.462	-.735	↓	.12	
	Female	0	4	9	12	7	A	A					
c. ... would help players to <b>make decision</b> .	UiTM	Male	0	2	5	23	9	A	A	.139	-1.480	-	.17
		Female	0	0	8	13	18	SA	A				
	UTM	Male	1	0	1	0	3	SA	SA	.461	-.738	↓	.17
		Female	0	0	7	6	2	N	A				
	UMS	Male	0	1	2	1	0	N	N	.185	-1.326	-	.28
		Female	0	0	9	8	1	N	N				
UMP	Male	0	0	0	2	2	A/SA	A	.116	-1.571	-	.26	
	Female	0	3	9	11	7	A	A					
d. ... would ensure the <b>functionality</b> of game technologies.	UiTM	Male	0	0	6	20	13	A	A	.451	-.753	-	.08
		Female	0	0	7	14	18	SA	A				
	UTM	Male	1	0	0	1	3	SA	SA	.221	-1.225	↓	.27
		Female	0	1	3	9	2	A	A				
	UMS	Male	0	1	2	0	1	N	N	.548	-.601	-	.13
		Female	0	0	12	6	0	N	N				
UMP	Male	0	0	1	3	0	A	A	.809	-.242	-	.04	
	Female	0	0	14	7	11	N	A					
e. ... would represent games as <b>cultural form</b> besides technological form.	UiTM	Male	0	2	11	20	6	A	A	.040	-2.053	-	.22
		Female	0	0	9	15	15	A/SA	A				
	UTM	Male	0	0	0	2	3	SA	SA	.089	-1.701	↓	.38
		Female	0	1	5	5	4	N/A	A				
	UMS	Male	0	0	1	3	0	A	A	.256	-1.136	↓	.24
		Female	0	1	10	6	1	N	N				
UMP	Male	0	0	0	3	1	A	A	.119	-1.560	-	.25	
	Female	1	4	9	14	4	A	A					
f. ... is related to flow experience of <b>motivation</b> .	UiTM	Male	1	0	9	20	8	A	A	.069	-1.817	-	.20
		Female	0	0	5	20	14	A	A				
	UTM	Male	0	0	2	1	2	N/SA	A	1.000	.000	-	.0
		Female	0	0	5	5	5	N/A/SA	A				
	UMS	Male	0	0	4	0	0	N	N	.150	-1.439	-	.31
		Female	0	1	8	8	0	N/A	N				
UMP	Male	0	0	0	4	0	A	A	.442	-.770	-	.12	
	Female	0	4	8	15	5	A	A					

(Continue)

Table 5.16 (Continued)

C1. Graphic designers should know aesthetics...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
g. ...is related to the study of beauty which need <b>evaluation process.</b>	UiTM	Male	0	2	15	16	6	A	A	0.05	-2.824	-	.31
		Female	0	0	8	15	16	SA	A				
	UTM	Male	0	0	3	1	1	N	N	.506	-.665	↑	.15
		Female	0	0	5	8	2	A	A				
	UMS	Male	0	0	1	2	0	A	A	.432	-.785	↓	.17
		Female	0	1	10	6	1	N	N				
	UMP	Male	1	0	0	2	1	A	A	.770	-.292	-	.05
		Female	1	1	12	12	6	N/A	A				
h. ... is related to <b>human preferences.</b>	UiTM	Male	0	0	10	22	6	A	A	0.22	-2.293	-	.25
		Female	0	0	6	17	16	A	A				
	UTM	Male	0	0	2	1	2	N/SA	A	.350	-.935	-	.21
		Female	0	1	6	7	1	A	A				
	UMS	Male	0	0	2	2	0	N/A	A	1.000	.000	-	.0
		Female	0	1	8	8	1	N/A	A				
	UMP	Male	0	0	1	3	0	A	A	.956	-.055	-	.01
		Female	1	2	9	13	6	A	A				

### 5.8.5 Graphic designers should know the functions and roles of aesthetics in game graphic design

As shown in Table 5.17, 63% (98 out of 155) of the respondents across four universities regarded graphic designers should know aesthetics as a branch of philosophy that concerned about beauty. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (33 out of 52) and 63% (65 out of 103) of female respondents agreed or strongly agreed with the proposition.

As shown in item 2, a majority or 70% (108 out of 154) of the respondents across four universities regarded graphic designers should know aesthetics plays an important role in the advancement of game technologies. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents



(37 out of 52) agreed or strongly agreed with the proposition, whereas, 68% (71 out of 104) of female respondents echoed the males' perception.

As shown in item 3, a majority or 74% of the respondents (116 out of 156) across four universities regarded graphic designers should know aesthetics requires human learning experience. In a word, this proposition was accepted as a guiding principle. More than half of male respondents (40 out of 52) and 73% (76 out of 104) of female respondents agreed or strongly agreed with the proposition.

As for last item, 69% (106 out of 154) of the respondents across four universities regarded graphic designers should know aesthetics enhances players' engagement. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (40 out of 50) agreed or strongly agreed with the proposition, whilst, 63% (66 out of 104) of female respondents echoed the males' perception.

In term of gender difference, Mann-Whitney U tests revealed a significant difference between male and female students of UiTM,  $z = -2.977$ ,  $p = .003$ , with a large effect size ( $r = 0.32$ ) on "graphic designers should know aesthetics as a branch of philosophy that concerned about beauty", despite a tied median score (Md = Agree). This difference might be caused by the fact that most of male students from UiTM agreed or neutral with the proposition, while most of female students agreed or strongly agreed with it (see Appendix G).





In the same proposition, despite a tied median score ( $Md = \text{Agree}$ ), Mann-Whitney U tests revealed a significant difference between male and female students of UTM,  $z = -1.993$ ,  $p = .046$ , with a large effect size ( $r = 0.45$ ). This difference might be caused by the fact that most of male students from UTM agreed or strongly agreed with the proposition, while most of female students agreed or neutral with it. Perhaps, some of male students from UiTM and female students from UTM saw aesthetics in a wider scope more than a branch of philosophy related to beauty (see Appendix G).

In addition, Mann-Whitney U tests revealed a significant difference between male and female students of UiTM on "graphic designers should know aesthetics plays an important role in the advancement of game technologies", despite a tied median score ( $Md = \text{Agree}$ ),  $z = -1.992$ ,  $p = .046$ , with a large effect size ( $r = 0.22$ ).

This difference might be caused by the fact that majority of male students agreed with the proposition, while majority of female respondents strongly agreed with it. Perhaps female students of UiTM were more particular with the important roles of aesthetics in the advancement of game technologies (see Appendix G).

Mann-Whitney U tests also revealed a statistically significant difference between male and female respondents of UTM on "graphic designers should know aesthetics enhances players' engagement",  $z = -2.030$ ,  $p = .042$ , with a large effect size ( $r = 0.45$ ). This difference might be caused by the fact that most of male students agreed or strongly agreed with the proposition, while most of female students simply agreed with it. Perhaps male and female students of UTM saw aesthetics is not only element that enhances players' engagement in games (see Appendix G).





Kruskal-Wallis tests showed a significant difference between programmes across four universities on three propositions: "graphic designers should know aesthetics plays an important role in the advancement of game technologies",  $X^2(3, n = 162) = 16.036, p = .001$ , with a mean score of 94.01 for UiTM, 74.07 for UMP, 71.85 for UTM and 56.50 for UMS, "graphic designers should know aesthetics requires human learning experience",  $X^2(3, n = 164) = 25.932, p = .000$ , with a mean score of 98.28 for UiTM, 74.32 for UMP, 67.22 for UTM and 50.27 for UMS as well as "graphic designers should know aesthetics enhances players' engagement ",  $X^2(3, n = 161) = 28.078, p = .000$ , with a mean score of 96.81 for UiTM, 77.55 for UTM, 67.86 for UMP and 46.41 for UMS (see Appendix H).

Table 5.17

*Students' perception towards graphic designers should know the functions and roles of aesthetics in game graphic design (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C1. Graphic designers should know aesthetics...			Perception					Mode	Md	p	z	d	r	
			SD	D	N	A	SA							
a. ... as a branch of philosophy that concerned about <b>beauty</b> .	UiTM	Male	0	3	14	19	3	A	A	.003	-2.977	-	.32	
		Female	0	0	9	16	14	A	A					
	UTM	Male	0	0	0	3	2	A	A	.046	-1.993	-	.45	
		Female	0	0	5	9	1	A	A					
	UMS	Male	0	1	0	3	0	A	A	.810	-.241	↓	.05	
		Female	0	1	8	6	2	N	N					
	UMP	Male	0	1	0	1	2	SA	SA	.444	-.765	↓	.12	
		Female	1	1	13	10	7	N	A					
	b. ... plays an <b>important role</b> in the advancement of game technologies	UiTM	Male	1	0	8	17	11	A	A	.046	-1.992	-	.22
			Female	0	0	4	16	19	SA	A				
UTM		Male	1	0	0	3	1	A	A	.681	-.411	-	.09	
		Female	0	1	3	10	1	A	A					
UMS		Male	0	0	2	2	0	N/A	N	1.000	.000	-	.0	
		Female	0	0	10	6	2	N	N					
UMP		Male	0	1	0	1	2	SA	SA	.444	-.765	↓	.12	
		Female	1	1	13	10	7	N	A					

(Continue)

Table 5.17 (Continued)

C1. Graphic designers should know aesthetics...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
c. ... requires human <b>learning experience</b> .	UiTM	Male	1	0	5	18	15	A	A	.485	-.698	-	.08
		Female	0	0	5	16	18	SA	A				
	UTM	Male	1	0	0	3	1	A	A	.584	-.547	-	.12
		Female	0	0	5	9	1	A	A				
	UMS	Male	0	0	4	0	0	N	N	.054	-1.925	↓	.41
		Female	1	0	6	11	0	A	A				
	UMP	Male	0	1	0	0	3	SA	SA	.193	-1.302	↓	.21
		Female	1	1	9	15	6	A	A				
d. ... enhances players' <b>engagement</b> .	UiTM	Male	1	0	5	19	13	A	A	.726	-.351	-	.04
		Female	0	0	6	18	15	A	A				
	UTM	Male	0	0	0	2	2	A/SA	A/S	.042	-2.030	-	.45
		Female	0	0	5	9	1	A	A				
	UMS	Male	0	0	3	1	0	N	N	.730	-.345	-	.07
		Female	1	0	10	7	0	N	N				
	UMP	Male	0	0	1	2	1	A	A	.381	-.877	↓	.14
		Female	1	2	13	10	6	N	N				

### 5.9 Propositions on the comprehension of game graphic design

The perceptions of students across four universities were compared to determine whether they were agree or not with the propositions on the comprehension of game graphic design. This statistical analysis involved five constructs: visual elements, game target audience, game user interface, digital game system and game evaluation process. Table 5.18 shows the questionnaire items for the comprehension of game graphic design.



Table 5.18

*The questionnaire items for propositions on the comprehension of game graphic design*

Design knowledge	Number of items	Knowledge examined in this study	Accepted as a guiding principle?
Visual elements	6	Visual elements as cue to evoke players' immediate emotional response	Yes
		Visual elements that captivate players' sight.	Yes
		Visual elements that represent consistency to players' sight.	Yes
		Visual elements that represent synchronization to players' sight.	Yes
		The organization of visual elements to evoke players' immediate emotional response	Yes
		The characterization of visual elements to evoke immediate emotional response of players.	Yes
Game target audience	3	The game concept for specific target audience.	Yes
		The design creativity for specific target audience.	Yes
		The design styles for specific target audience.	Yes
Game user interface	3	The design of graphical user interface that easy to use.	Yes
		The design of game characters that easy to recognize.	Yes
		The design of game environment that immerse the players.	Yes
Digital game technology	3	The design of visual representation that complies with digital game system.	Yes
		The design of visual representation that supports the digital game hardware.	Yes
		The design of visual representation that supports the virtual reality game system.	Yes
Game evaluation process	3	The design of visual representation for the game testing.	Yes
		To revise the design of visual representation after the game testing.	Yes
		To come out with the new design of visual representation after the game testing.	Yes





### **5.9.1 Graphic designers should comprehend the design of visual elements within visual representation of games**

As shown in Table 5.19, 69% of the respondents (106 out of 154) across four universities regarded graphic designers should comprehend the visual elements as cue to evoke immediate emotional response of players within visual representation of games. In a word, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (40 out 52) agreed or strongly agreed with the proposition, followed by 63% (66 out of 104) of female respondents echoed the males' perception.

As shown in item 2, a majority or 70% of the respondents (107 out of 153) across four universities regarded graphic designers should comprehend the visual elements that captivate players' sight. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (39 out 50) agreed or strongly agreed with the proposition, while, 66% (68 out of 103) of female respondents echoed the males' perception.

As shown in item 3, a majority or 72% of the respondents (112 out of 155) across four universities regarded graphic designers should comprehend the visual elements that represent consistency to players' sight. In a word, this proposition was accepted as a guiding principle. More than half of male respondents (43 out 52) and 67% (69 out of 103) of female respondents agreed or strongly agreed with the proposition.





As shown in item 4, a majority or 74% of the respondents (113 out of 154) across four universities regarded graphic designers should comprehend the visual elements that represent synchronization to players' sight. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (38 out 50) agreed or strongly agreed with the proposition, whereas, 72% (75 out of 104) of female respondents echoed the males' perception.

As shown in item 5, 70% (110 or 156) of the respondents across four universities regarded graphic designers should comprehend the organization of visual elements within visual representation of games to evoke immediate emotional response of players. Therefore, this proposition was accepted as a guiding principle. Half of male respondents (39 out 52) and 68% (71 out of 104) of female respondents agreed or strongly agreed with the proposition.

As for last item, a majority or 72% of the respondents (111 or 154) across four universities regarded graphic designers should comprehend the characterization of visual elements within visual representation of games to evoke immediate emotional response of players. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (37 out 50) agreed or strongly agreed with the proposition, while, 71% (74 out of 104) of female respondents echoed the males' perception.

In term of gender difference, Mann-Whitney U tests revealed a statistically significant reduction between male and female students of UTM on "graphic designers should comprehend the visual elements that captivate players' sight",  $z = -$





2.186,  $p = .029$ , with a large effect size ( $r = 0.49$ ). The median score on the perception decreased from strongly agree (Md = Strongly Agree) to neutral (Md = Neutral). This difference might be caused by the fact that majority of male respondents from UTM were strongly agreed upon the proposition, while majority of female respondents were uncertain with it. Perhaps female respondents of UTM were uncertain whether the design of visual elements within visual representation of games is capable to captivate players' sight (see Appendix G).

In addition, Mann-Whitney U tests revealed a statistically significant reduction between male and female students of UTM on "graphic designers should comprehend the visual elements that represent consistency to players' sight",  $z = -2.552$ ,  $p = .011$ , with a large effect size ( $r = 0.57$ ). The median score on the perception decreased from strongly agree (Md = Strongly Agree) to agree (Md = Agree). This difference might be caused by the fact that most of male students from UTM strongly agreed upon the proposition, while most of female students agreed or neutral with it. Perhaps some of female students were uncertain whether the design of visual elements within visual representation of games could represent consistency to players' sight (see Appendix G).

Besides, Mann-Whitney U tests revealed a statistically significant reduction between male and female students of UTM on "graphic designers should comprehend the visual elements that represent synchronization to players' sight",  $z = -2.187$ ,  $p = .029$ , with a large effect size ( $r = 0.49$ ). The median score on the perception decreased from strongly agree (Md = Strongly Agree) to neutral (Md = Neutral). This difference might be caused by the fact that majority of male students strongly agreed with the





proposition, while majority of female respondents were uncertain with it. Perhaps female students of UTM were uncertain whether the design of visual elements within visual representation of games could represent synchronization to players' sight (see Appendix G).

Mann-Whitney U tests also revealed a statistically significant difference between male and female students of UiTM on "graphic designers should comprehend the characterization of visual elements within visual representation of games to evoke immediate emotional response of players", despite a tied median score ( $Md = \text{Agree}$ ),  $z = -2.112$ ,  $p = .035$ , with a large effect size ( $r = 0.23$ ). This difference might be caused by the fact that majority of male students agreed with the proposition, while majority of female respondents agreed or strongly agreed with it. Probably female students of UiTM were more particular concerning the characterization of visual elements within visual representation of games could evoke players' immediate emotional response (see Appendix G).

In the same proposition, Mann-Whitney U tests also revealed a statistically significant reduction between male and female students of UTM,  $z = -2.068$ ,  $p = .039$ , with a large effect size ( $r = 0.46$ ). The median score on the perception decreased from strongly agree ( $Md = \text{Strongly Agree}$ ) to agree ( $Md = \text{Agree}$ ). This difference might be caused by the fact that majority of male students agreed with the proposition, while majority of female students agreed or neutral with it. Probably some of female students of UTM were uncertain whether the characterization of visual elements within visual representation of games could evoke players' immediate emotional response (see Appendix G).





Kruskal-Wallis tests showed a significant difference between programmes across four universities on four propositions: "graphic designers should comprehend the visual elements as cue to evoke immediate emotional response of players within visual representation of games" ,  $X^2 (3, n = 164) = 8.242, p = .041$ , with a mean score of 91.10 for UiTM, 79.68 for UMP, 70.20 for UMS and 65.28 for UTM, "graphic designers should comprehend the visual elements that represent consistency to players' sight",  $X^2 (3, n = 163) = 9.049, p = .029$ , with a mean score of 90.64 for UiTM, 84.71 for UTM, 71.57 for UMP and 64.68 for UMS, "graphic designers should comprehend the organization of visual elements within visual representation of games to evoke immediate emotional response of players",  $X^2 (3, n = 164) = 8.566, p = .036$ , with a mean score of 90.57 for UiTM, 82.54 for UMP, 68.55 for UMS and 63.90 for UTM as well as "graphic designers should comprehend the characterization of visual elements within visual representation of games to evoke immediate emotional response of players",  $X^2 (3, n = 162) = 8.575, p = .036$ , with a median score of 89.66 for UiTM, 83.68 for UTM, 73.80 for UMP and 62.14 for UMS (see Appendix H).





Table 5.19

Students' perception towards graphic designers should comprehend the design of visual elements within visual representation of games (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)

C2. Graphic designers should comprehend...			Perception					Mode	Md	p	z	d	r	
			SD	D	N	A	SA							
a. ... the visual elements as <b>cue</b> to evoke immediate emotional response of players.	UiTM	Male	0	1	6	24	8	A	A	.562	-.579	-	.06	
		Female	0	0	7	21	11	A	A					
	UTM	Male	0	0	2	1	2	N/SA	A	.315	-1.006	↓	.23	
		Female	0	0	8	6	1	N	N					
	UMS	Male	0	0	1	1	2	SA	SA	.149	-1.442	↓	.30	
		Female	0	0	8	9	1	A	A					
	UMP	Male	0	0	0	2	2	A/SA	SA	.119	-1.560	↓	.25	
		Female	0	1	10	14	7	A	A					
	b. ... the visual elements that <b>captivate</b> players' sight.	UiTM	Male	0	1	8	23	6	A	A	.159	-1.407	-	.15
			Female	0	0	7	20	12	A	A				
UTM		Male	0	0	1	1	3	SA	SA	.029	-2.186	↓	.49	
		Female	0	0	8	7	0	N	N					
UMS		Male	0	0	0	3	1	A	A	.052	-1.942	↓	.41	
		Female	0	0	9	8	1	N	N					
UMP		Male	0	0	1	1	1	N/A/SA	N/A/SA	.619	-.497	-	.08	
		Female	0	1	10	16	4	A	A					
c. ... the visual elements that represent <b>consistency</b> to players' sight.		UiTM	Male	0	0	7	24	8	A	A	.376	-.886	-	.10
			Female	0	0	8	17	14	A	A				
	UTM	Male	0	0	0	1	4	SA	SA	.011	-2.552	↓	.57	
		Female	0	0	6	6	2	N/A	A					
	UMS	Male	0	0	1	2	1	A	A	.303	-1.209	-	.22	
		Female	0	1	7	9	1	A	A					
	UMP	Male	0	0	1	1	2	SA	SA	.220	-1.226	↓	.22	
		Female	0	1	11	16	4	A	A					
	d. ... the visual elements that represent <b>synchronization</b> to players' sight.	UiTM	Male	0	1	9	20	7	A	A	.093	-1.678	-	.19
			Female	0	0	6	20	13	A	A				
UTM		Male	0	0	0	1	4	SA	SA	.029	-2.187	↓	.49	
		Female	0	0	7	4	4	N	N					
UMS		Male	0	0	1	2	1	A	A	.389	-.862	-	.19	
		Female	0	0	7	10	1	A	A					
UMP		Male	0	0	1	2	1	A	A	.848	-.191	-	.03	
		Female	0	1	8	16	7	A	A					

(Continued)

Table 5.19 (Continued)

C2. Graphic designers should comprehend...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
e. ... the <b>organizational</b> of visual elements within visual representation of games	UiTM	Male	1	1	8	20	9	A	A	.179	-1.344	-	.15
		Female	0	0	8	16	15	A	A				
	UTM	Male	0	0	1	2	2	A/SA	A	.060	-1.881	↓	.30
		Female	0	0	8	7	0	N	N				
	UMS	Male	0	0	2	1	1	N	A	.924	-.096	-	.02
		Female	0	0	6	11	1	A	A				
UMP	Male	0	0	0	2	2	A/SA	SA	.149	-1.444	↓	.23	
	Female	1	0	10	13	8	A	A					
f. ... the <b>characterization</b> of visual elements within visual representation of games.	UiTM	Male	1	1	9	20	7	A	A	.035	-2.112	-	.23
		Female	0	0	7	16	16	A/SA	A				
	UTM	Male	0	0	0	1	3	SA	SA	0.39	-2.068	↓	.46
		Female	0	0	6	6	3	N/A	A				
	UMS	Male	0	0	1	3	0	A	A	.594	-.533	-	.12
		Female	0	0	8	9	1	A	A				
	UMP	Male	0	0	1	3	0	A	A	.776	-.284	-	.05
		Female	1	0	8	18	5	A	A				

**5.9.2 Graphic designers should comprehend the design for game target audience within visual representation of games**

As shown in Table 5.20, a majority of 80% of the respondents (125 out of 156) across four universities regarded graphic designers should comprehend the game concept for specific target audience. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (45 out 52) and 77% (80 out of 104) of female respondents agreed or strongly agreed with the proposition.

As shown in item 2, 79% of the respondents (122 out of 155) across four universities regarded graphic designers should comprehend the design creativity for specific target audience. In conclusion, this proposition was accepted as a guiding



principle. In particular, more than half of male respondents (41 out of 51) agreed or strongly agreed with the proposition, while, 79% (81 out of 104) of female respondents echoed the males' perception.

A majority or 79% (123 out of 156) of the respondents across four universities regarded graphic designers should comprehend the design styles for specific target audience. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (44 out of 52) agreed or strongly agreed with the proposition, whereas, 76% (79 out of 104) of female respondents echoed the males' perception.

In term of gender difference, Mann-Whitney U tests revealed a statistically significant increment between male and female students of UiTM on "graphic designers should comprehend the game concept for specific target audience",  $z = -2.136$ ,  $p = .033$ , with a large effect size ( $r = 0.23$ ). The median score on the perception increased from agree ( $Md = Agree$ ) to strongly agree ( $Md = Strongly Agree$ ). This difference might be caused by the fact that majority of male students agreed with the proposition, while majority of female students strongly agreed with it. Probably female students of UiTM were more meticulous concerning the design concept for specific target audience (see Appendix G).

Mann-Whitney U tests also revealed a statistically significant reduction between male and female students of UTM on "graphic designers should comprehend the design styles for specific target audience",  $z = -2.373$ ,  $p = .018$ , with a large effect size ( $r = 0.53$ ). The median score on the perception decreased from strongly agree





(Md = Strongly Agree) to agree (Md = Agree). This difference might be caused by the fact that majority of male students strongly agreed with the proposition, while majority of female students simply agreed with it. Probably, male students of UTM were more meticulous in term of design styles for specific target audience (see Appendix G).

Kruskal-Wallis tests showed a significant difference between programmes across four universities on three propositions: "graphic designers should comprehend the game concept for specific target audience",  $X^2(3, n = 164) = 12.933, p = .005$ , with a mean score of 93.59 for UiTM, 76.33 for UMP, 72.72 for UTM and 59.70 for UMS, "graphic designers should comprehend the design creativity for specific target audience",  $X^2(3, n = 163) = 9.130, p = .028$ , with a mean score of 91.26 for UiTM, 80.75 for UTM, 72.89 for UMP and 63.93 for UMS as well as "graphic designers should comprehend the design styles for specific target audience",  $X^2(3, n = 164) = 13.193, p = .004$ , with a mean score of 93.60 for UiTM, 76.12 for UMP, 74.18 for UTM and 58.70 for UMS (see Appendix H).



Table 5.20

*Students' perception towards graphic designers should comprehend the design for game target audience within visual representation of games (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C2. Graphic designers should comprehend...			Perception					Mode	Md	p	z	d	r		
			SD	D	N	A	SA								
a. ... the <b>game concept</b> for specific target audience.	UiTM	Male	2	2	2	17	16	A	A	.033	-	2.136	↑	.23	
		Female	1	0	3	9	26	SA	SA						
	UTM	Male	0	0	1	1	3	SA	SA	.267	-	1.111	↓	.25	
		Female	0	0	5	6	4	A	A						
	UMS	Male	0	0	0	4	0	A	A	.561	-	.581	-	.12	
		Female	0	0	6	9	3	A	A						
	UMP	Male	0	0	0	2	2	A/SA	SA	.363	-	.910	↓	.15	
		Female	0	1	8	11	12	SA	A						
	b. ... the <b>design creativity</b> for specific target audience.	UiTM	Male	0	1	7	17	13	A	A	.128	-	1.522	↑	.17
			Female	1	0	4	14	20	SA	SA					
UTM		Male	0	0	1	1	3	SA	SA	.254	-	1.141	↓	.26	
		Female	0	0	3	9	3	A	A						
UMS		Male	0	0	1	3	0	A	A	.887	-	.142	-	.03	
		Female	0	0	6	9	3	A	A						
UMP		Male	0	0	0	3	1	A	A	.461	-	.737	↑	.12	
		Female	0	1	8	15	8	A	A						
i. ... the <b>design styles</b> for specific target audience.		UiTM	Male	0	2	3	19	15	A	A	.147	-	1.452	↑	.16
			Female	1	0	6	8	24	SA	SA					
	UTM	Male	0	0	0	2	3	SA	SA	.018	-	2.373	↓	.53	
		Female	0	0	3	11	1	A	A						
	UMS	Male	0	0	2	2	0	N/A	A	.330	-	.975	-	.21	
		Female	0	0	5	11	2	A	A						
	UMP	Male	0	0	1	1	2	SA	A	.595	-	.532	-	.09	
		Female	1	0	9	11	11	A/SA	A						

### 5.9.3 Graphic designers should comprehend the design of user interface within the visual representation of games

As shown in Table 5.21, 78% (122 out of 156) of the respondents across four universities regarded graphic designers should comprehend the design of graphical user interface that easy to use. In a word, this proposition was accepted as a guiding

principle. More than half of male respondents (44 out of 52) and 75% (78 out of 104) of female respondents agreed or strongly agreed with the proposition.

As shown in item 2, 78% (121 out of 155) of the respondents across four universities regarded graphic designers should comprehend the design of game characters that easy to recognize. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (39 out of 51) agreed or strongly agreed with the proposition, whilst, 79% (82 out of 104) of female respondents echoed the males' perception.

As for last item, 78% (123 out of 156) of the respondents across four universities regarded graphic designers should comprehend the design of game environment that immerse the players. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (41 out of 52) agreed or strongly agreed with the proposition, while 79% (82 out of 104) of female respondents echoed the males' perception.

In term of gender difference, Mann-Whitney U tests revealed a statistically significant difference between male and female students of UiTM on three propositions: "graphic designers should comprehend the design of graphical user interface that easy to use",  $z = -1.989$ ,  $p = .047$ , with a large effect size ( $r = 0.22$ ), "graphic designers should comprehend the design of game characters that easy to recognize",  $z = -2.896$ ,  $p = .004$ , with a large effect size ( $r = 0.32$ ) and "graphic designers should comprehend the design of game environment that immerse the players",  $z = -3.207$ ,  $p = .001$ , with a large effect size ( $r = 0.35$ ). The median score on



the propositions increased from agree (Md = Agree) to strongly agree (Md = Strongly Agree). These differences might be caused by the fact that majority of male students agreed or strongly agreed with the propositions, while majority of female students definitely strongly agreed with it. Probably female students of UiTM were more particular toward the design of user interface within visual representation of games that must be usable to players, game characters that must be recognized by players and game environment that must be immersed the players (see Appendix G).

Kruskal-Wallis tests also showed a significant difference between programmes across four universities on two propositions: "graphic designers should comprehend the design of graphical user interface that easy to use",  $X^2(3, n = 164) = 13.356, p = .004$ , with a mean score of 94.06 for UiTM, 74.80 for UMP, 73.12 for UTM and 60.18 for UMS as well as "graphic designers should comprehend the design of game characters that easy to recognize",  $X^2(3, n = 163) = 10.341, p = .016$ , with a mean score of 92.04 for UiTM, 77.50 for UTM, 74.24 for UMP and 61.64 for UMS (see Appendix H).



Table 5.21

*Students' perception towards graphic designers should comprehend the design of graphical user interface within the visual representation of games (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C2. Graphic designers should comprehend...			Perception					Mode	Md	p	z	d	r	
			S	D	N	A	SA							
a. ... the design of graphical user interface that easy to use.	UiTM	Male	0	1	5	17	16	A	A	0.47	-1.989	↑	.22	
		Female	0	0	5	8	26	SA	SA					
	UTM	Male	0	0	1	2	2	A/SA	A	.561	-.581	-	.13	
		Female	0	0	3	9	3	A	A					
	UMS	Male	0	0	1	2	1	A	A	.569	-.569	-	.12	
		Female	0	0	6	10	2	A	A					
	UMP	Male	0	0	0	3	1	A	A	.595	-.532	↑	.09	
		Female	0	1	11	8	12	SA	SA					
	b. ... the design of game characters that easy to recognize.	UiTM	Male	0	2	8	14	14	A/SA	A	.004	-2.896	↑	.32
			Female	1	0	1	11	26	SA	SA				
UTM		Male	0	0	0	2	3	SA	SA	.071	-1.807	↓	.40	
		Female	0	0	4	8	3	A	A					
UMS		Male	0	0	1	2	1	A	A	.569	-.569	-	.12	
		Female	0	0	6	10	2	A	A					
UMP		Male	0	0	1	2	2	SA	SA	.541	-.612	↓	.10	
		Female	0	1	9	12	10	A	A					
c. ... the design of game environment that immerse the players.		UiTM	Male	0	2	6	24	7	A	A	.001	-3.207	↑	.35
			Female	1	0	4	11	23	SA	SA				
	UTM	Male	0	0	1	1	3	SA	SA	.175	-1.356	↓	.30	
		Female	0	0	3	10	2	A	A					
	UMS	Male	0	1	0	2	1	A	A	.847	-.193	-	.04	
		Female	0	0	5	11	2	A	A					
	UMP	Male	0	0	1	3	0	A	A	.323	-.988	↑	.16	
		Female	0	1	8	9	14	SA	SA					

#### 5.9.4 Graphic designers should comprehend the design of visual representation that comply and support the digital game technology

As shown in Table 5.22, 71% (110 out of 156) of the respondents across four universities regarded graphic designers should comprehend the design of visual representation that complies with digital game system. In summary, this proposition





was accepted as a guiding principle. In particular, more than half of male respondents (40 out of 52) and 67% (70 out of 104) of female respondents agreed or strongly agreed with the proposition.

As shown in item 2, 72% (111 out of 155) of the respondents across four universities agreed regarded graphic designers should comprehend the design of visual representation that supports the digital game hardware. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (38 out 52) agreed or strongly agreed with the proposition, while, 71% (73 out of 103) of female respondents echoed the males' perception.

As shown in last item, a majority or 77% of the respondents (120 out of 155) across four universities regarded graphic designers should comprehend the design of visual representation that supports the virtual reality game system. In a word, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (42 out 52) agreed or strongly agreed with the proposition, whereas, 75% (78 out of 103) of female respondents echoed the males' perception.

In term of gender difference, Mann-Whitney U tests revealed a statistical significant between male and female students of UiTM on three propositions: "graphic designers should comprehend the design of visual representation that complies with digital game system",  $z = -2.826$ ,  $p = .005$ , with a large effect size ( $r = 0.31$ ), "graphic designers should comprehend the design of visual representation that supports the digital game hardware",  $z = -2.575$ ,  $p = .010$ , with a large effect size ( $r = 0.28$ ), and "graphic designers should comprehend the design of visual representation





that supports the virtual reality game system",  $z = -2.484$ ,  $p = .013$ , with a large effect size ( $r = 0.27$ ). The median score on the propositions increased from agree (Md = Agree) to strongly agree (Md = Strongly Agree). These differences might be caused by the fact that majority of male students agreed with the propositions, while majority of female students strongly agreed with it. Perhaps female students of UiTM were more meticulous concerning the design of visual representation of games that comply and support the digital game technology in terms of system, hardware and virtual reality (see Appendix G).

Kruskal-Wallis tests also showed a significant difference between programmes across four universities on three propositions: "graphic designers should comprehend the design of visual representation that complies with digital game system",  $X^2(3, n = 164) = 8.630$ ,  $p = .035$ , with a mean score of 91.15 for UiTM, 80.50 for UMP, 71.20 for UTM and 63.18 for UMS, "graphic designers should comprehend the design of visual representation that supports the digital game hardware",  $X^2(3, n = 163) = 17.198$ ,  $p = .001$ , with a mean score of 93.88 for UiTM, 87.68 for UTM, 65.36 for UMP and 59.19 for UMS as well as "graphic designers should comprehend the design of visual representation that supports the virtual reality game system",  $X^2(3, n = 163) = 8.245$ ,  $p = .041$ , with a mean score of 89.90 for UTM, 88.48 for UiTM, 75.95 for UMP and 60.84 for UMS (see Appendix H).



Table 5.22

*Students' perception towards graphic designers should comprehend the design of visual representation that complies with digital game system (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C2. Graphic designers should comprehend...			Perception					Mode	Md	p	z	d	r	
			S D	D	N	A	SA							
a. ... the design of visual representation that <b>complies with digital game system.</b>	UiTM	Male	1	0	8	24	6	A	A	.005	-2.826	↑	.31	
		Female	1	0	4	15	19	SA	SA					
	UTM	Male	0	0	2	0	3	SA	SA	.218	-1.231	↓	.26	
		Female	0	2	5	6	2	A	A					
	UMS	Male	0	0	1	2	1	A	A	.245	-1.162	↓	.25	
		Female	0	1	8	8	1	N/A	N					
	UMP	Male	0	0	0	2	2	A/SA	SA	.149	-1.442	↓	.23	
		Female	0	0	13	10	9	N	A					
	b... the design of visual representation that <b>supports the digital game hardware.</b>	UiTM	Male	0	2	7	19	11	A	A	.010	-2.575	↑	.28
			Female	0	0	3	15	21	SA	SA				
UTM		Male	0	0	1	0	4	SA	SA	0.85	-1.772	↓	.40	
		Female	0	0	4	8	3	A	A					
UMS		Male	0	0	2	1	1	N	A	.764	-.300	-	.06	
		Female	1	0	6	10	0	A	A					
UMP		Male	0	0	2	0	0	N/A	N	.704	-.379	-	.06	
		Female	0	1	15	8	8	N	N					
c. ... the design of visual representation that <b>supports the virtual reality game system.</b>		UiTM	Male	0	2	6	21	10	A	A	.013	-2.484	↑	.27
			Female	1	1	2	13	21	SA	SA				
	UTM	Male	0	0	1	0	4	SA	SA	.188	-1.318	↓	.29	
		Female	0	0	3	7	5	A	A					
	UMS	Male	0	0	1	2	1	A	A	.458	-.742	-	.16	
		Female	1	0	6	9	2	A	A					
	UMP	Male	0	0	0	2	2	A/SA	SA	.223	-1.220	↑	.20	
		Female	1	1	9	11	10	A	A					

### 5.9.5 Graphic designers should comprehend the design of visual representation for game evaluation process

As shown in Table 5.23, 71% of the respondents (110 out of 155) across four universities regarded graphic designers should comprehend the design of visual representation for game testing. In a word, this proposition was accepted as a guiding



principle. In particular, more than half of male respondents (34 out of 51) and 73% (76 out of 104) of female respondents agreed or strongly agreed with the proposition.

As shown in item 2, 73% (115 out of 156) of the respondents across four universities regarded graphic designers should comprehend to revise the design of visual representation after the game testing. Therefore, this proposition was accepted as a guiding principle. More than half of male respondents (38 out of 52) agreed or strongly agreed with the proposition, while, 74% (77 out of 104) of female respondents echoed the males' perception.

A majority or 74% of the respondents (116 out of 156) across four universities regarded graphic designers should comprehend to come out with the new design of visual representation after the game testing. In a word, this proposition was accepted as a guiding principle. More than half of male respondents (44 out of 52) and 74% (77 out of 104) of female respondents agreed or strongly agreed with the proposition.

In term of gender difference, Mann-Whitney U tests revealed a significant difference between male and female students of UiTM on three propositions: "graphic designers should comprehend the design of visual representation for game testing",  $z = -3.287$ ,  $p = .001$ , with a large effect size ( $r = 0.36$ ), "graphic designers should comprehend to revise the design of visual representation after the game testing",  $z = -2.918$ ,  $p = .004$ , with a large effect size ( $r = 0.32$ ) and "graphic designers should comprehend to come out with the new design of visual representation after the game testing",  $z = -3.866$ ,  $p = .000$ , with a large effect size ( $r = 0.42$ ). Despite a tied median score ( $Md = Agree$ ) and median score increased from agree ( $Md = Agree$ ) to strongly



agree (Md = Strongly Agree), these differences might be caused by the fact that majority of male students agreed with the propositions, while majority of female students strongly agreed with it. Perhaps female students were more meticulous concerning the design of visual representation for game testing which required graphic designers to revise and come out with a new design (see Appendix G).

Kruskal-Wallis tests showed a significant difference between programmes across four universities on two propositions: "graphic designers should comprehend to revise the design of visual representation after the game testing",  $X^2(3, n=164) = 10.424, p = .015$ , with a mean score of 91.36 for UiTM, 80.79 for UMP, 74.88 for UTM and 58.57 for UMS and "graphic designers should comprehend to come out with the new design of visual representation after the game testing",  $X^2(3, n=164) = 15.446, p = .001$ , with a mean score of 95.32 for UiTM, 69.28 for UMP, 75.78 for UTM and 62.52 for UMS (see Appendix H).

Table 5.23

*Students' perception towards graphic designers should comprehend the design of visual representation for game testing (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C2. Graphic designers should comprehend...			Perception					Mode	Md	p	z	d	r
			S	D	N	A	SA						
a. ... the design of visual representation for <b>game testing.</b>	UiTM	Male	1	1	10	21	5	A	A	.001	-3.287	-	.36
		Female	1	0	4	15	19	SA	A				
	UTM	Male	0	1	1	0	3	SA	SA	.714	-.367	↓	.08
		Female	0	0	5	6	4	A	A				
	UMS	Male	0	0	1	2	1	A	A	.382	-.873	-	.19
		Female	1	0	7	8	2	A	A				
	UMP	Male	0	0	2	1	1	N	A	.748	-.322	-	.05
		Female	1	1	8	15	7	A	A				

(Continue)

Table 5.23 (Continued)

C2. Graphic designers should comprehend...			Perception					Mode	Md	<i>p</i>	<i>z</i>	<i>d</i>	<i>r</i>
			S D	D	N	A	SA						
b. ... to <b>revise</b> the design of visual representation after the game testing.	UiTM	Male	0	2	8	20	9	A	A	.004	-2.918	-	.32
		Female	0	0	2	18	19	SA	A				
	UTM	Male	0	0	2	1	2	N/SA	A	-.419	-.419	-	.09
		Female	0	0	6	6	3	N/A	A				
	UMS	Male	0	0	2	1	1	N	A	.705	-.379	-	.08
		Female	0	1	7	10	0	A	A				
	UMP	Male	0	0	0	2	2	A/SA	A	.150	-1.440	-	.23
		Female	1	1	9	13	8	A	A				
c. ... to <b>come out</b> with the new design of visual representation after the game testing.	UiTM	Male	0	2	7	24	6	A	A	.000	-3.866	↑	.42
		Female	1	0	1	15	22	SA	SA				
	UTM	Male	0	1	1	1	2	SA	A	.882	-.149	-	.03
		Female	0	0	3	11	1	A	A				
	UMS	Male	0	1	0	2	1	A	A	.516	-.649	-	.14
		Female	0	1	7	9	1	A	A				
	UMP	Male	0	0	1	2	1	A	A	.526	-.635	-	.10
		Female	1	2	11	11	7	N/A	A				

### 5.10 Propositions on principles of game graphic design

The perceptions of students across four universities were compared to determine whether they were agree or not with the propositions on the principles of game graphic design. This statistical analysis involved six constructs: players' immediate emotional response, specific target audience, user interface, visual languages, digital game technology and game evaluation process. Table 5.24 shows the questionnaire items for propositions of the principles of game graphic design.

Table 5.24

*The questionnaire items for propositions on principles of game graphic design*

Principles	Number of items	Knowledge examined in this study	Accepted as a guiding principle?
Players' immediate emotional response	3	Gestalt principles to evoke players' immediate emotional response.	Yes
		Visual metaphor to evoke players' immediate emotional response.	Yes
		Emotional scenes in movies as design inspiration.	Yes
Specific target audience	3	Demographic profile of specific target audience.	Yes
		Design expectation of specific target audience.	Yes
		Characteristics of visual elements for specific target audience.	Yes
Game user interface	3	Graphical user interface is visually appealing.	Yes
		Character design is visually appealing.	Yes
		Game environment is visually appealing.	Yes
Visual languages	3	Visual literacy which support players' learnability.	Yes
		Visual communication which support players' interpretation.	Yes
		Visual perception that lead players to act accordingly while playing games.	Yes
Digital game technology	3	Compatible with the digital game system.	Yes
		Functioning within virtual reality games.	Yes
		Incorporate with game technologies to excite players.	Yes

(Continue)

Table 5.24 (Continued)

Principles	Number of items	Knowledge examined in this study	Accepted as a guiding principle?
Game evaluation process	3	Design evaluation process is an iterative process.	Yes
		Design evaluation process is meant to ensure the usability of players which is reflected from visual aesthetics.	Yes
		Design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics.	Yes

### 5.10.1 Graphic designers should recognize principles of players' immediate emotional response

As shown in Table 5.25, 70% of the respondents (108 out of 155) across four universities regarded graphic designers should recognize gestalt principles to evoke players' immediate emotional response. In a word, this proposition was accepted as a guiding principle. More than half of male respondents (40 out 51) and 65% (68 out of 104) of female respondents agreed or strongly agreed with the proposition.

As for item 2, 68% of the respondents (105 out of 154) across four universities regarded graphic designers should recognize visual metaphor to evoke players' immediate emotional response. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (40 out 52) agreed or strongly agreed with the proposition, while, 64% (65 out of 102) of female respondents' echoed the males' perception.



As for last item, a majority or 73% (112 out of 153) of the respondents across four universities regarded graphic designers should recognize emotional scenes in movies as design inspiration. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (38 out of 50) and 72% (74 out of 103) of female respondents agreed or strongly agreed with the proposition.

However, Kruskal-Wallis tests showed a significant difference between programmes across four universities on "graphic designers should recognize emotional scenes in movies as design inspiration",  $X^2(3, n = 161) = 8.933, p = .030$ , with a mean score of 89.57 for UiTM, 80.04 for UMP, 67.75 for UTM and 62.73 for UMS (see Appendix H).

Table 5.25

*Students' perception towards graphic designers should recognize design principles for players' immediate emotional response (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C3. Graphic designers should recognize ...			Perception					Mode	Md	p	z	d	r	
			S	D	N	A	SA							
a. ... <b>gestalt principles</b> to evoke players' immediate emotional response.	UiTM	Male	0	1	6	23	9	A	A	.697	-.390	-	.04	
		Female	1	0	9	15	14	A	A					
	UTM	Male	0	0	1	2	2	A/SA	A	.189	-1.313	-	.30	
		Female	0	0	7	6	2	N	A					
	UMS	Male	0	0	1	2	0	A	A	.954	-.058	-	.01	
		Female	0	0	7	10	1	A	A					
	UMP	Male	0	0	2	1	1	N	A	.832	-.212	-	.03	
		Female	0	2	10	12	8	A	A					
	b. ... <b>visual metaphor</b> to evoke players' immediate emotional response.	UiTM	Male	0	1	8	22	8	A	A	.513	-.654	-	.07
			Female	1	0	8	17	12	A	A				
UTM		Male	0	0	1	2	2	A/SA	A	.081	-1.744	-	.40	
		Female	0	0	7	8	0	A	A					
UMS		Male	0	0	1	2	1	A	A	.368	-.900	-	.19	
		Female	0	0	7	9	1	A	A					
UMP		Male	0	0	1	2	1	A	A	.556	-.589	-	.10	
		Female	0	1	13	11	7	N	A					

(Continue)

Table 5.25 (Continued)

C3. Graphic designers should recognize ...			Perception					Mode	Md	p	z	d	r
			S	D	N	A	SA						
c. ... <b>emotional scenes</b> in movies as design inspiration.	UiTM	Male	0	1	8	17	11	A	A	.186	-1.322	-	.11
		Female	1	0	4	18	16	A	A				
	UTM	Male	0	0	2	1	2	N/SA	A	.574	-.562	-	.13
		Female	0	0	7	5	3	N	A				
	UMS	Male	0	0	1	3	0	A	A	.880	-.151	-	.03
		Female	0	0	6	11	1	A	A				
	UMP	Male	0	0	0	1	3	SA	SA	.063	-1.862	↓	.30
		Female	1	0	10	11	9	A	A				

### 5.10.2 Graphic designers should recognize principles of specific target audience

As shown in Table 5.26, 71% (109 out of 154) of the respondents across four universities regarded graphic designers should recognize demographic profile of specific target audience. Therefore, this proposition was accepted as a guiding principle. More than half of male respondents (37 out of 52) agreed or strongly agreed with the proposition followed by 71% (72 out of 102) of female respondents' echoed the males' perception.

As shown in item 2, 71% (110 out of 155) of the respondents across four universities regarded graphic designers should recognize design expectation of specific target audience. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (38 out of 51) agreed or strongly agreed with the proposition followed by 69% (72 out of 104) of female respondents echoed the males' perception.



A majority or 71% of the respondents (109 out of 155) across four universities regarded graphic designers should recognize characteristics of visual elements for specific target audience. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (36 out of 52) agreed or strongly agreed with the proposition, whereas, 71% (73 out of 103) of female respondents echoed the males' perception.

In term of gender difference, Mann-Whitney U tests revealed a statistically significant increment between male and female students of UiTM on three propositions: "graphic designers should recognize demographic profile of specific target audience",  $z = -2.582$ ,  $p = .010$ , with a large effect size ( $r = 0.28$ ), "graphic designers should recognize design expectation of specific target audience",  $z = -2.005$ ,  $p = .045$ , with a large effect size ( $r = 0.22$ ), and "graphic designers should recognize characteristics of visual elements for specific target audience",  $z = -2.576$ ,  $p = .010$ , with a large effect size ( $r = 0.28$ ). The median score on the proposition increased from agree (Md = Agree) to strongly agree (Md = Strongly Agree). This difference might be caused by the fact that majority of male students agreed with the proposition, while majority of the female students strongly agreed with it. Probably female students from UiTM were more meticulous in term of graphic design market research (see Appendix G).

Kruskal-Wallis tests showed significant difference between programmes across four universities on "graphic designers should recognize characteristics of visual elements for specific target audience",  $X^2(3, n = 163) = 7.836$ ,  $p = .050$ , with a



mean score of 89.69 for UiTM, 74.22 for UMP, 74.02 for UTM and 68.93 for UMS

(see Appendix H).

Table 5.26

*Students' perception towards graphic designers should recognize design principles for specific target audience (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C3. Graphic designers should recognize ...			Perception					Mode	Md	p	z	d	r
			SD	D	N	A	SA						
a. ... <b>demographic profile</b> of specific target audience.	UiTM	Male	0	4	8	18	9	A	A	.010	-2.582	↑	.28
		Female	1	0	5	13	20	SA	SA				
	UTM	Male	0	0	1	2	2	SA	SA	.264	-1.117	↓	.25
		Female	0	0	7	5	3	A	A				
	UMS	Male	0	0	1	3	0	A	A	.958	-.052	-	.01
		Female	0	0	5	12	1	A	A				
	UMP	Male	0	0	1	1	2	SA	A	.274	-1.095	-	.12
		Female	1	2	9	12	6	A	A				
b. ... <b>design expectation</b> of specific target audience.	UiTM	Male	1	1	8	18	10	A	A	.045	-2.005	↑	.22
		Female	1	0	7	10	21	SA	SA				
	UTM	Male	0	0	1	1	3	SA	SA	.193	-1.303	↓	.14
		Female	0	0	7	4	4	N	A				
	UMS	Male	0	0	2	2	0	N/A	A	.491	-.689	-	.15
		Female	0	0	6	11	1	A	A				
	UMP	Male	0	0	0	3	1	A	A	.375	-.887	-	.14
		Female	0	1	10	13	8	A	A				
c. ... <b>characteristics</b> of visual elements for specific target audience.	UiTM	Male	0	1	12	16	10	A	A	.010	-2.576	↑	.28
		Female	1	0	4	14	20	SA	SA				
	UTM	Male	0	0	1	1	3	SA	SA	.229	-1.203	↓	.27
		Female	0	0	6	5	4	N	A				
	UMS	Male	0	0	1	3	0	A	A	.730	-.345	-	.07
		Female	0	0	7	10	1	A	A				
	UMP	Male	0	0	1	3	0	A	A	.869	-.165	-	.03
		Female	0	1	11	11	8	N/A	A				



### 5.10.3 Graphic designers should recognize principles of game user interface

As shown in Table 5.27, 74% of the respondents (114 out of 154) across four universities regarded graphic designers should recognize design principles to make graphical user interface visually appealing. In a word, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (40 out of 52) and 73% (74 out of 102) of female respondents agreed or strongly agreed with the proposition.

As shown in item 2, 76% of the respondents (118 out of 156) across four universities regarded graphic designers should recognize design principles to make character design visually appealing. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (43 out of 52) agreed or strongly agreed with the proposition, while, 72% (75 out of 104) of female respondents echoed the males' perception.

As shown for last item, a majority or 76% of the respondents (119 out of 156) across four universities regarded graphic designers should recognize design principles to make game environment visually appealing. In a word, this proposition was accepted as a guiding principle. More than half of male respondents (44 out of 52) agreed or strongly agreed with the proposition followed by 72% (75 out of 104) of female respondents echoed the males' perception.



In term of gender difference, Mann-Whitney U tests revealed a statistically significant reduction between male and female students of UTM on two propositions: "graphic designers should recognize design principles to make character design visually appealing",  $z = -2.541$ ,  $p = .011$ , with a large effect size ( $r = 0.57$ ) and "graphic designers should recognize design principles to make game environment visually appealing",  $z = -2.518$ ,  $p = .012$ , with a large effect size ( $r = 0.56$ ). The median score on the propositions decreased from strongly agree (Md = Strongly Agree) to agree (Md = Agree). This difference might be caused by the fact that majority of male students strongly agreed with the proposition, while majority of the female students simply agreed with it. Probably male students of UTM were more particular in term of design principles for game characters and game environment in games (see Appendix G).

Kruskal-Wallis tests showed significant difference between programmes across four universities on two propositions: "graphic designers should recognize design principles to make character design visually appealing",  $X^2(3, n = 164) = 13.057$ ,  $p = .005$ , with a mean score of 94.37 for UiTM, 72.49 for UMP, 71.78 for UTM and 64.23 for UMS and "graphic designers should recognize design principles to make game environment visually appealing",  $X^2(3, n = 164) = 7.949$ ,  $p = .047$ , with a mean score of 91.01 for UiTM, 79.70 for UMP, 70.30 for UTM and 65.93 for UMS (see Appendix H).

Table 5.27

Students' perception towards graphic designers should recognize design principles for game user interface (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)

C3. Graphic designers should recognize ...			Perception					Mode	Md	p	z	d	r	
			S	D	N	A	SA							
a. ... design principles to make <b>graphical user interface</b> visually appealing.	UiTM	Male	0	1	8	22	8	A	A	.143	-1.463	-	.16	
		Female	1	0	6	17	15	A	A					
	UTM	Male	0	0	1	1	3	SA	SA	.229	-1.203	↓	.27	
		Female	0	0	7	4	3	N	N					
	UMS	Male	0	0	1	3	0	A	A	.912	-.110	-	.02	
		Female	0	0	5	13	0	A	A					
	UMP	Male	0	0	1	2	1	A	A	.978	-.027	-	.0	
		Female	0	2	7	12	10	A	A					
	b. ... design principles to make <b>character design</b> visually appealing.	UiTM	Male	0	1	5	23	10	A	A	.078	-1.762	-	.19
			Female	1	0	3	17	18	SA	A				
UTM		Male	0	0	0	2	3	SA	SA	.011	-2.541	↓	.57	
		Female	0	0	7	7	1	N/A	A					
UMS		Male	0	0	1	3	0	A	A	.848	-.191	-	.04	
		Female	0	0	7	9	2	A	A					
UMP		Male	0	0	2	2	0	N/A	A	.337	-.961	-	.16	
		Female	0	1	10	12	9	A	A					
c. ... design principles to make <b>game environment</b> visually appealing.		UiTM	Male	0	1	5	23	10	A	A	.146	-1.455	-	.16
			Female	1	0	6	13	19	SA	A				
	UTM	Male	0	0	0	2	3	SA	SA	0.12	-2.518	↓	.56	
		Female	0	1	6	7	1	A	A					
	UMS	Male	0	0	1	3	0	A	A	.958	-.052	-	.01	
		Female	0	0	5	12	1	A	A					
	UMP	Male	0	0	1	1	2	SA	SA	.438	-.776	↓	.17	
		Female	1	0	9	14	8	A	A					

### 5.10.4 Graphic designers should recognize principles of visual languages

As shown in Table 5.28, 68% of the respondents (105 out of 156) across four universities regarded graphic designers should recognize design principles of visual literacy which support players' learnability. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (37 out of 52) and



65% (68 out of 104) of female respondents agreed or strongly agreed with the proposition.

As shown in item 2, 71% of the respondents (110 out of 156) across four universities regarded graphic designers should recognize design principles of visual communication which support players' interpretation. Therefore, this proposition was accepted as a guiding principle. In particular, more than half (38 out of 52) of male respondents agreed or strongly agreed with the proposition followed by 69% (72 out of 104) of female respondents echoed the males' perception.

A majority or 67% (105 out of 156) of the respondents across four universities regarded graphic designers should recognize design principles of visual perception that lead players to act accordingly while playing games. In conclusion, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (41 out of 52) agreed or strongly agreed with the proposition followed by 61% (64 out of 104) of female respondents echoed the males' perception.

In term of gender difference, Mann-Whitney U tests revealed a statistically significant reduction between male and female students of UTM on two propositions: "graphic designers should recognize design principles of visual communication which support players' interpretation",  $z = -2.422$ ,  $p = .015$ , with a large effect size ( $r = 0.54$ ) and " design principles of visual perception that lead players to act accordingly while playing games",  $z = - 2.799$ ,  $p = .005$ , with a large effect size ( $r = 0.63$ ). The median score on the perception decreased from strongly agree ( $Md = \text{Strongly Agree}$ ) to agree ( $Md = \text{Agree}$ ). These differences might be caused by the fact that majority of male





respondents from UTM strongly agreed upon the proposition, while majority of female respondents were merely agreed with it. Probably female students of UTM were more meticulous in term of design principles for visual communication and visual perception in game design (see Appendix G).

Table 5.28

*Students' perception towards graphic designers should recognize design principles of visual languages (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C3. Graphic designers should recognize ...			Perception					Mode	Md	p	z	d	r	
			SD	D	N	A	SA							
a. ... design principles of <b>visual literacy</b> which support players' <b>learnability</b> .	UiTM	Male	0	0	11	21	7	A	A	.224	-1.166	-	.13	
		Female	1	0	9	15	14	A	A					
	UTM	Male	0	0	1	2	2	A/SA	A	.225	-1.212	-	.27	
		Female	0	1	5	7	2	A	A					
	UMS	Male	0	0	2	2	0	N/A	A	.570	-.568	-	.12	
		Female	0	0	7	9	2	A	A					
	UMP	Male	0	0	3	0	0	A	A	.769	-.293	-	.05	
		Female	1	1	11	12	7	A	A					
	b. ... design principles of <b>visual communication</b> which support players' <b>interpretation</b> .	UiTM	Male	0	2	11	14	12	A	A	.429	-.790	-	.09
			Female	1	1	6	18	13	A	A				
UTM		Male	0	0	0	2	3	SA	SA	.015	-2.422	↓	.54	
		Female	0	0	5	9	1	A	A					
UMS		Male	0	0	1	3	0	A	A	.958	-.054	-	.01	
		Female	0	0	5	12	1	A	A					
UMP		Male	0	0	0	2	2	A/SA	SA	.054	-1.928	↓	.31	
		Female	0	2	12	13	5	A	A					
c. ... design principles of <b>visual perception</b> that lead players to <b>act</b> accordingly while playing games.		UiTM	Male	0	3	6	22	8	A	A	.487	-.696	-	.08
			Female	1	1	9	14	14	A/SA	A				
	UTM	Male	0	0	0	2	3	SA	SA	.005	-2.799	↓	.63	
		Female	0	1	6	8	0	A	A					
	UMS	Male	0	0	2	2	0	N/A	A	.628	-.485	-	.10	
		Female	0	0	7	10	1	A	A					
	UMP	Male	0	0	0	4	0	A	A	.453	-.750	-	.12	
		Female	0	1	14	9	8	N	A					



### 5.10.5 Graphic designers should recognize principles of the digital game system

As shown in Table 5.29, 68% of the respondents (106 out of 155) across four universities regarded graphic designers should recognize design principles which are compatible the digital game system. In conclusion, this proposition was accepted as a guiding principle. More than half of male respondents (40 out of 52) and 64% (66 out of 103) of female respondents agreed or strongly agreed with the proposition.

As shown in item 2, 71% of the respondents (111 out of 156) across four universities regarded graphic designers should recognize design principles that function within virtual reality games. Therefore, this proposition was accepted as a guiding principle. In particular, more than half of male respondents (39 out of 52) agreed or strongly agreed with the proposition followed by 69% (72 out of 104) of female respondents echoed the males' perception.

A majority or 68% of the respondents (106 out of 156) across four universities regarded graphic designers should recognize design principles that incorporate with game technologies to excite players. In a word, this proposition was accepted as a guiding principle. More than half of male respondents (35 out of 52) and 68% (71 out of 104) of female respondents agreed or strongly agreed with the proposition.

However, Kruskal-Wallis tests showed significant difference between programmes across four universities on "graphic designers should recognize design principles that incorporate with game technologies to excite players" ,  $X^2(3, n=164)$



= 9.901,  $p = .019$ ), with a mean score of 104.12 for UTM, 84.61 for UiTM, 75.14 for UMP and 63.86 for UMS (see Appendix H).

Table 5.29

*Students' perception towards graphic designers should recognize design principles of the digital game system (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C3. Graphic designers should recognize ...			Perception					Mode	Md	p	z	d	r
			S D	D	N	A	SA						
a. ... design principles which are <b>compatible</b> the digital game system.	UiTM	Male	2	1	7	21	8	A	A	.563	-.578	-	.06
		Female	1	0	12	12	14	SA	A				
	UTM	Male	0	0	1	1	3	SA	SA	.429	-.790	↓	.18
		Female	0	0	4	5	5	A/SA	A				
	UMS	Male	0	0	0	4	0	A	A	0.72	-1.797	↓	.38
		Female	0	0	9	9	0	N/A	N				
	UMP	Male	0	1	0	2	1	A	A	.848	-.192	-	.03
		Female	0	0	11	16	5	A	A				
b. ... design principles that <b>function</b> within virtual reality games.	UiTM	Male	0	3	8	19	9	A	A	.255	-1.137	-	.12
		Female	1	0	8	16	14	A	A				
	UTM	Male	0	0	1	1	3	SA	SA	.250	-1.150	↓	.26
		Female	0	1	4	6	4	A	A				
	UMS	Male	0	0	0	4	0	A	A	.226	-1.211	-	.26
		Female	0	0	7	10	1	A	A				
	UMP	Male	0	0	1	3	0	A	A	.933	-.084	-	.01
		Female	0	0	11	16	5	A	A				
c. ... design principles that <b>incorporate</b> with game technologies to excite players.	UiTM	Male	0	1	14	16	8	A	A	.103	-1.632	-	.18
		Female	1	1	7	16	14	A	A				
	UTM	Male	0	0	0	2	3	SA	SA	.318	-.998	↓	.22
		Female	0	0	3	6	6	A/SA	A				
	UMS	Male	0	0	1	3	0	A	A	.485	-.699	-	.15
		Female	0	0	8	10	0	A	A				
	UMP	Male	0	0	1	1	2	SA	SA	.228	-1.205	↓	.20
		Female	0	2	11	14	5	A	A				



### **5.10.6 Graphic designers should recognize the principles of game evaluation process**

As shown in Table 5.30, 63% of the respondents (98 out of 155) across four universities regarded graphic designers should recognize that design evaluation process is an iterative process. Therefore, this proposition was accepted as a guiding principle. More than half of male respondents (34 out of 52 students) and 62% (64 out of 103 students) of female respondents agreed or strongly agreed with the proposition.

As in item 2, 67% of the respondents (105 out of 155) across four universities regarded graphic designers should recognize that design evaluation process is meant to ensure the usability of players which is reflected from visual aesthetics. In a word, this proposition was accepted as a guiding principle. More than half of male respondents (38 out of 52 students) agreed or strongly agreed with the proposition followed by 65% (67 out of 103 students) of female respondents echoed the males' perception.

As for last item, a majority or 68% of the respondents (107 out of 156) across four universities regarded graphic designers should recognize that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics. In conclusion, this proposition was accepted as a guiding principle. In particular, almost half of male respondents (35 out of 52 students) agreed or strongly agreed with the proposition followed by 69% (72 out of 104 students) of female respondents echoed the males' perception (see Figure 5.164).



In term of gender difference, Mann-Whitney U tests revealed a statistical significant difference between male and female students of UiTM on "graphic designers should recognize that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics", despite a tied median score (Md= Agree),  $z = -.2.267, p = .023$ , with a large effect size ( $r = 0.25$ ). This difference might be caused by the fact that majority of male respondents agreed upon the proposition, while majority of the female respondents strongly agreed with it. Perhaps female respondents of UiTM were more meticulous concerning the design evaluation process must ensure the presence of players' positive emotion through visual aesthetics (see Appendix G).

Table 5.30

*Students' perception towards graphic designers should recognize that design evaluation process is an iterative process (SA: strongly agree; A: agree; N: neutral; D: disagree; SD: strongly disagree; d = direction of significance; r = effect size)*

C3. Graphic designers should recognize ...			Perception					Mode	Md	p	z	d	r	
			S	D	N	A	SA							
a. ... that design evaluation process is an <b>iterative</b> process.	UiTM	Male	0	1	11	18	9	A	A	.423	-.800	-	.09	
		Female	1	1	9	14	14	A/SA	A					
	UTM	Male	0	1	1	1	2	SA	A	.890	-.138	-	.03	
		Female	0	0	6	6	3	N/A	A					
	UMS	Male	0	0	2	2	0	N/A	N	.918	-.103	-	.02	
		Female	0	0	9	8	0	N	N					
	UMP	Male	0	1	1	1	1	D/N/A/SA	N/A	.557	-.587	-	.10	
		Female	0	0	13	11	8	N	A					
	b. ... that design evaluation process is meant to ensure the <b>usability</b> of players	UiTM	Male	0	1	9	19	10	A	A	.720	-.359	-	.04
			Female	1	1	10	17	10	A	A				
UTM		Male	0	1	1	0	3	SA	SA	.743	-.327	↓	.03	
		Female	0	0	7	3	5	N	A					
UMS		Male	0	1	1	2	0	A	A	.324	-.987	-	.21	
		Female	0	1	4	13	0	A	A					
UMP		Male	0	0	0	2	2	A/SA	A	.139	-1.480	-	.24	
		Female	0	1	11	11	8	N/A	A					

(Continue)

Table 5.30 (Continued)

C3. Graphic designers should recognize ...			Perception					Mode	Md	p	z	d	r
			S	D	N	A	SA						
c. ... that design evaluation process is meant to ensure the presence of players' <b>positive emotion</b>	UiTM	Male	0	1	12	19	7	A	A	.023	-2.267	-	.25
		Female	1	1	6	13	18	SA	A				
	UTM	Male	0	1	1	0	3	SA	SA	.582	-.550	↓	.12
		Female	0	0	6	6	3	N/A	A				
	UMS	Male	0	0	2	2	0	A/SA	A	.640	-.468	-	.10
		Female	0	1	6	9	2	A	A				
	UMP	Male	0	0	0	3	1	A	A	.316	-1.002	-	.16
		Female	0	1	10	14	7	A	A				

### 5.11 Summary

This chapter presented the results of a questionnaire survey conducted with respondents from UiTM, UTM, UMS and UMP. The results were analyzed and synthesized in order to construct the findings for the confirmative studies which benefiting graphic designers who want to involve in game design. In particular, 78 propositions were accepted as guiding principles, except one proposition was rejected due to the uncertainty from most of the students across four universities. Besides, 38 propositions showed significance differences related to gender, whilst, 36 propositions showed significance differences across four universities. The findings revealed the significant inferences and lacunae of knowledge which will be discussed in the next chapter for the insight of visual aesthetics studies in game graphic design.



## CHAPTER 6

### DISCUSSION



#### 6.0 Introduction

This chapter discusses the findings which correspond to the research questions. In the same time, this chapter also discusses the findings of significance differences toward gender and students across four universities in understanding the issues related to the research questions. This is relevant for four Malaysia public universities (UiTM, UMS, UMP and UTM) for strengthening their programmes, particularly in teaching and learning graphic design. Furthermore, this chapter also offering several explanations and suggestions whether complemented or contrasted with existing literature.





The explanations and suggestions were based on the findings of exploratory and confirmatory studies presented in chapter 4 and chapter 5. Therefore, this chapter is meant to provide some suggestions which valuable to the expansion of knowledge in the game design field.

This research examined the perceptions of game practitioners and graphic design students toward the characteristics of visual aesthetics in the notion of player-centric emotional design for digital games. Hence, this research also examined the perceptions from both sides to inform the creation of guiding principles for visceral level player-centric emotional design for digital games. Two methods of enquiries were deployed; exploratory and confirmatory in sequentially process to achieve the research aims. The exploratory study was conducted with five prominent game practitioners via semi structured interview. A list of hypothetical propositions was generated for the development of quantitative instrument for the confirmatory study.

In a form of questionnaire survey, the confirmatory study was conducted with undergraduate students who are taking bachelor degree related to graphic design programme from four Malaysian public universities; UiTM, UTM, UMS and UMP. The aim of the confirmatory study was intended to report the findings whether the students confirm or refute the hypothetical propositions which reveal the insight of visual aesthetics studies in game graphic design.







## 6.1 Differences in perceptions and views on the player-centric design

In exploratory study revealed the issues concerning the implementation of player-centric design for digital games (see section 4.4.1). With reference to the propositions made by game practitioners revealed there were the differences of perceptions toward the concept of player-centric design. Two of game practitioners (GD002 and GD003) did not seem to understand and ignored the concept of player-centric design when they considered all games are player-centric. Although another two game practitioners (GD001 and GD004) acknowledged the noteworthy of the concept, but they were hesitated that the design process that heavily relied on players would deter the development of digital games in view of the fact that players have various needs and preferences which impossible to be fulfilled. Therefore, based on game practitioners' perceptions, it can be assumed that they were not really exposed to academic researches which affirmed a lot of advantages for imposing the concept of player-centric design in game design process.

Other than that, one game practitioner (GD005) argued that most of game design process is not absolutely practicing the concept of player-centric design. He alleged that most of game developers claimed their digital games are player-centric but the actual fact that they simply design games based on the assumption of players' behaviour. This may means that most of game design process is not entirely applied the player-centric design approach due to the ignorance of game developers which previously discussed in section 2.2.





Moreover, there were also the diverse views toward the approach of player-centric design for digital games. Two of game practitioners (GD001 and GD002) regarded the approach of player-centric design should be focused on the players' game playing experience which connected to their desires. Such view was discussed in the academic literatures regarding the dynamic approach of player-centric design in regards to players' game playing experience (e.g Charles et al., 2005, Bakkes, Tan, & Pisan, 2007). The dynamic approach involved modelling the players by using adaptive game system.

Quite the opposite, one game practitioner (GD004) initiated that the player-centric design approach should be focused on user interface from the perspective of players can customize the games according to what they want. He also stated that the good user interface will engrossed the pleasing experience of players towards gameplay, graphic and music. This is in line with the study of user interface modification depicted by Targett (2012), where players were capable to control their playing ability through the user interface. Therefore, it can be concluded that the player-centric design approach is still ambiguous to most of game practitioners which needs more proven research specifically in the game design field.

## **6.2 The potential of visceral level player-centric emotional design for digital games**

Apparently, the player-centric design approach that accentuates players' emotion has a great potential. In exploratory study revealed all game practitioners held positive views toward the concept of emotional design when they associated emotion with the





feeling of pleasure that leads players' psychological abilities i.e. cognitive and behaviour skills to derive motivation and learning during game playing activities (see section 4.4.2). This certainly associated to the initial idea of this study to adapt the concept of emotional design collectively with learning domain for total learning and motivational experience in games which has been discussed in chapter two.

For that reason, the possibility of player-centric emotional design for digital games must be reinforced through the visceral level of design. Based on the understanding of game practitioners related to the effects of visceral response (see section 4.4.3) shows the necessity to trigger players' immediate emotional response through players' visceral level. Hence, the perceived guidelines of visceral level player-centric emotional design (see section 4.5) indicated that the used of visual aesthetics has its own merits which will be furthered discuss in the next section.

### **6.3 The characteristics of visual aesthetics: a reference to visual elements in game graphic design**

Throughout the exploratory study revealed no contradiction between the academic literatures and game practitioners' propositions regarding the significant roles of visual aesthetics in games. In particular, game practitioners constantly regarded visual aesthetics is related to the beauty of the game visuals that engross players' positive emotion. This is echoed the Calleja's (2011) proposition that players are increasingly turning to aesthetically beautiful games which engrossed their positive emotional experience while in game playing events.





In addition, the game practitioners also regarded visual aesthetics involved the work of art in game graphics as Niedenthal (2009) believed it would affect players' sense and perception for sensory knowledge and ways of knowing. Since players' sight sense is dominating other senses while in game playing events (Shinkle, 2008), game practitioners saw visual aesthetics through the art of game graphics can be used to trigger players' visceral level for immediate emotional response, thus leads their reactions and psychological understanding toward games.

However, this study argues that being able to recognize the significant roles of visual aesthetics in games does not mean the game practitioners being able to recognize the right attributes and characteristics that evoke player' immediate emotional response. Therefore, this thesis determined the knowledge gaps between the game practitioners and the existing literature reviews concerning the characteristics of visual aesthetics in games.

In the exploratory study indicated that the perceived attributes and characteristics of visual aesthetics are positively linked to art fundamentals. As mentioned in section 4.1.2, there were 4 visual elements of art; line, shape, form and colour with 13 characteristics related to principles of design were identified from game practitioners' propositions. As mentioned by Pentak and Lauer (2012) in the glossary of their book by the title of Design Basics, 'aesthetics is a branch of philosophy concerned with the beautiful art and how the viewer experienced it'. In addition, work of art consists of two aspects - form and content. Form constituted the visual aspect which involved the manipulation of visual elements with the guidance of





design principles, while content involved the subject matter, story or information of the artwork in order to communicate with the viewers.

By referring to Pentak and Lauers (2012) descriptions revealed the knowledge gaps between game practitioners and the existing art fundamentals. The knowledge mapping shows two visual elements of art - space and texture were not mentioned or depicted by game practitioners (see section 4.3.5). In a word, game practitioners are unable to determine the precise art fundamentals, despite enormous experience in game design process. Therefore, the propositions related to the characteristics of visual aesthetics comprising of 6 visual elements and 25 design principles were generated; hence need to be confirmed by the graphic design students in confirmatory study.



Throughout the statistical findings of the questionnaire survey indicated that the students generally accepted 24 propositions as guiding principles for the characteristics of visual aesthetics in game graphic design, despite significant differences between genders and programmes across four universities. However, 1 proposition was rejected due to the uncertainty by a majority of the students (see section 5.7.1). The rejected proposition was referred to the characteristic of lines used in game design should emphasize on sharp lines to evoke players' negative emotion. This means that the sharp lines did not necessarily evoke of players' negative emotion as it also evokes positive emotions.





In the questionnaire survey, the differences of perceptions were uncovered between male and female students across four universities in determining the characteristics of visual elements for game graphic design. In particular, male students of UTM, UMS and UMP, which in the field of computer science are more certain to determine the characteristics of lines, forms and textures compared to female students. It showed the knowledge gaps among the students in interpreting some characteristics of visual aesthetics. This knowledge gaps can be filled if the students are more exposed to art fundamentals.

However, the differences of perceptions between male and female students of UiTM, which in the field of art and design cannot be considered as a knowledge gap but certainly related to their attitudes toward visual aesthetics studies. With reference to Rugayah Hashim & Wan Narita Mustapha's (2004) study related to the attitudes of UiTM students toward learning and working about computers revealed females have more positive attitudes than males. This proves why female students are so meticulous in determining the characteristics of visual elements in game graphic design compared to male students.

#### **6.4 The knowledge of game graphic design related to visual aesthetics**

The knowledge of game graphic design related to visual aesthetics involves the understanding of aesthetics value, the design comprehension and principles. In questionnaire survey revealed the students across four universities recognized 54 propositions related to the knowledge of game graphic design, despite the significance





differences between genders and programmes (see section 5.8, 5.9 and 5.10). In other words, the majority of the students acknowledged the significant roles of visual aesthetics in games and how to realize it through game graphic design. However, the differences of perceptions among UTM students and the differences of attitudes among UiTM students contribute to the significance differences which worth to be discussed in the next section.

## 6.5 The differences of perceptions and attitudes of the students

The differences of perceptions between male and female students of UTM in determining the knowledge of game graphic design related to visual aesthetics is inextricably linked to their understanding in art fundamentals. This may be due by the fact that the students of UTM are not exposed to graphic design knowledge in art and design field which required them to recognize the philosophies between art and aesthetic, hence the knowledge on design elements and principles. Therefore, the curriculum balanced is needed to strengthen art and design knowledge especially for students in the field of computer science. According to Eber (2000), the cross-disciplinary setting that complement art and design in computer science learning is crucial since industry leading towards the interdisciplinary of art and science groups.

Throughout the mapping process of the programme structures involving UiTM, UMP, UTM and UMS (see Appendix IX) indicated the subjects that related to the knowledge of visual aesthetics obviously dominated by UiTM. For that reason, the subjects of art theory, criticism and history should be included in the curriculum of





computer science programme as reflected to Eber's (2000) suggestion which help the students to understand the aesthetic value, hence appraise it and lead them to effective design process.

In term of handling the differences of attitudes among UiTM students, the teaching and learning graphic design must required more participation of male students through collaborative learning. The collaborative learning is an educational approach which requires the students to work together in groups or pairs and exchanging their knowledge for better understanding in order to find meanings, solutions and product creation (Smith & MacGregor, 1992). Without negating the current teaching and learning graphic design is indeed practising collaborative learning but the improvement of the approach is needed to strengthen the students' knowledge especially for males. In this sense, the proper study toward collaborative learning should be conducted for graphic design programme in UiTM to resolve the knowledge gaps between male and female students.

## 6.6 Summary

This chapter presented the answer to the research questions - the characteristics of visual aesthetics and the guiding principles for designing the successful visceral level of emotional design through the game graphics. The concept of player-centric emotional design has been introduced as a main contribution of this thesis to the field of game design. The issues related to visual aesthetics studies in game graphic design were discussed, where several solutions have been proposed to the issues. Therefore,





the proposed solutions might be beneficial for the people in the design industry as well as the people in design education.



## CHAPTER 7

### CONCLUSION



#### 7.0 Introduction

The aim of this study has been set to resolve the issue related to the low success rate of digital games. The concept of player-centric emotional design has been introduced to cater the issue through the empirical exploration of visual aesthetics. Therefore, this chapter will present the synopsis of this research including the findings which contribute to the successful digital game design. In addition, this chapter provides several issues, suggestions and recommendations, and also discusses the limits of the research and directions for future studies.





## 7.1 The issue on success rate of digital games

As mentioned in Section 1.2, the success rate of digital games is as low as 20%. However, the success rate of digital games is always referred to the game revenue. According to McDonald (2017), the success rate of digital games in 2017 is expected to increase of 7.8% (\$7.8 billion) which is more than year 2016. The trend of consumers playing games on smart phones and tablets contributed to the success rate of digital games. In this sense, the success rate of digital games is still depending on the fundamental factors related to consumers' natural preference at visceral level (Norman, 2004) that is aligned to the advancement of computing technology. This justifies why this research is still relevant for game practitioners who want to design appropriate player-centric games and emphasize on the importance elements and



characteristics of visual aesthetics.

## 7.2 A critical overview of the research

This thesis is intended to see the potential of player-centric emotional design concept in the context of game design through the empirical exploration of visual aesthetics specifically on visceral level. The focus of the research is to identify the attributes and characteristics of visual aesthetics and to establish a set of guiding principles of visceral level player-centric emotional design which corresponded to game graphic design. The research was started by exploring the roles of visual aesthetics through the eyes of 5 game practitioners who have enormous experience in game industry. The findings of exploratory study have led to the expansion of 79 propositions (see





Chapter 5), in which need to be confirmed by the graphic design students from four universities.

The research revealed 78 propositions were confirmed by the students and turn into a list of characteristics of visual aesthetics and guiding principles of visceral level player-centric emotional design for digital games (see Chapter 5). In addition, the research also revealed that there were statistical significant differences between genders and programmes across four universities. This discovery compelled more discussions about the reasons behind these findings. The research is presented in chronological order which followed the exploratory sequential design of mixed methods (Creswell, 2014). This definitely shows the credibility of this study through the rigor of the research procedure that reflects the trustworthiness and validity of the findings. Although this research has reached the sensible findings, there were at least five issues that need to be addressed for reflections and become the prospects for further study.

### **7.3 Guiding principles as significant contribution of this research**

The focus of this study is to identify the understanding of participants toward visual aesthetics in the notion of player-centric emotional design. Two groups of participants were identified; the game practitioners and the graphic design students. It is worth to discuss the research participants which implicate the findings of this research.





### 7.3.1 The game practitioners

According to Cambridge University Online (2016), practitioners are defined as 'someone involved in a skilled job or activity'. In the context of digital games, the game practitioners are considered as professionals who involved in the game design activity. In this research, the five prominent game practitioners were selected as participants. The participants were from various backgrounds such as game artists, technical art trainer and game writer. In other words, the participants have the ability to describe their understanding toward the design of visual aesthetics, hence contributing to more ideas according to their life experiences in game design process. Nonetheless, there were three issues that arise through the exploratory study with game practitioners, which include:



- The knowledge gaps concerning the characteristics of visual aesthetics.
- The differences of perceptions toward the implementation of player-centric design for digital games.
- The diverse views in regard to the approach of player-centric design for digital games.

The above issues could be resolved if the game practitioners were more open to recognize the academic researchers. Undeniably, the actual practice in game design process is different, but the views of academicians would help the game practitioners to produce the quality digital games. According to Van De Ven & Johnson (2006),





they assumed that the knowledge in actual practise should be at least reflects from the research knowledge. In this sense, there must be the practise of knowledge exchange to fill the gaps between academics and practitioners especially in the field of game design.

### 7.3.2 The graphic design students

Initially, the involvement of graphic design students in this study is to confirm or refute the findings gathered from game practitioners. The confirmation from graphic design students are required since they are obviously involved in the learning visual design process and may not bias in giving their feedbacks. This is to ensure the sensible research findings. Therefore, the Malaysian public universities students who are enrolling bachelor degree related to graphic design programme were chosen as respondents. According to the information provided by Ministry of Education, Malaysia (2014), the bachelor degree in graphic design programme comprised of two field of studies:

- Art and Humanities or Art and Design programme (UiTM).
- Science, Mathematics and Computing or Computer Science programme (UTM, UMP and UMS).





This means that the students from both fields of studies should have similar knowledge and skills in graphic design. However, the statistical findings showed that there were at least two issues that have arisen, such as:

- The knowledge gaps between male and female students of computer science programmes in understanding the characteristics and design of visual aesthetics.
- The differences of attitudes between male and female students of art and design programme toward the characteristics and design of visual aesthetics.

Therefore, the insertion of art fundamentals subjects in the curriculum of computer science programme and the enhancement of collaborative learning for art and design programme particularly in graphic design were suggested. These suggestions are predominantly to strengthen the students' knowledge in visual aesthetics which led to the effectiveness of designing graphics for digital games.

#### **7.4 The theoretical contribution for digital game design**

According to Corley and Gioia (2011), 'theory is a statement of concepts and their interrelationships that shows how and/or why a phenomenon occurs'. In this sense, they have defined theoretical contribution as how we signify a significant theoretical advancement through our understanding of a phenomenon which could benefits to people on specific field. Therefore, in the context of digital game design, this study offers one theoretical contribution; The Shahrel player-centric design model of visual





aesthetics in digital games. This theoretical contribution will be discussed further in the next section.

#### 7.4.1 The Shahrel player-centric design model

As described in section 2.7, this study is meant to introduce the player-centric design model that emphasize on players' emotion. The model was structured through the integration of Norman's three level of emotional design with Blooms' three domains of learning. However, this study is only focus on a visceral level of emotional design since it is connected to affective domain and proficient to evoke players' immediate emotional response which recognized as visceral response. Visceral response is one of important aspect in games that enhances players' enjoyable experience (Koster, 2005).

This would increases the chances of digital games to be played and purchased by the players. The study on visceral level embarks a broader view of aesthetics design. Therefore, the empirical exploration of visual aesthetics is essential to discover the right attributes and characteristics that trigger players' visceral response while in game playing events.

This player-centric design model will encounter the problem in fulfilling players' desires toward digital games. It could be applied to all stages in the game design process as recommended by Sykes and Federoff (2006). In fact, this player-centric model will be more effective if it is applied in the pre-production stage, where the prototype or a mock-up of digital games can be designed and players can be taken







to give visual feedback whether their immediate emotional response is triggered or not. Therefore, it will save game production time and cost.

Moreover, this player-centric model could be adapted in player modelling process (Charles et al., 2005, Bakkes, Tan, & Pisan, 2007), in which the grouping and labelling players not only referred to their game playing experience but also covered their emotional experience. In particular, the game developer will collect the information not only limited to players' demographics, gender and playing styles but also their emotional response toward visual in games. This definitely helps the game developer to fine-tune the design of gameplay that meets the players' desires. In other words, this additional player-centric design model is practical and it can be adapted in any player-centric design approach.



#### **7.4.2 The influence of visual aesthetics in digital games**

Throughout the exploratory study with the game practitioners, all of them gave a positive outlook on visual aesthetics. Besides appealing to players' sight, they regarded visual aesthetics could influence players' acceptance towards digital games, players' efficiency in game playing and leading the players to perceive the playability of digital games.

In term of players' acceptance towards digital games is merely related to human aesthetics preferences in the visual domain, which involved the preferences for specific visual elements and design principles (Palmer et al., 2013). For that reason,





the study in this thesis is practical to ensure the design of game graphic is coincides with players' desires.

Other than that, visual aesthetics could influences players' efficiency from the perspective of an appealing game graphic may engrosses positive reaction of players and directly improves their performance in game playing. In the study of the beneficial effects of visual aesthetics, Moshagen, Musch and Göritz (2009) regarded visual aesthetics has positive effect to our task performance under certain conditions. In other words, visual aesthetics could enhance players' efficiency while in game playing events. Besides, visual aesthetics could lead the players to perceive games are playable, in which corresponds to the playability of digital games. Indeed, playability of games could makes players to achieve goals while having a fun time which functioning more than usability context (González Sanchez, Padilla Zea, & Gutiérrez, 2009).

Moreover, game practitioners regarded visual aesthetics in games involved the art direction or art styles of graphical user interface (GUI) and game characters which would implicate the game concept and the gameplay of games. In fact, one of game practitioner suggested the design of game visuals must be referred to animation movie as design inspiration. This definitely required the knowledge and skill as well as experience in graphic design. Evidently, the views of game practitioners have been regarded by graphic design students in the confirmatory study that show the importance of visual aesthetics in digital game design.





## 7.5 The practical contribution for digital game design

The theoretical contribution has directed the practical contribution of this study. The findings show that this study would help graphic designers to design appropriate graphics for digital games through specific characteristics of visual aesthetics and the guiding principles of visceral level player-centric emotional design. These two aspects of practical contribution will be further discussed in the next section.

### 7.5.1 The attributes and characteristics of visual aesthetics for digital games

The attributes and characteristics of visual aesthetics involved the manipulation of visual elements with certain design principles as guidelines (Pentak & Lauer, 2012).

Therefore, throughout the exploratory and confirmatory studies, six visual elements (line, shape, form, space, texture, and colour) with specific design principles were identified explicitly for games. Table 7.1 shows the visual elements and design principles which recognized as the attributes and characteristics of visual aesthetics for digital games.



Table 7.1

*The attributes and characteristics of visual aesthetics for digital games*

	Attributes	Characteristics
1.	Lines used in game design should...	1. ...emphasize on <b>thin line</b> to evoke players' <b>positive</b> emotion
		2. ...emphasize on <b>directional lines</b> to lead players' eyes.
2.	Shapes used in game design should...	3. ...emphasize on <b>round edges</b> to evoke players' <b>positive</b> emotion.
		4. ...emphasize on <b>sharp edges</b> to evoke players' <b>negative</b> emotion.
		5. ...underline <b>the proportion</b> to distinct <b>the game characters</b> for players' recognition.
3.	Forms used in game design should...	6. ...impose the <b>3 dimensional</b> for <b>impression of volume</b> .
		7. ...impose the <b>3 dimensional</b> for <b>impression of weight</b> .
		8. ...impose the <b>3 dimensional</b> for <b>impression of density</b> .
4.	Spaces used in game design should...	9. ...impose the <b>linear perspective</b> for players' <b>depth perception</b> .
		10. ...impose the <b>overlapping shapes</b> for players' <b>depth perception</b> .
		11. ...impose the <b>size gradient</b> for players' <b>depth perception</b> .
		12. ...impose the <b>texture gradient</b> for players' <b>depth perception</b> .
5.	Textures used in game design should...	13. ...emphasize on <b>repetition of lines</b> to evoke players' <b>sense of touch</b> .
		14. ...emphasize on <b>repetition of shapes</b> to evoke players' <b>sense of touch</b> .
		15. ...emphasize on <b>rhythm of lines</b> to evoke players' <b>sense of touch</b> .
		16. ...emphasize on <b>rhythm of shapes</b> to evoke players' <b>sense of touch</b> .

(Continue)

Table 7.1 (Continued)

	Attributes	Characteristics
6.	Colours used in game design should...	17. ...emphasize on <b>cool colour</b> to evoke players' <b>positive emotion</b> . 18. ...emphasize on <b>warm colour</b> to evoke players' <b>negative emotion</b> . 19. ...emphasize on <b>cool colour</b> for <b>background</b> of game environment. 20. ...emphasize on <b>warm colour</b> for <b>foreground</b> of game environment. 21. ...balance in <b>colour intensity</b> to <b>ease</b> players' eyes. 22. ...grade <b>the colour properties</b> for players' <b>emotional effects</b> . 23. ...impose <b>the colour harmony</b> for <b>uniformity</b> of game themes. 24. ...should employ the <b>symbolic colour meanings</b> for players' <b>interpretation</b> .

### 7.5.2 The guiding principles of visceral level player-centric emotional design for digital games

Three important aspects of game graphic design were identified through the exploratory and confirmatory studies which can be used as the guiding principles of visceral level player-centric emotional design. Such three aspects involved the knowledge of aesthetics values in game graphic design, the comprehension of game graphic design, and the principles of game graphic design. Table 7.2 shows a list of guiding principles of visceral level player-centric emotional design for digital games.

Table 7.2

*The guiding principles of visceral level player-centric emotional design for digital games*

A. Aesthetic value
<p><b>1. Graphic designers should know the influences of aesthetics in game graphic design.</b></p> <ul style="list-style-type: none"> <li>• Aesthetics influences players' emotional experience.</li> <li>• Aesthetics influences players' first impression for playing the games.</li> <li>• Aesthetics influences players' efficiency while in game playing events.</li> </ul>
<p><b>2. Graphic designers should know elicitation of aesthetics in game graphic design.</b></p> <ul style="list-style-type: none"> <li>• Aesthetics elicits players' immediate visceral reaction while being in game playing events.</li> <li>• Aesthetics elicits players' beauty experience from sight sense.</li> </ul>
<p><b>3. Graphic designers should know intention of aesthetics in game graphic design.</b></p> <ul style="list-style-type: none"> <li>• Aesthetics in games intended to appeal players' sight sense.</li> </ul>
<p><b>4. Graphic designers should know the needs and requirements of aesthetics in game graphic design.</b></p> <ul style="list-style-type: none"> <li>• Aesthetics in games needs players' feedbacks.</li> <li>• Aesthetics in games would accomplish players' preference in game playing events.</li> <li>• Aesthetics in games would help players to make decision.</li> <li>• Aesthetics in games would help players' to ensure the functionality of game technologies.</li> <li>• Aesthetics represents games as cultural form besides technological form.</li> <li>• Aesthetics is related to flow experience of motivation.</li> <li>• Aesthetics is related to the study of beauty which need evaluation process.</li> <li>• Aesthetics is related to human preferences.</li> </ul>

(Continue)



Table 7.2 (Continued)

A. Aesthetic value
<p><b>5. Graphic designers should know the functions and roles of aesthetics in game graphic design.</b></p> <ul style="list-style-type: none"> <li>• Aesthetics as a branch of philosophy that concerned about beauty.</li> <li>• Aesthetics plays an important role in the advancement of game technologies.</li> <li>• Aesthetics requires human learning experience.</li> <li>• Aesthetics enhances players' engagement.</li> </ul>
B. Design skills
<p><b>1. Graphic designers should comprehend the design of visual elements within visual representation of games.</b></p> <ul style="list-style-type: none"> <li>• The visual elements as cue to evoke players' immediate emotional response.</li> <li>• The visual elements that captivate players' sight.</li> <li>• The visual elements that represent consistency to players' sight.</li> <li>• The visual elements that represent synchronization to players' sight.</li> <li>• The organization of visual elements to evoke players' immediate emotional response.</li> <li>• The characterization of visual elements to evoke players' immediate emotional response.</li> </ul>
<p><b>2. Graphic designers should comprehend the design for game target audience within visual representation of games.</b></p> <ul style="list-style-type: none"> <li>• The game concept for specific target audience.</li> <li>• The design creativity for specific target audience.</li> <li>• The design styles for specific target audience.</li> </ul>
<p><b>3. Graphic designers should comprehend the design of user interface within the visual representation of games.</b></p> <ul style="list-style-type: none"> <li>• The design of graphical user interface that easy to use.</li> <li>• The design of game characters that easy to recognize.</li> <li>• The design of game environment that immerse the players.</li> </ul>

(Continue)



Table 7.2 (Continued)

B. Design skills
<p><b>4. Graphic designers should comprehend the design of visual representation that comply and support the digital game technology.</b></p> <ul style="list-style-type: none"> <li>• The design of visual representation that complies with digital game system.</li> <li>• The design of visual representation that supports the digital game hardware.</li> <li>• The design of visual representation that supports the virtual reality game system.</li> </ul>
<p><b>5. Graphic designers should comprehend the design of visual representation for game evaluation process.</b></p> <ul style="list-style-type: none"> <li>• The design of visual representation for the game testing.</li> <li>• To revise the design of visual representation after the game testing.</li> <li>• To come out with the new design of visual representation after the game testing.</li> </ul>
C. Design knowledge
<p><b>1. Graphic designers should recognize the principles of players' immediate emotional response.</b></p> <ul style="list-style-type: none"> <li>• Gestalt principles to evoke players' immediate emotional response.</li> <li>• Visual metaphor to evoke players' immediate emotional response.</li> <li>• Emotional scenes in movies as design inspiration.</li> </ul>
<p><b>2. Graphic designers should recognize the principles of specific target audience.</b></p> <ul style="list-style-type: none"> <li>• Demographic profile of specific target audience.</li> <li>• Design expectation of specific target audience.</li> <li>• Characteristics of visual elements for specific target audience.</li> </ul>
<p><b>3. Graphic designers should recognize the principles of game user interface.</b></p> <ul style="list-style-type: none"> <li>• Graphical user interface is visually appealing.</li> <li>• Character design is visually appealing.</li> <li>• Game environment is visually appealing.</li> </ul>

(Continue)



Table 7.2 (Continued)

C. Design knowledge
<p><b>4. Graphic designers should recognize the principles of visual languages.</b></p> <ul style="list-style-type: none"> <li>• Visual literacy which support players' learnability.</li> <li>• Visual communication which support players' interpretation.</li> <li>• Visual perception that lead players to act accordingly while playing games.</li> </ul>
<p><b>5. Graphic designers should recognize the principles of digital game system.</b></p> <ul style="list-style-type: none"> <li>• Compatible with digital game system.</li> <li>• Functioning within virtual reality games.</li> <li>• Incorporate with game technologies to excite players.</li> </ul>
<p><b>6. Graphic designers should recognize the principles of game evaluation process.</b></p> <ul style="list-style-type: none"> <li>• Design evaluation process is an iterative process.</li> <li>• Design evaluation process is meant to ensure the usability of players which is reflected from visual aesthetics.</li> <li>• Design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics.</li> </ul>

### 7.6 Limitation of the thesis

Such as digital game technology has developed in leaps and bounds, the development of game graphics yield different practises in game design process. Therefore, the findings in this doctoral research might not reflect the current phenomenon in game design. However, although the digital game technology is changing rapidly, but the fundamental aspect of art in games is still remained essential (Crawford, 1984).



Consequently, the findings in this research are relevant to face the game technology changes. In actual fact, graphic design is considered as an important key component in game design (Shannon, 1992), in which allowing the players to be immersed completely while in game playing events.

Nevertheless, the process of collecting and analyzing the data come from the individual studies which lead to conclusive propositions. Therefore, the best conclusions have been made. Although the conceptual player-centric design model was deliberately developed to solve the methodological problems of the research design, this thesis is still limited to provide the best practises in designing graphics for games but could provide opportunities and directions for future studies.



## **7.7 Narrow research scope, area and moderate sample**

Regardless of this research involved more than 150 participants in two phases, the research scope only focus on the visual aesthetics formed in the context of game design. Besides, the research area was limited in Malaysia. The samples were moderate; especially in the exploratory study when only five game practitioners were participated. In addition, the questionnaire survey used the nonparametric statistical techniques which related to optimum choice in the quantitative data analysis. Although the research methods seemed vigorous to face the constraint from the available resources, but the bigger sample size and the additional rigorous parametric statistics would enhance the validity and reliability of the findings. Thus, the





replication of questionnaire survey for further studies would help the future researchers to compare and contrast the results with the findings of this research.

## 7.8 Summary

This last chapter depicts the summarization of the thesis through the critical overview. The concluding propositions gathered throughout the doctoral journey are listed and grouped under two types of contributions; theoretical contribution consists of the additional player-centric design model and the influence of visual aesthetics for games; and practical contribution consists of the characteristics of visual aesthetics and the guiding principles of visceral level player-centric emotional design for digital games. The thesis ends with some limitations and suggestions for direction of future studies.





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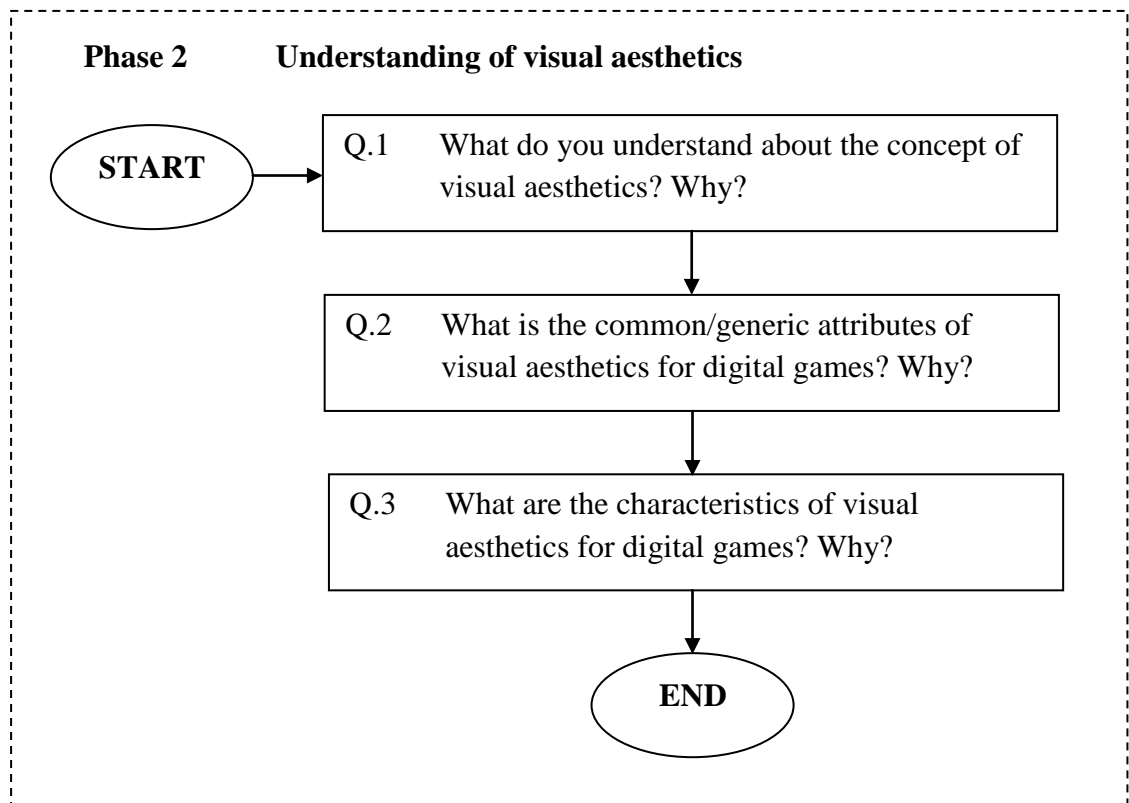
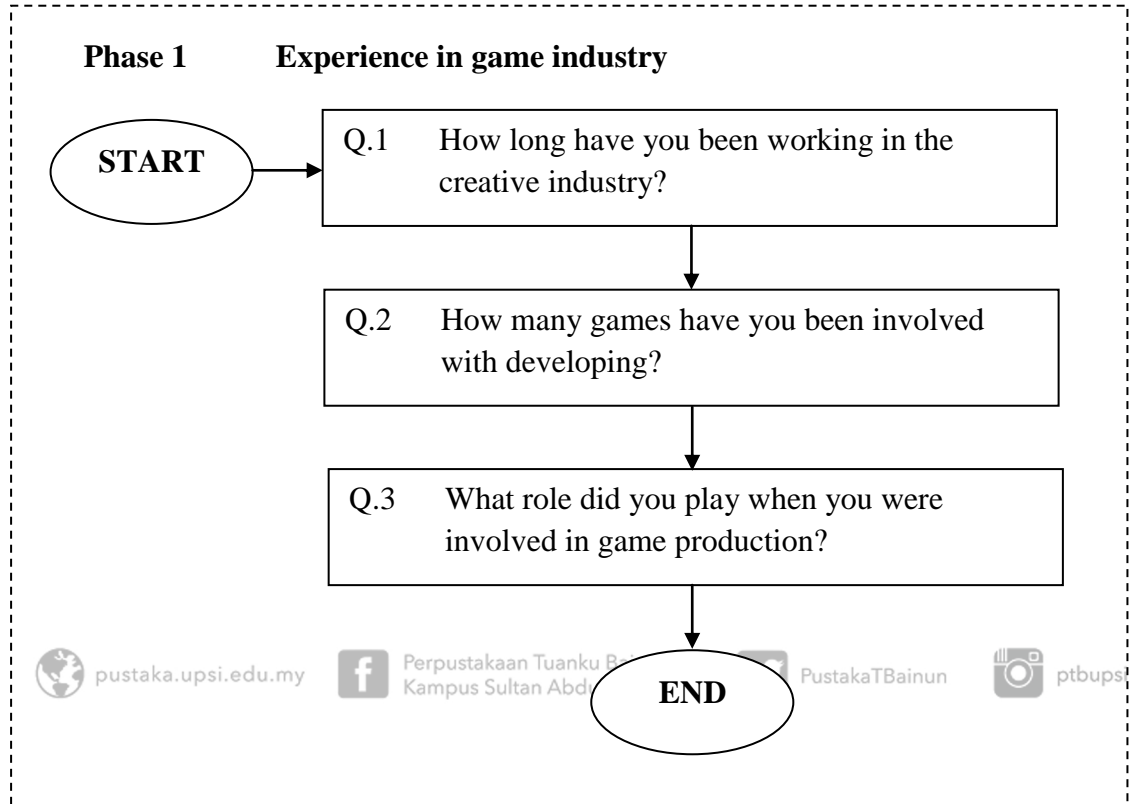
Zyda, M. (2005). From visual simulation to virtual reality to games. *Computer*, 38(9), 25–32.

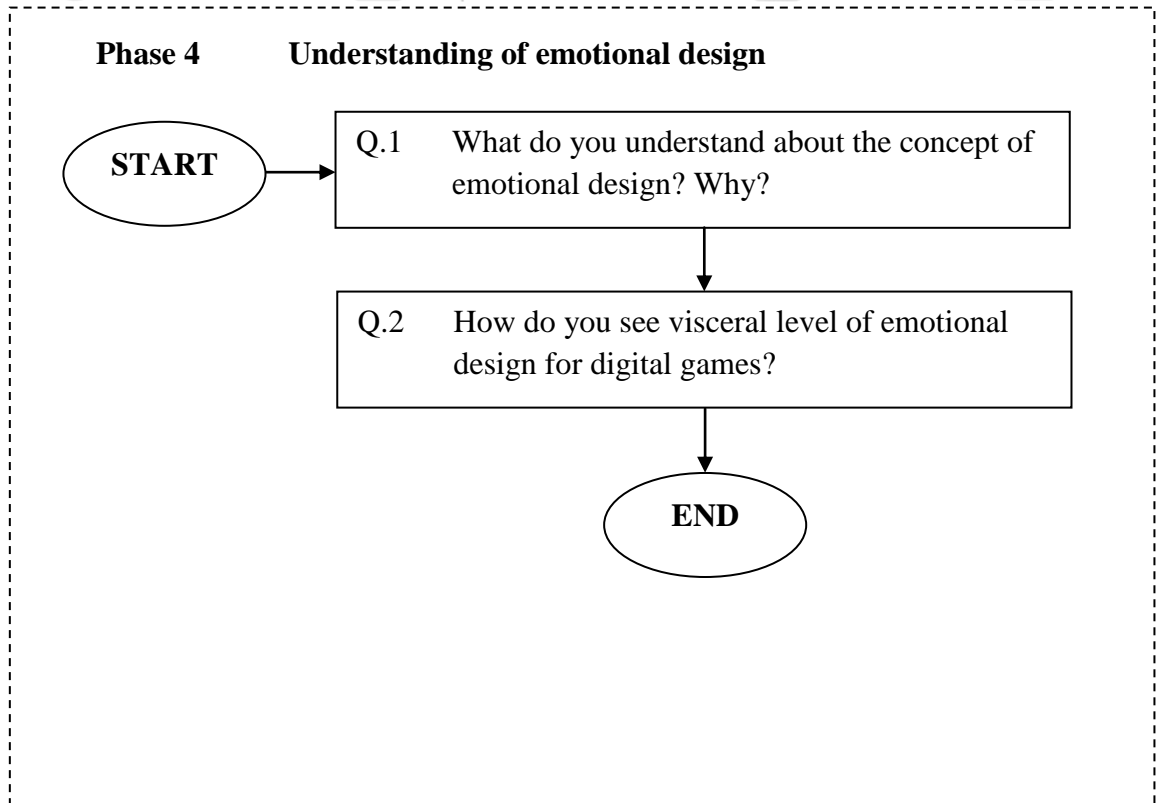
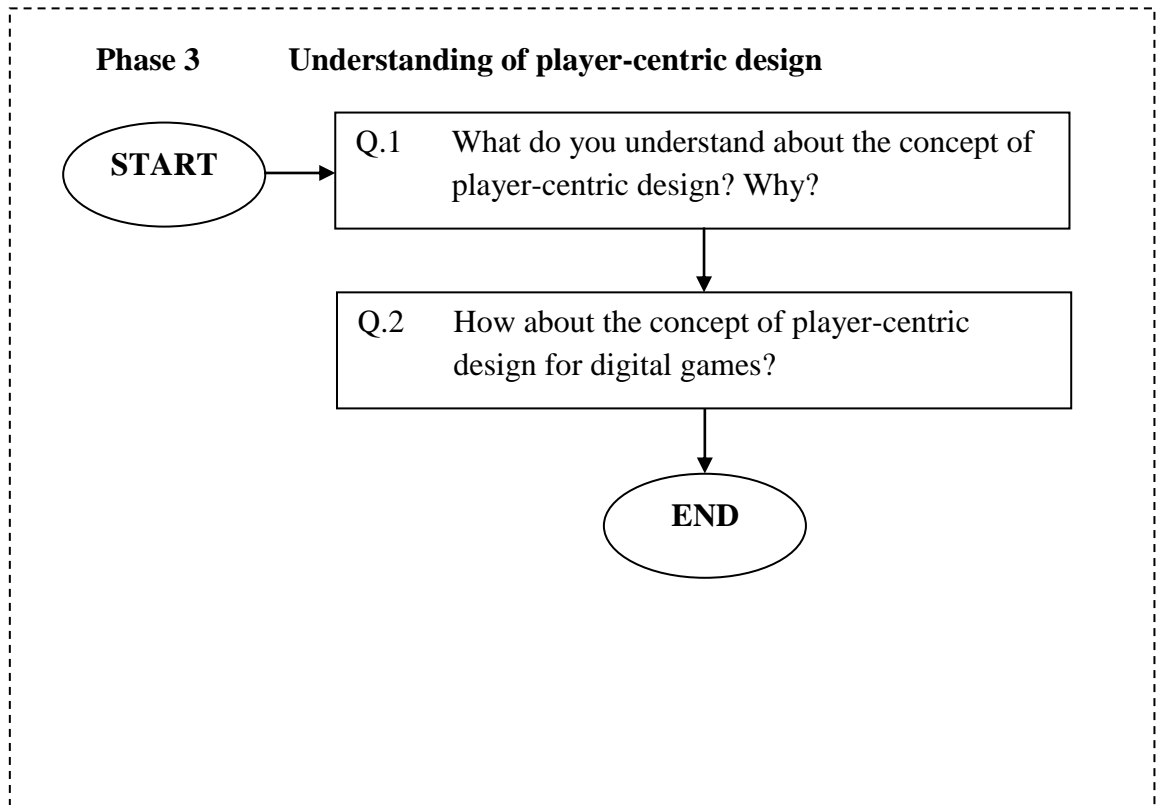




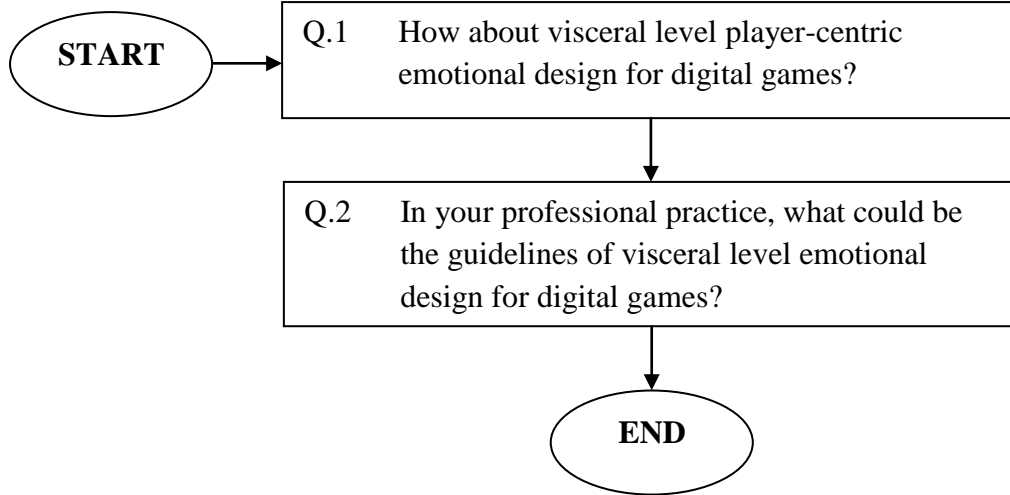
## APPENDICES

### A. Interview protocol and flow chart





**Phase 5      Understanding of visceral level player-centric emotional**





## B. Information sheet

**Project Title:** Player-Centric Emotional Design for Digital Games: An Empirical Exploration in Visual Aesthetics

**Date:** \_\_/\_\_/20\_\_



You are invited to take part in a research study which is being conducted as part of a PhD degree at the Institut Pengajian Siswazah, Universiti Pendidikan Sultan Idris. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please feel free to contact us if you would like more information or you have any concern regarding this research. Take time to decide whether or not you wish to take part.

### What is the purpose of this study?

This study aims to identify attributes and characteristics of visual aesthetics and to establish a set of guiding principles of player-centric emotional design at visceral level for digital games.



### Why is the study being done?

This study will be beneficial to the digital game design field by resolving the issue encountered by game practitioners in the creative industry. The concept of player-centric emotional design approach would be introduced in game design process, in which the concepts will be expanded to form a set of guiding principles for game practitioners in order to use the approach. This could support the practitioners in identifying appropriate visual aesthetics in games that could stimulate players' immediate emotional response in game playing events. Consequently, the stimulation will enhance the chances of commercial success among digital games.

### Why have I been invited to participate?

You have been invited to take part in this study because this study intends to collect your views as a game practitioner in either education or the game industry.

### Do I have to take part?

It is up to you to decide whether or not to take part. If you decide to take part, you have to sign a consent form for this study. You will be free to withdraw at any time and without giving a reason. This decision will not affect you or your rights in any way.



**What do I have to do?**

You will be asked to sign a consent form and take part in an interview. The interview questions are attached together with this document. The questions are semi-structured in nature and there will be no right or wrong answers. The interview session would take about 30 to 45 minutes.

**What are the possible benefits of taking part?**

There are no direct benefits to you from taking part in this study. We are hoping that the data collected will produce information about and contribute to the design and development of game-based learning. However, you would be exposed to key concepts and terms associated with digital game design and used in academia. Such indirect benefits could be life-long.

**What are the possible disadvantages of taking part?**

The interview will take some of your time. Every effort has been made to keep any inconvenience to a minimum.

**Will my taking part in the study be kept confidential?**

The use of any information that identifies you during the course of the research will be kept strictly confidential. This information will be kept in a secure place and only people involved in the study or authorised individuals will have access to it.

**What happens when the research stops?**

The data obtained will be used for internal publication for a PhD Project and submitted for assessment with a view to being published in academic journals/conferences. We can also send participants a summary of the study results on request.

**Contact details**

If you would like any further information please contact:

Shahrel Nizar Bin Baharom  
Institut Pengajian Siswazah  
Universiti Pendidikan Sultan Idris  
Tanjung Malim, Perak Darul Ridzuan  
Tel: 019-2536405  
Email: [shahrelnizar@gmail.com](mailto:shahrelnizar@gmail.com)  
Web: [www.upsi.edu.my](http://www.upsi.edu.my)

Thank you for taking the time to read this information.



### C. Consent form

**Project Title:** Player-Centric Emotional Design for Digital Games: An Empirical Exploration in Visual Aesthetics



**Name of Researcher:** Shahrel Nizar b. Baharom

**I confirm that I have read and understood the information sheet dated \_\_/\_\_/20\_\_ for the above project which I may keep for my records and have had the opportunity to ask any questions I may have.**

I agree to take part in the above study and I am willing to have my involvement in the interview recorded.

I understand that my information will be held and processed for the following purposes:

- To be used anonymously for internal publication for a PhD project and submitted for assessment with a view to being published in academic journals /conferences.

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason without being penalised or disadvantaged in any way.

_____	_____	_____
Name of Participant	Date	Signature

_____	_____	_____
Researcher	Date	Signature

Institut Pengajian Siswazah  
Universiti Pendidikan Sultan Idris  
Tel: 019-2536405  
Email: [shahrelnizar@gmail.com](mailto:shahrelnizar@gmail.com)  
Web: [www.upsi.edu.my](http://www.upsi.edu.my)



## D. Cover Letter



**Title:** Player-centric emotional design for digital games: An empirical exploration in visual aesthetics

Dear Respondent,

I am writing to request your participation in my research project to survey the prospective of player-centric emotional design for digital games through an empirical exploration in visual aesthetics. The aims of this study are twofold: to find out whether graphic design students (bachelor degree) would agree or not with the attributes and characteristics of visual aesthetics for digital games; and to gather graphic design students' opinion toward the implementation of visceral design for visual elements in games.

This project is being conducted as part of my PhD degree at the University Pendidikan Sultan Idris. I have attached a survey which I hope you will fill out and return it to me. It should take you about fifteen to twenty minutes to complete. The findings of this study will be used to propose suggestions or guidelines for visceral level player-centric emotional design for digital games.

If you choose to participate in my survey, please fill in your answers and send the survey back to me using the stamped addressed envelope. The questionnaire is anonymous and I am committed to respecting your privacy. I will make sure that your answers cannot be linked to you personally when I write the report or publish the results in academic journals/conferences.

There are no risks to you or to your privacy if you decide to join my study by filling out this survey. But if you choose not to participate that is fine. Whether or not you decide to respond, I would be very happy to share my results with you if you are interested. To get a copy of my results, please email me at [shahrelnizar@gmail.com.my](mailto:shahrelnizar@gmail.com.my)

If you have any questions about the survey, or about taking part, please email me or phone me at 019 2536405. Thank you in advance for your help and contribution to this study.

Sincerely,  
Shahrel Nizar Baharom  
PhD Candidate  
Universiti Pendidikan Sultan Idris  
Tel: 019 2536405  
Website: [www.upsi.edu.my](http://www.upsi.edu.my)



### E. Questionnaire

#### PART A: About You.

Please tick the appropriate box in response to each question.

1. Date of Birth: \_\_\_\_\_

2. Nationality:  Malaysian  Non-Malaysian

3. Gender:  Male  Female

4. Ethnicity:  Malay  Iban  Kadazan/Dusun  
 Chinese  Indian  Other (Please specify: \_\_\_\_\_)

5. Programme:  Bachelor of Graphic Design (Honours)  
 Bachelor of Computer Science (Graphics & Multimedia Software)  
 Bachelor of Science with Honours (Mathematics with Computer Graphics)  
 Bachelor of Computer Science (Graphics & Multimedia Technology) with Honours

#### PART B: Characteristics of visual elements.

1. Please indicate whether you agree or disagree with following **characteristics of line** used in game design.

Line used in game design...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. ...emphasizes on <b>thin</b> line to evoke players' <b>positive</b> emotion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...emphasizes on <b>sharp</b> line to evoke players' <b>negative</b> emotion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...emphasizes on <b>directional lines</b> to lead players' <b>eyes</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Please indicate whether you agree or disagree with following **characteristics of shape** used in game design.

Shape used in game design...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. ...emphasizes on <b>round</b> edges to evoke players' <b>positive</b> emotion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...emphasizes on <b>sharp</b> edges to evoke players' <b>negative</b> emotion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...underlines the <b>proportion</b> to distinct the <b>game characters</b> for players' recognition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



3. Please indicate whether you agree or disagree with following **characteristics of form** used in game design.

Form used in game design...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. ...imposes the <b>3 dimensional</b> for impression of <b>volume</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...imposes the <b>3 dimensional</b> for impression of <b>weight</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...imposes the <b>3 dimensional</b> for impression of <b>density</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Please indicate whether you agree or disagree with following **characteristics of space** used in game design.

Space used in game design...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. ...imposes the <b>linear perspective</b> for players' depth perception.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...imposes the <b>overlapping shapes</b> for players' depth perception.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...imposes the <b>size gradient</b> for players' depth perception.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ...imposes the <b>texture gradient</b> for players' depth of perception.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Please indicate whether you agree or disagree with following **characteristics of texture** used in game design.

Texture used in game design emphasizes on...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. ...emphasizes on <b>repetition of lines</b> to evoke players' sense of touch.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...emphasizes on <b>repetition of shapes</b> to evoke players' sense of touch.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...emphasizes on <b>rhythm of lines</b> to evoke players' sense of touch.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ...emphasizes on <b>rhythm of shapes</b> to evoke players' sense of touch.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Please indicate whether you agree or disagree with following **characteristics of colour** used in game design.

Colour used in game design...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. ...emphasize on <b>cool colour</b> to evoke players' <b>positive</b> emotion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...emphasize on <b>warm colour</b> to evoke players' <b>negative</b> emotion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...emphasize on <b>cool colour</b> for <b>background</b> of game environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ...emphasize on <b>warm colour</b> for <b>foreground</b> of game environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. ...balances in <b>colour intensity</b> to <b>ease</b> players' eyes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. ...grades the <b>colour properties</b> for players' <b>emotional effects</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. ...imposes the <b>colour harmony</b> for <b>uniformity</b> of game	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

themes.	
h. ...employs the <b>symbolic colour</b> meanings for players' <b>interpretation</b> .	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

### PART C: Knowledge and skills of game graphic design.

Please indicate whether you agree or disagree with these perceptions.

#### 1. Aesthetic value

Graphic designers should know aesthetics...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. ...influences players' <b>emotional</b> experience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...influences players' <b>first impression</b> for playing the games.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ... influences players' <b>efficiency</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ...elicits immediate <b>visceral reaction</b> of players while being in game playing events.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. ...elicits <b>beauty experience</b> from sight sense.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. ...in games is intended to <b>appeal</b> players' sight sense.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. ...in games needs players' <b>feedback</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. ...would accomplish <b>players' preference</b> in game playing events.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. ...would help players to <b>make decision</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. ...would ensure the <b>functionality</b> of game technologies.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. ...would represent games as <b>cultural form</b> besides technological form.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. ...is related to flow experience of <b>motivation</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. ...is related to the study of beauty which need <b>evaluation process</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. ...is related to <b>human preferences</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. ...as a branch of philosophy that concerned about <b>beauty</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. ...plays an <b>important role</b> in the advancement of game technologies.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
q. ...requires human <b>learning experience</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
r. ...enhances players' <b>engagement</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### 2. Design skills

Graphic designers should comprehend...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. ...the visual elements as <b>cues</b> to evoke immediate emotional response of players within visual representation of games.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...the visual elements that <b>captivate</b> players' sight.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...the visual elements that represent <b>consistency</b> to players' sight.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ... the visual elements that represent <b>synchronization</b> to players' sight.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. ...the <b>organization</b> of visual elements within visual representation of games to evoke immediate emotional response of players.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. ...the <b>characterization</b> of visual elements within visual representation of games to evoke immediate emotional response of players.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

g. ... the <b>game concept</b> for specific target audience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. ...the <b>design creativity</b> for specific target audience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. ...the <b>design styles</b> for specific target audience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. ...the design of <b>graphical user interface</b> that easy to <b>use</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. ...the design of <b>game characters</b> that easy to <b>recognize</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. ...the design of <b>game environment</b> that <b>immerse</b> the players.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. ...the design of visual representation that complies with <b>digital game system</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. ...the design of visual representation that supports the <b>digital game hardware</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. ...the design of visual representation that supports the <b>virtual reality game system</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. ...the design of visual representation for the <b>game testing</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
q. ...to <b>revise</b> the design of visual representation after the game testing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
r. ...to <b>come out</b> with the new design of visual representation after the game testing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 3. Design knowledge

Graphic designers should recognize...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. ... <b>gestalt principles</b> to evoke players' immediate emotional response.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ... <b>visual metaphor</b> to evoke players' immediate emotional response.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ... <b>emotional scenes</b> in movies as design inspiration.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ... <b>demographic profile</b> of specific target audience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. ... <b>design expectation</b> of specific target audience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. ... <b>characteristics</b> of visual elements for specific target audience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. ...design principles to make <b>graphical user interface</b> visually appealing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. ...design principles to make <b>character design</b> visually appealing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. ...design principles to make <b>game environment</b> visually appealing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. ...design principles of <b>visual literacy</b> which support players' <b>learnability</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. ...design principles of <b>visual communication</b> which support players' <b>interpretation</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. ...design principles of <b>visual perception</b> that lead players to <b>act</b> accordingly while playing games.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. ...design principles which are <b>compatible</b> the digital game system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. ...design principles that <b>function</b> within virtual reality games.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. ...design principles that <b>incorporate</b> with game technologies to excite players.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. ...that design evaluation process is an <b>iterative</b> process.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
q. ...that design evaluation process is meant to ensure the <b>usability</b> of players which is reflected from visual aesthetics.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
r. ...that design evaluation process is meant to ensure the presence of players' <b>positive emotion</b> which is reflected from visual aesthetics.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**F. One-sample Kolmogorov-Smirnov goodness-of-fit test**

**One-Sample Kolmogorov-Smirnov Test**

		Age	Nationality	Gender	Ethnicity	Program
N		164	164	164	164	164
Normal Parameters <sup>a</sup>	Mean	32.72	.01	5.46	1.25	1.09
	Std. Deviation	25.517	.078	21.252	7.936	1.255
	Most Extreme Differences	Absolute	.464	.525	.534	.437
	Positive	.464	.525	.534	.416	.319
	Negative	-.311	-.469	-.399	-.437	-.194
Kolmogorov-Smirnov Z		5.937	6.724	6.844	5.602	4.080
Asymp. Sig. (2-tailed)		.000	.000	.000	.000	.000

a. Test distribution is Normal.

**G. Mann-Whitney U tests**

**PART B: The perceptions of students toward characteristics of visual elements in game graphic design.**

**a) Lines used in game design should emphasize on sharp line to evoke players' negative emotion (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
emphasizes on sharp line to evoke players' negative emotion	20	2	5	3.35	.745
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * emphasizes on sharp line to evoke players' negative emotion	20	100.0%	0	.0%	20	100.0%

**Gender \* emphasizes on sharp line to evoke players' negative emotion Crosstabulation**

Count

		emphasizes on sharp line to evoke players' negative emotion				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	2	1	2	5
	FEMALE	1	11	3	0	15
Total		1	13	4	2	20

## Ranks

	Gender	N	Mean Rank	Sum of Ranks
emphasizes on sharp line to evoke players' negative emotion	MALE	5	14.30	71.50
	FEMALE	15	9.23	138.50
	Total	20		

Test Statistics<sup>b</sup>

	emphasizes on sharp line to evoke players' negative emotion
Mann-Whitney U	18.500
Wilcoxon W	138.500
Z	-1.957
Asymp. Sig. (2-tailed)	.050
Exact Sig. [2*(1-tailed Sig.)]	.098 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$   
time points

$$r = 1.957 / \sqrt{20} = 1.957 / 4.47 = 0.437 = \text{large effect.}$$

### Results of analysis from UTM students:

Mann-Whitney U tests revealed a statistical significant reduction in the perception of 'lines used in game design should emphasize on sharp line to evoke players' negative emotion' between male and female students of UTM,  $z = -1.957$ ,  $p = .050$  with a large effect size ( $r = 0.44$ ). The median score on the perception decreased from Agree ( $Md = \text{Agree}$ ) to Neutral ( $Md = \text{Neutral}$ ).

**b) Forms used in game design should impose the 3 dimensional for impression of density (UMP).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
imposes the 3 dimensional for impression of density	38	2	5	3.68	.739
Valid N (listwise)	38				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * imposes the 3 dimensional for impression of density	38	100.0%	0	.0%	38	100.0%

**Gender \* imposes the 3 dimensional for impression of density Crosstabulation**

Count		imposes the 3 dimensional for impression of density				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	0	2	2	4
	FEMALE	2	12	17	1	32
	99	0	0	1	1	2
Total		2	12	20	4	38

**imposes the 3 dimensional for impression of density**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid DISAGREE	2	5.3	5.3	5.3
NEUTRAL	12	31.6	31.6	36.8
AGREE	20	52.6	52.6	89.5
STRONGLY AGREE	4	10.5	10.5	100.0
Total	38	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
imposes the 3 dimensional for impression of density	MALE	4	29.50	118.00
	FEMALE	32	17.12	548.00
	Total	36		

**Test Statistics<sup>b</sup>**

	imposes the 3 dimensional for impression of density
Mann-Whitney U	20.000
Wilcoxon W	548.000
Z	-2.452
Asymp. Sig. (2-tailed)	.014
Exact Sig. [2*(1-tailed Sig.)]	.024 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$   
time points

$$r = 2.452 / \sqrt{38} = 2.452 / 6.16 = 0.398 = \text{large effect.}$$



**Results of analysis from UMP students:**

Mann-Whitney U tests revealed a significant difference in the perception of ‘forms used in game design should impose the 3 dimensional for impression of density’ between male and female students of UMP,  $z = -2.452$ ,  $p = .014$  with a large effect size ( $r = 0.40$ ).

**c) Textures used in game design should emphasize on rhythm of lines to evoke players’ sense of touch (UMS).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
emphasizes on rhythm of lines to evoke players' sense of touch	22	1	4	3.41	.734
Valid N (listwise)	22				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * emphasizes on rhythm of lines to evoke players' sense of touch	22	100.0%	0	.0%	22	100.0%

**Gender \* emphasizes on rhythm of lines to evoke players' sense of touch Crosstabulation**

Count

		emphasizes on rhythm of lines to evoke players' sense of touch			Total
		STRONGLY DISAGREE	NEUTRAL	AGREE	
Gender	MALE	0	0	4	4
	FEMALE	1	10	7	18
Total		1	10	11	22

**emphasizes on rhythm of lines to evoke players' sense of touch**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	4.5	4.5	4.5
	NEUTRAL	10	45.5	45.5	50.0
	AGREE	11	50.0	50.0	100.0
Total		22	100.0	100.0	

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
emphasizes on rhythm of lines to evoke players' sense of touch	MALE		4	17.00	68.00
	FEMALE		18	10.28	185.00
	Total		22		

Test Statistics<sup>b</sup>

	emphasizes on rhythm of lines to evoke players' sense of touch
Mann-Whitney U	14.000
Wilcoxon W	185.000
Z	-2.117
Asymp. Sig. (2-tailed)	.034
Exact Sig. [2*(1-tailed Sig.)]	.066 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 2.117 / \sqrt{22} = 2.117 / 4.69 = 0.451 = \text{large effect.}$$

### Results of analysis from UMS students:

Mann-Whitney U tests revealed a statistically significant reduction in the perception of 'Textures used in game design should emphasize on rhythm of lines to evoke players' sense of touch' between male and female students of UMS,  $z = -2.117$ ,  $p = .034$  with a large effect size ( $r = 0.45$ ). The median score on the perception decreased from Strongly Agree ( $Md = \text{Strongly Agree}$ ) to Neutral ( $Md = \text{Neutral}$ ).

**d) Colours used in game design should emphasize on cool colour to evoke players' positive emotion (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
emphasizes on cool colour to evoke players' positive emotion	84	1	5	4.15	.799
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * emphasizes on cool colour to evoke players' positive emotion	84	100.0%	0	.0%	84	100.0%

**Gender \* emphasizes on cool colour to evoke players' positive emotion Crosstabulation**

Count

		emphasizes on cool colour to evoke players' positive emotion					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	1	2	6	23	7	39
	FEMALE	0	0	2	18	19	39
	99	0	0	1	2	3	6
Total		1	2	9	43	29	84

**emphasizes on cool colour to evoke players' positive emotion**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid STRONGLY DISAGREE	1	1.2	1.2	1.2
DISAGREE	2	2.4	2.4	3.6
NEUTRAL	9	10.7	10.7	14.3
AGREE	43	51.2	51.2	65.5
STRONGLY AGREE	29	34.5	34.5	100.0
Total	84	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
emphasizes on cool colour to evoke players' positive emotion	MALE	39	31.94	1245.50
	FEMALE	39	47.06	1835.50
	Total	78		

**Test Statistics<sup>a</sup>**

	emphasizes on cool colour to evoke players' positive emotion
Mann-Whitney U	465.500
Wilcoxon W	1245.500
Z	-3.262
Asymp. Sig. (2-tailed)	.001

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 3.262 / \sqrt{84} = 3.262 / 9.17 = 0.355 = \text{large effect.}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a significant difference in the perception of ‘Colours used in game design should emphasize on cool colour to evoke players’ positive emotion’ between male and female students of UiTM, despite a tied median score (Md = Agree),  $z = -3.262, p = .001$  with a large effect size ( $r = 0.36$ ).

**e) Colours used in game design should emphasize on warm colour to evoke players’ negative emotion (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
emphasizes on warm colour to evoke players' negative emotion	84	1	5	3.79	.945
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * emphasizes on warm colour to evoke players' negative emotion	84	100.0%	0	.0%	84	100.0%

**Gender \* emphasizes on warm colour to evoke players' negative emotion Crosstabulation**

Count

		emphasizes on warm colour to evoke players' negative emotion					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	1	5	11	17	5	39
	FEMALE	0	1	9	15	14	39
	99	0	1	1	3	1	6
Total		1	7	21	35	20	84

**emphasizes on warm colour to evoke players' negative emotion**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	1.2	1.2	1.2
	DISAGREE	7	8.3	8.3	9.5
	NEUTRAL	21	25.0	25.0	34.5
	AGREE	35	41.7	41.7	76.2
	STRONGLY AGREE	20	23.8	23.8	100.0
Total		84	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
emphasizes on warm colour to evoke players' negative emotion	MALE	39	33.35	1300.50
	FEMALE	39	45.65	1780.50
	Total	78		

**Test Statistics<sup>a</sup>**

	emphasizes on warm colour to evoke players' negative emotion
Mann-Whitney U	520.500
Wilcoxon W	1300.500
Z	-2.529
Asymp. Sig. (2-tailed)	.011

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.529 / \sqrt{84} = 2.529 / 9.17 = 0.275 = \text{large effect.}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a significant difference in the perception of 'Colours used in game design should emphasize on warm colour to evoke players' negative emotion' between male and female students of UiTM, despite a tied median score (Md = Agree)  $z = -2.529, p = .011$  with a large effect size ( $r = 0.28$ ).

**f) Colours used in game design should emphasize on warm colour to evoke players' negative emotion (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
emphasizes on warm colour to evoke players' negative emotion	20	1	5	3.65	.988
Valid N (listwise)	20				



**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * emphasizes on warm colour to evoke players' negative emotion	20	100.0%	0	.0%	20	100.0%

**Gender \* emphasizes on warm colour to evoke players' negative emotion Crosstabulation**

Count

		emphasizes on warm colour to evoke players' negative emotion					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	0	0	3	2	5
	FEMALE	1	1	5	7	1	15
	Total	1	1	5	10	3	20

**emphasizes on warm colour to evoke players' negative emotion**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	5.0	5.0	5.0
	DISAGREE	1	5.0	5.0	10.0
	NEUTRAL	5	25.0	25.0	35.0
	AGREE	10	50.0	50.0	85.0
	STRONGLY AGREE	3	15.0	15.0	100.0
	Total	20	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
emphasizes on warm colour to evoke players' negative emotion	MALE	5	15.10	75.50
	FEMALE	15	8.97	134.50
	Total	20		

**Test Statistics<sup>b</sup>**

	emphasizes on warm colour to evoke players' negative emotion
Mann-Whitney U	14.500
Wilcoxon W	134.500
Z	-2.168
Asymp. Sig. (2-tailed)	.030
Exact Sig. [2*(1-tailed Sig.)]	.042 <sup>a</sup>

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2}$

time points

$$r = 2.168 / \sqrt{20} = 2.168 / 4.47 = 0.485 = \text{large effect.}$$

**Results of analysis from UTM students:**

Mann-Whitney U tests revealed a significant difference in the perception of ‘Colours used in game design should emphasize on warm colour to evoke players’ negative emotion’ between male and female students of UTM, despite a tied median score (Md = Agree),  $z = -2.168$ ,  $p = .030$  with a large effect size ( $r = 0.49$ ).

**g) Colours used in game design should balance in colour intensity to ease players' eyes (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
balances in colour intensity to ease players' eyes	20	2	5	3.90	.852
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * balances in colour intensity to ease players' eyes	20	100.0%	0	.0%	20	100.0%

**Gender \* balances in colour intensity to ease players' eyes Crosstabulation**

Count

		balances in colour intensity to ease players' eyes				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	0	2	3	5
	FEMALE	1	5	7	2	15
Total		1	5	9	5	20

**balances in colour intensity to ease players' eyes**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DISAGREE	1	5.0	5.0	5.0
	NEUTRAL	5	25.0	25.0	30.0
	AGREE	9	45.0	45.0	75.0
	STRONGLY AGREE	5	25.0	25.0	100.0
	Total	20	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
balances in colour intensity to ease players' eyes	MALE	5	15.20	76.00
	FEMALE	15	8.93	134.00
	Total	20		

**Test Statistics<sup>b</sup>**

	balances in colour intensity to ease players' eyes
Mann-Whitney U	14.000
Wilcoxon W	134.000
Z	-2.187
Asymp. Sig. (2-tailed)	.029
Exact Sig. [2*(1-tailed Sig.)]	.042 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.187 / \sqrt{20} = 2.187 / 4.47 = 0.487 = \text{large effect.}$$

**Results of analysis from UTM students:**

Mann-Whitney U tests revealed a statistically significant reduction in the perception of ‘Colours used in game design should balance in colour intensity to ease players’ eyes’ between male and female students of UTM,  $z = -2.187, p = .029$  with a large effect size ( $r = 0.49$ ). The median score on the perception decreased from strongly agree (Md = Strongly Agree) to agree (Md = Agree).

**g) Colours used in game design should grade the colour properties for players’ emotional effects (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
grades the colour properties for players' emotional effects	84	1	5	4.14	.778
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * grades the colour properties for players' emotional effects	84	100.0%	0	.0%	84	100.0%

**Gender \* grades the colour properties for players' emotional effects Crosstabulation**

Count

		grades the colour properties for players' emotional effects				Total
		STRONGLY DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	1	7	22	9	39
	FEMALE	0	5	16	18	39
	99	0	2	2	2	6
Total		1	14	40	29	84

**grades the colour properties for players' emotional effects**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	1.2	1.2	1.2
	NEUTRAL	14	16.7	16.7	17.9
	AGREE	40	47.6	47.6	65.5
	STRONGLY AGREE	29	34.5	34.5	100.0
Total		84	100.0	100.0	

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
grades the colour properties for players' emotional effects	MALE		39	34.71	1353.50
	FEMALE		39	44.29	1727.50
	Total		78		

Test Statistics<sup>a</sup>

	grades the colour properties for players' emotional effects
Mann-Whitney U	573.500
Wilcoxon W	1353.500
Z	-2.040
Asymp. Sig. (2-tailed)	.041

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$   
time points

$$r = 2.040 / \sqrt{84} = 2.040 / 9.17 = 0.222 = \text{large effect.}$$

### Results of analysis from UiTM students:

Mann-Whitney U tests revealed a statistically significant difference in the perception of 'Colours used in game design should grade the colour properties for players' emotional effects' between male and female students of UiTM,  $z = -2.040$ ,  $p = .041$  with a large effect size ( $r = 0.22$ ).

**h) Colours used in game design should impose the colour harmony for uniformity of game themes (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
imposes the colour harmony for uniformity of game themes	20	2	5	4.05	.759
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * imposes the colour harmony for uniformity of game themes	20	100.0%	0	.0%	20	100.0%

**Gender \* imposes the colour harmony for uniformity of game themes Crosstabulation**

Count		imposes the colour harmony for uniformity of game themes				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	0	2	3	5
	FEMALE	1	2	10	2	15
Total		1	2	12	5	20



**imposes the colour harmony for uniformity of game themes**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid DISAGREE	1	5.0	5.0	5.0
NEUTRAL	2	10.0	10.0	15.0
AGREE	12	60.0	60.0	75.0
STRONGLY AGREE	5	25.0	25.0	100.0
Total	20	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
imposes the colour harmony for uniformity of game themes	MALE	5	14.60	73.00
	FEMALE	15	9.13	137.00
	Total	20		

**Test Statistics<sup>b</sup>**

	imposes the colour harmony for uniformity of game themes
Mann-Whitney U	17.000
Wilcoxon W	137.000
Z	-2.040
Asymp. Sig. (2-tailed)	.041
Exact Sig. [2*(1-tailed Sig.)]	.081 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.040 / \sqrt{20} = 2.040 / 4.47 = 0.456 = \text{large effect.}$$

### Results of analysis from UTM students:

Mann-Whitney U tests revealed a statistical significant reduction in the perception of 'Colours used in game design should imposes the colour harmony for uniformity of game themes' between male and female students of UTM,  $z = -2.040$ ,  $p = .041$  with a large effect size ( $r = 0.46$ ). The median score on the perception decreased from Strongly Agree (Md = Strongly Agree) to Agree (Md = Agree).

### PART C: The perception of students towards the knowledge of game graphic design.

#### 1. Aesthetic value in game graphic design

#### a) Graphic designers should know aesthetics in games is intended to appeal players' sight sense (UTM).

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
in games is intended to appeal players' sight sense	20	3	5	3.90	.852
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * in games is intended to appeal players' sight sense	20	100.0%	0	.0%	20	100.0%

**Gender \* in games is intended to appeal players' sight sense Crosstabulation**

Count

		in games is intended to appeal players' sight sense			Total
		NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	2	3	5
	FEMALE	8	4	3	15
Total		8	6	6	20

**in games is intended to appeal players' sight sense**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEUTRAL	8	40.0	40.0	40.0
	AGREE	6	30.0	30.0	70.0
	STRONGLY AGREE	6	30.0	30.0	100.0
Total		20	100.0	100.0	

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
in games is intended to appeal players' sight sense		MALE	5	15.10	75.50
		FEMALE	15	8.97	134.50
		Total	20		

Test Statistics<sup>b</sup>

	in games is intended to appeal players' sight sense
Mann-Whitney U	14.500
Wilcoxon W	134.500
Z	-2.135
Asymp. Sig. (2-tailed)	.033
Exact Sig. [2*(1-tailed Sig.)]	.042 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 2.135 / \sqrt{20} = 2.135 / 4.47 = 0.447 = \text{large effect.}$$

### Results of analysis from UTM students:

Mann-Whitney U tests revealed a statistically significant reduction in the perception of 'Graphic designers should know aesthetics in games is intended to appeal players' sight sense' between male and female students of UTM,  $z = -2.135$ ,  $p = .033$ , with a large effect size ( $r = 0.45$ ). The median score on the perception decreased from Strongly Agree ( $Md = \text{Strongly Agree}$ ) to Neutral ( $Md = \text{Neutral}$ ).

**b) Graphic designers should know aesthetics would represent games as cultural form besides technological form (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
would represent games as cultural form besides technological form	84	1	5	3.90	.873
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * would represent games as cultural form besides technological form	84	100.0%	0	.0%	84	100.0%

**Gender \* would represent games as cultural form besides technological form**

**Crosstabulation**

Count

		would represent games as cultural form besides technological form					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	2	11	20	6	39
	FEMALE	0	0	9	15	15	39
99		1	1	1	2	1	6
Total		1	3	21	37	22	84

would represent games as cultural form besides technological form

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	1.2	1.2	1.2
	DISAGREE	3	3.6	3.6	4.8
	NEUTRAL	21	25.0	25.0	29.8
	AGREE	37	44.0	44.0	73.8
	STRONGLY AGREE	22	26.2	26.2	100.0
	Total	84	100.0	100.0	

Ranks

	Gender	N	Mean Rank	Sum of Ranks
would represent games as cultural form besides technological form	MALE	39	34.58	1348.50
	FEMALE	39	44.42	1732.50
	Total	78		

Test Statistics<sup>a</sup>

	would represent games as cultural form besides technological form
Mann-Whitney U	568.500
Wilcoxon W	1348.500
Z	-2.053
Asymp. Sig. (2-tailed)	.040

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = .2.053/\sqrt{84} = 2.053/9.17 = 0.223 = \text{large effect.}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a significant difference in the perception of ‘Graphic designers should know aesthetics would represent games as cultural form besides technological form’ between male and female students of UiTM, despite a tied median score (Md = Agree),  $z = - 2.053, p = .040$ , with a large effect size ( $r = 0.22$ ).

**c) Graphic designers should know aesthetics is related to the study of beauty which need evaluation process (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
is related to the study of beauty which need evaluation process	84	2	5	3.95	.820
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * is related to the study of beauty which need evaluation process	84	100.0%	0	.0%	84	100.0%

**Gender \* is related to the study of beauty which need evaluation process Crosstabulation**

Count

		is related to the study of beauty which need evaluation process				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	2	15	16	6	39
	FEMALE	0	8	15	16	39
	99	0	1	3	2	6
Total		2	24	34	24	84

**is related to the study of beauty which need evaluation process**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DISAGREE	2	2.4	2.4	2.4
	NEUTRAL	24	28.6	28.6	31.0
	AGREE	34	40.5	40.5	71.4
	STRONGLY AGREE	24	28.6	28.6	100.0
Total		84	100.0	100.0	

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
is related to the study of beauty which need evaluation process	MALE		39	32.67	1274.00
	FEMALE		39	46.33	1807.00
	Total		78		



Test Statistics<sup>a</sup>

	is related to the study of beauty which need evaluation process
Mann-Whitney U	494.000
Wilcoxon W	1274.000
Z	-2.824
Asymp. Sig. (2-tailed)	.005

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 2.824 / \sqrt{84} = 2.824 / 9.17 = 0.307 = \text{large effect}$$

### Results of analysis from UiTM students:

Mann-Whitney U tests revealed a statistically significant difference in the perception of ‘Graphic designers should know aesthetics is related to the study of beauty which need evaluation process’ between male and female students of UiTM, despite a tied median score (Md = Agree),  $z = -2.824$ ,  $p = .005$ , with a large effect size ( $r = 0.31$ ).

**d) Graphic designers should know aesthetics is related to human preferences (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
is related to human preferences	83	2	5	4.04	.723
Valid N (listwise)	83				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * is related to human preferences	83	98.8%	1	1.2%	84	100.0%

**Gender \* is related to human preferences Crosstabulation**

Count

		is related to human preferences				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	10	22	6	38
	FEMALE	0	6	17	16	39
99		1	1	4	0	6
Total		1	17	43	22	83

**is related to human preferences**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DISAGREE	1	1.2	1.2	1.2
	NEUTRAL	17	20.2	20.5	21.7
	AGREE	43	51.2	51.8	73.5
	STRONGLY AGREE	22	26.2	26.5	100.0
	Total	83	98.8	100.0	
Missing	99	1	1.2		
Total		84	100.0		

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
is related to human preferences	MALE		38	33.58	1276.00
	FEMALE		39	44.28	1727.00
	Total		77		

**Test Statistics<sup>a</sup>**

	is related to human preferences
Mann-Whitney U	535.000
Wilcoxon W	1276.000
Z	-2.293
Asymp. Sig. (2-tailed)	.022

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 2.293 / \sqrt{84} = 2.293 / 9.17 = 0.250 = \text{large effect}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a significant difference in the perception of ‘Graphic designers should know aesthetics is related to human preferences’ between male and female students of UiTM, despite of median score (Md = Agree),  $z = -2.293$ ,  $p = .022$ , with a large effect size ( $r = 0.25$ ).

**e) Graphic designers should know aesthetics as a branch of philosophy that concerned about beauty (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
as a branch of philosophy that concerned about beauty	84	2	5	3.83	.804
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * as a branch of philosophy that concerned about beauty	84	100.0%	0	.0%	84	100.0%

**Gender \* as a branch of philosophy that concerned about beauty Crosstabulation**

Count

		as a branch of philosophy that concerned about beauty				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	3	14	19	3	39
	FEMALE	0	9	16	14	39
	99	0	3	2	1	6
Total		3	26	37	18	84

**as a branch of philosophy that concerned about beauty**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DISAGREE	3	3.6	3.6	3.6
	NEUTRAL	26	31.0	31.0	34.5
	AGREE	37	44.0	44.0	78.6
	STRONGLY AGREE	18	21.4	21.4	100.0
Total		84	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
as a branch of philosophy that concerned about beauty	MALE	39	32.36	1262.00
	FEMALE	39	46.64	1819.00
	Total	78		

Test Statistics<sup>a</sup>

	as a branch of philosophy that concerned about beauty
Mann-Whitney U	482.000
Wilcoxon W	1262.000
Z	-2.977
Asymp. Sig. (2-tailed)	.003

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.977 / \sqrt{84} = 2.977 / 9.17 = 0.324 = \text{large effect}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a statistically significant difference in the perception of ‘Graphic designers should know aesthetics as a branch of philosophy that concerned about beauty’ between male and female students of UiTM,  $z = -2.977$ ,  $p = .003$ , with a large effect size ( $r = 0.32$ ).

**f) Graphic designers should know aesthetics as a branch of philosophy that concerned about beauty (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
as a branch of philosophy that concerned about beauty	20	3	5	3.90	.641
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * as a branch of philosophy that concerned about beauty	20	100.0%	0	.0%	20	100.0%

**Gender \* as a branch of philosophy that concerned about beauty Crosstabulation**

Count

		as a branch of philosophy that concerned about beauty			Total
		NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	3	2	5
	FEMALE	5	9	1	15
Total		5	12	3	20

as a branch of philosophy that concerned about beauty

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid NEUTRAL	5	25.0	25.0	25.0
AGREE	12	60.0	60.0	85.0
STRONGLY AGREE	3	15.0	15.0	100.0
Total	20	100.0	100.0	

Ranks

	Gender	N	Mean Rank	Sum of Ranks
as a branch of philosophy that concerned about beauty	MALE	5	14.50	72.50
	FEMALE	15	9.17	137.50
	Total	20		

Test Statistics<sup>b</sup>

	as a branch of philosophy that concerned about beauty
Mann-Whitney U	17.500
Wilcoxon W	137.500
Z	-1.993
Asymp. Sig. (2-tailed)	.046
Exact Sig. [2*(1-tailed Sig.)]	.081 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 1.993 / \sqrt{20} = 1.993 / 4.47 = 0.445 = \text{large effect}$$



**Results of analysis from UTM students:**

Mann-Whitney U tests revealed a statistically significant difference in the perception of ‘Graphic designers should know aesthetics as a branch of philosophy that concerned about beauty’ between male and female students of UTM, despite a tied median score (Md = Agree),  $z = -1.993$ ,  $p = .046$ , with a large effect size ( $r = 0.45$ ).

**g) Graphic designers should know aesthetics plays an important role in the advancement of game technologies (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
plays an important role in the advancement of game technologies	82	1	5	4.17	.798
Valid N (listwise)	82				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * plays an important role in the advancement of game technologies	82	97.6%	2	2.4%	84	100.0%

**Gender \* plays an important role in the advancement of game technologies Crosstabulation**

Count

		plays an important rol in the advancement of game technologies				Total
		STRONGLY DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	1	8	17	11	37
	FEMALE	0	4	16	19	39
	99	0	2	3	1	6
Total		1	14	36	31	82

**plays an important role in the advancement of game technologies**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	1.2	1.2	1.2
	NEUTRAL	14	16.7	17.1	18.3
	AGREE	36	42.9	43.9	62.2
	STRONGLY AGREE	31	36.9	37.8	100.0
	Total	82	97.6	100.0	
Missing	99	2	2.4		
Total		84	100.0		

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
plays an important role in the advancement of game technologies		MALE	37	33.72	1247.50
		FEMALE	39	43.04	1678.50
		Total	76		

Test Statistics<sup>a</sup>

	plays an important role in the advancement of game technologies
Mann-Whitney U	544.500
Wilcoxon W	1247.500
Z	-1.992
Asymp. Sig. (2-tailed)	.046

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 1.992 / \sqrt{84} = 1.992 / 9.17 = 0.217 = \text{large effect}$$

### Results of analysis from UiTM students:

Mann-Whitney U tests revealed a significant difference in the perception of ‘Graphic designers should know aesthetics plays an important role in the advancement of game technologies’ between male and female students of UiTM, despite a tied median score (Md = Agree),  $z = -1.992$ ,  $p = .046$ , with a large effect size ( $r = 0.22$ ).

**h) Graphic designers should know aesthetics enhances players' engagement (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
enhances players' engagement	19	3	5	3.89	.658
Valid N (listwise)	19				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * enhances players' engagement	19	95.0%	1	5.0%	20	100.0%

**Gender \* enhances players' engagement Crosstabulation**

Count

		enhances players' engagement			Total
		NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	2	2	4
	FEMALE	5	9	1	15
Total		5	11	3	19

**enhances players' engagement**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEUTRAL	5	25.0	26.3	26.3
	AGREE	11	55.0	57.9	84.2
	STRONGLY AGREE	3	15.0	15.8	100.0
	Total	19	95.0	100.0	
Missing	99	1	5.0		
Total		20	100.0		

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
enhances players' engagement	MALE	4	14.50	58.00
	FEMALE	15	8.80	132.00
	Total	19		

**Test Statistics<sup>b</sup>**

	enhances players' engagement
Mann-Whitney U	12.000
Wilcoxon W	132.000
Z	-2.030
Asymp. Sig. (2-tailed)	.042
Exact Sig. [2*(1-tailed Sig.)]	.080 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2}$

time points

$$r = 2.030 / \sqrt{20} = 2.030 / 4.47 = 0.454 = \text{large effect.}$$

**Results of analysis from UTM students:**

Mann-Whitney U tests revealed a statistically significant difference in the perception of ‘Graphic designers should know aesthetics enhances players' engagement’ between male and female students of UTM,  $z = -2.030$ ,  $p = .042$ , with a large effect size ( $r = 0.45$ ).

**2. The comprehension of game graphic design**

**a) Graphic designers should comprehend the visual elements that captivate players’ sight (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the visual elements that captivate players' sight	20	3	5	3.70	.733
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the visual elements that captivate players' sight	20	100.0%	0	.0%	20	100.0%

**Gender \* the visual elements that captivate players' sight Crosstabulation**

Count

		the visual elements that captivate players' sight			Total
		NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	1	1	3	5
	FEMALE	8	7	0	15
Total		9	8	3	20

**the visual elements that captivate players' sight**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEUTRAL	9	45.0	45.0	45.0
	AGREE	8	40.0	40.0	85.0
	STRONGLY AGREE	3	15.0	15.0	100.0
Total		20	100.0	100.0	

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
the visual elements that captivate players' sight		MALE	5	15.10	75.50
		FEMALE	15	8.97	134.50
		Total	20		

Test Statistics<sup>b</sup>

	the visual elements that captivate players' sight
Mann-Whitney U	14.500
Wilcoxon W	134.500
Z	-2.186
Asymp. Sig. (2-tailed)	.029
Exact Sig. [2*(1-tailed Sig.)]	.042 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 2.186 / \sqrt{20} = 2.186 / 4.47 = 0.489 = \text{large effect.}$$

### Results of analysis from UTM students:

Mann-Whitney U tests revealed a statistically significant reduction in the perception of 'Graphic designers should comprehend the visual elements that captivate players' sight' between male and female students of UTM,  $z = -2.186$ ,  $p = .029$ , with a large effect size ( $r = 0.49$ ). The median score on the perception decreased from Strongly Agree ( $Md = \text{Strongly Agree}$ ) to Neutral ( $Md = \text{Neutral}$ ).



**b) Graphic designers should comprehend the visual elements that represent consistency to players' sight (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the visual elements that represent consistency to players' sight	19	3	5	4.00	.816
Valid N (listwise)	19				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the visual elements that represent consistency to players' sight	19	95.0%	1	5.0%	20	100.0%

**Gender \* the visual elements that represent consistency to players' sight Crosstabulation**

Count

		the visual elements that represent consistency to players' sight			Total
		NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	1	4	5
	FEMALE	6	6	2	14
Total		6	7	6	19

**the visual elements that represent consistency to players' sight**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEUTRAL	6	30.0	31.6	31.6
	AGREE	7	35.0	36.8	68.4
	STRONGLY AGREE	6	30.0	31.6	100.0
	Total	19	95.0	100.0	
Missing	99	1	5.0		
Total		20	100.0		

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
the visual elements that represent consistency to players' sight	MALE	5	15.20	76.00
	FEMALE	14	8.14	114.00
	Total	19		

**Test Statistics<sup>b</sup>**

	the visual elements that represent consistency to players' sight
Mann-Whitney U	9.000
Wilcoxon W	114.000
Z	-2.552
Asymp. Sig. (2-tailed)	.011
Exact Sig. [2*(1-tailed Sig.)]	.014 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.552/\sqrt{20} = 2.552/4.47 = 0.570 = \text{large effect}$$

**Results of analysis from UTM students:**

Mann-Whitney U tests revealed a statistically significant reduction in the perception of ‘Graphic designers should comprehend the visual elements that represent consistency to players’ sight’ between male and female students of UTM,  $z = -2.552$ ,  $p = .011$ , with a large effect size ( $r = 0.57$ ). The median score on the perception decreased from Strongly Agree (Md = Strongly Agree) to Agree (Md = Agree).

**c) Graphic designers should comprehend the visual elements that represent synchronization to players’ sight (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the visual elements that represent synchronization to players' sight	20	3	5	4.05	.887
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the visual elements that represent synchronization to players' sight	20	100.0%	0	.0%	20	100.0%

**Gender \* the visual elements that represent synchronization to players' sight Crosstabulation**

Count

		the visual elements that represent synchronization to players' sight			Total
		NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	1	4	5
	FEMALE	7	4	4	15
Total		7	5	8	20

**the visual elements that represent synchronization to players' sight**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEUTRAL	7	35.0	35.0	35.0
	AGREE	5	25.0	25.0	60.0
	STRONGLY AGREE	8	40.0	40.0	100.0
Total		20	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
the visual elements that represent synchronization to players' sight	MALE	5	15.20	76.00
	FEMALE	15	8.93	134.00
	Total	20		

Test Statistics<sup>b</sup>

	the visual elements that represent synchronization to players' sight
Mann-Whitney U	14.000
Wilcoxon W	134.000
Z	-2.187
Asymp. Sig. (2-tailed)	.029
Exact Sig. [2*(1-tailed Sig.)]	.042 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.187 / \sqrt{20} = 2.187 / 4.47 = 0.489 = \text{large effect}$$

### Results of analysis from UTM students:

Mann-Whitney U tests revealed a statistically significant reduction in the perception of 'Graphic designers should comprehend the visual elements that represent synchronization to players' sight' between male and female students of UTM,  $z = -2.187$ ,  $p = .029$ , with a large effect size ( $r = 0.49$ ). The median score on the perception decreased from Strongly Agree ( $Md = \text{Strongly Agree}$ ) to Neutral ( $Md = \text{Neutral}$ ).

**d) Graphic designers should comprehend the characterization of visual elements within visual representation of games to evoke immediate emotional response of players (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the characterization of visual elements within visual representation of games to evoke immediate emotional response of players	83	1	5	4.07	.823
Valid N (listwise)	83				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the characterization of visual elements within visual representation of games to evoke immediate emotional response of players	83	98.8%	1	1.2%	84	100.0%

**Gender \* the characterization of visual elements within visual representation of games to evoke immediate emotional response of players Crosstabulation**

Count

		the characterization of visual elements within visual representaion of games to evoke immediate emotional response of players					
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	Total
Gender	MALE	1	1	9	20	7	38
	FEMALE	0	0	7	16	16	39
	99	0	0	0	2	4	6
Total		1	1	16	38	27	83

**the characterization of visual elements within visual representation of games to evoke immediate emotional response of players**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	1.2	1.2	1.2
	DISAGREE	1	1.2	1.2	2.4
	NEUTRAL	16	19.0	19.3	21.7
	AGREE	38	45.2	45.8	67.5
	STRONGLY AGREE	27	32.1	32.5	100.0
	Total	83	98.8	100.0	
Missing	99	1	1.2		
Total		84	100.0		

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
the characterization of visual elements within visual representation of games to evoke immediate emotional response of players	MALE	38	33.93	1289.50
	FEMALE	39	43.94	1713.50
	Total	77		

Test Statistics<sup>a</sup>

	the characterization of visual elements within visual representation of games to evoke immediate emotional response of players
Mann-Whitney U	548.500
Wilcoxon W	1289.500
Z	-2.112
Asymp. Sig. (2-tailed)	.035

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2}$   
time points

$$r = 2.112 / \sqrt{84} = 2.112 / 9.17 = 0.230 = \text{large effect}$$

### Results of analysis from UiTM students:

Mann-Whitney U tests revealed a significant difference in the perception of ‘Graphic designers should comprehend the characterization of visual elements within visual representation of games to evoke immediate emotional response of players’ between male and female students of UiTM, despite a tied median score ( $Md = \text{Agree}$ ),  $z = -2.112$ ,  $p = .035$ , with a large effect size ( $r = 0.23$ ).



**e) Graphic designers should comprehend the characterization of visual elements within visual representation of games to evoke immediate emotional response of players (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the characterization of visual elements within visual representation of games to evoke immediate emotional response of players	19	3	5	4.00	.816
Valid N (listwise)	19				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the characterization of visual elements within visual representation of games to evoke immediate emotional response of players	19	95.0%	1	5.0%	20	100.0%

**Gender \* the characterization of visual elements within visual representation of games to evoke immediate emotional response of players Crosstabulation**

Count

		the characterization of visual elements within visual representation of games to evoke immediate emotional response of players			
		NEUTRAL	AGREE	STRONGLY AGREE	Total
Gender	MALE	0	1	3	4
	FEMALE	6	6	3	15
Total		6	7	6	19

**the characterization of visual elements within visual representation of games to evoke immediate emotional response of players**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEUTRAL	6	30.0	31.6	31.6
	AGREE	7	35.0	36.8	68.4
	STRONGLY AGREE	6	30.0	31.6	100.0
	Total	19	95.0	100.0	
Missing	99	1	5.0		
Total		20	100.0		

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
the characterization of visual elements within visual representation of games to evoke immediate emotional response of players	MALE	4	14.88	59.50
	FEMALE	15	8.70	130.50
	Total	19		

Test Statistics<sup>b</sup>

	the characterization of visual elements within visual representation of games to evoke immediate emotional response of players
Mann-Whitney U	10.500
Wilcoxon W	130.500
Z	-2.068
Asymp. Sig. (2-tailed)	.039
Exact Sig. [2*(1-tailed Sig.)]	.049 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$   
time points

$$r = 2.068 / \sqrt{20} = 2.068 / 4.47 = 0.462 = \text{large effect}$$

### Results of analysis from UTM students:

Mann-Whitney U tests revealed a statistically significant reduction in the perception of 'Graphic designers should comprehend the characterization of visual elements within visual representation of games to evoke immediate emotional response of players' between male and female students of UTM,  $z = -2.068$ ,  $p = .039$ , with a large effect size ( $r = 0.46$ ). The median score on the perception decreased from Strongly Agree ( $Md = \text{Strongly Agree}$ ) to Agree ( $Md = \text{Agree}$ ).

**f) Graphic designers should comprehend the game concept for specific target audience (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the game concept for specific target audience	84	1	5	4.35	.963
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the game concept for specific target audience	84	100.0%	0	.0%	84	100.0%

**Gender \* the game concept for specific target audience Crosstabulation**

Count		the game concept for specific target audience					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	2	2	2	17	16	39
	FEMALE	1	0	3	9	26	39
	99	0	0	0	1	5	6
Total		3	2	5	27	47	84

**the game concept for specific target audience**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid STRONGLY DISAGREE	3	3.6	3.6	3.6
DISAGREE	2	2.4	2.4	6.0
NEUTRAL	5	6.0	6.0	11.9
AGREE	27	32.1	32.1	44.0
STRONGLY AGREE	47	56.0	56.0	100.0
Total	84	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
the game concept for specific target audience	MALE	39	34.58	1348.50
	FEMALE	39	44.42	1732.50
	Total	78		

**Test Statistics<sup>a</sup>**

	the game concept for specific target audience
Mann-Whitney U	568.500
Wilcoxon W	1348.500
Z	-2.136
Asymp. Sig. (2-tailed)	.033

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.136 / \sqrt{84} = 2.136 / 9.17 = 0.232 = \text{large effect.}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a statistically significant increment in the perception of ‘Graphic designers should comprehend the game concept for specific target audience’ between male and female students of UiTM,  $z = -2.136, p = .033$ , with a large effect size ( $r = 0.23$ ). The median score on the perception increased from Agree (Md = Agree) to Strongly Agree (Md = Strongly Agree).

**g) Graphic designers should comprehend the design styles for specific target audience (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the design styles for specific target audience	20	3	5	4.05	.605
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the design styles for specific target audience	20	100.0%	0	.0%	20	100.0%

**Gender \* the design styles for specific target audience Crosstabulation**

Count

		the design styles for specific target audience			
		NEUTRAL	AGREE	STRONGLY AGREE	Total
Gender	MALE	0	2	3	5
	FEMALE	3	11	1	15
Total		3	13	4	20

**the design styles for specific target audience**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEUTRAL	3	15.0	15.0	15.0
	AGREE	13	65.0	65.0	80.0
	STRONGLY AGREE	4	20.0	20.0	100.0
	Total	20	100.0	100.0	

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
the design styles for specific target audience	MALE		5	15.10	75.50
	FEMALE		15	8.97	134.50
	Total		20		

Test Statistics<sup>b</sup>

	the design styles for specific target audience
Mann-Whitney U	14.500
Wilcoxon W	134.500
Z	-2.373
Asymp. Sig. (2-tailed)	.018
Exact Sig. [2*(1-tailed Sig.)]	.042 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 2.373 / \sqrt{20} = 2.373 / 4.47 = 0.530 = \text{large effect}$$

### Results of analysis from UTM students:

Mann-Whitney U tests revealed a statistically significant reduction in the perception of 'Graphic designers should comprehend the design styles for specific target audience' between male and female students of UTM,  $z = -2.373$ ,  $p = .018$ , with a large effect size ( $r = 0.53$ ). The median score on the perception decreased from Strongly Agree ( $Md = \text{Strongly Agree}$ ) to Agree ( $Md = \text{Agree}$ ).



**h) Graphic designers should comprehend the design of graphical user interface that easy to use (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the design of graphical user interface that easy to use	84	2	5	4.38	.759
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the design of graphical user interface that easy to use	84	100.0%	0	.0%	84	100.0%

**Gender \* the design of graphical user interface that easy to use Crosstabulation**

Count

		the design of graphical user interface that easy to use				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	1	5	17	16	39
	FEMALE	0	5	8	26	39
	99	0	11	25	36	66
Total		1	11	27	45	84

**the design of graphical user interface that easy to use**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DISAGREE	1	1.2	1.2	1.2
	NEUTRAL	11	13.1	13.1	14.3
	AGREE	27	32.1	32.1	46.4
	STRONGLY AGREE	45	53.6	53.6	100.0
	Total	84	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
the design of graphical user interface that easy to use	MALE	39	34.91	1361.50
	FEMALE	39	44.09	1719.50
	Total	78		

**Test Statistics<sup>a</sup>**

	the design of graphical user interface that easy to use
Mann-Whitney U	581.500
Wilcoxon W	1361.500
Z	-1.989
Asymp. Sig. (2-tailed)	.047

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 1.989 / \sqrt{84} = 1.989 / 9.17 = 0.216 = \text{large effect}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a statistically significant increment in the perception of ‘Graphic designers should comprehend the design of graphical user interface that easy to use’ between male and female students of UiTM,  $z = -1.989$ ,  $p = .047$ , with a large effect size ( $r = 0.22$ ). The median score on the perception increased from Agree (Md = Agree) to Strongly Agree (Md = Strongly Agree).

**i) Graphic designers should comprehend the design of game characters that easy to recognize (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the design of game characters interface that easy to recognize	83	1	5	4.30	.880
Valid N (listwise)	83				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the design of game characters interface that easy to recognize	83	98.8%	1	1.2%	84	100.0%

**Gender \* the design of game characters interface that easy to recognize Crosstabulation**

Count

		the design of game characters interface that easy to recognize					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	2	8	14	14	38
	FEMALE	1	0	1	11	26	39
	99	0	0	2	1	3	6
Total		1	2	11	26	43	83

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
the design of game characters interface that easy to recognize	MALE	38	32.21	1224.00
	FEMALE	39	45.62	1779.00
	Total	77		

**Test Statistics<sup>a</sup>**

	the design of game characters interface that easy to recognize
Mann-Whitney U	483.000
Wilcoxon W	1224.000
Z	-2.896
Asymp. Sig. (2-tailed)	.004

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.896 / \sqrt{84} = 2.896 / 9.17 = 0.315 = \text{large effect.}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a statistically significant increment in the perception of ‘Graphic designers should comprehend the design of game characters that easy to recognize’ between male and female students of UiTM,  $z = -2.896, p = .004$ , with a large effect size ( $r = 0.32$ ). The median score on the perception increased from Agree (Md = Agree) to Strongly Agree (Md = Strongly Agree).

**j) Graphic designers should comprehend the design of game environment that immerse the players (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the design of game environment that immerse the players	83	1	5	4.17	.824
Valid N (listwise)	83				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the design of game environment that immerse the players	83	98.8%	1	1.2%	84	100.0%

**Gender \* the design of game environment that immerse the players Crosstabulation**

Count

		the design of game environment that immerse the players					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	2	6	24	7	39
	FEMALE	1	0	4	11	23	39
	99	0	0	0	4	1	5
Total		1	2	10	39	31	83

**the design of game environment that immerse the players**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	1.2	1.2	1.2
	DISAGREE	2	2.4	2.4	3.6
	NEUTRAL	10	11.9	12.0	15.7
	AGREE	39	46.4	47.0	62.7
	STRONGLY AGREE	31	36.9	37.3	100.0
	Total	83	98.8	100.0	
Missing	99	1	1.2		
Total		84	100.0		

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
the design of game environment that immerse the players	MALE	39	31.91	1244.50
	FEMALE	39	47.09	1836.50
	Total	78		

Test Statistics<sup>a</sup>

	the design of game environment that immerse the players
Mann-Whitney U	464.500
Wilcoxon W	1244.500
Z	-3.207
Asymp. Sig. (2-tailed)	.001

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 3.207 / \sqrt{84} = 3.207 / 9.17 = 0.349 = \text{large effect}$$

### Results of analysis from UiTM students:

Mann-Whitney U tests revealed a statistically significant increment in the perception of 'Graphic designers should comprehend the design of game environment that immerse the players' between male and female students of UiTM,  $z = -3.207$ ,  $p = .001$ , with a large effect size ( $r = 0.35$ ). The median score on the perception increased from Agree ( $Md = \text{Agree}$ ) to Strongly Agree ( $Md = \text{Strongly Agree}$ ).

**k) Graphic designers should comprehend the design of visual representation that complies with digital game system (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the design of visual representation that complies with digital game system	84	1	5	4.07	.847
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the design of visual representation that complies with digital game system	84	100.0%	0	.0%	84	100.0%

**Gender \* the design of visual representation that complies with digital game system  
Crosstabulation**

Count

		the design of visual representation that complies with digital game system				Total
		STRONGLY DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	1	8	24	6	39
	FEMALE	1	4	15	19	39
99		0	3	1	2	6
Total		2	15	40	27	84



**the design of visual representation that complies with digital game system**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	2	2.4	2.4	2.4
	NEUTRAL	15	17.9	17.9	20.2
	AGREE	40	47.6	47.6	67.9
	STRONGLY AGREE	27	32.1	32.1	100.0
	Total	84	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
the design of visual representation that complies with digital game system	MALE	39	32.86	1281.50
	FEMALE	39	46.14	1799.50
	Total	78		

**Test Statistics<sup>a</sup>**

	the design of visual representation that complies with digital game system
Mann-Whitney U	501.500
Wilcoxon W	1281.500
Z	-2.826
Asymp. Sig. (2-tailed)	.005

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.826 / \sqrt{84} = 2.826 / 9.17 = 0.308 = \text{large effect}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a statistically significant increment in the perception of ‘Graphic designers should comprehend the design of visual representation that complies with digital game system’ between male and female students of UiTM,  $z = -2.826, p = .005$ , with a large effect size ( $r = 0.31$ ). The median score on the perception increased from Agree (Md = Agree) to Strongly Agree (Md = Strongly Agree).

**1) Graphic designers should comprehend the design of visual representation that supports the digital game hardware (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the design of visual representation that supports digital game hardware	84	2	5	4.19	.799
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the design of visual representation that supports digital game hardware	84	100.0%	0	.0%	84	100.0%

**Gender \* the design of visual representation that supports digital game hardware  
Crosstabulation**

Count

		the design of visual representation that supports digital game hardware				
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	Total
Gender	MALE	2	7	19	11	39
	FEMALE	0	3	15	21	39
	99	1	1	3	1	6
Total		3	11	37	33	84

**the design of visual representation that supports digital game hardware**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DISAGREE	3	3.6	3.6	3.6
	NEUTRAL	11	13.1	13.1	16.7
	AGREE	37	44.0	44.0	60.7
	STRONGLY AGREE	33	39.3	39.3	100.0
Total		84	100.0	100.0	

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
the design of visual representation that supports digital game hardware	MALE		39	33.42	1303.50
	FEMALE		39	45.58	1777.50
	Total		78		

Test Statistics<sup>a</sup>

	the design of visual representation that supports digital game hardware
Mann-Whitney U	523.500
Wilcoxon W	1303.500
Z	-2.575
Asymp. Sig. (2-tailed)	.010

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 2.575 / \sqrt{84} = 2.575 / 9.17 = 0.280 = \text{large effect}$$

### Results of analysis from UiTM students:

Mann-Whitney U tests revealed a statistical significant increment in the perception of ‘Graphic designers should comprehend the design of visual representation that supports digital game hardware’ between male and female students of UiTM,  $z = -2.575$ ,  $p = .010$ , with a large effect size ( $r = 0.28$ ). The median score on the perception increased from Agree ( $Md = \text{Agree}$ ) to Strongly Agree ( $Md = \text{Strongly Agree}$ ).

**m) Graphic designers should comprehend the design of visual representation that supports the virtual reality game system (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the design of visual representation that supports the virtual reality game system	83	1	5	4.19	.848
Valid N (listwise)	83				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the design of visual representation that supports the virtual reality game system	83	98.8%	1	1.2%	84	100.0%

**Gender \* the design of visual representation that supports the virtual reality game system**

**Crosstabulation**

Count

		the design of visual representation that supports the virtual reality game system					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	2	6	21	10	39
	FEMALE	1	1	2	13	21	38
	99	0	0	0	4	2	6
Total		1	3	8	38	33	83

**the design of visual representation that supports the virtual reality game system**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	1.2	1.2	1.2
	DISAGREE	3	3.6	3.6	4.8
	NEUTRAL	8	9.5	9.6	14.5
	AGREE	38	45.2	45.8	60.2
	STRONGLY AGREE	33	39.3	39.8	100.0
	Total	83	98.8	100.0	
Missing	System	1	1.2		
Total		84	100.0		

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
the design of visual representation that supports the virtual reality game system	MALE		39	33.24	1296.50
	FEMALE		38	44.91	1706.50
	Total		77		

**Test Statistics<sup>a</sup>**

	the design of visual representation that supports the virtual reality game system
Mann-Whitney U	516.500
Wilcoxon W	1296.500
Z	-2.484
Asymp. Sig. (2-tailed)	.013

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.484 / \sqrt{84} = 2.484 / 9.17 = 0.270 = \text{large effect}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a statistical significant increment in the perception of ‘Graphic designers should comprehend the design of visual representation that supports the virtual reality game system’ between male and female students of UiTM,  $z = -2.484$ ,  $p = .013$ , with a large effect size ( $r = 0.27$ ). The median score on the perception increased from Agree (Md = Agree) to Strongly Agree (Md = Strongly Agree).

**n) Graphic designers should comprehend the design of visual representation for game testing (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
the design of visual representation for the game testing	83	1	5	3.99	.930
Valid N (listwise)	83				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * the design of visual representation for the game testing	83	98.8%	1	1.2%	84	100.0%

**Gender \* the design of visual representation for the game testing Crosstabulation**

Count

		the design of visual representation for the game testing					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	1	1	10	21	5	38
	FEMALE	1	0	4	15	19	39
99		1	0	1	3	1	6
Total		3	1	15	39	25	83

**the design of visual representation for the game testing**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	3	3.6	3.6	3.6
	DISAGREE	1	1.2	1.2	4.8
	NEUTRAL	15	17.9	18.1	22.9
	AGREE	39	46.4	47.0	69.9
	STRONGLY AGREE	25	29.8	30.1	100.0
Total		83	98.8	100.0	
Missing	99	1	1.2		
Total		84	100.0		



Ranks

Gender	N	Mean Rank	Sum of Ranks	
the design of visual representation for the game testing	MALE	38	31.12	1182.50
	FEMALE	39	46.68	1820.50
	Total	77		

Test Statistics<sup>a</sup>

	the design of visual representation for the game testing
Mann-Whitney U	441.500
Wilcoxon W	1182.500
Z	-3.287
Asymp. Sig. (2-tailed)	.001

05-4506832 a. Grouping Variable: Gender

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PustakaTBainun

ptbupsi

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$   
time points

$$r = 3.287 / \sqrt{84} = 3.287 / 9.17 = 0.358 = \text{large effect}$$

### Results of analysis from UiTM students:

Mann-Whitney U tests revealed a significant difference in the perception of 'Graphic designers should comprehend the design of visual representation for the game testing' between male and female students of UiTM, despite a tied median score ( $Md = \text{Agree}$ ),  $z = -3.287$ ,  $p = .001$ , with a large effect size ( $r = 0.36$ ).

**o) Graphic designers should comprehend to revise the design of visual representation after the game testing (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
to revise the design of visual representation after the game testing	84	2	5	4.12	.767
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * to revise the design of visual representation after the game testing	84	100.0%	0	.0%	84	100.0%

**Gender \* to revise the design of visual representation after the game testing Crosstabulation**

Count

		to revise the design of visual representation after the game testing				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	2	8	20	9	39
	FEMALE	0	2	18	19	39
99		0	4	2	0	6
Total		2	14	40	28	84

to revise the design of visual representation after the game testing

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid DISAGREE	2	2.4	2.4	2.4
NEUTRAL	14	16.7	16.7	19.0
AGREE	40	47.6	47.6	66.7
STRONGLY AGREE	28	33.3	33.3	100.0
Total	84	100.0	100.0	

Ranks

	Gender	N	Mean Rank	Sum of Ranks
to revise the design of visual representation after the game testing	MALE	39	32.65	1273.50
	FEMALE	39	46.35	1807.50
	Total	78		

Test Statistics<sup>a</sup>

	to revise the design of visual representation after the game testing
Mann-Whitney U	493.500
Wilcoxon W	1273.500
Z	-2.918
Asymp. Sig. (2-tailed)	.004

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.918 / \sqrt{84} = 2.918 / 9.17 = 0.318 = \text{large effect}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a significant difference in the perception of ‘Graphic designers should comprehend to revise the design of visual representation after the game testing’ between male and female students of UiTM, despite a tied median score (Md =Agree),  $z = -2.918$ ,  $p = .004$ , with a large effect size ( $r = 0.32$ ).

**p) Graphic designers should comprehend to come out with the new design of visual representation after the game testing (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
to come out with the new design of visual representation after the game testing	84	1	5	4.18	.809
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * to come out with the new design of visual representation after the game testing	84	100.0%	0	.0%	84	100.0%

**Gender \* to come out with the new design of visual representation after the game testing**

**Crosstabulation**

Count

		to come out with the new design of visual representation after the game testing					
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	Total
Gender	MALE	0	2	7	24	6	39
	FEMALE	1	0	1	15	22	39
	99	0	0	1	2	3	6
Total		1	2	9	41	31	84

**to come out with the new design of visual representation after the game testing**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	1	1.2	1.2	1.2
	DISAGREE	2	2.4	2.4	3.6
	NEUTRAL	9	10.7	10.7	14.3
	AGREE	41	48.8	48.8	63.1
	STRONGLY AGREE	31	36.9	36.9	100.0
Total		84	100.0	100.0	

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
to come out with the new design of visual representation after the game testing		MALE	39	30.47	1188.50
		FEMALE	39	48.53	1892.50
		Total	78		

Test Statistics<sup>a</sup>

	to come out with the new design of visual representation after the game testing
Mann-Whitney U	408.500
Wilcoxon W	1188.500
Z	-3.866
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over 2 time points}$

$$r = 3.866 / \sqrt{84} = 3.866 / 9.17 = 0.421 = \text{large effect}$$

### Results of analysis from UiTM students:

Mann-Whitney U tests revealed a significant difference in the perception of 'graphic designers should comprehend to come out with the new design of visual representation after the game testing' between male and female students of UiTM,  $z = -3.866$ ,  $p = .000$ , with a large effect size ( $r = 0.42$ ). The median score on the perception increased from Agree (Md = Agree) to Strongly Agree (Md = Strongly Agree).

### 3. Principles of game graphic design

a) Graphic designers should recognize demographic profile of specific target audience (UiTM).

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
demographic profile of specific target audience	84	1	5	4.08	.908
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * demographic profile of specific target audience	84	100.0%	0	.0%	84	100.0%

**Gender \* demographic profile of specific target audience Crosstabulation**

Count

		demographic profile of specific target audience					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	4	8	18	9	39
	FEMALE	1	0	5	13	20	39
99		0	0	0	4	2	6
Total		1	4	13	35	31	84

demographic profile of specific target audience

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid STRONGLY DISAGREE	1	1.2	1.2	1.2
DISAGREE	4	4.8	4.8	6.0
NEUTRAL	13	15.5	15.5	21.4
AGREE	35	41.7	41.7	63.1
STRONGLY AGREE	31	36.9	36.9	100.0
Total	84	100.0	100.0	

Ranks

	Gender	N	Mean Rank	Sum of Ranks
demographic profile of specific target audience	MALE	39	33.28	1298.00
	FEMALE	39	45.72	1783.00
	Total	78		

Test Statistics<sup>a</sup>

	demographic profile of specific target audience
Mann-Whitney U	518.000
Wilcoxon W	1298.000
Z	-2.582
Asymp. Sig. (2-tailed)	.010

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.582 / \sqrt{84} = 2.582 / 9.17 = 0.281 = \text{large effect.}$$



**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a statistically significant increment in the perception of ‘Graphic designers should recognize demographic profile of specific target audience’ between male and female students of UiTM,  $z = -2.582, p = .010$ , with a large effect size ( $r = 0.28$ ). The median score on the perception increased from Agree (Md = Agree) to Strongly Agree (Md = Strongly Agree).

**b) Graphic designers should recognize design expectation of specific target audience (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
design expectation of specific target audience	83	1	5	4.10	.932
Valid N (listwise)	83				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * design expectation of specific target audience	83	98.8%	1	1.2%	84	100.0%

**Gender \* design expectation of specific target audience Crosstabulation**

Count

		design expectation of specific target audience					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	1	1	8	18	10	38
	FEMALE	1	0	7	10	21	39
	99	0	0	2	2	2	6
Total		2	1	17	30	33	83

**design expectation of specific target audience**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	2	2.4	2.4	2.4
	DISAGREE	1	1.2	1.2	3.6
	NEUTRAL	17	20.2	20.5	24.1
	AGREE	30	35.7	36.1	60.2
	STRONGLY AGREE	33	39.3	39.8	100.0
	Total	83	98.8	100.0	
Missing	System	1	1.2		
Total		84	100.0		

**Ranks**

		Gender	N	Mean Rank	Sum of Ranks
design expectation of specific target audience		MALE	38	34.14	1297.50
		FEMALE	39	43.73	1705.50
		Total	77		

Test Statistics<sup>a</sup>

	design expectation of specific target audience
Mann-Whitney U	556.500
Wilcoxon W	1297.500
Z	-2.005
Asymp. Sig. (2-tailed)	.045

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$   
time points

$$r = 2.005 / \sqrt{84} = 2.005 / 9.17 = 0.218 = \text{large effect}$$

### Results of analysis from UiTM students:

Mann-Whitney U tests revealed a statistically significant increment in the perception of ‘Graphic designers should recognize design expectation of specific target audience’ between male and female students of UiTM,  $z = -2.005$ ,  $p = .045$ , with a large effect size ( $r = 0.22$ ). The median score on the perception increased from Agree ( $Md = \text{Agree}$ ) to Strongly Agree ( $Md = \text{Strongly Agree}$ ).

**c) Graphic designers should recognize characteristics of visual elements for specific target audience (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
characteristics of visual elements for specific target audience	84	1	5	4.12	.870
Valid N (listwise)	84				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * characteristics of visual elements for specific target audience	84	100.0%	0	.0%	84	100.0%

**Gender \* characteristics of visual elements for specific target audience Crosstabulation**

Count		characteristics of visual elements for specific target audience					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	1	12	16	10	39
	FEMALE	1	0	4	14	20	39
	99	0	0	2	1	3	6
Total		1	1	18	31	33	84

**characteristics of visual elements for specific target audience**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid STRONGLY DISAGREE	1	1.2	1.2	1.2
DISAGREE	1	1.2	1.2	2.4
NEUTRAL	18	21.4	21.4	23.8
AGREE	31	36.9	36.9	60.7
STRONGLY AGREE	33	39.3	39.3	100.0
Total	84	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
characteristics of visual elements for specific target audience	MALE	39	33.31	1299.00
	FEMALE	39	45.69	1782.00
	Total	78		

**Test Statistics<sup>a</sup>**

	characteristics of visual elements for specific target audience
Mann-Whitney U	519.000
Wilcoxon W	1299.000
Z	-2.576
Asymp. Sig. (2-tailed)	.010

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.576 / \sqrt{84} = 2.576 / 9.17 = 0.280 = \text{large effect.}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a statistically significant increment in the perception of ‘Graphic designers should recognize characteristics of visual elements for specific target audience’ between male and female students of UiTM,  $z = -2.576, p = .010$ , with a large effect size ( $r = 0.28$ ). The median score on the perception increased from Agree (Md = Agree) to Strongly Agree (Md = Strongly Agree).

**d) Graphic designers should recognize design principles to make character design visually appealing (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
design principles to make character design visually appealing	20	3	5	3.85	.745
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * design principles to make character design visually appealing	20	100.0%	0	.0%	20	100.0%

**Gender \* design principles to make character design visually appealing Crosstabulation**

Count

		design principles to make character design visually appealing			Total
		NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	2	3	5
	FEMALE	7	7	1	15
Total		7	9	4	20

**design principles to make character design visually appealing**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEUTRAL	7	35.0	35.0	35.0
	AGREE	9	45.0	45.0	80.0
	STRONGLY AGREE	4	20.0	20.0	100.0
Total		20	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
design principles to make character design visually appealing	MALE	5	15.90	79.50
	FEMALE	15	8.70	130.50
	Total	20		

Test Statistics<sup>b</sup>

	design principles to make character design visually appealing
Mann-Whitney U	10.500
Wilcoxon W	130.500
Z	-2.541
Asymp. Sig. (2-tailed)	.011
Exact Sig. [2*(1-tailed Sig.)]	.015 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$   
time points

$$r = 2.541 / \sqrt{20} = 2.541 / 4.47 = 0.568 = \text{large effect}$$

### Results of analysis from UTM students:

Mann-Whitney U tests revealed a statistically significant reduction in the perception of ‘Graphic designers should recognize design principles to make character design visually appealing’ between male and female students of UTM,  $z = -2.541$ ,  $p = .011$ , with a large effect size ( $r = 0.57$ ). The median score on the perception decreased from Strongly Agree ( $Md = \text{Strongly Agree}$ ) to Agree ( $Md = \text{Agree}$ ).



**e) Graphic designers should recognize design principles to make game environment visually appealing (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
design principles to make game environment visually appealing	20	2	5	3.80	.834
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * design principles to make game environment visually appealing	20	100.0%	0	.0%	20	100.0%

**Gender \* design principles to make game environment visually appealing Crosstabulation**

Count

		design principles to make game environment visually appealing				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	0	2	3	5
	FEMALE	1	6	7	1	15
Total		1	6	9	4	20

**design principles to make game environment visually appealing**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid DISAGREE	1	5.0	5.0	5.0
NEUTRAL	6	30.0	30.0	35.0
AGREE	9	45.0	45.0	80.0
STRONGLY AGREE	4	20.0	20.0	100.0
Total	20	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
design principles to make game environment visually appealing	MALE	5	15.90	79.50
	FEMALE	15	8.70	130.50
	Total	20		

**Test Statistics<sup>b</sup>**

	design principles to make game environment visually appealing
Mann-Whitney U	10.500
Wilcoxon W	130.500
Z	-2.518
Asymp. Sig. (2-tailed)	.012
Exact Sig. [2*(1-tailed Sig.)]	.015 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.518 / \sqrt{20} = 2.518 / 4.47 = 0.563 = \text{large effect}$$

**Results of analysis from UTM students:**

Mann-Whitney U tests revealed a statistically significant reduction in the perception of ‘Graphic designers should recognize design principles to make game environment visually appealing ‘between male and female students of UTM,  $z = -2.518, p = .012$ , with a large effect size ( $r = 0.56$ ). The median score on the perception decreased from Strongly Agree (Md = Strongly Agree) to Agree (Md = Agree).

**f) Graphic designers should recognize design principles of visual communication which support players' interpretation (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
design principles of visual communication which support players' interpretation	20	3	5	3.95	.686
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * design principles of visual communication which support players' interpretation	20	100.0%	0	.0%	20	100.0%

**Gender \* design principles of visual communication which support players' interpretation**

**Crosstabulation**

Count

		design principles of visual communication which support players' interpretation			Total
		NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	2	3	5
	FEMALE	5	9	1	15
Total		5	11	4	20

**design principles of visual communication which support players' interpretation**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEUTRAL	5	25.0	25.0	25.0
	AGREE	11	55.0	55.0	80.0
	STRONGLY AGREE	4	20.0	20.0	100.0
Total		20	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
design principles of visual communication which support players' interpretation	MALE	5	15.50	77.50
	FEMALE	15	8.83	132.50
	Total	20		

**Test Statistics<sup>b</sup>**

	design principles of visual communication which support players' interpretation
Mann-Whitney U	12.500
Wilcoxon W	132.500
Z	-2.422
Asymp. Sig. (2-tailed)	.015
Exact Sig. [2*(1-tailed Sig.)]	.025 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$

time points

$$r = 2.422 / \sqrt{20} = 2.422 / 4.47 = 0.541 = \text{large effect.}$$

**Results of analysis from UTM students:**

Mann-Whitney U tests revealed a statistically significant reduction in the perception of ‘Graphic designers should recognize design principles of visual communication which support players' interpretation’ between male and female students of UTM,  $z = -2.422$ ,  $p = .015$ , with a large effect size ( $r = 0.54$ ). The median score on the perception decreased from Strongly Agree (Md = Strongly Agree) to Agree (Md = Agree).

**g) Graphic designers should recognize design principles of visual perception that lead players to act accordingly while playing games (UTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
design principles of visual perception that lead players to act accordingly while playing games	20	2	5	3.75	.786
Valid N (listwise)	20				

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * design principles of visual perception that lead players to act accordingly while playing games	20	100.0%	0	.0%	20	100.0%

**Gender \* design principles of visual perception that lead players to act accordingly while playing games Crosstabulation**

Count

		design principles of visual perception that lead players to act accordingly while playing games				Total
		DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	0	2	3	5
	FEMALE	1	6	8	0	15
Total		1	6	10	3	20

**design principles of visual perception that lead players to act accordingly while playing games**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid DISAGREE	1	5.0	5.0	5.0
NEUTRAL	6	30.0	30.0	35.0
AGREE	10	50.0	50.0	85.0
STRONGLY AGREE	3	15.0	15.0	100.0
Total	20	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
design principles of visual perception that lead players to act accordingly while playing games	MALE	5	16.40	82.00
	FEMALE	15	8.53	128.00
	Total	20		

**Test Statistics<sup>b</sup>**

	design principles of visual perception that lead players to act accordingly while playing games
Mann-Whitney U	8.000
Wilcoxon W	128.000
Z	-2.799
Asymp. Sig. (2-tailed)	.005
Exact Sig. [2*(1-tailed Sig.)]	.008 <sup>a</sup>

a. Not corrected for ties.

b. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.799/\sqrt{20} = 2.799/4.47 = 0.626 = \text{large effect.}$$

**Results of analysis from UTM students:**

Mann-Whitney U tests revealed a statistically significant reduction in the perception of ‘Graphic designers should recognize design principles of visual perception that lead players to act accordingly while playing games’ between male and female students of UTM,  $z = - 2.799$ ,  $p = .005$ , with a large effect size ( $r = 0.63$ ). The median score on the perception decreased from Strongly Agree ( $Md = \text{Strongly Agree}$ ) to Agree ( $Md = \text{Agree}$ ).

**h) Graphic designers should recognize that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics (UiTM).**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics	84	1	5	3.95	.930
Valid N (listwise)	84				



**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics	84	100.0%	0	.0%	84	100.0%

**Gender \* that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics Crosstabulation**

Count

		that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics					Total
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	
Gender	MALE	0	1	12	19	7	39
	FEMALE	1	1	6	13	18	39
	99	1	0	2	2	1	6
Total		2	2	20	34	26	84

**that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	STRONGLY DISAGREE	2	2.4	2.4	2.4
	DISAGREE	2	2.4	2.4	4.8
	NEUTRAL	20	23.8	23.8	28.6
	AGREE	34	40.5	40.5	69.0
	STRONGLY AGREE	26	31.0	31.0	100.0
Total		84	100.0	100.0	

**Ranks**

	Gender	N	Mean Rank	Sum of Ranks
that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics	MALE	39	34.03	1327.00
	FEMALE	39	44.97	1754.00
	Total	78		

**Test Statistics<sup>a</sup>**

	that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics
Mann-Whitney U	547.000
Wilcoxon W	1327.000
Z	-2.267
Asymp. Sig. (2-tailed)	.023

a. Grouping Variable: Gender

Effect size,  $r = z / \text{square root of } N$  where  $N = \text{total number of observations over } 2$  time points

$$r = 2.267 / \sqrt{84} = 2.267 / 9.17 = 0.247 = \text{large effect.}$$

**Results of analysis from UiTM students:**

Mann-Whitney U tests revealed a statistical significant difference in the perception of ‘Graphic designers should recognize that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics’

between male and female students of UiTM, despite a tied median score (Md= Agree),  $z = -2.267$ ,  $p = .023$ , with a large effect size ( $r = 0.25$ ).

## H. Kruskal-Wallis Test

a) Is there significance difference across four universities towards the perceptions on characteristics of visual elements in game graphic design?

Ranks			
	Program	N	Mean Rank
B1LINEa. Lines used in game design should emphasize on thin line to evoke players' positive emotion	B HONS GRAPHIC DESIGN, UiTM	84	88.77
	B CS GRAPHICS & MULTIMEDIA, UTM	20	77.08
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	77.07
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	74.63
	Total	164	
B1LINEb. Lines used in game design should emphasize on sharp line to evoke players' negative emotion	B HONS GRAPHIC DESIGN, UiTM	84	88.41
	B CS GRAPHICS & MULTIMEDIA, UTM	20	72.78
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	78.93
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	74.26
	Total	163	
B1LINEc. Lines used in game design should emphasize on directional lines to lead players' eyes	B HONS GRAPHIC DESIGN, UiTM	83	87.51
	B CS GRAPHICS & MULTIMEDIA, UTM	20	64.48
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	72.09
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	82.81
	Total	162	

B2SHAPEa. Shapes used in game design should emphasize on round edges to evoke players' positive emotion	B HONS GRAPHIC DESIGN, UiTM	84	82.38
	B CS GRAPHICS & MULTIMEDIA, UTM	20	92.08
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	81.70
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	75.86
	Total	163	
B2SHAPEb. Shapes used in game design should emphasize on sharp edges to evoke players' negative emotion	B HONS GRAPHIC DESIGN, UiTM	84	91.75
	B CS GRAPHICS & MULTIMEDIA, UTM	20	79.00
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	79.48
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	65.64
	Total	164	
B2SHAPEc. Shapes used in game design should underline the proportion to distinct the game characters for players' recognition	B HONS GRAPHIC DESIGN, UiTM	84	92.83
	B CS GRAPHICS & MULTIMEDIA, UTM	20	70.85
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	76.05
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	69.54
	Total	164	
B3FORMa. Forms used in game design should impose the 3 dimensional for impression of volume	B HONS GRAPHIC DESIGN, UiTM	83	87.94
	B CS GRAPHICS & MULTIMEDIA, UTM	20	67.30
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	74.45
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	81.13
	Total	163	



B3FORMb. Forms used in game design should impose the 3 dimensional for impression of weight	B HONS GRAPHIC DESIGN, UiTM	83	91.73
	B CS GRAPHICS & MULTIMEDIA, UTM	20	75.62
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	56.30
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	78.99
	Total	163	
B3FORMc. Forms used in game design should impose the 3 dimensional for impression of density	B HONS GRAPHIC DESIGN, UiTM	84	98.00
	B CS GRAPHICS & MULTIMEDIA, UTM	20	65.45
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	60.86
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	69.74
	Total	164	
B4SPACEa. Spaces used in game design should impose the linear perspective for players' depth perception	B HONS GRAPHIC DESIGN, UiTM	83	87.04
	B CS GRAPHICS & MULTIMEDIA, UTM	20	77.50
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	66.95
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	79.89
	Total	162	
B4SPACEb. Spaces used in game design should impose the overlapping shapers for players' depth perception	B HONS GRAPHIC DESIGN, UiTM	84	88.90
	B CS GRAPHICS & MULTIMEDIA, UTM	20	88.22
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	74.70
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	36	64.64
	Total	162	



B4SPACEc. Spaces used in game design should impose the size gradient for players' depth perception	B HONS GRAPHIC DESIGN, UiTM	83	88.02
	B CS GRAPHICS & MULTIMEDIA, UTM	20	74.42
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	80.95
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	35	65.86
	Total	160	
B4SPACEd. Spaces used in game design should impose the texture gradient for players' depth perception	B HONS GRAPHIC DESIGN, UiTM	84	84.09
	B CS GRAPHICS & MULTIMEDIA, UTM	20	91.12
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	71.91
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	78.32
	Total	163	
B5TEXTUREa. Textures used in game design should emphasize on repetition of lines to evoke players' sense of touch	B HONS GRAPHIC DESIGN, UiTM	84	91.94
	B CS GRAPHICS & MULTIMEDIA, UTM	20	71.10
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	73.43
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	72.88
	Total	164	
B5TEXTUREb. Textures used in game design should emphasize on repetition of shapes to evoke players' sense of touch	B HONS GRAPHIC DESIGN, UiTM	84	89.58
	B CS GRAPHICS & MULTIMEDIA, UTM	20	78.05
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	66.25
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	78.59
	Total	164	

B5TEXTUREc. Textures used in game design should emphasize on rhythm of lines to evoke players' sense of touch	B HONS GRAPHIC DESIGN, UiTM	84	91.79
	B CS GRAPHICS & MULTIMEDIA, UTM	20	73.82
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	66.45
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	75.82
	Total	164	
B5TEXTUREd. Textures used in game design should emphasize on rhythm of shapes to evoke players' sense of touch	B HONS GRAPHIC DESIGN, UiTM	84	88.73
	B CS GRAPHICS & MULTIMEDIA, UTM	20	79.95
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	66.55
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	79.32
	Total	164	
B6COLOURa. Colours used in game design should emphasize on cool colour to evoke players' positive emotion	B HONS GRAPHIC DESIGN, UiTM	84	86.66
	B CS GRAPHICS & MULTIMEDIA, UTM	20	80.65
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	61.27
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	86.57
	Total	164	
B6COLOURb. Colours used in game design should emphasize on warm colour to evoke players' negative emotion	B HONS GRAPHIC DESIGN, UiTM	84	86.18
	B CS GRAPHICS & MULTIMEDIA, UTM	20	81.00
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	70.32
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	82.20
	Total	164	



B6COLOURc. Colours used in game design should emphasize on cool colour for background of game environment	B HONS GRAPHIC DESIGN, UiTM	84	85.57
	B CS GRAPHICS & MULTIMEDIA, UTM	20	89.50
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	61.95
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	83.92
	Total	164	
B6COLOURd. Colours used in game design should emphasize on cool colour for foreground of game environment	B HONS GRAPHIC DESIGN, UiTM	81	83.86
	B CS GRAPHICS & MULTIMEDIA, UTM	20	74.30
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	66.30
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	84.95
	Total	160	
B6COLOURe. Colours used in game design should balance in colour intensity to ease players' eyes	B HONS GRAPHIC DESIGN, UiTM	84	84.39
	B CS GRAPHICS & MULTIMEDIA, UTM	20	76.40
	BSC HONS MATH WITH COMP GRAPHIC, UMS	21	66.10
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	88.45
	Total	163	
B6COLOURf. Colours used in game design should grade the colour properties for players' emotional effects	B HONS GRAPHIC DESIGN, UiTM	84	86.64
	B CS GRAPHICS & MULTIMEDIA, UTM	20	86.00
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	67.30
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	78.04
	Total	163	

B6COLOURg. Colours used in game design should impose the colour harmony for uniformity of game themes	B HONS GRAPHIC DESIGN, UiTM	82	87.95
	B CS GRAPHICS & MULTIMEDIA, UTM	20	82.35
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	61.16
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	78.92
	Total	162	
B6COLOURh. Colours used in game design should employ the symbolic colour meanings for players' interpretation	B HONS GRAPHIC DESIGN, UiTM	84	89.76
	B CS GRAPHICS & MULTIMEDIA, UTM	20	91.55
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	55.86
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	77.11
	Total	164	

Test Statistics <sup>a,b</sup>									
	B1LI NEa	B1LIN Eb	B1LIN Ec	B2SHA PEa	B2SHA PEb	B2SHA PEc	B3FOR Ma	B3FOR Mb	B3FOR Mc
Chi-Square	3.601	3.958	5.763	1.829	9.356	9.643	4.555	13.050	23.233
df	3	3	3	3	3	3	3	3	3
Asym p. Sig.	.308	.266	.124	.609	.025	.022	.207	.005	.000

a. Kruskal Wallis Test

b. Grouping Variable: Program

Test Statistics <sup>a,b</sup>									
	B4SP ACEa	B4SPA CEb	B4SPA CEc	B4SPAC Ed	B5TEXT UREa	B5TEXT UREb	B5TEX TUREc	B5TEX TUREd	B6COL OURa
Chi-Square	4.251	9.169	7.060	2.500	7.738	5.573	8.288	4.743	6.244
df	3	3	3	3	3	3	3	3	3
Asymp. Sig.	.236	.027	.070	.475	.052	.134	.040	.192	.100

a. Kruskal Wallis Test

b. Grouping Variable: Program

Test Statistics <sup>a,b</sup>									
	B6CO LOUR b	B6COL OURc	B6COL OURd	B6COLO URe	B6COLO URf	B6COLO URg	B6COL OURh		
Chi-Square	2.189	5.633	3.586	4.062	3.922	6.898	11.424		
df	3	3	3	3	3	3	3		
Asymp. Sig.	.534	.131	.310	.255	.270	.075	.010		

a. Kruskal Wallis Test

b. Grouping Variable: Program

Report		
Perceptions on six visual elements in game graphic design		
Visual Elements	N	Asymp. Sig.
B2SHAPEb	164	.025
B2SHAPEc	164	.022
B3FORMb	163	.005
B3FORMc	164	.000

B4SPACEb	162	.027
B5TEXTUREc	164	.040
B6COLOURh	164	.010

A Kruskal Wallis Test revealed a statistical significant difference across four universities towards the perceptions on characteristics of visual elements in game graphic design (B2SHAPEb,  $n = 164$ :  $p = .025$ , B2SHAPEc,  $n = 164$ :  $p = .022$ , B3FORMb,  $n = 163$ :  $p = .005$ , B3FORMc,  $n = 164$ :  $p = .000$ , B4SPACEb,  $n = 162$ :  $p = .027$ , B5TEXTUREc,  $n = 164$ :  $p = .040$ , B6COLOURh,  $n = 164$ :  $p = .010$ ).

**b) Is there significance difference across four universities towards the propositions on aesthetic value in game graphic design?**

Ranks			
	Program	N	Mean Rank
C1AESTHETIC_a. Graphic designers should know aesthetics influence players' emotional experience	B HONS GRAPHIC DESIGN, UiTM	84	90.86
	B CS GRAPHICS & MULTIMEDIA, UTM	20	64.25
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	69.02
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	81.42
	Total	164	
C1AESTHETIC_b. Graphic designers should know aesthetics influence players' first impression for playing the games	B HONS GRAPHIC DESIGN, UiTM	83	86.90
	B CS GRAPHICS & MULTIMEDIA, UTM	20	85.68
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	65.98

	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	78.63
	Total	163	
C1AESTHETHIC_c. Graphic designers should know aesthetics influence players' efficiency.	B HONS GRAPHIC DESIGN, UiTM	84	90.37
	B CS GRAPHICS & MULTIMEDIA, UTM	19	87.11
	BSC HONS MATH WITH COMP GRAPHIC, UMS	20	61.10
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	65.19
	Total	160	
C1AESTHETHIC_d. Graphic designers should know aesthetics elicit immediate visceral reaction of players while being in game playing events	B HONS GRAPHIC DESIGN, UiTM	83	89.48
	B CS GRAPHICS & MULTIMEDIA, UTM	20	81.55
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	67.23
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	72.05
	Total	162	
C1AESTHETHIC_e. Graphic designers should know aesthetics elicit beauty experience from sight sense	B HONS GRAPHIC DESIGN, UiTM	84	89.81
	B CS GRAPHICS & MULTIMEDIA, UTM	20	93.25
	BSC HONS MATH WITH COMP GRAPHIC, UMS	21	64.45
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	68.51
	Total	163	
C1AESTHETHIC_f. Graphic designers should know aesthetics in games is intended to appeal players' sight sense	B HONS GRAPHIC DESIGN, UiTM	81	86.59
	B CS GRAPHICS & MULTIMEDIA, UTM	20	79.40
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	77.64

	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	69.47
	Total	160	
C1AESTHETHIC_g. Graphic designers should know aesthetics in games needs players' feedback	B HONS GRAPHIC DESIGN, UiTM	84	89.20
	B CS GRAPHICS & MULTIMEDIA, UTM	20	91.10
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	66.50
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	72.43
	Total	164	
C1AESTHETHIC_h. Graphic designers should know aesthetics would accomplish players' preferences in game playing events	B HONS GRAPHIC DESIGN, UiTM	83	88.33
	B CS GRAPHICS & MULTIMEDIA, UTM	20	76.60
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	67.45
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	79.43
	Total	163	
C1AESTHETHIC_i. Graphic designers should know aesthetics would help players to make decision	B HONS GRAPHIC DESIGN, UiTM	84	92.65
	B CS GRAPHICS & MULTIMEDIA, UTM	20	72.82
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	56.57
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	36	75.54
	Total	162	
C1AESTHETHIC_j. Graphic designers should know aesthetics would ensure the functionality of game technologies	B HONS GRAPHIC DESIGN, UiTM	84	94.08
	B CS GRAPHICS & MULTIMEDIA, UTM	20	79.90
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	46.59

	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	76.76
	Total	163	
C1AESTHETHIC_k. Graphic designers should know aesthetics would represent games as cultural form besides technological form	B HONS GRAPHIC DESIGN, UiTM	84	88.23
	B CS GRAPHICS & MULTIMEDIA, UTM	20	92.80
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	62.27
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	76.13
	Total	164	
C1AESTHETHIC_1. Graphic designers should know aesthetics is related to flow experience of motivation	B HONS GRAPHIC DESIGN, UiTM	83	91.05
	B CS GRAPHICS & MULTIMEDIA, UTM	20	87.45
	BSC HONS MATH WITH COMP GRAPHIC, UMS	21	50.52
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	74.62
	Total	162	
C1AESTHETHIC_m. Graphic designers should know aesthetics is related to the study of beauty which need evaluation process	B HONS GRAPHIC DESIGN, UiTM	84	89.64
	B CS GRAPHICS & MULTIMEDIA, UTM	20	77.95
	BSC HONS MATH WITH COMP GRAPHIC, UMS	21	60.95
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	78.87
	Total	163	
C1AESTHETHIC_n. Graphic designers should know aesthetics is related to human preferences	B HONS GRAPHIC DESIGN, UiTM	83	91.57
	B CS GRAPHICS & MULTIMEDIA, UTM	20	69.90
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	61.14

	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	77.28
	Total	162	
C1AESTHETHIC_o. Graphic designers should know aesthetics as a branch of philosophy that concerned about beauty	B HONS GRAPHIC DESIGN, UiTM	84	84.75
	B CS GRAPHICS & MULTIMEDIA, UTM	20	88.35
	BSC HONS MATH WITH COMP GRAPHIC, UMS	21	68.81
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	79.87
	Total	163	
C1AESTHETHIC_p. Graphic designers should know aesthetics plays an important role in the advancement of game technologies	B HONS GRAPHIC DESIGN, UiTM	82	94.01
	B CS GRAPHICS & MULTIMEDIA, UTM	20	71.85
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	56.50
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	74.07
	Total	162	
C1AESTHETHIC_q. Graphic designers should know aesthetics requires human learning experience	B HONS GRAPHIC DESIGN, UiTM	84	98.28
	B CS GRAPHICS & MULTIMEDIA, UTM	20	67.22
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	50.27
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	74.32
	Total	164	
C1AESTHETHIC_r. Graphic designers should know aesthetics enhances players' engagement	B HONS GRAPHIC DESIGN, UiTM	83	96.81
	B CS GRAPHICS & MULTIMEDIA, UTM	19	77.55
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	46.41



	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	67.86
	Total	161	

Test Statistics <sup>a,b</sup>									
	C1AES THETH IC_a	C1AESTHETHIC_b	C1AESTHETHIC_c	C1AESTHETHIC_d	C1AESTHETHIC_e	C1AESTHETHIC_f	C1AESTHETHIC_g	C1AESTHETHIC_h	C1AESTHETHIC_i
Chi-Square	8.676	4.374	13.211	6.877	11.096	4.102	7.358	4.560	13.721
df	3	3	3	3	3	3	3	3	3
Asymp. Sig.	.034	.224	.004	.076	.011	.251	.061	.207	.003

a. Kruskal Wallis Test

b. Grouping Variable: Program

Test Statistics <sup>a,b</sup>									
	C1AESTHETHIC_j	C1AESTHETHIC_k	C1AESTHETHIC_l	C1AESTHETHIC_m	C1AESTHETHIC_n	C1AESTHETHIC_o	C1AESTHETHIC_p	C1AESTHETHIC_q	C1AESTHETHIC_r
Chi-Square	20.587	7.716	15.939	7.568	11.059	2.696	16.036	25.932	28.078
df	3	3	3	3	3	3	3	3	3
Asymp. Sig.	.000	.052	.001	.056	.011	.441	.001	.000	.000

a. Kruskal Wallis Test

b. Grouping Variable: Program

Report		
The propositions on aesthetic value in game graphic design.		
Aesthetic Value	N	Asymp. Sig.
C1AESTHETHIC_a	164	.034
C1AESTHETHIC_c	160	.004
C1AESTHETHIC_e	163	.011
C1AESTHETHIC_i	162	.003
C1AESTHETHIC_j	163	.000
C1AESTHETHIC_l	162	.001
C1AESTHETHIC_n	162	.011
C1AESTHETHIC_p	162	.001
C1AESTHETHIC_q	164	.000
C1AESTHETHIC_r	161	.000

A Kruskal Wallis Test revealed a statistical significant difference across four universities to the propositions on aesthetic value in game graphic design (C1AESTHETHIC\_a,  $n = 164$ :  $p = .034$ , C1AESTHETHIC\_c,  $n = 160$ :  $p = .004$ , C1AESTHETHIC\_e,  $n = 163$ :  $p = .011$ , C1AESTHETHIC\_i,  $n = 162$ :  $p = .003$ , C1AESTHETHIC\_j,  $n = 163$ :  $p = .000$ , C1AESTHETHIC\_l,  $n = 162$ :  $p = .001$ , C1AESTHETHIC\_n,  $n = 162$ :  $p = .011$ , C1AESTHETHIC\_p,  $n = 162$ :  $p = .001$ , C1AESTHETHIC\_q,  $n = 162$ :  $p = .000$ , C1AESTHETHIC\_r,  $n = 161$ :  $p = .000$ ).

**c) Is there significance difference across four universities to the propositions on comprehension of game graphic design?**

Ranks			
	Program	N	Mean Rank
C2SKILLS_a.Graphic designers should comprehend the visual elements as cues to evoke immediate emotional response of players within visual representation of games	B HONS GRAPHIC DESIGN, UiTM	84	91.10
	B CS GRAPHICS & MULTIMEDIA, UTM	20	65.28
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	70.20
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	79.68
	Total	164	
C2SKILLS_b.Graphic designers should comprehend the visual elements that captivate players' sight	B HONS GRAPHIC DESIGN, UiTM	83	89.55
	B CS GRAPHICS & MULTIMEDIA, UTM	20	70.00
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	69.34
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	36	74.53
	Total	161	
C2SKILLS_c.Graphic designers should comprehend the visual elements that represent consistency to players' sight	B HONS GRAPHIC DESIGN, UiTM	84	90.64
	B CS GRAPHICS & MULTIMEDIA, UTM	19	84.71
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	64.68
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	71.57
	Total	163	

C2SKILLS_d.Graphic designers should comprehend the visual elements that represent synchronization to players' sight	B HONS GRAPHIC DESIGN, UiTM	82	85.57
	B CS GRAPHICS & MULTIMEDIA, UTM	20	85.82
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	66.45
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	79.16
	Total	162	
C2SKILLS_e.Graphic designers should comprehend the organization of visual elements within visual representation of games to evoke immediate emotional response of players	B HONS GRAPHIC DESIGN, UiTM	84	90.57
	B CS GRAPHICS & MULTIMEDIA, UTM	20	63.90
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	68.55
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	82.54
	Total	164	
C2SKILLS_f.Graphic designers should comprehend the characterization of visual elements within visual representation of games to evoke immediate emotional response of players	B HONS GRAPHIC DESIGN, UiTM	83	89.66
	B CS GRAPHICS & MULTIMEDIA, UTM	19	83.68
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	62.14
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	73.80
	Total	162	
C2SKILLS_g.Graphic designers should comprehend the game concept for specific target audience	B HONS GRAPHIC DESIGN, UiTM	84	93.59
	B CS GRAPHICS & MULTIMEDIA, UTM	20	72.72
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	59.70
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	76.33
	Total	164	

C2SKILLS_h.Graphic designers should comprehend the design creativity for specific target audience	B HONS GRAPHIC DESIGN, UiTM	83	91.26
	B CS GRAPHICS & MULTIMEDIA, UTM	20	80.75
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	63.93
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	72.89
	Total	163	
C2SKILLS_i.Graphic designers should comprehend the design styles for specific target audience	B HONS GRAPHIC DESIGN, UiTM	84	93.60
	B CS GRAPHICS & MULTIMEDIA, UTM	20	74.18
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	58.70
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	76.12
	Total	164	
C2SKILLS_j.Graphic designers should comprehend the design of graphical user interface that easy to use	B HONS GRAPHIC DESIGN, UiTM	84	94.06
	B CS GRAPHICS & MULTIMEDIA, UTM	20	73.12
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	60.18
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	74.80
	Total	164	
C2SKILLS_k.Graphic designers should comprehend the design of game characters interface that easy to recognize	B HONS GRAPHIC DESIGN, UiTM	83	92.04
	B CS GRAPHICS & MULTIMEDIA, UTM	20	77.50
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	61.64
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	74.24
	Total	163	



C2SKILLS_l.Graphic designers should comprehend the design of game environment that immerse the players	B HONS GRAPHIC DESIGN, UiTM	83	87.74
	B CS GRAPHICS & MULTIMEDIA, UTM	20	78.12
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	66.23
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	80.63
	Total	163	
C2SKILLS_m.Graphic designers should comprehend the design of visual representation that complies with digital game system	B HONS GRAPHIC DESIGN, UiTM	84	91.15
	B CS GRAPHICS & MULTIMEDIA, UTM	20	71.20
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	63.18
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	80.50
	Total	164	
C2SKILLS_n.Graphic designers should comprehend the design of visual representation that supports digital game hardware	B HONS GRAPHIC DESIGN, UiTM	84	93.88
	B CS GRAPHICS & MULTIMEDIA, UTM	20	87.68
	BSC HONS MATH WITH COMP GRAPHIC, UMS	21	59.19
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	65.36
	Total	163	
C2SKILLS_o.Graphic designers should comprehend the design of visual representation that supports the virtual reality game system	B HONS GRAPHIC DESIGN, UiTM	83	88.48
	B CS GRAPHICS & MULTIMEDIA, UTM	20	89.90
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	60.84
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	75.95
	Total	163	



C2SKILLS_p.Graphic designers should comprehend the design of visual representation for the game testing	B HONS GRAPHIC DESIGN, UiTM	83	87.82
	B CS GRAPHICS & MULTIMEDIA, UTM	20	83.95
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	68.27
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	76.21
	Total	163	
C2SKILLS_q.Graphic designers should comprehend to revise the design of visual representation after the game testing	B HONS GRAPHIC DESIGN, UiTM	84	91.36
	B CS GRAPHICS & MULTIMEDIA, UTM	20	74.88
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	58.57
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	80.79
	Total	164	
C2SKILLS_r.Graphic designers should comprehend to come out with the new design of visual representation after the game testing	B HONS GRAPHIC DESIGN, UiTM	84	95.32
	B CS GRAPHICS & MULTIMEDIA, UTM	20	75.78
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	62.52
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	69.28
	Total	164	

Test Statistics <sup>a,b</sup>									
	C2SKI LLS_a	C2SK ILLS _b	C2SKI LLS_c	C2SKI LLS_d	C2SKI LLS_e	C2SKIL LS_f	C2SKI LLS_g	C2SKI LLS_h	C2SKI LLS_i
Chi-Square	8.242	7.247	9.049	3.717	8.566	8.575	12.933	9.130	13.193
df	3	3	3	3	3	3	3	3	3
Asymp . Sig.	.041	.064	.029	.294	.036	.036	.005	.028	.004

a. Kruskal Wallis Test

b. Grouping Variable: Program

Test Statistics <sup>a,b</sup>									
	C2SKI LLS_j	C2SK ILLS _k	C2SKIL LS_l	C2SKIL LS_m	C2SKIL LS_n	C2SKIL LS_o	C2SKI LLS_p	C2SKI LLS_q	C2SKI LLS_r
Chi-Square	13.356	10.34 1	4.486	8.630	17.198	8.245	4.234	10.424	15.446
df	3	3	3	3	3	3	3	3	3
Asymp . Sig.	.004	.016	.214	.035	.001	.041	.237	.015	.001

a. Kruskal Wallis Test

b. Grouping Variable: Program



Report		
The propositions on comprehension of game graphic design.		
Design Skills	N	Asymp. Sig.
C2SKILLS_a	164	.041
C2SKILLS_c	163	.029
C2SKILLS_e	164	.036
C2SKILLS_f	162	.036
C2SKILLS_g	164	.005
C2SKILLS_h	163	.028
C2SKILLS_i	164	.004
C2SKILLS_j	164	.004
C2SKILLS_k	163	.016
C2SKILLS_m	164	.035
C2SKILLS_n	163	.001
C2SKILLS_o	163	.041
C2SKILLS_q	164	.015
C2SKILLS_r	164	.001

A Kruskal Wallis Test revealed a statistical significant difference across four universities to the propositions on comprehension of game graphic design.

(C2SKILLS\_a, n = 164:  $p = .041$ , C2SKILLS\_c, n = 163:  $p = .029$ , C2SKILLS\_e, n = 164:  $p = .036$ , C2SKILLS\_f, n = 162:  $p = .036$ , C2SKILLS\_g, n = 164:  $p = .005$ , C2SKILLS\_h, n = 163:  $p = .028$ , C2SKILLS\_i, n = 164:  $p = .004$ , C2SKILLS\_j, n = 164:  $p = .004$ , C2SKILLS\_k, n = 163:  $p = .016$ , C2SKILLS\_m, n = 164:  $p =$

.004, C2SKILLS\_n, n = 163:  $p = .001$ , C2SKILLS\_o, h = 163:  $p = .41$ , C2SKILLS\_q, n = 164:  $p = .015$ , C2SKILLS\_r, n = 164:  $p = .001$ ).

**C3: Is there significance difference across four universities to the propositions on principles of game graphic design.**

Ranks			
	Program	N	Mean Rank
C3KNOWLEDGE_a. Graphic designers should recognize gestalt principles to evoke players' immediate emotional response	B HONS GRAPHIC DESIGN, UiTM	84	90.51
	B CS GRAPHICS & MULTIMEDIA, UTM	20	74.40
	BSC HONS MATH WITH COMP GRAPHIC, UMS	21	67.00
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	75.49
	Total	163	
C3KNOWLEDGE_b. Graphic designers should recognize visual metaphor to evoke players' immediate emotional response	B HONS GRAPHIC DESIGN, UiTM	83	89.27
	B CS GRAPHICS & MULTIMEDIA, UTM	20	71.15
	BSC HONS MATH WITH COMP GRAPHIC, UMS	21	72.07
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	75.18
	Total	162	
C3KNOWLEDGE_c. Graphic designers should recognize emotional scenes in movies as design inspiration	B HONS GRAPHIC DESIGN, UiTM	82	89.57
	B CS GRAPHICS & MULTIMEDIA, UTM	20	67.75
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	62.73
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	80.04
	Total	161	

C3KNOWLEDGE_d. Graphic designers should recognize demographic profile of specific target audience	B HONS GRAPHIC DESIGN, UiTM	84	89.69
	B CS GRAPHICS & MULTIMEDIA, UTM	20	74.02
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	68.93
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	36	74.22
	Total	162	
C3KNOWLEDGE_e. Graphic designers should recognize design expectation of specific target audience	B HONS GRAPHIC DESIGN, UiTM	83	89.19
	B CS GRAPHICS & MULTIMEDIA, UTM	20	78.70
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	63.00
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	79.04
	Total	163	
C3KNOWLEDGE_f. Graphic designers should recognize characteristics of visual elements for specific target audience	B HONS GRAPHIC DESIGN, UiTM	84	90.30
	B CS GRAPHICS & MULTIMEDIA, UTM	20	82.20
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	63.93
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	73.80
	Total	163	
C3KNOWLEDGE_g. Graphic designers should recognize design principles to make graphical user interface visually appealing	B HONS GRAPHIC DESIGN, UiTM	84	86.72
	B CS GRAPHICS & MULTIMEDIA, UTM	19	76.42
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	66.32
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	81.28
	Total	162	

C3KNOWLEDGE_h. Graphic designers should recognize design principles to make character design visually appealing	B HONS GRAPHIC DESIGN, UiTM	84	94.37
	B CS GRAPHICS & MULTIMEDIA, UTM	20	71.78
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	64.23
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	72.49
	Total	164	
C3KNOWLEDGE_i. Graphic designers should recognize design principles to make game environment visually appealing	B HONS GRAPHIC DESIGN, UiTM	84	91.01
	B CS GRAPHICS & MULTIMEDIA, UTM	20	70.30
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	65.93
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	79.70
	Total	164	
C3KNOWLEDGE_j. Graphic designers should recognize design principles of visual literacy which support players' learnability	B HONS GRAPHIC DESIGN, UiTM	84	89.02
	B CS GRAPHICS & MULTIMEDIA, UTM	20	79.30
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	70.89
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	76.49
	Total	164	
C3KNOWLEDGE_k. Graphic designers should recognize design principles of visual communication which support players' interpretation	B HONS GRAPHIC DESIGN, UiTM	83	88.40
	B CS GRAPHICS & MULTIMEDIA, UTM	20	83.25
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	73.02
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	72.57
	Total	163	

C3KNOWLEDGE_j. Graphic designers should recognize design principles of visual perception that lead players to act accordingly while playing games	B HONS GRAPHIC DESIGN, UiTM	84	90.04
	B CS GRAPHICS & MULTIMEDIA, UTM	20	76.92
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	68.95
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	76.62
	Total	164	
C3KNOWLEDGE_m. Graphic designers should recognize design principles which are compatible the digital game system	B HONS GRAPHIC DESIGN, UiTM	84	85.57
	B CS GRAPHICS & MULTIMEDIA, UTM	19	96.05
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	63.86
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	77.58
	Total	163	
C3KNOWLEDGE_n. Graphic designers should recognize design principles that function within virtual reality games	B HONS GRAPHIC DESIGN, UiTM	84	86.92
	B CS GRAPHICS & MULTIMEDIA, UTM	20	87.98
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	70.23
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	76.95
	Total	164	
C3KNOWLEDGE_o. Graphic designers should recognize design principles that incorporate with game technologies to excite players	B HONS GRAPHIC DESIGN, UiTM	83	84.61
	B CS GRAPHICS & MULTIMEDIA, UTM	20	104.12
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	63.86
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	75.14
	Total	163	

C3KNOWLEDGE_p. Graphic designers should recognize that design evaluation process is an iterative process	B HONS GRAPHIC DESIGN, UiTM	84	89.08
	B CS GRAPHICS & MULTIMEDIA, UTM	20	80.02
	BSC HONS MATH WITH COMP GRAPHIC, UMS	21	61.36
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	78.80
	Total	163	
C3KNOWLEDGE_q. Graphic designers should recognize that design evaluation process is meant to ensure the usability of players which is reflected from visual aesthetics	B HONS GRAPHIC DESIGN, UiTM	84	84.82
	B CS GRAPHICS & MULTIMEDIA, UTM	20	83.08
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	67.43
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	37	83.68
	Total	163	
C3KNOWLEDGE_r. Graphic designers should recognize that design evaluation process is meant to ensure the presence of players' positive emotion which is reflected from visual aesthetics	B HONS GRAPHIC DESIGN, UiTM	84	87.45
	B CS GRAPHICS & MULTIMEDIA, UTM	20	80.38
	BSC HONS MATH WITH COMP GRAPHIC, UMS	22	68.36
	B CS HONS GRAPHICS & MULTIMEDIA TECH, UMP	38	80.86
	Total	164	



Test Statistics <sup>a,b</sup>									
	C3KNO WLEDG E_a	C3KN OWLE DGE_ b	C3KNOW LEDGE_ c	C3KNOW LEDGE_ d	C3KNOW LEDGE_ e	C3KNOW LEDGE_ f	C3KNO WLEDG E_g	C3KNO WLEDG E_h	C3KNO WLEDG E_i
Chi-Square	6.969	5.535	8.933	6.259	6.463	7.836	4.115	13.057	7.949
df	3	3	3	3	3	3	3	3	3
Asymp . Sig.	.073	.137	.030	.100	.091	.050	.249	.005	.047

a. Kruskal Wallis Test

b. Grouping Variable: Program

Test Statistics <sup>a,b</sup>									
	C3KNO WLEDG E_j	C3KN OWLE DGE_ k	C3KNOW LEDGE_ l	C3KNOW LEDGE_ m	C3KNOW LEDGE_ n	C3KNOW LEDGE_ o	C3KNO WLEDG E_p	C3KNO WLEDG E_q	C3KNO WLEDG E_r
Chi-Square	4.146	4.440	5.434	6.565	3.456	9.901	6.862	2.779	3.326
df	3	3	3	3	3	3	3	3	3
Asymp . Sig.	.246	.218	.143	.087	.327	.019	.076	.427	.344

a. Kruskal Wallis Test

b. Grouping Variable: Program



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Design Skills	N	Asymp. Sig.
C3KNOWLEDGE_c	161	.030
C3KNOWLEDGE_f	163	.050
C3KNOWLEDGE_h	164	.005
C3KNOWLEDGE_i	164	.047
C3KNOWLEDGE_o	163	.019

A Kruskal Wallis Test revealed a statistical significant difference across four universities to the propositions on principles of game graphic design.

(C3KNOWLEDGE\_c, n = 161:  $p = .030$ , C3KNOWLEDGE\_f, n = 163:  $p = .050$ , C3KNOWLEDGE\_h, n = 164:  $p = .005$ , C3KNOWLEDGE\_i, n = 164:  $p = .047$ , C3KNOWLEDGE\_o, n = 163:  $p = .019$ ).



## I. Structure of graphic design programme in Malaysia public universities related to visual aesthetics

University	Programme	Course (CORE)	Visual Aesthetics					
			Line	Shape	Form	Space	Texture	Colour
UiTM	Bachelor of Graphic Design (Honours)	History of Graphic Communication	/	/	/	/	/	/
		Intro to Visual Research & Drawing	/	/	/	/	/	/
		Art & Design History and Theory	/	/	/	/	/	/
		Illustration & Creative Application	/	/	/	/	/	/
		2 Dimension Design	/	/	/	/	/	/
		Electronic Media & Application	/	/	/	/	/	/
		Photography in Communication Design	/	/	/	/	/	/
		Creative & Critical Thinking	/	/	/	/	/	/
		Psychology & Interpersonal Communication	/	/	/	/	/	/
		Copywriting in Communication Design	/	/	/	/	/	/
		Graphic Design Reproduction	/	/	/	/	/	/
		Graphic Design Theory	/	/	/	/	/	/
		Type in Publication	/	/	/	/	/	/
		Art & Design Entrepreneurship						
		Design Managements & Ethics						
		Marketing Communication	/	/	/	/	/	/
		Packaging Design and Production	/	/	/	/	/	/
Art Direction in Communication	/	/	/	/	/	/		

Design						
Professional Development	/	/	/	/	/	/
Graphic Design Research	/	/	/	/	/	/
Design and Branding Strategies	/	/	/	/	/	/
Contemporary Design Issues	/	/	/	/	/	/
Graphic Design Studio	/	/	/	/	/	/
Service Design	/	/	/	/	/	/
Information Design	/	/	/	/	/	/
Advertising Design Research	/	/	/	/	/	/
Brand Architecture in Advertising	/	/	/	/	/	/
Contemporary Design Issues	/	/	/	/	/	/
Advertising Design Studio	/	/	/	/	/	/
Designing Advocacy for Social Impact	/	/	/	/	/	/
Case Studies in Advertising and Public Relations	/	/	/	/	/	/
Multimedia Design Research	/	/	/	/	/	/
Motion Graphics	/	/	/	/	/	/
Concept and Storyboard	/	/	/	/	/	/
Multimedia Design Studio	/	/	/	/	/	/
Digital Video	/	/	/	/	/	/
Assistive Technology Content	/	/	/	/	/	/
Illustration Design Research	/	/	/	/	/	/
Contemporary Illustration	/	/	/	/	/	/
Illustration Material and Techniques	/	/	/	/	/	/
Illustration Design Studio	/	/	/	/	/	/
Independent Publishing	/	/	/	/	/	/
Scientific	/	/	/	/	/	/

		Illustration						
<b>UMP</b>	Bachelor of Computer Science (Graphics & Multimedia Technology) with Honours	Technology & Information System						
		Discrete Structure						
		Programming Technique I						
		Digital Logic						
		Mathematics for Computer Graphics						
		Programming Technique II						
		Network Communications						
		Probability & Statistical Data Analysis						
		Science, Technology and Human						
		Database						
		System Analysis and Design						
		Data Structure and Algorithm						
		Computer Organisation and Architecture						
		Human Computer Interaction						
		Web Programming						
		Object Oriented Programming						
		Software Engineering						
		Operating Systems						
		Fundamental of Computer Graphics	/	/	/	/	/	/
		Database Programming						
Theory of Computer Science								
Innovation & Creativity								

		Subcluster						
		Application Development						
		Artificial Intelligence						
		Geometric Modeling						
		Real-time Computer Graphics	/	/	/	/	/	/
		Netcentric Computing						
		Graphics and Multimedia Software Project 1						
		Multimedia Data Processing						
		Windows Programming						
		Data Visualisation						
		Fundamental of Image Processing						
		Multimedia Networking						
		Graphics and Multimedia Software	/	/	/	/	/	/
		Computer Games Development						
		Advanced Computer Graphics	/	/	/	/	/	/
		Multimedia Web Programming						
		Introduction to Speech Recognition						
<b>UTM</b>	Bachelor of Computer Science (Graphics and Multimedia Software)	Computer Architecture & Organization						
		Data Communication & Networking						
		Database Systems						
		Operating Systems						

		Programming Techniques						
		Data Structure & Algorithms						
		Object Oriented Programming						
		Fundamental Discrete Structure						
		Discrete Structure & Applications						
		Applied Statistics						
		Application Development Workshop						
		ICT Competency Workshop						
		Multimedia Technology & Applications						
		Human Computer Interaction						
		Computer Graphics						
		Artificial Intelligence Techniques						
		Image Processing						
		Systems Analysis & Design						
		Web Scripting						
		Virtual Reality						
		3D Modelling						
		Data Visualization						
		Modelling & Simulation						
		Multimedia Interactive Development						
<b>UMS</b>	Bachelor of Science (Honours) (Mathematics with Computer Graphics)	Computer Programming and Simulation						
		Statistical Programming Package						
		Scientific						

	Writing						
	Mathematics I						
	Statistical Economics						
	Mathematics II						
	Linear Algebra						
	Advanced Mathematics I						
	Discrete Mathematics						
	Differential Equations						
	Numerical Computation						
	Real Analysis						
	Mathematical Programming						
	Cryptography						
	Numerical Methods						
	Complex Variable Calculus						
	Fuzzy Mathematics						
	Computational Geometry						
	Advanced Mathematics II						
	Mathematical Modelling						
	Control Mathematics						
	Digital System						
	Introduction to Data Structure						
	Object Oriented Programming						
	Computer Interface Programming						
	Database						
	Computer Graphics	/	/	/	/	/	/
	Virtual Reality						
	Advanced Computer Graphics	/	/	/	/	/	/
	Data						

		Compression						
		Artificial Intelligence						