



The Roles of Visual Design in Tablet Games for Children's EFL Learning: A Social Semiotic Perspective

SOMPATU VUNGTHONG

*Department of Language Studies, School of Liberal Arts,
King Mongkut's University of Technology Thonburi, Bangkok, Thailand*
Author e-mail: sompatu_vun@kmutt.ac.th

The 21st century marks the digital era which is characterised by advanced technology and witnesses the increasing use of visual design in the realm of education. Despite various studies addressing the roles of visual design, there is still limited understanding of its roles in electronic educational materials, especially for language learning and teaching. Adopting a social semiotic perspective, this study combines Halliday's (1994) systemic functional grammar with Kress and Van Leeuwen's frameworks (Kress & Van Leeuwen, 2001, 2006; Van Leeuwen, 2005 for analyzing visual design of the game section in the Grade 2 EFL app (seven games in total) in the Thai government's One Tablet Per Child (OTPC) project. In particular, it investigates how visuals in the game section of the Grade 2 EFL tablet app are used in support of language learning through three aspects: ideational/representational (analyzing narrative or conceptual processes), interpersonal/interactive (analyzing engagement through the use of images), and textual/compositional (analyzing compositional meanings). The findings shed light on various pedagogical implications for teachers and learning material designers in terms of the roles of visual design in children's language learning.

Keywords *visual design, games, EFL learning, social semiotics*

INTRODUCTION

Images have played an increasingly important role in the realm of education. Such visual tools as videos and films and photos in textbooks can be used in classrooms to enhance learning and teaching. As the prominent roles of visuals in learning and teaching have been recognized, the use of images and visual design to support learning has received considerable attention in the education field for various subjects such as the work of Derewianka and Coffin (2008), which explored time visuals' functions in history textbooks and argued for the better use of visuals for history learning, and Jewitt's work (2006), which analyzed how a visual design in computer programming applications help shape students' knowledge of mathematics and science.

For language learning, the focus of this study, the use of visuals has been confirmed to be useful in various pieces of experimental research with the comparison between an experimental vs. control group (e.g. Carpenter & Olson, 2012, Brett, 1997; Guichona & McLornan, 2008) as well as in studies using self-reports and questionnaires (e.g. Wang, Shang & Briody, 2011); however, much fewer studies explore how visuals can be used to communicate meanings and support language learning. Most of the research, which addresses the question of how visual design is used to enhance language learning and points to the importance of the use of visual design in language learning contexts, tends to focus on the visual design in language textbooks only (e.g. Liu & Qu, 2014; Salbego, Heberle & Silva Balen, 2015; Yumin, 2009; Silva, 2016; Ajayi, 2012; Weninger & Kiss, 2013). For example, images in English text-

books for beginner students in Brazil were analysed through a social semiotic perspective and it was revealed that visuals were useful for helping beginners to understand the content of the language activity (Salbego, Heberle & Silva Balen, 2015). As another example, visuals in English as a Foreign Language (EFL) textbook series for Chinese college students were explored and the findings showed that the visuals related to the verbal language and helped support language learning but the degree of intersemiotic complementarity was different in different textbooks (Liu & Qu, 2014).

The visual design in electronic language materials has received less attention in comparison to research on textbooks. In the current digital era, new technology has been developed to offer various affordances for language learning and teaching. Studies which investigate the use of visuals in new technology can reveal specific affordances for enhancing language learning. The examples of these studies are the work of Vungthong, Djonov and Torr (2017) which analysed EFL songs in the tablet apps in Thailand and shed light on certain types of visual-verbal relations which are useful or problematic for primary school students' vocabulary learning. Another example is the research of Jewitt (2002) which revealed how the use of visuals, color and fonts in a novel CD-ROM helped students gain an insight into characters and themes in a novel. Like these two studies, this research aims to contribute to the fledgling field of multimodal research on the use of visual design in digital materials for language learning and teaching.

As a case study, through a social semiotic perspective, this research explored the visual design in the games section in the Grade 2 EFL app in the One Tablet Per Child project (OTPC) in Thailand. The selection of games in the OTPC tablet application for Grade 2 is based on two main reasons. Firstly, the focus on language games has been supported by research which pointed to various benefits for language learning such as strengthening students' motivation and confidence (e.g. Kuo, 2008; Chen, 2007) as well as offering opportunities to learn language through useful affordances outside classroom contexts (Holden & Sykes, 2013; Gunter et al., 2016). Secondly, the games in the OTPC tablet app were chosen as a large number of Thai students were likely to use them compared to other commercial apps. Supported by the Thai government, the OTPC project, which had cost more than 5 billion Baht (or more than 160 million US dollars), involved the distribution of tablet PCs and the development of apps to be included in the tablets (Ministry of Education, Thailand, 2013). The OTPC tablet apps included the EFL games which were used by a large number of users, unlike apps or software programs for education designed for specific courses or learning skills, which tend to be used by a single class or school only (e.g. Udomsate, Churintorn & Chianguen, 2011).

A social semiotic perspective

Through a social semiotic perspective, this study used Kress and Van Leeuwen's frameworks (Kress & Van Leeuwen, 2006; Van Leeuwen, 2005) to analyse how the visual design in the game section of the Grade 2 EFL app is used in support of language learning. Semiotics, which is concerned with all aspects of the study of meaning (Halliday & Hasan, 1985, p. 4), is suitable for this study's aim, which is to explore how visual design is used to create meanings and enhance children's language learning. Multimodal social semiotics is based on Halliday's (1994) theory of language as a social semiotic, according to which language is seen as one among many resources for making meaning in society. Through this perspective, language is viewed as one means of making meaning among others, not as the only dominant one (Jewitt, 2009).

Halliday (1994) proposes that language is functional and outlines three broad metafunctions accounting for its organization. The first one is 'ideational' which is related to "constructing a model of experience" (p. 36). Through the ideational aspect, language is a means to conceptualize the world or represent our experience. The second one is 'interpersonal' which involves "enacting social relationship" (p. 36). Language is used to create and maintain social relations. The third function of language is 'textual' which is concerned with "creating relevance to context" (p. 36) or how language makes links with the situation in which it is used.

Based on Halliday's systemic functional approach to language (1994), Kress and Van Leeuwen (2006) contend that images, like language, conform to the three metafunctions. The ideational aspect is referred to in their work as 'representational' which refers to how events, participants and circumstances are verbally and visually constructed. The interpersonal aspect is termed as 'interactive' which involves the relationships among speakers/listeners, writers/readers, and viewers/what is viewed. The textual aspect or the compositional aspect in their term refers to the distribution of the information value among visual and verbal elements in the text.

For representational meanings, images can be analysed in terms of narrative representations or conceptual representations (Kress & Van Leeuwen, 2006). For images as narrative representations, they involve visual structures that can realize ways of representing the world and can be categorized into six structures: action, reactional, speech & mental, conversion, geometric symbolism, and circumstances. We can analyse the vectors, foreground/background and participants as communicating meanings. An example of narrative (action) process can be seen from the upper frames of Figure 1 and Figure 2. In Figure 1, two characters (an elephant and a monkey) are performing an action of pulling a rope which functions as a clear vector connecting these two participants. In Figure 2, two characters (a rabbit and a chicken) are running and a vector is the invisible line of these two participants moving forward in their running lane. For conceptual representations, they show participants in terms of their class and structure. We can analyse the processes: classificational (participants as subordinates or the supersubordinate), analytical (participants as carrier (the whole) and possessive attribute (the parts)) and symbolic (about what a participant is/means). An example of conceptual (analytical) process can be seen from the lower frames of Figure 1 and Figure 2. In Figure 1, a picture of a whole skateboard is considered 'carrier' which includes various 'attributes' or the parts which are essential for a skateboard (e.g. a flat board and wheels). In Figure 2, a picture of a nose is 'carrier' whereas the elements of a nose are 'attributes' (e.g. two holes or nostrils).

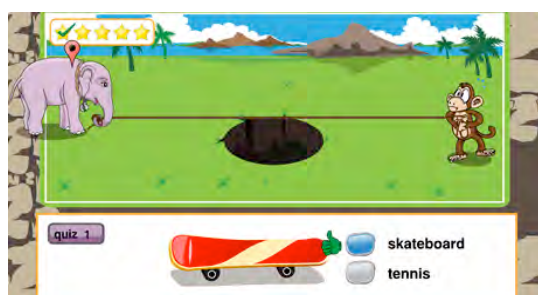


Figure 1 A page from the game 'Tug of War'

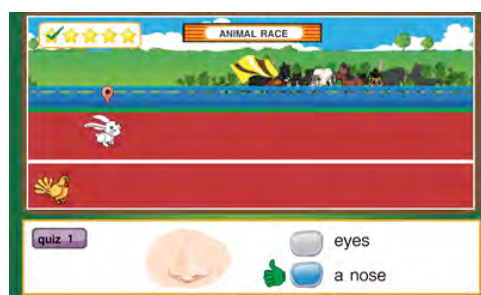


Figure 2 A page from the game 'Animal Race'

In terms of interactive meanings, we can analyse images in terms of contact, social distance and attitude (Kress & Van Leeuwen, 2006). For contact, image act or gaze can be examined. The gaze can mean 'demand' or 'offer'. If there is a gaze looking at the viewers in the eyes, it is 'demand'. The absence of the gaze is 'offer'. The size of frames can also signify the social distance: intimate (seeing the face or the head only), close personal (seeing the head and shoulders), far personal (seeing from the waist up), close social (seeing the whole figure), far social (seeing the whole figure with space around it), and public distance (seeing the torso of at least 4-5 people). For attitude, degree of involvement can be communicated through the horizontal angle and power through the vertical angle.

For compositional meanings (Kress & Van Leeuwen, 2006; Van Leeuwen, 2005), information value and framing can be analyzed. To begin with, information value involves the values attached to the zones of the images: left-right, top-bottom and center-margin (Kress & Van Leeuwen, 2006). For the vertical elongation, the top means the most important or ideal whereas the bottom means less important or real. For the horizontal elongation, the left is the familiar or given information and the right is the new one. Secondly, framing refers to how the elements of a visual design are connected or disconnected through several ways. Frame-lines, empty space and discontinuities of color can serve as the disconnection devices in the frame whereas the absence of such disconnection devices and similarities of color and visual shape signify the visual connection of the elements in a visual composition. Framing can be divided into segregation, separation and integration (Van Leeuwen, 2005). Segregation refers to the way in which verbal texts and pictures are disconnected entirely. Separation refers to the way in which there is the empty space between verbal texts and pictures. Integration can be divided into pictorial integration (for which the verbal text is integrated into the pictorial space) and textual integration (for which the picture is integrated into the textual space).

METHODOLOGY

Data

The data in this study included all the games in the Grade 2 OTPC tablet app for EFL. A list of games in the Grade 2 EFL app is as shown in Table 1.

Table 1
A list of games in the Grade 2 OTPC tablet app for EFL

	Game Title	Number of Games
1	Tug of War	2
2	Matching Game	3
3	The Dunk Tank	4
4	Animal Race	4
5	Crossword	1
6	Bump and Jump	2
7	Balloon	3



Data analysis

1. A unit of analysis is a screen page in the games. All the games feature 1) a title page, 2) a question page, and 3) a score page. However, only Tug of War and Animal Race have a player selection page. There were 142 screen pages or units in total for this study.
2. Each screen page/unit was analyzed in terms of representational, interactive and compositional meanings based on Kress and Van Leeuwen’s frameworks (Kress & Van Leeuwen, 2001, 2006; Van Leeuwen, 2005) as shown in Figure 3.
3. The number of unit for each type was counted and changed into the percentage.
4. The visual design patterns and their implications were discussed.

RESULTS

1. Representational meanings: Narrative or conceptual orientations

For representational meanings of visual design, there were four main types of images in the Grade 2 OTPC games: 1) Narrative (when a screen page features one image of a narrative process), 2) Conceptual (when a screen page features one image of a conceptual process), 3) Narrative-Narrative (when a screen page features two different images, both of which are narrative processes), 4) Conceptual-Conceptual (when a screen page features two different images, both of which are conceptual processes) and 5) Narrative-Conceptual (when a screen page features one image of a narrative process and one image of a conceptual process). As can be seen from the table below, the results show that most of the screen pages of the Grade 2 OTPC games used both narrative and conceptual processes (80/56.34%) as well as only one conceptual image (52/36.62%). The rest were the use of two conceptual images (5/3.52%), the use of a narrative image (3/2.11%) and the use of two narrative images (2/1.41%) on a screen page.

Table 2
Types of representational meanings found in the Grade 2 OTPC games

Representational meanings	Types	Number	Percentage
	Narrative-Conceptual	80	56.34%
	Conceptual	52	36.62%
	Conceptual-Conceptual	5	3.52%
	Narrative	3	2.11%
	Narrative-Narrative	2	1.41%
	Total	142	100%

Firstly, for pages with narrative and conceptual images (80/56.34%), narrative images tended to be used for entertainment and competitive purposes (the entertainment realm) whereas those with a conceptual process, all of which were the ‘analytical’ type (Carrier and Attribute/ Part-Whole relations), were likely to relate to the verbal language which students were supposed to learn (the academic/educational realm). To illustrate, in the game

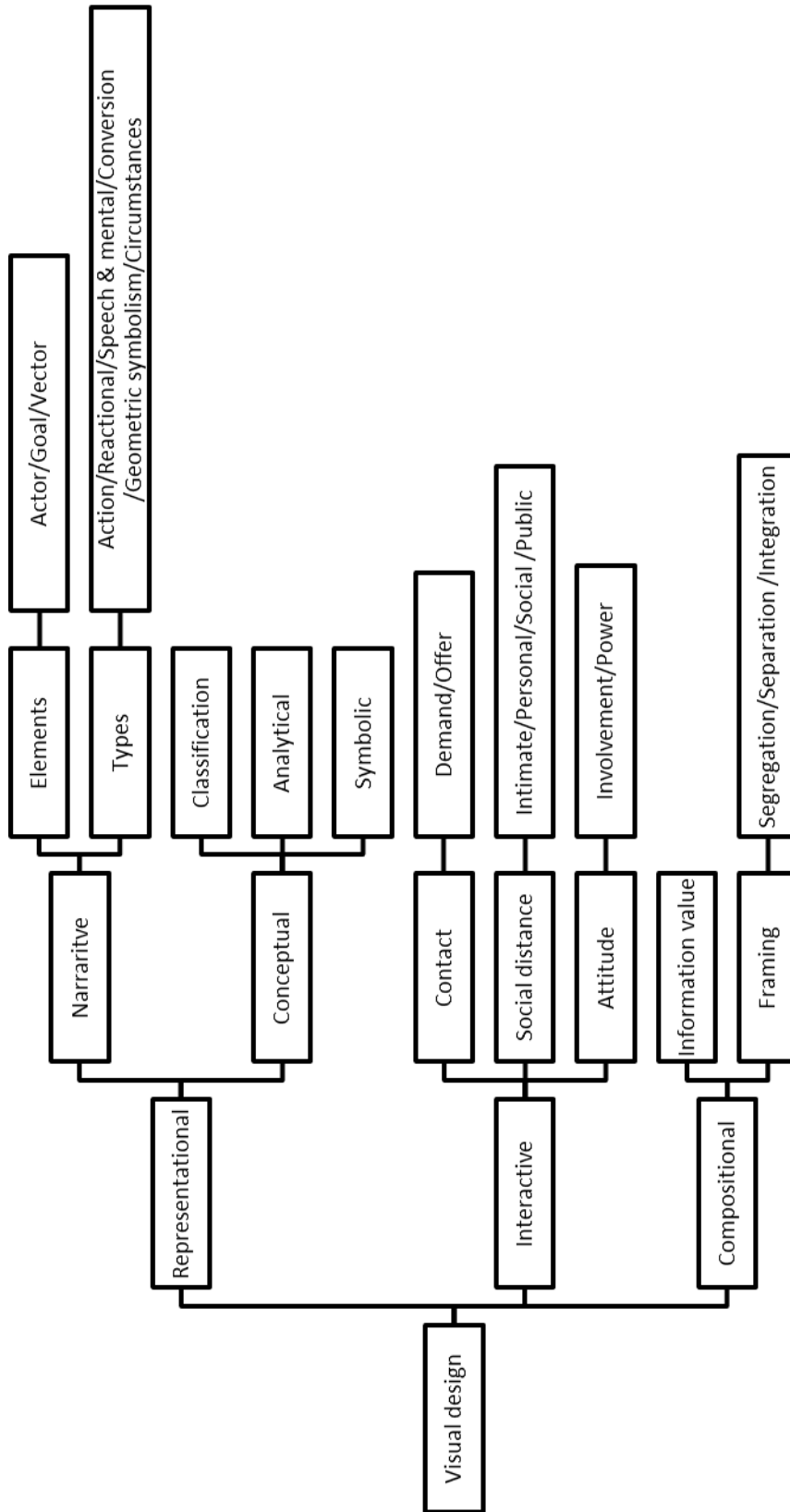


Figure 3 The SFL-based visual design framework (Kress & Van Leeuwen, 2006; Van Leeuwen, 2005)



Tug of War, The Dunk Tank, Animal Race, Bump and Jump, Balloon and Crosswords, there were two types of images on the same page of screen but in a separate space: one with a narrative process and the other with a conceptual process. In Figure 1 from Tug of War, the narrative process in the top frame depicts two animal characters pulling the rope. A student is represented by a character on the right. When he/she gives a correct answer, the animal character on the right would pull the rope one step into its territory. The student would win if he/she pulls the opponent into the hole in the center. The conceptual image in the bottom frame of Figure 1, on the other hand, depicts the conceptual analytical image which points to certain vocabulary, that is 'skateboard'. A student is asked to choose a written word which matches this picture. As another example, in Figure 2, in the game Animal Race, the narrative process in the top frame depicts two animal characters in a running race. A student chooses a character on the upper lane. When he/she gives a correct answer, the character would move one step forward. The one which reaches the finish line first wins the race. The conceptual process in the bottom frame in Figure 2, on the other hand, depicts the image of a nose which relates to vocabulary for a student to learn. This pattern was also applicable to The Dunk Tank, Bump and Jump, Balloon, and Crosswords as shown in Table 3.

Table 3
Summary of the Grade 2 OTPC games using a narrative and conceptual process on the same page

Game	Narrative process: The entertainment realm	Conceptual process: The academic realm
Tug of War	two animal characters pulling the rope	a conceptual image which relates to a word or vocabulary
Animal Race	two animal characters running	
The Dunk Tank	a girl dropping into a tank of water	
Bump and Jump	a boy jumping over an obstacle	
Balloon	balloons going up into the sky	
Crosswords	A highlight pen highlighting some letters	

Secondly, more than one third of all the screen pages (52/36.62%) featured a conceptual process only. Those pages were a character selection page, a score page, a title page of Matching Game and Animal Race, and some Matching Game Pages. On a character selection page in the Animal Race game (See Figure 5), a player can choose from four animal characters. On a score page, a conceptual analytical image of the character which a player chose is shown. The image can be a sad or happy character depending on whether the player wins or loses the game. On a title page of Matching Game and Animal Race, the conceptual analytical images of game characters were shown without narrative processes. On some Matching Game pages, there were only conceptual analytical images of circle cards with written words for a player to match.

The rest are Conceptual-Conceptual (5/3.52%), Narrative (3/2.11%), and Narrative-Narrative (2/1.41%). The Conceptual-Conceptual type was applicable to pages of Matching Games which featured an image of many cards (one conceptual process) and an image of vocabulary to be learned (the other conceptual process). The Narrative-Narrative type was found on a page of

Dunk Tank and Bump and Pump with a narrative image of a character in a game doing something and another narrative image of vocabulary (for which a word ‘fisherman’ was visually represented as a man throwing a fishing net and a word ‘television’ was visually represented as a man watching TV).

2. Interactive meanings: Engagement through images

Through an analysis of contact, social distance and attitude (involvement and power), most of the images did not seek emotional or intimate involvement but tended to situate a student as participating in the game and contemplating over the information from an oblique and equal angle.

Table 4
Types of interactive meanings found in the Grade 2 OTPC games

Interactive meanings	Types		Number	Percentage
	Contact	Offer		62
Offer-Offer			47	33.10%
Offer-Demand			25	17.61%
Demand			8	5.63%
Total			142	100%
Social distance	Intimate		0	0%
	Personal		13	13.54%
	Social		83	86.46%
	Public		0	0%
	Total		96	100%
Involvement	Frontal		33	34.38%
	Frontal-Oblique		6	6.25%
	Oblique		57	59.37%
	Total		96	100%
Power	High angle		0	0%
	Eye-level		96	100%
	Low angle		0	0%
	Total		96	100%

To begin with an analysis of contact, most of the images in the games in the app were ‘Offer’, offering information for students to contemplate rather than seeking deep emotional involvement. The images with human or animal participants rarely looked at the viewers in the eyes. However, there was an exception for a girl image in the game The Dunk Tank. In this game, a girl is sitting on a collapsing seat over a large tank of water. If a player gives a wrong answer, the girl would fall into the tank. In this game, the girl image looks at the viewers in the eyes (See Figure 4) and her fate depends on the student’s answer. This to some extent enables the viewers to be emotionally attached to the girl and makes the game more exciting and entertaining. In this study, almost half of the screen pages (62/43.66%) used only an Offer image. It was found on title pages (except for The Dunk Tank), score pages, some Matching Game pages, all Crossword Game pages, and all Balloon Game pages. For the use of two Offer images on the same screen page, there were around one third

of all pages (47/33.10%). This was applicable to some quiz pages of Tug of War, Animal Race, Crossword, Matching Game, Balloon, and Bump and Jump. For 25 pages with both an Offer image and a Demand one (17.61%), they were a character selection page of Tug of War and Animal Race as well as quiz pages from The Dunk Tank in which a girl in the game keeps looking at the viewers' eye. Lastly, pages with a Demand image only were rarely found (8/5.63%). This type was found on the title and score pages of The Dunk Tank.

For an analysis of social distance, only 96 pages included a participant with human characteristics which are the criteria for analyzing social distance. Most images with human or animal participants (83/86.46%) were 'social' as we can see their whole figures with space around it. This situates viewers as one who contemplates over the event, rather than personal involvement. However, there were some far personal images (seeing the waist up) (13/13.54%) on the pages for students to choose a character or for players to represent themselves in the game. For example, in Figure 5 from the game Animal Race, four animal characters are presented as a close up in order for students to see the attributes of each character more easily and this to some extent enables the attachment to the character when a player plays against the other character in the game although it is not a maximum emotional involvement enabled by the use of an image of intimate distance.

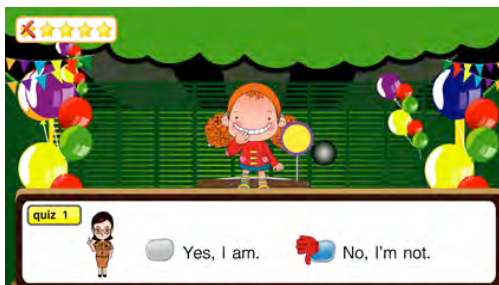


Figure 4 A page from the game 'The Dunk Tank'

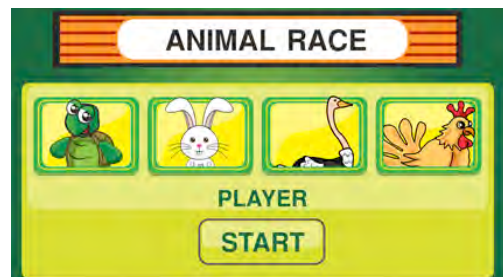


Figure 5 A page from the game 'Animal Race'

Through an analysis of 'attitude', for 'involvement', there were only 96 pages with human/animal participants. Most of the participants were presented from an oblique angle (57 pages/59.37%). It means players were not encouraged to have maximum emotional involvement with the characters/participants for most of the parts of the games. The exception is The Dunk Games and some score/title pages with the characters presented from a frontal angle (33 pages/34.38%) as well as character section pages with some characters presented from a front angle and some from an oblique one (6 pages/6.25%) (See Figure 3 as an example). As for 'power', all the pages with human/animal participants were presented from an eye level signifying the equal relationship. Players tended to identify with the characters in the games as being equal, rather than considering them as participants to look up to, as enabled through the use of high angle, or to look down upon, as enabled through the use of low angle.

3. Compositional meanings: Information value and framing

3.1 Information value

For an analysis of information value, there were two dominant patterns found in this study. The first one is Ideal/Top and Real/Bottom. This pattern correlated with the narrative (entertainment) and conceptual (academics) processes as shown in Figure 6. We can see that the Ideal space tended to belong to the entertainment realm whereas the Real space featured the realm of education/academics (language quizzes).

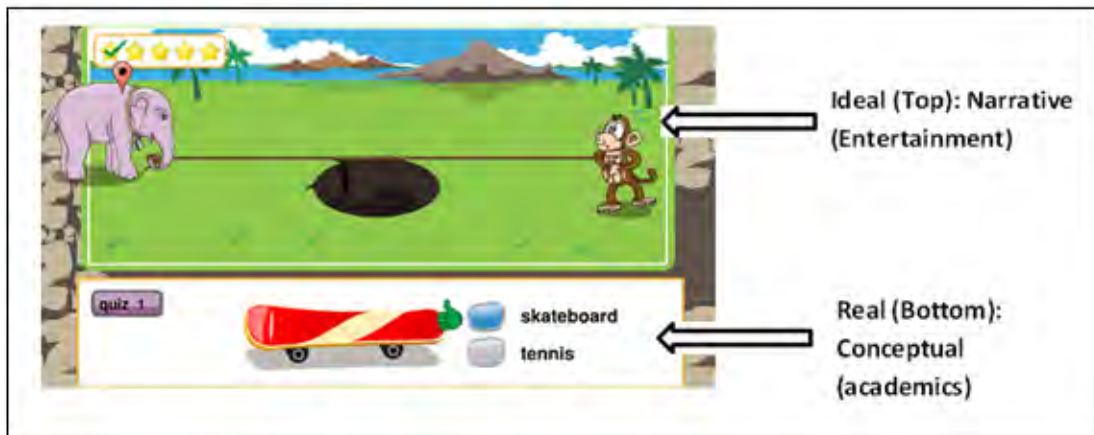
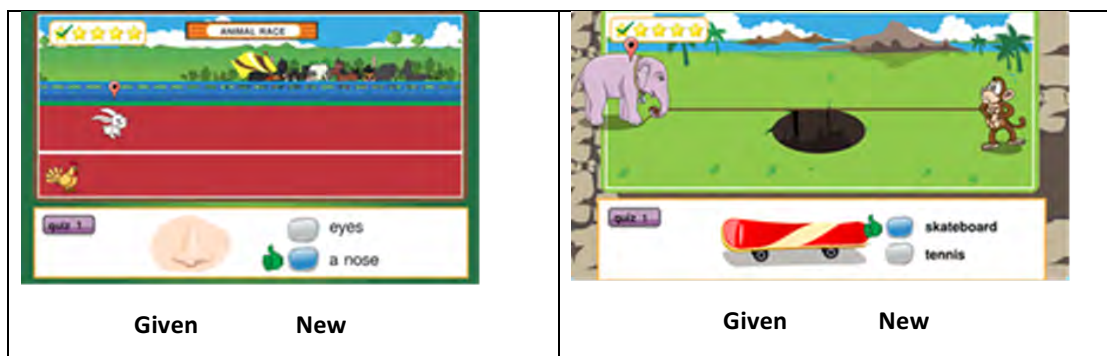


Figure 6 The dominant Ideal/Top and Real/Bottom pattern in the study

The second pattern is Given (Left) – New (Right). This pattern was found in the relations between visuals (Given) and words/vocabulary (New) in Animal Race, Tug of War, The Dunk Tank, and Balloon (See some examples in Figure 7). When visuals were related to words/vocabulary in a quiz, visuals tended to be on the left (Given), something players already know and have the knowledge of, and verbal language or vocabulary tended to be on the right (New), a new knowledge to be learned or tested.



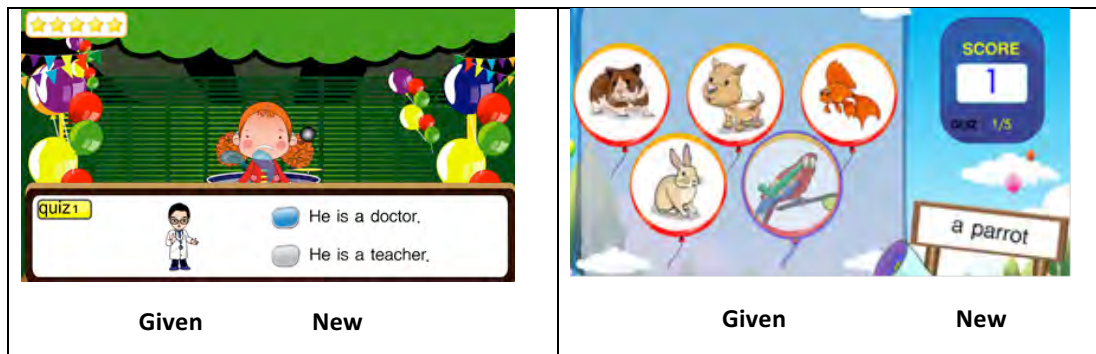


Figure 7 The dominant Given (Left) - New (Right) pattern in the study

3.2 Framing

For an analysis of framing, a summary of results was shown in Table 5. Pictorial integration was used the most frequently (85/59.86%) whereas textual integration was not found at all in this study. The linguistic aspect was always part of the pictorial space. The pages with pictorial integration included a title page, a character selection page, some Matching Games and Balloon pages, and score pages.

The second most frequently used type is the use of segregation and separation on the same page. It was found in Tug of War, Animal Race, and the Dunk Tank (See Figure 8 for an example). In this second type, 'segregation' was used to totally distinguish the entertainment realm (Ideal/Top) from the academic/educational realm (Real/Bottom) whereas 'separation' was used to signify that an image was related to the verbal language beside it although they belonged to a different mode of communication.

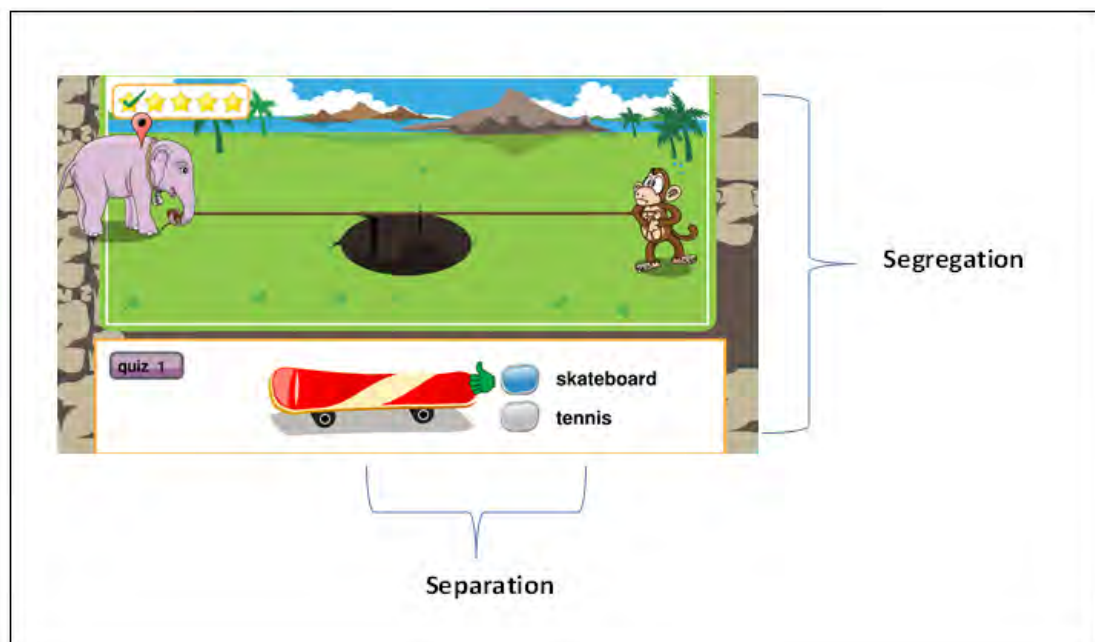


Figure 8 An example of pages using two types of framing (Segregation and Separation)

Thirdly, around 12 pages (8.45%) used the framing type of ‘segregation’ only. This was applicable to those quiz pages which featured two separate frames (one with a narrative image and the other one with verbal texts only). However, in this study no page was found to feature only one type of separation framing. In this study, ‘separation’ was always used together with ‘segregation’.

Table 5
Types of framing found in the Grade 2 OTPC games

Compositional meanings: Framing	Types		Number	Percentage
	Integration	Pictorial integration	85	59.86%
	Textual integration	0	0%	
Segregation & Separation		45	31.69%	
Segregation		12	8.45%	
Separation		0	0%	
Total		142	100%	

DISCUSSION AND PEDAGOGICAL IMPLICATIONS

An analysis of visual design in the games section of the OTPC app for Grade 2 students’ EFL learning sheds light on various implications on material design, multimodal research and pedagogy.

Firstly, in line with previous research (e.g. Vungthong, Djonov & Torr, 2017, Jewitt 2006), the specific roles the visual design of the games play in language learning can be recognized. To illustrate, in terms of ideational meanings, narrative images in the games in this study were mainly used for entertainment whereas conceptual processes were likely to be used for academic aspects. Most of the narrative images in this study were related to the interactive affordances of the games to instigate students’ motivation and excitement; they were not directly linked to the language points to be learned or tested. When a student gives a correct answer, participants in a narrative process always perform some action and a certain action is presented such as a balloon going up and exploding, a girl dropping into a tank of water, an animal running forward or the opponent character being pulled into a hole. These are all narrative processes motivating and entertaining young students as they are playing language quiz games. The rare use of the narrative processes for academic purposes in this study is attributed to the fact that most of the vocabulary in the Grade 2 OTPC games were mainly nouns which are better presented through a conceptual process. The vocabulary tested in these games was quite simple and rarely involved an action or a narrative process.

Secondly, this study contributes to the multimodal research on language learning. Whereas previous studies tend to focus only on one aspect such as ideational meanings (e.g. Vungthong, Djonov, and Torr’s analysis of visual-verbal relations for vocabulary learning (2017)) and interpersonal meanings (e.g. Yumin’s analysis of interpersonal meanings of EFL textbooks (2009)), this paper examined the visual design across three aspects or metafunctions (ideational, interpersonal and textual) and found arising patterns which run across metafunctions

(See Figure 9). To illustrate, the top part of a page of the games tended to be a narrative process for entertainment and the bottom part tended to be a conceptual process for educational purposes. The two parts were clearly divided through the ‘segregation’ type of framing. The bottom part of a page can feature both a conceptual image on the left (Given) and verbal language on the right (New) which were related and separated only by an empty space (‘separation’).

Thirdly, an analysis of interpersonal meanings of the visual design of the games can reveal how material designers situate game players as learners. For example, this study found that, through the frequent use of Offer images and the presentation of the characters from a social distance, players were situated as viewers who contemplate the information provided on the screen rather than having deep personal involvement with the characters in the games. This can be attributed to the fact that the games (except for The Dunk Tank) tended to involve two characters competing with each other or without the characters at all. When two characters were represented as competing, they would look at each other or look toward the finish line, and they tended to be represented from a social distance as game players need to see the whole body of the characters and their action. In addition, the predominant use of the eye-level presentation of the characters can help game players view the characters as having an equal relationship with them and then easily identify as well as engage with the characters more easily.

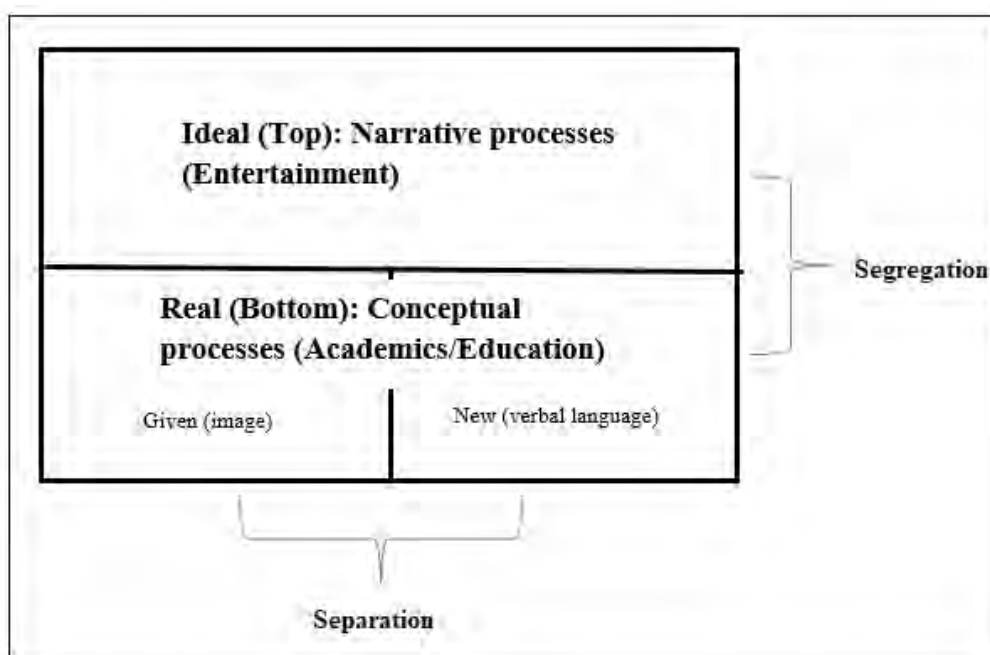


Figure 9 Patterns across metafunctions found in this study

From this study, we can see that visual design plays an important role in language learning materials, not merely for decoration purposes. Language learning materials especially for the digital ones include various modes of communication, not only just the verbal language. There is the need to understand how the meaning potential of these modes can help support language learning and teaching in order to ensure better pedagogical practices and make the best use of multimodal affordances a new technology has been designed to offer.

THE AUTHOR

Sompatu Vungthong is a lecturer at King Mongkut's University of Technology Thonburi, Bangkok, Thailand, and a PhD graduate from Department of Education, Macquarie University, Sydney, Australia. Her research interests include ELT, critical discourse analysis, and social semiotics. She has published in journals (e.g. TESOL Quarterly) and written a book chapter.

sompatu.vun@kmutt.ac.th

REFERENCES

- Ajayi, L. (2012). How teachers deploy multimodal textbooks to enhance English language learning. *TESOL Journal*, 6, 16–35.
- Brett, P. (1997). A comparative study of the effects of the use of multimedia on listening comprehension. *System*, 25(1), 39-53. Retrieved from doi:10.1016/S0346-251X(96)00059-0
- Carpenter, S. K., & Olson, K. M. (2012). Are pictures good for learning new vocabulary in a foreign language? Only if you think they are not. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 38(1), 92-101.
- Chen, J. L. (2007). Using games in teaching English to preschool students (Master's thesis). National Dong Hwa University, Hualien, Taiwan.
- Derewianka, B., & Coffin, C. (2008). Time visuals in history textbooks: some pedagogic issues. In L. Unsworth (Ed.), *Multimodal semiotics: Functional analysis in contexts of education* (pp. 187-200). London, England: Continuum.
- Guichona, N., & McLornan, S. (2008). The effects of multimodality on L2 learners: Implications for CALL resource design. *System*, 36(1), 85–93. Retrieved from doi:10.1016/j.system.2007.11.005
- Gunter, G. A., Campbell, L. O., Braga, J., Racilan, M., & Souza, V. S. (2016). Language learning apps or games: an investigation utilizing the RETAIN model. *Revista Brasileira de Linguística Aplicada*, 16(2), 209-235. Retrieved from <http://dx.doi.org/10.1590/1984-639820168543>
- Halliday, M. A. K. (1994). *An introduction to functional grammar*. London, England: Edward Arnold.
- Halliday, M. A. K., & Hasan, R. (1985). *Language, context, and text: Aspects of language in a social-semiotic perspective*. Oxford, England: Oxford University Press.
- Holden, C., & Sykes, J. (2013). Leveraging mobile games for place-based language learning. In P. Felicia (Ed.), *Developments in current game-based learning design and deployment* (pp. 27-45). Hershey PA: IGI Global.
- Jewitt, C. (2002). The move from page to screen: the multimodal reshaping of school English. *Journal of Visual Communication*, 1(2), 171–196.
- Jewitt, C. (2006). *Technology, literacy and learning: A multimodal approach*. London, England: Routledge.
- Jewitt, C. (Ed.). (2009). *The Routledge handbook of multimodal analysis*. London, England: Routledge.
- Kress, G., & Van Leeuwen, T. (2001). *Multimodal discourse: Modes and media of contemporary communication*. London, England: Arnold.
- Kress, G., & Van Leeuwen, T. (2006). *Reading images: the grammar of visual design*. New York, NY: Routledge.
- Kuo, Y. L. (2008). *The effect of games in fifth graders' English speaking ability in an elementary school in Taipei County* (Master's thesis). National Taipei University of Education, Taipei, Taiwan.
- Liu, X., & Qu, D. (2014). Exploring the multimodality of EFL textbooks for Chinese college students: A comparative study. *RELC Journal*, 45(2), 135-150. Retrieved from doi:10.1177/0033688214533865
- Ministry of Education, Thailand. (2013). The report on the implementation of government policy. Retrieved from <http://www.moe.go.th/moe/th/home/>
- Salbego, N., Heberle, V. M., & Silva Balen, M. G. S. (2015). A visual analysis of English textbooks: Multimodal scaffolded learning. *Calidoscópico*, 13(1), 5-13. Retrieved from doi: 10.4013/cld.2015.131.01



- Silva, M. (2016). Accounting for multimodality in an EFL textbook: Analysing activities and suggesting ways to approach multimodal texts. *Diálogo das Letras, Pau dos Ferros*, 5(2), 92-109.
- Udomsate, K., Churintorn, S., & Chiannguen, A. (2011). Results of the use of tablets in Thai Language and mathematics classrooms for Grade 1 students at The Prince Royal's College, Thailand. Prince Royal's College Report.
- Van Leeuwen, T. (2005). *Introducing social semiotics*. New York, NY: Routledge.
- Vungthong, S., Djonov, E., & Torr, J. (2017). Images as a resource for supporting vocabulary learning: A multimodal analysis of Thai EFL tablet apps for primary school children. *TESOL Quarterly*, 51(1), 32–58. Retrieved from doi: 10.1002/tesq.274
- Wang, Y. Shang, H., & Briody, P. (2011). Investigating the impact of using games in teaching children English. *International Journal of Learning and Development*, 1(1), 127-141. Retrieved from <http://www.macrothink.org/journal/index.php/ijld/article/viewFile/1118/874>
- Weninger, C. & Kiss, T. (2013). Culture in English as a foreign language (EFL) textbooks: A semiotic approach. *TESOL Quarterly*, 47, 694–716. Retrieved from doi: 10.1002/tesq.87
- Yumin, C. (2009). *Interpersonal meaning in the textbooks for teaching English as a foreign language in China: A multimodal approach* (PhD thesis). University of Sydney, Australia. Retrieved from <https://ses.library.usyd.edu.au/bitstream/2123/5143/1/Y-Chen-2009-thesis.pdf>