

**EFFECTS OF ANIMATION ON STUDENTS' UNDERSTANDING OF
A NOVEL**

ELVIN SELVADASAN A/L KANAPATHY

**A project report submitted in partial fulfilment of the requirements for the
award of the degree of Master of Education (TESL)**

**Faculty of Education
In Collaboration with the
Language Academy
Universiti Teknologi Malaysia**

DECEMBER 2013

DEDICATION

To my beloved parents, wife Jayanti and sons Ethan and Endre

ACKNOWLEDGEMENT

My deepest gratitude to Associate Professor Dr Wan Fara Adlina Binti Wan Mansor
for her wisdom, guidance, insight and patience
in supervising this project.

Thank you.

ABSTRACT

This research is carried out to investigate the use of animation in the field of education. The constructivist theory and related concepts that influence the use of animation have also been discussed besides exploring the importance of Education Technology of which animation is a key component. This research investigates the effects of using animation to help students understand the novel “The Curse” besides determining the students’ perception on using animation in the teaching and learning of the novel. This research used qualitative methodology such as observation, reflection, interview and feedback to meet the objectives of this research. The results of the research indicated that animation managed to assist the participants in understanding the novel and encouraged the participants to participate actively in the teaching and learning activities related to the novel. Additionally animation also encouraged the participants to read the novel and other related materials to the novel itself. The participants of this research also believed that the use of animation should be encouraged in the teaching and learning process of learning literature.

ABSTRAK

Kajian ini dilaksanakan untuk mengetahui penggunaan animasi di bidang pendidikan. Teori konstruktivist dan konsep-konsep yang berkaitan yang telah mempengaruhi penggunaan animasi di bidang pendidikan telah dibincang selain daripada perbincangan mengenai teknologi pendidikan di mana animasi merupakan komponen yang penting. Kajian ini berhasrat mengesan penggunaan animasi di dalam membantu murid memahami karya sastera “The Curse”, selain daripada ingin mengetahui persepsi murid-murid tentang penggunaan animasi di dalam proses pengajaran dan pembelajaran sastera berkenaan. Kajian ini menggunakan kaedah kualitatif di mana pemerhatian, refleksi, temuduga dan maklumbalas daripada peserta-peserta kajian merupakan instrumen yang digunakan untuk mencapai objektif-objektif kajian ini. Hasil kajian ini menunjukkan bahawa animasi membantu murid memahami karya sastera berkenaan. Seterusnya, animasi didapati juga menggalakkan para peserta kajian ini untuk mengambil bahagian di dalam aktiviti-aktiviti pengajaran dan pembelajaran secara aktif selain daripada menggalak mereka membaca karya sastera berkenaan serta buku aktiviti berkaitan dengan karya itu. Akhir sekali, para peserta kajian ini berpendapat bahawa penggunaan animasi perlu digalakkan di dalam aktiviti-aktiviti pengajaran dan pembelajaran sastera.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	x
	LIST OF FIGURES	xi
	LIST OF APPENDICES	xii
1	INTRODUCTION	1
	1.1 Background of Study	2
	1.2 Problem Statement	3
	1.3 Objectives	4
	1.4 Research Questions	4
	1.5 Significance of Study	4
	1.6 Scope of the Study	5
	1.7 Theoretical and Conceptual Framework	5
	1.8 Definition of Terms	7
2	LITERATURE REVIEW	
	2.1 Constructivist Theory and its Relevance in Education	13
	2.2 Constructivist Approach and its Relevance in Teaching Literature Today	17

2.3	Students Participation in a Constructivist Classroom	20
2.4	Tools for a Constructivist Classroom	23
2.5	Educational Technology Application in a Constructivist Classroom	24
2.5.2	Factors Influencing the Effectiveness of Using Educational Technology in a Constructivist Classroom	27
2.6	Teaching Literature Using Animation in a Constructivist Classroom	29
2.6.1	Five Principles of the Human Cognitive System Relevant to Using Animation in Education	31
2.6.2	Significance of Cognitive Load Theory in using Animation to Teach Literature	33
2.6.3	Types of Cognitive Loads and its Implication on Using Animation to Teach Literature	35
2.6.4	Comparison Between Using Animation Versus Static Pictures in Teaching Literature	37
2.6.5	Using Animation Effectively in a Literature Lesson	39
3	RESEARCH METHODOLOGY	41
3.1	Research Design	42
3.2	Participants of the Study	42
3.3	Data Collection Methods / Research Instruments	44
3.3.1	Observation	44
3.3.2	Comprehension Evaluation Exercises and Essay	45
3.3.3	Feedback grid	46
3.3.4	Structured Interview	47
3.3.5	Reflection	48
3.4	Research Procedure	49
3.5	Data Analysis	51

4	FINDINGS AND DISCUSSION	53
4.1	Findings	53
4.1.1	Effects of Using Animation on Students Understanding of the Novel “The Curse”	54
4.1.2	Students’ Perception on Teaching and Learning of “The Curse” using animation	62
4.2	Discussion	64
4.2.1	Animation Assists Understanding of the Novel	64
4.2.2	Animation Encourages Participation	66
4.2.3	Animation Encouraged Further Reading	67
5	CONCLUSIONS AND IMPLICATIONS	70
5.1	Summary of Findings	70
5.2	Implications of the Study	72
5.3	Limitations of the Study	73
5.4	Recommendations for Future Research	74
5.5	Conclusion	75
	REFERENCES	78-82
	Appendices	83-105

LIST OF TABLES

TABLE NO.	TITLE	PAGE
3.1	Participants English Language Proficiency Profile	43
3.2	Level of Proficiency	43
3.3	Research Procedure	51
4.1	Participants' Comprehension Evaluation Exercises and Essay Score	54

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
1.1	Theoretical and Conceptual Framework	6

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Observation	83
B	Comprehension Evaluation Questions (Set 1) Prologue and Chapters 1 to 3	84
C	Comprehension Evaluation Questions (Set 2) Chapters 4 to 6	85
D	Comprehension Evaluation Questions (Set 3) Chapters 7 to 12	86
E	Comprehension Evaluation Question (Set 4) Chapters 1 to 12	87
F	Feedback Grid	88
G	Interview Transcription on Students’ Perception on Whether Animation Assisted Understanding	89
H	Interview Transcription on Whether Animation Should Be Used in Teaching and Learning Activities	90
I	Interview Transcription on Participants’ Perception on Whether Animation Encouraged Them to Participate in the Related Activities	91
J	Observation on Participants’ Understanding	

	of the Role Play and Presentation Activities	92
K	Observation on Participants' Participation in the Role Play and Presentation Activities	96
L	Participants' Perception on Using Animation using the Feedback Grid	100
M	Band Descriptor for Literature Marking Scheme	101
N	Static Pictures of Stage 1 Animation	102
O	Static Pictures of Stage 2 Animation	103
P	Static Pictures of Stage 3 Animation	104
Q	Summary of the Novel	105

CHAPTER 1

INTRODUCTION

Education is the most important and meaningful gift to a child nevertheless parents and educationist at times find it difficult to assist children in understanding the knowledge imparted to them. With the rapid advancement of technology, an increasing number of students use information technology tools to help them acquire knowledge and information. This change of lifestyle has brought about a change in how teaching and learning is conducted. It is difficult to accept that someone is educated if he is not able to use technology in daily life such as internet, websites and multimedia. Therefore to ensure that students are not left behind, educationist should embrace technology and use it in the teaching and learning process (Bates and Poole, 2003).

The past years have seen the increase in the use of education technologies that has made teaching and learning materials presented to students become more visual, flawless and with the opportunity for interaction. Education technologies when used effectively would encourage both teachers and students to be absorbed in the topic that they are engaged in (Schifter and Stewart, 2010). Next, Gokcearshan *et al.* (2009) revealed a study conducted showed that a student who is presented with 10% of the data learns 50% of it by watching a movie while the same student could learn as much as 90% of the same data when motion, display, sound and interaction is used.

One of the forms of using technology in education is animation. According to Alessi and Trollip (2001) “Pictures, especially animated ones, capture attention more than text”. Animation when designed well is able to attract students including children and teenagers to be focused to the animation for a period of time which is very difficult with just reading a text. Animation opens the horizons and helps students to imagine and ponder about certain processes such as movement of mechanical parts in a machine (Kriz and Hegarty, 2007).

1.1 Background of Study

This research hopes to shed some light on the effects of animation on students understanding of a novel “The Curse”. In addition the participants’ perception on using animation in the teaching and learning activities would also be gathered. Animation in education has received mix reviews. Some critics find it is no better in enhancing understanding compared with using static pictures (Wong *et al.*, 2009; Lowe, 2003), while others find a lot of potential in using it to teach for instance visualising the mechanism of a technical process could be extremely difficult for some students. Animation lets students visualise the movement of these technical and complex process which is impossible with the naked eyes (Kriz and Hegarty, 2007).

Nevertheless when cognitive load is increased, this may result in animation not being effective in assisting the intended audience. Animation shows a movement which is continuous and this might even become an extraneous load for the working memory which results in unsuccessful attainment of information and knowledge (Hoffler *et al.*, 2010). However, by improvising the designed features of animation such as interactivity (Kriz and Hegarty, 2007), unnecessary cognitive load can be minimised.

Not surprisingly animation has even found its way into the world of literature. Recently Longmans a well known publisher has introduced an animated version of the form five literature novel “The Curse”. A research conducted in Malaysia on whether animation assisted computer science students in understanding one of their core subjects which is difficult to understand has showed promising results (Rais and Zaman, 2012).

1.2 Problem Statement

Students in a secondary school in Kulai who are weak and average in their proficiency of the English language appear to have problems in understanding the novel while others are not keen to participate in the literature activities for the Form 5 Novel ‘The Curse’. Their level of proficiency is based on their Lower Secondary Examination (PMR) results, form 4 midyear and year end English examinations results. The mentioned problems could be attributed to several reasons and one of it is they are not able to understand the Form 5 literature novel “The Curse” well enough to appreciate the underlying values and characteristics of the characters as many of them just memorise sample answers for the examination. These students have to be forced to participate in the teaching and learning activities as some find it boring.

With the use of animation in the form of an animated novel of “The Curse” it is hoped that it would be helpful for students to understand the novel better and they would be encouraged to participate in the activities held thereafter.

1.3 Objectives

The objectives of the study are:

- 1.3.1 To examine the effects of using animation on students' understanding of a novel "The Curse"
- 1.3.2 To investigate students' perception on teaching and learning of the "The Curse" using animation.

1.4 Research Questions

This study intends to answer these questions.

- 1.4.1 What are the effects of using animation on students' understanding of a novel "The Curse"?
- 1.4.2 What are the students' perception on teaching and learning of "The Curse" using animation?

1.5 Significance of Study

It is hoped that this study would assist these students' understanding of the novel "The Curse" which is part of the form 5 English syllabus. Students were tested on their comprehension of the novel in Paper 2 of their "Sijil Pelajaran Malaysia" (SPM) or the Malaysia standardized high school examination. As technology is changing rapidly, so is the mind-set, wants and needs and aspirations of these students who are teenagers. It is hoped that using animation to teach the novel would enhance students understanding and participation in the class activities that followed.

Furthermore, this study also hoped to assist teachers to ensure the teaching and learning process for the literature component of SPM English is carried out effectively. It is hoped that animation as a technique of teaching could be applied to other English components if it is found to be useful to enhance students' understanding and participation in class.

1.6 Scope of the Study

This research which was conducted for 6 weeks, focused on the effects of animation on students understanding of a novel "The Curse" among 12 Form Five students of a school in Kulai who are weak and average in their proficiency of the English language. The students' proficiency level is based on their Lower Secondary Examination (PMR) result, form 4 midyear and year end English examinations results. Apart from that, the research also hoped to find out what are the students' perceptions of using animation in helping them understand the novel.

1.7 Theoretical and Conceptual Framework

Due to the nature of this research, specifically in the effort to help the students understand and appreciate a certain novel that is being used for SPM exam, these are the theories and concepts that guide this research.

Beginning at the top and the most central, as seen in figure 1.1, the Constructivist theory is guiding the whole theoretical framework. The essence of this theory which is exploration, collaboration, cooperation and reflection suits well with

the objectives of this research. Furthermore the constructivist theory which emphasises on authentic and meaningful task will not only bring about effective and useful learning but will encourage the participants to participate in the activities held. Besides, the activities for this research are in line with this thought.

Consequently, educational technology forms the inner circle of the theoretical and conceptual framework in figure 1:1 as education technology tool would be used to assist, encourage, facilitate and even create enthusiasm to fulfil and answer the research questions and objectives set forth. Thus an in-depth understanding of the use and benefits of Education Technology would be explored in this research.

Next, animation in education forms the utmost inner circle of the theoretical and conceptual framework in figure 1.1 as the researcher plans to use animation of a novel to determine the effects of animation on students' understanding of a novel in form five and in the related activities. An understanding on how animation watched is understood and retained would be further scrutinised using the Cognitive Load Theory and the Five Principles of the Human Cognitive System. This theory and concept are explored to find out their significance in ensuring suitable animation is used to enhance students' understanding of the literature animation watched.

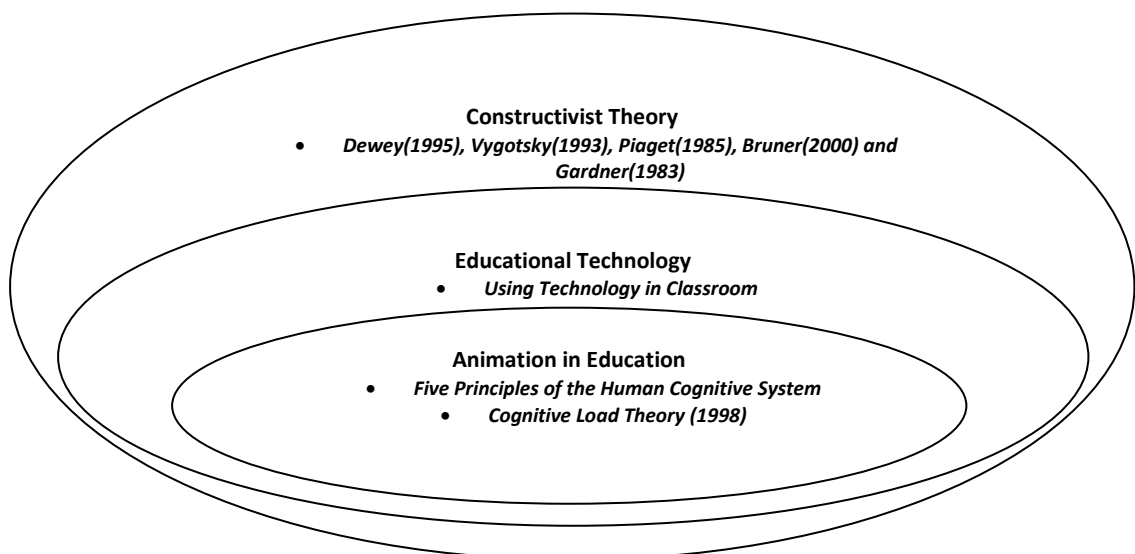


Figure 1.1: Theoretical and Conceptual Framework

1.8 Definition of Terms

1.8.1 Constructivist Theory

Proponents of this theory believe that students continuously acquire knowledge by building on existing knowledge and experience. Besides, students continuously built cognitive structures which assist them in understanding. New knowledge and experience acquired is filtered and assimilated into existing knowledge and experience. Some proponents of constructivism also believe that the activities a student is involved in and the environment or culture a student is exposed to influences his perception of things. Collaboration among students is given emphasis as students are able to exchange knowledge and experience to attain a common objective. This theory is student centred and teachers are encouraged to have activities that assist students in the real world. In this research, the constructivist theory would be the theoretical framework of the research.

1.8.2 Constructivist Approach

The constructivist approach uses the constructivist theory in the teaching and learning process where students are given the opportunity to collaborate, cooperate and reflect in the activities they are required to participate. Activities prepared are student centred which would require the assistance of the teacher to facilitate and moderate so the teaching outcomes are met. The activities prepared are based on the students' previous knowledge where room for improvement is considered so that students are in the Zone of Proximal Development. At the end of the day students acquire new knowledge.

1.8.3 Zone of Proximal Development

According to Vygotsky (1993) a student is able to master a task by collaborating with his peers or with the guidance of an adult. Zone of Proximal Development is the differences between the levels where a student is able to independently complete a task and the level where he needs assistance. In this research, the Zone of Proximal Development would be taken into consideration when choosing the animation to be watched and when choosing the relevant activities for the participants to participate in.

1.8.4 Scaffolding

Relevant and effective instruction could be given by teachers when they know at which stage of development a child is and prepare activities based on the experience of the child. This term is associated with Vygotsky a well-known learning theorist. The researcher has taken into consideration scaffolding to ensure the objectives of this research are met.

1.8.5 Education Technology

Educational Technology is the process of using technology in its various forms which includes animations, power point presentations and even whiteboards to assist learning. Educational technology uses these aids to encourage, promote, facilitate and even create enthusiasm so that the process of teaching and learning could be effective.

1.8.6 Animation

Series of pictures that appear to move which normally form a sequence of events which is logical in nature. Cartoons and computer games are examples of animation. In this research, participants would be watching an animation of a novel “The Curse”.

1.8.7 Working Memory

It is a conscious memory that could handle a certain number of processes. If the number of processes exceeds the capacity of the working memory, a person is not able to digest and understand the information received. The researcher felt it is important to consider working memory in the cognitive process of a student as this would affect the student’s understanding of the animation watched.

1.8.8 Long Term Memory

Acts as an information store area where information which is understood is stored for long term use in a form of a schema. The researcher felt it is relevant to understand the cognitive process and how what is watched in animation is stored in the long term memory.

1.8.9 Schema Theory

Schema theory states that multiple information received are kept in the form of schemas in LTM. Schemas are retrieved from LTM and used in working memory to assist in understanding. In this research schema theory highlights how information is stored in the memory that would be used by the participants in the activities that follow after watching the animation.

1.8.10 Cognitive Processing

The process of how thought is analysed and made sense of from information gathered. The researcher felt that how information is processed is important to be understood.

1.8.11 Cognitive Load

Is the amount of information that has to be processed by the working memory at a particular time. It could be distinguished into intrinsic load, extraneous load and effective load. The researcher felt the understanding on the various loads would help the researcher to choose the appropriate animation that would assist the participants understanding of the novel "The Curse".

References

- Alessi, M. S. and Trollip, R. S. (2001). *Multimedia for Learning. Methods and Development (3rd ed.)*. Massachusetts: Allyn & Bacon.
- Angela, T. (2011). [A constructivist approach to new media: An opportunity to improve social studies didactics.](#) *Procedia - Social and Behavioral Sciences*, Volume 11, 2011, 185-189.
- Atasheneh, N. & Izadi, A. (2012). The role of teachers in Reducing/Increasing listening comprehension test anxiety: A case of Iranian EFL learners. *English Language Teaching*, 5(3), 178-187.
- Baek, Y., Jung, J. & Kim, B. (2008). [What makes teachers use technology in the classroom? Exploring the factors affecting facilitation of technology with a Korean sample](#) . *Computers & Education*, Volume 50, Issue 1, January 2008, 224-234.
- Bates, A. W. and Poole, G. (2003). *Effective Teaching with Technology in Higher Education (1st ed.)*. San Francisco: Josset-Bass.
- Brooks, G.J. & Brooks, M.J. (1999). [In search of understanding: the case for constructivist classrooms / with a new introduction by the authors Jacqueline Grennon Brooks, Martin G. Brooks.](#) Alexandria: Association for Supervision and Curriculum Development.
- Camphell, J. (1995). *Understanding John Dewey*. Chicago: Open Court.
- Chittravelu, N., Sithamparam, S., Choon, S.T. (2004). *ELT Methodology Principles and Practice*. Selangor: Penerbit Fajar Bakti Sdn. Bhd.

- Doolittle, E.P., Terry, P.K., Mariano, J.G. (2009). *Multimedia Learning and Working Memory Capacity*. In Zheng, Z.R. *Cognitive Effects of Multimedia Learning* (pp. 17-33). Hershey: Information Science Reference.
- Flavell, J. (1985). *Cognitive Development (2nd ed.)*. Englewood Cliffs, NJ: Prentice Hall.
- Gerjets, H.P. & Hesse, W.F. (2004). [When are powerful learning environments effective? The role of learner activities and of students' conceptions of educational technology.](#) *International Journal of Educational Research*, Volume 41, Issue 6, 2004, 445-465.
- Gardner, H. (1983). *Frames of Mind*. New York: Basic Books.
- Gökçearsan, A. (2009). [The place of training cd's in computer aided education and the problems encountered with them.](#) *Procedia - Social and Behavioral Sciences*, Volume 1, Issue 1, 2009, 2007-2012.
- Heinich, R., Molenda, M., Russell, D.J., Smaldino, E.S. (1999). *Instructional Media and Technologies for Learning*. New Jersey: Prentice-Hall, Inc.
- Höffler, N. T, Prechtel, H., Nerdel, C. (2010). [The influence of visual cognitive style when learning from instructional animations and static pictures,](#) *Learning and Individual Differences*, Volume 20, Issue 5, October 2010, 479-483.
- Kaufman, D. (2004). Constructivist Issues in Language Learning and Teaching. *Annual Review of Applied Linguistics*, 24, 303-319.
- Kementerian Pendidikan Malaysia, (2001), *Sukatan Pelajaran Bahasa Inggeris Kurikulum Bersepadu Sekolah Menengah*. Ampang: Percetakan Dewan Bahasa dan Pustaka.

- Kriz, S. & Hegarty, M. (2007). [Top-down and bottom-up influences on learning from animations](#). *International Journal of Human-Computer Studies*, Volume 65, Issue 11, November 2007, 911-930.
- Kombartzky, U., Ploetzner, R., Schlag, S. & Metz, B. (2010). [Developing and evaluating a strategy for learning from animations](#). *Learning and Instruction*, Volume 20, Issue 5, October 2010, 424-433.
- Lever-Duffy, J. & McDonald, B. J. (2008). *Teaching and Learning with Technology*. Boston: Pearson Education, Inc.
- Longman Dictionary of Contemporary English (2005), England: Pearson Education Limited.
- Lowe, K. R. (2003). [Animation and learning: selective processing of information in dynamic graphics](#). *Learning and Instruction*, Volume 13, Issue 2, April 2003, 157-176.
- Low, R., Jin, P. & Sweller, J. (2009). *Cognitive Architecture and Instructional Design in a Multimedia Context*. In Zheng, Z.R. *Cognitive Effects of Multimedia Learning* (pp. 1-17). Hershey: Information Science Reference.
- Memartabatkan Bahasa Malaysia Memperkukuhkan Bahasa Inggeris. Available from: <http://www.moe.gov.my/userfiles/file/MBMMBI.pdf>. [August 19, 2012]
- Merriam, B. S. (2001). *Qualitative Research and Case Study Applications in Education, Revised and Expanded from Case Study in Education*. San Francisco: Jossey-Bass Publishers.
- Mok, Jane (2011), A case study of students' perceptions of peer assessment in Hong Kong, *ELT J* (2011) 65 (3): 230-239.

- Münzer, S., Siefert, T., Brünken, R. (2009). [Learning from multimedia presentations: Facilitation function of animations and spatial abilities](#), *Learning and Individual Differences*, Volume 19, Issue 4, December 2009, 481-485.
- Nie, Y. & Lau, S. (2010). [Differential relations of constructivist and didactic instruction to students' cognition, motivation, and achievement](#). *Learning and Instruction*, Volume 20, Issue 5, October 2010, 411-423.
- Ormrod, J. (2000). *Educational psychology: Developing learners (3rd ed.)*. Upper Saddle River, NJ: Merrill/Prentice Hall.
- Onwuegbuzie, J. A, Bailey, P., Daley, E.C. (1999). Factors associated with foreign language anxiety. *Applied Psycholinguistics*, 20, 217-239.
- Paas, F., Renkl, A. & Sweller, J. (2003). Cognitive Load Theory and Instructional Design: Recent Developments, *Educational Psychologist*, 38:1, 1-4.
- Rias, R. M. and Zaman, B. H., (2012). Can Different Types of Animation Enhance Recall and Transfer of Knowledge? A case study on a Computer Science Subject. *AJTLHE*, Vol. 4(No.1), 32-43.
- Roblyer, M.D. (2006). *Integrating Educational Technology into Teaching*. New Jersey: Pearson Education, Inc.
- Roskos, K., Vukelich, C., Risko, V. (2001). Reflection and Learning to Teach Reading: A Critical Review of Literacy and General Teacher Education Studies, *Journal of Literacy Research* 2001 33: 595.
- Schifter, C. C. and Stewart, M. C. (2010). *Technologies and the Classroom Come to Age: After Century of Growth*. In Stewart, M. C., Schifter, C. C. and Selverian, M. E. M. (Eds.) *Teaching and Learning with Technology Beyond Constructivism*. (pp. 3-24). New York: Routledge.

- Sharp, F.V. (2009). *Computer Education for Teachers, Integrating Technology into Classroom Teaching*. New Jersey: John Wiley & Sons, Inc.
- Spanjers, A.E.I., Gog, V.T., Wouters, P., van Merriënboer, J.G.J. (2012). Explaining the segmentation effect in learning from animations: The role of pausing and temporal cueing. *Computers & Education*, Volume 59, Issue 2, September 2012, 274-280.
- Surat Siaran Kementerian Pelajaran Malaysia Bilangan 6 Tahun 2011: Pindaan Perkara 6 Dan Lampiran dalam Surat Siaran Kementerian Pelajaran Malaysia Bilangan 5 Tahun 2011: Garis Panduan Pelaksanaan Dasar Memartabatkan Bahasa Malaysia Memperkukuh Bahasa Inggeris (MBMMBI).
- Sweller, J., van Merriënboer, J. J. G. & Paas, F. (1998). Cognitive architecture and instructional design. *Educational Psychology Review*, 10, 251-296.
- Vygotsky, L. (1993). *Interaction between Learning and Development*. In Gauvain, M. and Cole, M. (Eds.) *Readings on the Development of Children* (pp. 29-36). New York: W.H Freeman and Company.
- Wangpipatwong, T. & Papasratorn, B. (2009). *The influence of Constructivist E-Learning System on Student Learning Outcomes*. In Tomei, L. *Information Communication Technologies for Enhanced Education and Learning*. (pp. 45-57). Hershey: Information Science Reference.
- Wong, A., Marcus, N., Ayres, P., Smith, L., Cooper, A. G., Paas, F. & Sweller, J. (2009). [Instructional animations can be superior to statics when learning human motor skills](#). *Computers in Human Behavior*, Volume 25, Issue 2, March 2009, 339-347.