

# Influence of Form, Texture and Shading on 'Abstract' and 'Realistic' Style Preferences: an Overview of Design Characteristics through Incidental Thematic Results

Lilian Lee Shiau Gee  
Universiti Sains Malaysia  
lilianlsg087@gmail.com

Jasni Dolah  
Universiti Sains Malaysia  
jasnidolah@usm.my

**Abstract** *In the context of graphic styles, the specific characterization will induce the sensed value experienced and thereby generate satisfaction. This brings up an important understanding needed to explore the style details or specific design features to the 'Abstract' and 'Realistic' style, particularly in educational game design in terms of visual aspect. In this case, the design features or art elements such as shape, texture and shading are assessed as stimuli to contribute to the breakdown of graphic styles visualization. The aim of this paper is to study the selection and combination of these three elements of art that are capable to produce a pleasant response, particularly among local students. The findings may suggest the satisfying characteristic of the graphic styles that should be considered in terms of the art elements as be directed to the students. Semi-structured interviews are conducted with 12 students, of which 6 are male and 6 are female with in order to collect student feedback which demonstrates pleasant feelings. Data analysis is borne out by counting the frequency of keywords obtained - associated with the selection of the three elements of art based on student responses and preferences. The results show that the natural form and shading of the most frequently mentioned and with it, a combination of natural form and shading appear most likely to get the student pleasures, were in response to the 'Abstract' style tends to accentuate the 2D natural form and flat shading, and feedback to 'Realistic' style more in the 3D natural form and smooth shading. This paper concludes that the integration of natural form and shading as a reference or a specific guide to exhibiting abstract and realistic-oriented graphics styles as an additional proposition in the future design process.*

**Keywords:** Abstract, Realistic, Form, Texture, Shading, Student's preferences

## INTRODUCTION

The role of visual design in educational games is not just for beauty but it is for a critical boost to attract students to foster emotional value and thereby enhance their positive experiences (Whitton, 2011; Rooney, 2012; Egenfeldt-Nielsen et al, 2015). Visual design impacts can be emphasized based on graphic representation modes such as 'Abstract' style and 'Realistic' style. Implementation of the graphic style as a conceptualized specification - with intent to summarize the overall design concept to interpret the appearances toward players (Soylucicek, 2012) - as the consideration factor that needed to be prioritized in identifying the interaction between students and games.

Importance each type of graphic styles and its impact on students should be evaluated in the design features context (Druin and Hourcade, 2005; Tversky, 2005) in which underlying the art elements eliciting experience outcomes (Becta, 2006; Rice, 2007; 2006; Asgari & Kaufman, 2011) - become important implications for improving graphic style display attributes in full, including the design process, design strategy and design restructuring in presenting a meaningful context and to the strengthen students' attention. Consequently, the suitability of 'Abstract' style and 'Realistic' style in educational games rigorously integrate visual elements to further enhance the graphic style characterizations in order to fit the

students' preferences to produce positive personal experiences.

In this paper, art elements are viewed as the key to enhancing the power of graphic style- successful characterization ideas have to regard the student preferences from their point of view of seeing the combination of art elements (shape, texture and shadowing) which referred as an inspiration factor of style - endeavour towards a more complete game design in an 'Abstract' and 'Realistic' style. Therefore, the graphic styles (abstract and realistic) and graphics elements (form, texture and shading) are expanded in visual games, and identifying the relationship between the three art elements in each style in order to understand how visual design can bear on the strength of educational games. An understanding the use of art elements and whether there are any systematic approach for designers and educators to identify the unification and priorities of each elements from the student perspectives. Explore into shape, texture, and shading that are intertwined with graphic style appearance, with the intent of creating guidelines that will be used to design the educational game outlooks dedicated to the needs and meet local student preferences.

## **IDENTIFICATION OF GRAPHIC STYLE PROPERTIES**

These elements may relate to the appearance of ‘Abstract’ and ‘Realistic’ style as a whole or to some specific design details or features. Similar to formal quality artwork, parsing properties that used to classify the graphic styles are based on the art elements in traditional fine arts. The nature of visual or visual characteristic associated with the graphic style in concentrated on the three main art elements shape, texture and shading (McLaughlin et al, 2010; Egenfeldt-Nielsen et al, 2015) to be evaluated in this paper. Explanation and definition of these three elements are as follows:

### **FORM**

Form is the basic elements of art to see and cultivate intuitive designs with positive emotional arousal. In this study, using the term “form” to imply a definite object situated in space, disregarding of whether the object in two-dimensional or three-dimensional (Thorn, 2014). There are natural form and geometric form. The natural forms are identified as an organic outlook that always asymmetrical and irregular such as the flora and fauna. Geometric forms most often described as rectilinear and curvilinear with precise edges (Sale & Betti, 2008). The condition of “form” as used for visually describe and discusses the configuration visual objects being in distinguishing through game environment sensations based on the graphic style implementations – the consistency of natural form and geometric form influencing the student emotional value.

### **TEXTURE**

Textures can relate to the inclination of visual game appearance (Matthews, 2011) in influencing player emotions. A texture, in game terms, is used to design the surface in detailed (Gantzler, 2005) with consideration the usage of texturing to attract attention and individual’s satisfaction under subtle ‘Abstract’ and ‘Realistic’ styles. For example, a fine visual texture (painted texture) added in the flat drawing or iconic illustration compared to the ‘Realistic’ style, texture map or mapping is the define texture technique that utilized to wrap around a polygon object’s surface.

### **SHADING**

Shading is generalized to depict the gradation on an image or illustration by varying levels of darkness. Shading appear related to the amount of hue applied on each game asset, including the game scene background. Shading can be regarded as influencing on the visualization concepts of ‘Abstract’ and ‘Realistic’ style. This influence consists of *toon shading* and *smooth shading*. For instance, *toon shading* refers to the matte colour techniques applied to achieve a flat cartoon effect (Scott-Baron, 2006) while *smooth shading* is computed in 3D modelling

objects with high intensity of ambient and diffuse lighting to make a smooth blended outlook (Kerlow, 2004).

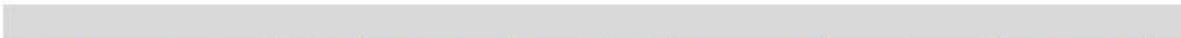
## **METHODOLOGY**

Semi-structured interviews are conducted on 12 students (6 boys and 6 girls) with the purpose of collecting student feedback and interpretation of art element characterization in terms related to ‘Abstract’ and ‘Realistic’ style. During the interview session, “two set of pictures” are designed in order to identify the characteristics of visual elements preferred – as drawn to describe the main characteristics of ‘Abstract’ and ‘Realistic’ style apply in the educational games. The inductive thematic analysis approach applied to analyse all the data obtained. Data analysis begins with labelling and the classifying student feedbacks (raw data) into the keywords list. Then the keywords were coded and, subsequently the results of keyword frequencies will identify the features as a coherent and meaningful main theme of pleasurable graphic styles.

## **TWO SETS OF PICTURES**

The “two sets of pictures” were designed as an instrument for interview sessions aimed to identify preferences of art elements (form, texture and shading) as to in details retrieving the graphic style concepts for juxtaposing the visual design of educational game. Each set of picture is represent ‘Abstract’ and ‘Realistic’ style, which the Visual Picture 1 illustrates the design with added the element of texture and shading but with a different form (e.g. natural form and geometric form). The Visual Picture 2 emphasizes on forms and shading, but excluded texture, and Visual Picture 3 illustrates the importance of form and texture without shading (see Table 1).

Table 1: List of Set Picture 1 and Set Picture 2



Set Picture 1  
(Abstract)



Visual Picture 1  
(texture+ shading+  
natural form)



Visual Picture 2  
(texture+ natural form)



Visual Picture 3  
(shading+ natural form)



Visual Picture 1  
(texture+ shading+  
geometric form)



Visual Picture 2  
(texture+ geometric form)



Visual Picture 3  
(shading+ geometric form)

Set Picture 2  
(Realistic)



Visual Picture 1  
(texture+ shading+  
natural form)



Visual Picture 2  
(texture+ geometric form)



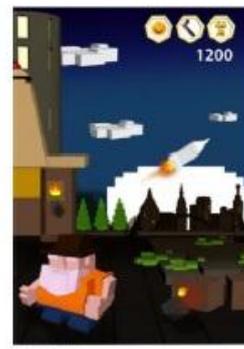
Visual Picture 3  
(shading+ geometric form)



Visual Picture 1  
(texture+ shading+  
geometric form)



Visual Picture 2  
(texture+ geometric form)



Visual Picture 3  
(shading+ geometric form)

## RESULTS OF ANALYSIS

The 14 keywords that were categorized by reference to ‘Abstract’ and ‘Realistic’ style, and the frequencies of each keywords of each style were calculated (see Table 2 and Table 3) in order to gain any further insights into what kind of elements were mostly student preferences in terms of form, texture and shading. In the pursuit of ‘Abstract style’, keywords related to “form” and “shading” were mentioned 16 and 17 times respectively. From the frequencies, it showed that students seem more interested and impressed on the integration of “natural form” and “toon shading” on the overall ‘Abstract’ style representation. The results of the selection form, it turns out that students prefer to round, curved and less geometrical. With the addition of simple and flat colour tone greatly extensive the sensation among students towards abstraction appearance. Furthermore, shading seen more capable to reinforce clear font, readability and information delivery in game, which majority of students supported that adding of shading were constantly attracted and memorable information text with the game environment.

Table 2: The Frequency of Keyword Factors, Art elements toward ‘Abstract’ style

	Element of Art	Keyword Factors	Data frequency	
			n	%
<b>Abstract Style</b>	2D Form	Natural form	16	28.57%
		Geometric form	2	3.57%
		Comfortable font	0	0.00%
		Increase readability	1	1.78%
		Comprehend information	1	1.78%
	Visual Texture	Texture	4	7.14%
		Comfortable font	0	0.00%
		Increase readability	1	1.78%
		Comprehend information	1	1.78%
	Toon Shading	Shading	17	30.35%
		Flat	2	3.57%
		Comfortable font	3	5.35%
		Increase readability	6	10.71%
		Comprehend information	2	3.57%
	Total number of times mentioned		56	100 %

Table 3: The Frequency of Keyword Factors, Art elements toward ‘Realistic’ style

	Element of Art	Keyword Factors	Data frequency	
			n	%
<b>Realistic Style</b>	3D Form	Natural form	11	18.30%
		Geometric form	2	3.33%
		Comfortable font	0	0.00%
		Increase readability	0	0.00%
		Comprehend information	0	0.00%
	Texture map	Texture	7	11.66%
		Comfortable font	0	0.00%
		Increase readability	1	1.66%
		Comprehend information	1	1.66%
	Smooth Shading	Shading	26	43.33%
		Gradient	1	1.66%
		Comfortable font	1	1.66%
		Increase readability	7	11.66%
		Comprehend information	3	5.00%
Total number of times mentioned		60	100%	

Interestingly, with respect to ‘Realistic’ styles, students seem more attentive to the form and shading elements that should be prioritized in the realistic outlook, as the keyword analysis shows that the form and shading are most often mentioned by as well as 11 and 26 times respectively. This also leads to realistic theme propositions towards the *natural form* and *smooth shading*. Students argue that the organic shape or curved poly mesh seems to be more essential within the visual-driven factors for enhancing emotional values, regard that *natural form* of 3D objects should be accompanied by shading, in which this element tends to build up softer and smooth appearance to attain high-intensity surfaces. At the same time, student tendency to indicate the shading as a benefit for handling ease readability that brings visibility and information more perceiving in the game representation. Indirectly, this reflects the concept of ‘Realistic’ style emphasis on *natural form* and *smooth shading*, expecting this concept to be apparent at a sensible point to meet the student’s preference and sustain visual stimulation.

## DISCUSSION AND CONCLUSION

Identifying the graphic styles characteristic not only offer new knowledge on the ‘Abstract’ and ‘Realistic’ basic structure designs, but also assist the designers and educators' to shape ideas and guidelines

to characterize the suitability of the style, in particular, to deepen the relationship between graphic style and student's experiences can be put forward in educational games. The analysis results show that *natural form* and shading are the main sensory considerations in an 'Abstract' style and 'Realistic' style to attract the student attentions. In addition, shading is also an optional element that facilitates understanding of information, improves readability and generates comfortable fonts. In other words, the combination of shape and shade is enough to be a starting point for creating a whole game environment (characters, objects and background) became more prominent to stimulate emotion and sensation among students as reinforce the student's experiences.

These underlined graphic style characteristics provide the first description of visual examinations in terms of representational style values for integrating essential art elements to improving student's satisfaction. The results are in concordance with the studies of Janlert and Stolterman (1997), Bar and Neta (2006) and Solarski (2017) that supported natural form as an important attention feature in the game. In further, effect of shading also stands on an important role (Wisessing et al, 2016) and must be applied with visual object that is curved in shape and natural. The concept of natural form and shading emphasized as the main criterion of 'Abstract' and 'Realistic' style in the educational game (see example in Table 4), as the art elements of the 'Abstract' style that stand out are 2D natural forms and flat shading, and 'Realistic' styles are more to 3D natural form and smooth shading.

Table 4: The design concept of graphic styles

'Abstract' Style = 2D Natural Form + Toon Shading
'Realistic' Style = 3D Natural Form + Smooth Shading

This paper substantiates that the student's selection of object shape and shading level showcases force relationship of the graphic styles in more detail, which indicated that form and shade inspire the student's imagination to interpret the significance and relevance of the spectacle and the ability to bring experience to them. Consequently, designers should be encouraged to pay attention on the art elements manipulation as a prescriptive or process design styles that is important to heighten the attractiveness of the game's appearance by meeting the student preferences. Accordingly, designers should consider the influence of certain art elements by underlying the suitability of representation styles that evokes affective experiences such as motivation, engagement and enjoyment.

Exploring the extent to which art elements can trigger subtle emotive visualization that can raise the game design acceptance to support student interaction as important context in educational games. With that, insights gained from this analysis enable and describe the relationship between art elements in depth and the discernment needed in the graphic style, as well as

open an opportunity to understand and examine the types of graphic style of interacting with students in specification in design areas. In conclusion, identifying art elements is an unlimited visual challenge, but a valuable design guide is influenced by the awareness of the importance of integration of art elements. Further research needs to be undertaken to expand the importance of visual design and pay attention to the graphic styles to reflect how 'Abstract' and 'Realistic' style interactions relate to the student's experience from various aspects.

## FUTURE WORK

Opinions and preferences of students gathered in interviews this to be a list of guidelines that can be used to visualize the educational games for specification - oriented graphic style. It is clear that many additions and especially deepen understanding needed in the characteristic graphical concepts of that encompass various aspects, as with the consideration of other elements of art to create an 'Abstract' and 'Realistic' style of views, consideration of how the attributes of the art elements function are defined, and to examine the complexities of graphic styles that have a more long-term effect on the student's experiences in exploring the interaction of visual design, which can add the potential value of graphic style in bringing visual designs as possible close to the local student preferences.

## ACKNOWLEDGEMENT

This study is presented as a constituent of the Ph.D. thesis research. The authors gratefully to the 12 interviewees for their participation in the interview sessions. As well, special thanks to all organizations for their helpful assistance and the reviewer for their constructive comments.

## REFERENCES

- [1.] Asgari, M and Kaufman, D. (2011). Motivation, Learning, and Game Design. In Klinger, K. (Eds.), *Gaming and Simulations: Concepts, Methodologies, Tools, and Applications*. Vol 1. 528 - 543. Information Science Reference. IGI Global.
- [2.] Bar, M., & Neta, M. (2006). Humans Prefer Curved Visual Objects, *17*(2001), 645–648.
- [3.] BECTA. (2006). Engagement and motivation in games development processes. Coventry, UK: BECTA.
- [4.] Druin A., Hourcade J.P. (2005) Interaction design and children, in *Communications of the ACM*, 48 (1).
- [5.] Egenfeldt-Nielsen. S, Smith. H.J & Tosca. P.S. (2015). *Understanding Video Games: The Essential Introduction*. Abingdon: Routledge, Taylor & Francis Group.
- [6.] Gantzler, Todd. (2005). *Game development essentials: Video game art*. Thomson Delmar Learning.

- [7.] Janlert, L., & Stolterman, E. (1997). The character of things. *Design Studies*, 18(3), 297–314.
- [8.] Kerlow, Isacc V. (2004). *The Art of 3D Computer Animation and Effects*. 3<sup>rd</sup> ed. Hoboken, NJ: John Wiley & Sons, Inc.
- [9.] Matthews, D. Panda3D 1.6 .(2011). *Game Engine Beginner’s Guide*, Packt Publishing. United Kingdom
- [10.] McLaughlin, T., Smith, D., and Brown, I.A. (2010). A framework for evidence based visual style development for serious games. *Proceedings of the Fifth International Conference on the Foundations of Digital Games, ACM* (2010), 132–138.
- [11.] Rice, J. (2007). New Media Resistance: Barriers to Implementation of Computer Video Games in the Classroom. *Journal of Educational Multimedia and Hypermedia* 16(3), 249-261.
- [12.] Rooney, P (2012). A Theoretical Framework for Serious Game Design: Exploring Pedagogy, Play and Fidelity and their Implications for the Design Process' *International Journal of Game-based Learning*, 2 (4). 41-60.
- [13.] Sale, T., & Betti, C. (2008). *Drawing: a contemporary approach* (6<sup>th</sup> Ed.). CA: Thompson/Wadsworth.
- [14.] Scott-Baron, H. (2006). *Manga Clip Art: Everything You Need to Create Your Own professionallooking Manga Artwork*. Ilex Press, Cambridge.
- [15.] Solarski, C. (2017). *Interactive Stories and Video Game Art: A Storytelling Framework for Game Design*. CRC Press. Taylor & Francis Group
- [16.] Soylicicek, S. (2012). Graphic design on educational computer games. *Procedia - Social and Behavioral Sciences* 46 (2012). 2083 – 2087 WCES.
- [17.] Thorn, A. (2014). *Game Development Principles*. Cengage Learning PTR. United States of America.
- [18.] Tversky, B, (2005). Visuallspatial reasoning. In Holyoak, K. and Morrison, R. (Eds.) *Handbook of Reasoning*, Cambridge, England; Cambridge University Press, 209-249
- [19.] Whitton, P.2011. The Impact of Visual Design Quality on Game-Based learning. In Khine, M. (Eds) *Playful Teaching, Learning Games: New Tool For Digital Classrooms* (pp.1-20), Sense Publishers.
- [20.] Wisessing, P., Dingliana, J., & McDonnell, R. (2016). Perception of lighting and shading for animated virtual characters. *Proceedings of the ACM Symposium on Applied Perception - SAP '16*, 25–29.
- [21.] Ying, C. (2014). Study on the suggestibility of visual element in educational game design - Intellective theme game of ceramic culture taking as an example. *Proceedings of the 9th International Conference on Computer Science and Education, ICCSE 2014*, 821–825.