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A Systematic Review on Multimedia Learning and Its Potential in Teaching Reading Comprehension in Malaysia

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Abstract

The rise of technology use in classroom has been an issue for teachers especially in teaching second language learners and one of the most commonly used technology-infused approach in school is the use of multimedia. However, most teacher are struggling in planning and utilizing multimedia learning effectively in classroom. Therefore, there is a need to explore the potential of multimedia learning in teaching of reading comprehension so that the pupils can make a better connection with the text and teacher able to make full use of it in teaching comprehension skills. Thus**,** this study aims to review articles on the potential of multimedia learning especially in teaching reading comprehension skills. This study was inspired by the rising of reading comprehension as important skills in early literacy and the need for a review on latest multimedia learning approaches used by the teacher and researcher deemed as crucial as it will help other language practitioners to evaluate and employ it effectively in teaching reading comprehension. The data was collected through systematic review and analysis of 20 relevant articles based on the theme selected. The finding shows that multimedia learning approach has three major potentials which gave significant impact towards reading comprehension competency.

Keywords: Multimedia Learning, Reading Comprehension, Teaching of Reading, Technology

Introduction

Over the years, Malaysia has been progressing from year to year in improving its score in Programme for International Student Assessment (PISA). Throughout the years, Malaysia managed to score averagely compare to another country but scored poorly in the reading section. In the study done by Puteh, Zin & Ismail (2016) aimed to examine the differences in reading performance between gender and they found out girl performed better than boys. In addition, Malaysian pupils did better in low-level reading skills than high level which the need of high order thinking skills (HOTS) is needed in our education. Besides that, the findings also show Malaysian pupils have issue in interpret and integrate, and reflect and evaluate skills in reading because our education system did not support or foster high-level thinking or using

different level of question. Thus, the issue among Malaysian pupils is the lack of skills in comprehend the text given in reading classes.

In addition, critical reading also one of the issues among the reader as they need to decode the information and comprehend the information. Some of the novice readers always focusing on decoding single words than looking at the information as whole which leads to a failure in reading comprehension (Paris, Wasik & Turner, 2016). A study by Zin, Wong & Rafik-Galea (2014) explained the lack of critical reading skills among Malaysian university pupils due to the claims by educators and employers on their ability in processing the reading text. The study found out, the pupils have poor grasp on identifying main idea, purpose of the article and important details.

This finding later supported with the study by Musa, Lie & Azman (2012) which explained the cause of limited English proficiency was due to perception of English as a difficult subject, high dependency on teachers and use of dictionary during a reading lesson. Besides that, the lack of exposure in language skills also limited the pupils' involvement in reading classes and the lack of motivation and vocabulary also hinder the reading process (Ismail, 2008; Shaari, 2008). Thus, it can be concluded that most of the problem faced by the pupils related to unsuitable approach used in teaching reading comprehension.

Besides that, teacher plays an important role as a facilitator and guider for pupils to achieve the required skills in reading because the process of teaching contribute to the pupils' success in acquiring basic skills in reading(Anderson, Evertson, & Brophy, 1979). Most of the teachers equipped with good background knowledge on language teaching but what is it mean by teaching of reading comprehension and what are the elements or skills that need to be taught? Normally, a teacher will describe reading as process of comprehend information, understanding or getting meaning but reading is more than that. Reading is a process of integrating prior knowledge, information, and additional support from surrounding to build, create, decode and construct meaning (Day, 2018). Thus, effective teaching of reading comprehension required the teacher to aware the diversity of the reader, the nature of reading and which method and approach is suitable for them (Kameenui & Carnine, 1998). These bits of knowledge are needed to ensure the selection of approaches meets the objective such as the use of multimedia learning in teaching reading comprehension. Despite of this awareness, educators are still not familiar with the operation of multimedia in teaching language. Thus, this study aims to identify the trend, advantages, weaknesses and its potential in teaching reading comprehension.

Nowadays, the evolution of the industry has given a new change to educational transformation where the main essence of education focused on innovation and creative thinking (Ferrari, Cachia, & Punie, 2009; Treffinger, Schoonover, & Selby, 2012). In order to shape these transformational changes, there is a need for a new invention in teaching reading especially comprehension skills. The injection of technology is one of the approaches highlighted in new education transformation. Technology has impacted almost every aspect of life especially education and multimedia learning has sparked the educators' interest in implementing the technology in their classroom. Multimedia learning is not something new as it has been popularized by Richard Meyer in his cognitive theory of multimedia learning which support the theory of dual coding by Allan Paivio. Both researchers exclaimed the need for verbal and nonverbal stimulus to help reader comprehend text and it can be achieved through multimedia learning (Moreno & Mayer, 2002; Sadoski & Paivio, 2013). Despite being popular among the teachers, multimedia learning has not been in discussion, reviewing the potential of it in helping students learn reading comprehension skills. Thus, in order to

develop a well-suited approach to help pupils comprehend text better, a detail review of multimedia learning research should be done. The findings of the study might be useful as a guidance for the future researcher and educator in planning their reading comprehension lesson.

Research Objectives and Research Questions

Purpose of my study is to review the potential of multimedia learning in teaching reading comprehension as illustrated below: -

a) Research Objectives

i. To find out the potentials of multimedia learning in teaching reading comprehension.

b) Research Questions

i. What are the potentials of multimedia learning in teaching reading comprehension?

Literature Review

Definition of Reading

Reading is a recent human activity and has been around for 5000 years (Hudson, 1998). Reading is an ability to read the symbol or sign and, in every case, the reader who makes sense, recognize an object, place, and surrounding. The reader is the one who makes sense of the situation, give meaning to it and decipher it. Reading almost like breathing, it is essential and we used it to understand the world around us. Nothing we can do but read as it is our important skills in life (Manguel, 2014). Nowadays, reading required the learner to understand the system of language before able to read. It is related to the complexity of the relationship between reader and the text (Manguel, 2014). Some of the factors influence the reader's reading ability is their prior knowledge on the symbol or text, the experience, attitude and the language of the community. The process of reading mainly related to social and cultural event especially in ancient times. The text may come in many versions but normally it appears in visual and printed or some of it in braille form.

Importance of Reading

Reading is one of the language skills acquired by a human in formal education and reading plays a vital role in many aspects of life such as literacy, reading fluency, reading comprehension and discover new knowledge. Reading owns a deep meaning in human's life as we interact with world and ourselves, we connected through the reading process (Freire, 1983). Meanwhile, in the book by Commeyras, Bisplinghoff & Olson (2003) discussed the importance and influence of reading in the classroom from teacher's perspective. One of the notable issues raised by the teachers was the formation of new words and acquisition of vocabulary through reading which can be achieved through suitable approaches. In addition, reading is also a multifaceted cognitive task that is essential for the proper functioning and knowledge gain in today's society and involves an integration of memory and interpretation (Alfassi, 2004).

Multimedia Learning as A Tool for Learning Reading Comprehension

Multimedia learning on reading comprehension is not a new approach to teaching understanding of reading, particularly among pupils at primary school. Multimedia learning approach is where students will be introduced to the use of audio, pictures such as animation, video and technology during reading comprehension lessons (Mayer & Moreno, 2002) . According to (Wiesen, 2019), the learning process in the classroom, using multimedia

presentation and teaching methods, can be described as multimedia learning which has been popularized by Richard Meyer through his cognitive theory of multimedia learning.

The Cognitive theory of multimedia learning is a combination on several cognitive theory on cognitive processing such as Allan Paivio (1990) dual coding theory, cognitive load theory (Sweller & Chandler, 1994; Sweller, Chandler, Tierney, & Cooper, 1990) and theory of working memory (Baddeley, 1992). The cognitive theory of multimedia learning (CTML) Focused on the idea that learners are trying to make meaningful connections between words and images, and that they learn more deeply than using words or images only when reading text. (Kirschner, Park, Malone, & Jarodzka, 2017). In addition, The implementation of multimedia in text comprehension also has been proven to improve learning achievement, learning satisfaction and memory retention on the information presented using multimedia (Chiou, Tien, & Lee, 2015). Multimedia learning also proven to help the reader to link their prior knowledge and foster the process of building mental image which lead to better comprehension skills (Herrlinger, Höffler, Opfermann, & Leutner, 2017; Khezrlou, Ellis, & Sadeghi, 2017).

According to CTML, one of the basic goals of multimedia instruction is to enable the learner to create a coherent mental image of the presented content. The learner's task is to make sense of the presented material as an active participant, and ultimately to build new knowledge. Students will also develop a mental picture based on learning and will be better able to understand the text with the support of multiple stimulus. (Cervetti, Wright, & Hwang, 2016). Besides that, the study by (Rahimi & Allahyari, 2019; J. Wang, Mendori, & Hoel, 2019) suggested the use of multimedia elements in language learning especially in vocabulary can be helpful as it help the visual learner to learn better and cater to their learning needs. In a nutshell, an effective use of multimedia learning in education will provide pupils with limitless chances to make learning meaningful and effective

Method

Systematic review was adopted to conduct a review on many articles of multimedia learning in research field. Systematic review was chosen due to its criteria of eliminating a bias in selection of article. Besides that, a well-planned and detail planning will facilitate the researcher and reader to have a panoramic understanding on the issue discussed (Moher et al., 2015). This review include a detail and comprehensive plan by identifying, selecting and reviewing all suitable articles based on the selected topic or issue (Staples & Niazi, 2007).

There were 8 stages of planning a systematic review as described by Uman (2011).Firstly, The researcher build his own research question and objective based on the selected topic by reviewing the tittle. Secondly, the researcher defined inclusion and exclusion criteria. Details of the review can be decided earlier by the researcher to ensure a detailed and systematic review process. Among the keywords used are multimedia learning, reading and reading comprehension. In the next stage, the researcher used electronic searches such as Google Scholar, Educational Resources Information Centre (ERICS), Science Direct, and Springer e-journals to find a peer-reviewed article.

Then, the researcher set a standard to ease the locating process by limiting the article from 2010 to 2019 and find articles which meet the criteria. Total number of 16800 articles were found related with multimedia learning. After the comprehensive list of articles obtained in the earlier process, the researcher makes a full review to select the best studies. After finding a long list of articles, the researcher chose 20 articles that meet the criteria. the

data extraction should be simple and easy to compare and the researcher found the use of proper subheading in categorizing the finding were suitable.

Next, the researcher used relevant key term to assess the quality of study. Some of the key terms were children, reading comprehension, visual learning, mental image and multimedia learning. The analysis and interpretation of the result was being made after the thorough reviewed on the selected articles. The researcher planned to use a qualitative method to analyse the articles by reviewing the writing and find the patterns, effects, and frequency of the multimedia learning used in the study. Lastly, the findings of the review should be published in a simple form and straightforward language to help the readers read the findings easily. The researcher disseminates the findings through several main topics. Table 1 illustrated the process of systematic review.

Table 1:
Search Criteria, Inclusion and Exclusion Criteria

Literature search/ search criteria	***Selection for inclusion based on the title***
• **Article published 2010 until Jun 2019** • **English Language** • **Reading comprehension and multimedia learning**	• Education • Multimedia learning • Children/ students • Multimedia Learning/ Glossing • Cognitive theory of multimedia learning • Reading / Comprehension • Second Language Learning
Selection for Inclusion Based on Abstract and Eligibility Phase	
Inclusion: • **Focused on the use of multimedia learning in teaching reading.** • **Available for free access and full texts.** • **Explanatory articles for the relationship between multimedia learning and reading comprehension.**	Exclusion • Describing solely on multimedia learning. • Dissertation and theses. • Focusing on other language skills than reading

Findings

Based on the eight steps taken in planning a systematic review, a total of 20 articles were selected for this study. All the articles related to criteria selected during article selection and the findings were categorized into three subheadings: multimedia learning and learning disability with 20% frequency, multimedia learning and children with 20% frequency and vocabulary, mental image, and cognitive load with 60% frequency as illustrated in table 2. The findings discussed three major potential of multimedia learning in teaching reading comprehension as found in 20 articles throughout systematic review process.

Table 2:
Potential of multimedia learning in teaching reading comprehension

No	***Theme Emerged***	***Frequency***	***Percentage***
1	Multimedia Learning and Learning Disability	4	20%
2	Multimedia Learning and Children Education	4	20%
3	Vocabulary, Mental Image and Cognitive Load	12	60%
	TOTAL	20	100%

Multimedia Learning and Learning Disability

The first potential of multimedia learning in teaching reading comprehension concerning on special education for learning disability students. A human with a learning disability can be defined as someone who is having a problem in comprehending or processing information on several factors. Some of the factors may be related to memory, attention, speech, behavior and many more. Across the year from 2010 to 2019, The recent trends on using multimedia learning as one of the methods to help learning disability people in focusing and comprehending the text has been discussed by other researchers. These articles on multimedia learning discussed and highlighted on learning disability and how it can be used to help them learning better. Some of the articles discussed on multimedia effect towards learning disability were written by Knoop-van Campen et al. 2018; Nikolaraizi et al. 2012; Syamsinar & Aznan 2018; L. Wang & Li 2019. One of the factors contributing to the use of multimedia learning in teaching people with learning disability is the ability to help people building mental image. Their ability in building mental image lead to a failure of comprehending the text and it needs a thorough approach which considered their knowledge and disability. Most of the researcher used multimedia learning to help people with hearing impaired, imagery deficit and dyslexia. The support from image such as animation, picture, audio and video help them to decode and decipher the information. Surprisingly, multimedia can be seen as the substitution for sign language for hearing impaired learner as they make a connection with sentence and the pictures to comprehend the text. Besides that, learner with dyslexia found to be able learn better with audio or auditory (Knoop-van Campen et al., 2018). These findings exclaimed the bright potential of multimedia learning in building new path for special education teacher to teach reading comprehension in meaningful way.

Multimedia Learning and Children Education

Aside from special education, multimedia learning holds a magnificent potential in developing early reading comprehension among children education. From a very young age, children had been used image and their prior knowledge to imagine or understand a topic or issue presented in their daily life. Despite of the natural born- talent, children are still having low prior knowledge compared to adult and this reason is one of the factors haunted primary school teacher in teaching comprehension. Some of the articles discussed on children and multimedia learning were written by McTigue 2009; Sarı et al. 2019; Silverman & Hines 2009; Sung & Chen 2019. The elements of bright picture, animation and audio in the multimedia learning attract the children attention in learning. Some of the example is the use of digital storytelling and multimedia storybook. The use of these materials provides a scaffolding of

vocabulary learning and comprehension of story to children as they will be able to visualize and make meaning independently.

Besides that, the use of multimedia to non-English Language Learner (ELL) and second language learner children were effective as it motivates the children to learn in fun and meaningful way. Furthermore, some of the suggested method to teach vocabulary to children was through the combination of read aloud and multimedia support. The suitable and appropriate amount of multimedia will help the children to acquire vocabulary and able to comprehend text later in school. These findings illustrated the potential of multimedia learning in encourage children to understand abstract and concrete information through the support of multiple media.

Vocabulary, Mental Image and Cognitive Load

Lastly, multimedia learning has a vast potential in scaffold the cognitive process among learners through vocabulary memorization, building mental image and lessen cognitive load. The essence of reading is the ability to understand and visualizing the information presented and it can be achieved through vast knowledge of vocabulary and prior knowledge in building mental image. Throughout the years, researcher has acknowledged the importance of prior knowledge in helping reader to comprehend the text and some of the popular method was multimedia learning approach. These are the selected articles found discussed on the use of multimedia approach and its potential in teaching vocabulary and building mental image were written by Khezrlou et al. 2017; Marzban 2011; Rahimi & Allahyari 2019; Ramezanali & Faez 2019; Scheiter et al. 2014; Seufert 2019; Silverman & Hines 2009; Türk & Erçetin 2014; Varol & Erçetin 2019; Yanguas 2009. In most of the articles, vocabulary and mental image are visualize through the use of multi modal of media. The combination of picture, audio, animation, video help the learner and reader to connect the content with their prior knowledge. Besides that, multimedia glossing seen as effective in helping the learner to guess meaning of unfamiliar words. In addition, many learners prefer to use vocabulary glosses through multimedia than dictionary because of the support it offered to the learner. They can link the information presented with prior knowledge and form a new information which explained the process of comprehension.

Besides that, the process of comprehension requires the learner to manage the information effectively through several techniques. Some of the factors hinder the process of comprehension is cognitive load. Thus, the article selected during systematic review process discussed on cognitive load are Austin 2009; Leutner et al. 2009; Lusk et al. 2009 . The articles exclaimed human has a limited working memory due to their individual differences and to help them learn better, an approach which catered to all should be considered. Many of the researcher in the articles selected suggested the use of multimedia learning as it helps to reduce the cognitive load during learning. Multiple use of media in multimedia learning has been proven to support learners with different learning styles such as auditory, kinesthetic and visual learners. It can be achieved through proper segmentation of the multimedia presentation. In order to do so, the planning of multimedia learning needed the students' preference to accommodate their need in learning reading comprehension which helping them lessen the cognitive load. In addition, the proper planning of multimedia learning scaffold the process of building mental image which in result help the learner to reduce cognitive load, increase comprehension and learning outcome. Despite of the claimed by other researcher of how multimedia learning help to reduce cognitive load, Austin 2009 in his study found out the overuse of multimedia without proper distribution can contribute to

attention split, increase cognitive load and hinder transfer learning. It shows multimedia learning has positive and negative potential in teaching reading comprehension but with proper management of multimedia, it can hamper a failed reading comprehension lesson.

Discussions

The findings collected through document analysis show a varied conclusion on the potential of multimedia learning in teaching reading comprehension. Some of the results point out the potential of multimedia learning is to scaffold the vocabulary retention, mental image construction and lessen cognitive load among learners. The basic of teaching reading comprehension relied on the ability of pupils to decipher the written text and the children's vocabulary knowledge. Thus, multimedia learning is the best suited to support pupils' in connecting their prior and vocabulary knowledge in comprehending the written text. According to Clark & Paivio 1991; Mayer & Moreno 1998, learner learnt better through the use of different learning modes such as audio, video, text, animation and any else. These different learning modes assist learner to build mental image and linking with their prior knowledge to make meaning of certain difficult words. Furthermore, the learner will be able to store those vocabulary in their long term memory and recall it effortlessly with the help of linking the words and other stimulus (Sadoski, 2005). As a result, the cognitive load among learner can be reduced effectively as the process of recalling and comprehending the text assisted by multimedia learning.

Besides that, multimedia learning also a powerful tool to help learning disability learner and children in learning reading comprehension. Learning disability learner usually has difficulty in maintaining their attention and processing information skills compared to others but through the findings, this problem can be solved by providing suitable stimulus during teaching reading comprehension such as the implementation of multimedia learning. Therefore, the use of audiobooks, multimedia presentation, digital books and many more may be the most effective intervention for learning disability children. Besides that, children also affected greatly by the use of multimedia learning which help them to create mental image and understanding information. It known to many, picture has a vital role in helping children to linking the information presented and it has been proven to be effective as children could understand a cartoon in television even with different language as the picture helps them to process and comprehend the information (Hansen & Zambo, 2005; Prior, Willson, & Martinez, 2012; Troseth, 2003). Thus, multimedia learning is the best option for the teacher and others to teach reading comprehension to children.

Conclusion and Implication

Based on the finding, it can be concluded that multimedia learning has a specific pattern and trends in helping pupils learn reading comprehension. Among the trends that can be seen through a systematic review conducted is multimedia learning can help children and students with learning disability to focus better. In addition, the process of comprehension driven by the interesting features of multimedia. The pupils get to rely on different modes of learning to build mental image and decipher the written text well, thus shape them to be an independent learner in future. Besides that, the findings are useful to another researcher as they could see the pattern on multimedia learning research from 2010 to 2019. Additionally, the pattern could help the researcher to plan better strategy in exercising multimedia learning onto new learning method and other language skills such as listening, speaking and writing. Nowadays, special children education is highly discussed among teacher as their education

become an important agenda for the school. So, it will be helpful for the teachers to implement multimedia learning in different environment, participants and perspective. Despite having different ability in understanding information compare with normal students, students with learning disability have their own pace in processing information in unique way and by implementing this finding with them, might shed a new light for special education teacher in planning their lesson by using multimedia learning. In a nutshell, multimedia learning can provide a fun and technology incorporated lesson for the children which significantly capturing their interest in learning second language especially English.

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References

Alfassi, M. (2004). Reading to learn: Effects of combined strategy instruction on high school students. *The Journal of Educational Research*, *97*(4), 171–185.

Anderson, L. M., Evertson, C. M., & Brophy, J. E. (1979). An experimental study of effective teaching in first-grade reading groups. *The Elementary School Journal*, *79*(4), 193–223.

Austin, K. A. (2009). Multimedia learning: Cognitive individual differences and display design techniques predict transfer learning with multimedia learning modules. *Computers and Education*, *53*(4), 1339–1354. https://doi.org/10.1016/j.compedu.2009.06.017

Baddeley, A. (1992). Working memory. *Science*, *255*(5044), 556–559.

Cervetti, G. N., Wright, T. S., & Hwang, H. (2016). Conceptual coherence, comprehension, and vocabulary acquisition: A knowledge effect? *Reading and Writing*, *29*(4), 761–779.

Chiou, C.-C., Tien, L.-C., & Lee, L.-T. (2015). Effects on learning of multimedia animation combined with multidimensional concept maps. *Computers & Education*, *80*, 211–223.

Clark, J. M., & Paivio, A. (1991). Dual coding theory and education. *Educational Psychology Review*, *3*(3), 149–210.

Commeyras, M., Bisplinghoff, B. S., & Olson, J. (2003). *Teachers as Readers: Perspectives on the Importance of Reading in Teachers' Classrooms and Lives.* ERIC.

Day, R. R. (2018). Reflective and Effective Teaching of Reading. In *Issues in Applying SLA Theories toward Reflective and Effective Teaching* (pp. 199–207). Brill Sense.

Ferrari, A., Cachia, R., & Punie, Y. (2009). Innovation and creativity in education and training in the EU member states: Fostering creative learning and supporting innovative teaching. *JRC Technical Note*, *52374*, 64.

Freire, P. (1983). The importance of the act of reading. *Journal of Education*, *165*(1), 5–11.

Hansen, C. C., & Zambo, D. (2005). Piaget, meet Lilly: Understanding child development through picture book characters. *Early Childhood Education Journal*, *33*(1), 39–45.

Herrlinger, S., Höffler, T. N., Opfermann, M., & Leutner, D. (2017). When do pictures help learning from expository text? Multimedia and modality effects in primary schools. *Research in Science Education*, *47*(3), 685–704.

Hudson, T. (1998). Theoretical Perspectives on Reading. *Annual Review of Applied Linguistics*, *18*, 43–60. https://doi.org/10.1017/S0267190500003470

Ismail, R. (2008). *Factors affecting less proficient ESL learners' use of strategies for language*

and content area learning. Universiti Putra Malaysia.

Kameenui, E. J., & Carnine, D. W. (1998). *Effective teaching strategies that accommodate diverse learners.* ERIC.

Khezrlou, S., Ellis, R., & Sadeghi, K. (2017). Effects of computer-assisted glosses on EFL learners' vocabulary acquisition and reading comprehension in three learning conditions. *System*, *65*, 104–116. https://doi.org/https://doi.org/10.1016/j.system.2017.01.009

Kirschner, P. A., Park, B., Malone, S., & Jarodzka, H. (2017). Toward a cognitive theory of multimedia assessment (CTMMA). *Learning, Design, and Technology: An International Compendium of Theory, Research, Practice, and Policy*, 1–23.

Knoop-van Campen, C. A. N., Segers, E., & Verhoeven, L. (2018). The modality and redundancy effects in multimedia learning in children with dyslexia. *Dyslexia*, *24*(2), 140–155. https://doi.org/10.1002/dys.1585

Leutner, D., Leopold, C., & Sumfleth, E. (2009). Cognitive load and science text comprehension: Effects of drawing and mentally imagining text content. *Computers in Human Behavior*, *25*(2), 284–289. https://doi.org/10.1016/j.chb.2008.12.010

Lusk, D. L., Evans, A. D., Jeffrey, T. R., Palmer, K. R., Wikstrom, C. S., & Doolittle, P. E. (2009). Multimedia learning and individual differences: Mediating the effects of working memory capacity with segmentation. *British Journal of Educational Technology*, *40*(4), 636–651. https://doi.org/10.1111/j.1467-8535.2008.00848.x

Manguel, A. (2014). *A History of Reading* (2nd ed.). New York: PENGUIN BOOK.

Marzban, A. (2011). Investigating the role of multimedia annotations in efl reading comprehension. *Procedia - Social and Behavioral Sciences*, *28*, 72–77. https://doi.org/10.1016/j.sbspro.2011.11.015

Mayer, R. E., & Moreno, R. (1998). A cognitive theory of multimedia learning: Implications for design principles. *Journal of Educational Psychology*, *91*(2), 358–368.

Mayer, R. E., & Moreno, R. (2002). Aids to computer-based multimedia learning. *Learning and Instruction*, *12*(1), 107–119.

McTigue, E. M. (2009). Does multimedia learning theory extend to middle-school students? *Contemporary Educational Psychology*, *34*(2), 143–153. https://doi.org/10.1016/j.cedpsych.2008.12.003

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., … Stewart, L. A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, *4*(1), 1.

Moreno, R., & Mayer, R. E. (2002). Verbal redundancy in multimedia learning: When reading helps listening. *Journal of Educational Psychology*, *94*(1), 156.

Musa, N. C., Lie, K. Y., & Azman, H. (2012). Exploring English language learning and teaching in Malaysia. *GEMA Online®Journal of Language Studies*, *12*(1).

Nikolaraizi, M., Vekiri, I., & Easterbrooks, S. R. (2012). Investigating deaf students' use of visual multimedia resources in reading comprehension. *American Annals of the Deaf*, *157*(5), 458–473. https://doi.org/10.1353/aad.2013.0007

Paivio, A. (1990). *Mental representations: A dual coding approach* (Vol. 9). Oxford University Press.

Paris, S. G., Wasik, B. A., & Turner, J. C. (2016). *The development of strategic readers*.

Prior, L. A., Willson, A., & Martinez, M. (2012). Picture this: Visual literacy as a pathway to character understanding. *The Reading Teacher*, *66*(3), 195–206.

Puteh, M., Zin, Z. M., & Ismail, I. (2016). Reading Performance of Malaysian Students across

Gender in PISA 2012. *3L: Language, Linguistics, Literature®*, *22*(2).

Rahimi, M., & Allahyari, A. (2019). Effects of Multimedia Learning Combined With Strategy-Based Instruction on Vocabulary Learning and Strategy Use. *SAGE Open*, *9*(2). https://doi.org/10.1177/2158244019844081

Ramezanali, N., & Faez, F. (2019). Vocabulary learning and retention through multimedia glossing. *Language Learning and Technology*, *23*(2), 105–124.

Sadoski, M. (2005). A dual coding view of vocabulary learning. *Reading & Writing Quarterly*, *21*(3), 221–238.

Sadoski, M., & Paivio, A. (2013). *Imagery and text: A dual coding theory of reading and writing*. Routledge.

Sarı, B., Başal, H. A., Takacs, Z. K., & Bus, A. G. (2019). A randomized controlled trial to test efficacy of digital enhancements of storybooks in support of narrative comprehension and word learning. *Journal of Experimental Child Psychology*, *179*, 212–226. https://doi.org/10.1016/j.jecp.2018.11.006

Scheiter, K., Schüler, A., Gerjets, P., Huk, T., & Hesse, F. W. (2014). Extending multimedia research: How do prerequisite knowledge and reading comprehension affect learning from text and pictures. *Computers in Human Behavior*, *31*(1), 73–84. https://doi.org/10.1016/j.chb.2013.09.022

Seufert, T. (2019). Training for coherence formation when learning from text and picture and the interplay with learners' prior knowledge. *Frontiers in Psychology*, *10*(FEB), 1–11. https://doi.org/10.3389/fpsyg.2019.00193

Shaari, Z. A. H. (2008). *Peer Interaction and Meaning Construction among Esl Learners in Comprehending Texts in Second Language Context*. Universiti Putra Malaysia.

Silverman, R., & Hines, S. (2009). The Effects of Multimedia-Enhanced Instruction on the Vocabulary of English-Language Learners and Non-English-Language Learners in Pre-Kindergarten Through Second Grade. *Journal of Educational Psychology*, *101*(2), 305–314. https://doi.org/10.1037/a0014217

Staples, M., & Niazi, M. (2007). Experiences using systematic review guidelines. *Journal of Systems and Software*, *80*(9), 1425–1437.

Sung, H. Y., & Chen, S. H. (2019). "The screen shows movement – movement is interesting!" exploring effects of multimedia stories on preschool children's story comprehension and enjoyment. *Library Hi Tech*, *37*(2), 168–182. https://doi.org/10.1108/LHT-04-2018-0057

Sweller, J., & Chandler, P. (1994). Why some material is difficult to learn. *Cognition and Instruction*, *12*(3), 185–233.

Sweller, J., Chandler, P., Tierney, P., & Cooper, M. (1990). Cognitive load as a factor in the structuring of technical material. *Journal of Experimental Psychology: General*, *119*(2), 176.

Syamsinar, A. J., & Aznan, C. A. (2018). The Design of Multimedia Interactive Courseware for Teaching Reading to Hearing Impaired Students The Design of Multimedia Interactive Courseware for Teaching Reading to Hearing Impaired Students. *International Journal of Academic Research in Progressive Education and Development*, *7*(4), 223–230. https://doi.org/10.6007/IJARPED/v7-i4/4849

Treffinger, D. J., Schoonover, P. F., & Selby, E. C. (2012). *Educating for Creativity and Innovation.* ERIC.

Troseth, G. L. (2003). Getting a clear picture: Young children's understanding of a televised image. *Developmental Science*, *6*(3), 247–253.

Türk, E., & Erçetin, G. (2014). Effects of interactive versus simultaneous display of multimedia glosses on L2 reading comprehension and incidental vocabulary learning. *Computer Assisted Language Learning*, *27*(1), 1–25. https://doi.org/10.1080/09588221.2012.692384

Uman, L. S. (2011). Systematic reviews and meta-analyses. *Journal of the Canadian Academy of Child and Adolescent Psychiatry = Journal de l'Academie Canadienne de Psychiatrie de l'enfant et de l'adolescent*, *20*(1), 57–59. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/21286370

Varol, B., & Erçetin, G. (2019). Effects of gloss type, gloss position, and working memory capacity on second language comprehension in electronic reading. *Computer Assisted Language Learning*, *0*(0), 1–25. https://doi.org/10.1080/09588221.2019.1643738

Wang, J., Mendori, T., & Hoel, T. (2019). Strategies for Multimedia Learning Object Recommendation in a Language Learning Support System: Verbal Learners Vs. Visual Learners. *International Journal of Human-Computer Interaction*, *35*(4–5), 345–355. https://doi.org/10.1080/10447318.2018.1543085

Wang, L., & Li, J. (2019). Development of an Innovative Dual-Coded Multimedia Application to Improve Reading Comprehension of Students With Imagery Deficit. *Journal of Educational Computing Research*, *57*(1), 170–200. https://doi.org/10.1177/0735633117746748

Wiesen, G. (2019). What is Multimedia Learning? Retrieved May 22, 2019, from Wisegeek website: https://www.wisegeek.com/what-is-multimedia-learning.htm

Yanguas, I. (2009). Multimedia glosses and their effect on L2 text comprehension and vocabulary learning. *Language Learning and Technology*, *13*(2), 48–67.

Zin, Z. M., Wong, B. E., & Rafik-Galea, S. (2014). Critical reading ability and its relation to L2 proficiency of Malaysian ESL learners. *3L: Language, Linguistics, Literature®*, *20*(2).