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Using Mind-mapping via MALL in Competitive and Cooperative Modes and its Effect on L2 Reading Comprehension: A Review Study

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Abstract:- One of the technological devices that has been used quite frequently in the field of EFL is the mobile phone. Mobile-Assisted Language Learning (MALL) is a fast-developing field that is constantly growing and evolving in education. Although several investigations have explored the effect of MALL on reading comprehension, there is a dearth of studies focusing on the effects of using mind mapping via MALL in competitive and cooperative modes on reading comprehension performance. Some investigations have been conducted to shed light on the effect of the mind map (electronic or traditional) on reading comprehension, with all of them showing that mind maps impact reading comprehension positively. The results of a strand of studies showed that the mind map can be used as an effective strategy teachers and learners can use to improve their reading comprehension level. Research results show that electronic mind maps can result in the following: Developed critical reading skills enhanced learners' writing in English, organized content, raised motivation for learning English, and an increase in the level of reasoning and critical thinking.

Keywords*: Mind-mapping, Mobile-Assisted Language Learning (MALL), Competitive Learning, Cooperative Learning*

Introduction

1. Introduction

According to Hwang and Duke (2020), reading is considered an essential language skill, and it is necessary to develop a thorough understanding of this skill should one aim to enhance reading comprehension. Elaborating on the important role of reading, Pearson and Cervetti (2017) maintain that having the ability to decode what one reads is crucial for learning in the context of school as well as for life in general. The prominent role of reading ability is evident in both academic environments and many media including websites, magazines, newspapers, etc. written in English. Put another way, having the ability to figure out and understand the written form of English is essential even for individuals at various educational levels (Brevik, 2019). Given the fact that reading is deemed a core language skill, a lot of studies have been conducted on this skill (e.g., Ahour & Nourzad Haradasht, 2014; Brevik, 2019; Hwang & Duke, 2020).

Since reading comprehension has come to be considered an important language skill, teachers need to deal with this skill strategically to help learners enhance this vital skill (San Risqiya, 2013). Marzola (2011) elaborates on five factors influencing the reading comprehension process.

According to Kusmaningrum (2016), mind mapping is an effective strategy used for decoding written text. Mind mapping can be used as a visual tool to create new ideas, organize thinking, and develop concepts (Kusmaningrum, 2016). Buzan and Buzan (1993) have defined a mind map as a tool through which radiant thinking can be expressed; therefore, it is a function of the human mind as well as a strong graphic technique that offers an invaluable key to unlocking the potential of the brain.

Conventional teaching techniques have become integrated with technological advancements in the field of English as a Foreign Language (EFL) teaching due to the surge of newly developed technological devices (Gutiérrez Colón, Frumuselu, & Curell, 2020). One of the technological devices that has been used quite frequently in the field of EFL is the mobile phone (Keezhatta & Omar, 2019). As Gutiérrez Colón, Frumuselu, and Curell (2020) maintain, Mobile-Assisted Language Learning (MALL) is a fast-developing field that is constantly growing and evolving in education. Although several investigations (e.g., Alemi & Lari, 2012; Gheytasi, Azizifar, & Gowhary, 2015; Gutiérrez-Colon, Gimeno, Appel, & Joseph, 2016) have explored the effect of MALL on reading comprehension, there is a dearth of studies focusing on the effects of using mind-mapping via MALL in competitive and cooperative modes on reading comprehension performance.

2. Reading Comprehension

Smith (1997) described reading comprehension as a dynamic process thereby the learner can interpret the text and make minor changes to it, resulting in a match between his/her ability and his/her prior knowledge. Reading comprehension is defined by Grellet (1995) as the capability to work out the meaning of the written text by extracting the major ideas efficiently. In their definition, Lakshmi and Rao (2006) described reading comprehension as deriving the meanings of words and sentences besides the author's intended meaning irrespective of the reading purpose, i.e. Specialized knowledge, general information, or for fun.

Reading comprehension can be described as a mental ability involving using prior knowledge to derive the meaning of a text (Lipson & Wixson, 2009). Reading comprehension hinges on mental perception rather than sensory perception, and though it starts with the sensory perception of the text, it requires the reader to concentrate, perceive, and analyze all elements as an integrated unit (Lakshmi & Rao, 2006). Put another way, it consists of the reader's grasp of the meaning of the text, which may be either explicit or implicit.

Reading comprehension entails the formation of mental images and imagination of symbols and written words. Some researchers including Zeki (1993), Moore and Lo (2008) have explained the visual images generated inside the brain, asserting that the brain builds a visual world where seeing and understanding occur simultaneously. Therefore, as a modern strategy, a mind map has the potential to speed up learning and help the learners find knowledge easily by depicting a diagram. This illustrates the major concepts along with the main and sub-ideas. The mind map is also characterized by its capability to quickly arrange ideas, quick learning, and information recall (Buzan & Buzan, 1993).

3. Approaches to the Reading Process

There are three main approaches to reading comprehension including the following: top-down processing, bottom-up processing, and the interactive model. Goodman (1967) was among the first investigators who proposed a systematic analysis of reading comprehension. He proposed one of the most frequent models of reading skills known as the top-down approach or conceptually driven processing. As Goodman (1967) notes, reading is a psycholinguistic guessing game in his conceptualization because background knowledge and perceptions of the readers significantly affect lower-level processing like word recognition, phonological processing, and orthographic processing. Readers are not passive and indifferent receivers of text information (Goodman, 1967). According to Davoudi (2005), during the stage of comprehension, background knowledge of the readers and other interpretive skills which are accompanied by cognitive and metacognitive strategies improve lower-level processing speed.

Bottom-up processing is another reading process. Bottom-up processing proponents focus on the critical role of lower-level recognition skills (Garnham, 1985). In their opinion, reading is a step-by-step and hierarchical process, initiation from understanding a specific phoneme to words, clauses, sentences, and then all parts of the discourse. For the supporters of this research strand, readers do not skip any section of the text while they are reading the text and the high level of understanding is the result of unconscious processing not because of the readers' conscious and strategic processing.

The interactive model is another reading model. Rumelhart and Ortony (1977) contend that in the case of reading comprehension, meaning does not exist only in the text; rather, it is the result of information co-construction within the interpretations of the readers and text. Information collected by the eyes is visually registered in practice and then sent to the pattern synthesizer. Simultaneously, while reading a text, a vast amount of semantic, syntactic, and pragmatic concept information is taken from long-term memory and sent to working memory. The reader is engaged in drawing up the meaning of the text during this process and making inferences through continuous and simultaneous interactions between the background knowledge of the reader and the text's surface structure. Ultimately, the activated information from these two sources is integrated into text-driven meaning and coherent discourse.

There is still a vast gap to be filled by reading psychologists in defining the multifaceted nature of reading despite the research endeavors aforementioned. The situation model as a new reading theory was introduced by some psycholinguists such as Kintsch (1998), and Zwaan and Radvansky (1998). Kintsch and Van Djik (1978) assumed that the comprehension process involves more than a mental representation construct: comprehension is mainly about understanding the topic of the text which is called the situation model. Inference generation as a key process in language comprehension is significantly drawn on by the situation model.

Drawing on the studies of Alderson (2000), Grabe and Stoller (2002) concluded that the fluent reading process is characterized by qualities such as rapidity, motivation, purposefulness, and interactivity. Moreover, such a reading includes the use of strategies, evaluation, comprehension, and linguistics. There is an interaction between lower-level skills (e.g., decoding) and higher-level skills (e.g., comprehension and extra-linguistic elements), resulting in effective comprehension of texts. Grabe and Stoller (2002) label such an interaction as lower and higher-level processes.

Reading comprehension involves challenges both regarding instructional practices on the side of the teacher and performances on the side of the learners (Burns, Roe, & Ross, 1999). These challenges become more serious when teaching and learning reading in a foreign language. Similarly, Alexander (1990) defines reading as an explanation that is meaningful of written verbal symbols. Reading comprehension is a result of the interplay between the notion of graphic symbols that show language and the reader’s language skills and knowledge of the world.

4. Mind Map

Buzan (2006) established the mind map strategy to enable learners to arrange and classify ideas and tasks, and to improve reading, problem-solving, and decision-making. Buzan's motivation for creating the mind map was his awareness of the educational systems which mainly focused on the employment of the left side of the brain. The left side of the brain is responsible for the use of logic, language, arithmetic, sequencing, and details of any topic. There was a complete negligence to the right side which is responsible for using images, imagination, emotions, colors, and a comprehensive view of different subjects (Murley, 2007).

Buzan was motivated by his awareness of the educational systems which by far concentrate on the application of the left side of the brain, which is claimed to be in charge of using logic, language, arithmetic talent, sequencing, and details. However, a blind eye was turned to the right side tasked with using images, imagination, emotions, colors, and a comprehensive view of different subjects (Murley, 2007).

Mind maps make use of both sides of the brain, with words, images, and colors being considered pivotal to the preparation of these maps. The title is inserted in the center and sub-ideas branch out in all directions through radiant thinking. This construct clarifies how the human brain treats various ideas and information (Al-Jarf, 2009). This is done by connecting ideas through relationships using colors and images that refer to these ideas and using keywords for each concept. The curved links are used to interconnect the concepts in a mind map. The strength of these links varies as they move away from the center (Buzan, 2006).

Many investigations have sought to explore the effect of such a map i.e. mind map on students’ reading comprehension. The findings indicate the positive effect of mind maps on reading comprehension. Stankovic, Besic, Papic, and Aleksic (2011), for example, investigated the use of mind maps in teaching reading. The

participants included two groups of EFL learners. The experimental group was exposed to mind maps while the control group received the conventional instruction of reading. The two groups received reading pretest and posttest before and after the study. The findings demonstrated that the mind map is highly effective in reading comprehension enhancement since it gives the learners a chance to realize the links as well as the potential associations that may be held between core ideas and minor ones (sub-ideas). Additionally, they will be able to recognize the notes and details related to the ideas. In a similar study, Malekzadeh and Bayat (2015) sought to explore the impact of the mind map on grasping the ideas in English passages. The research was carried out in an Iranian university. They adopted a quasi-experimental design and used mind mapping in the experimental group while the control group did not receive such a treatment. They analyzed the collected pretest and posttest reading comprehension data through independent samples t-tests. The results demonstrated that using a mind map was significantly effective in increasing the English reading comprehension of the learners.

Mind mapping is beneficial for visual learners because it helps learners manage thought, lead learning, and make relationships (Stephen & Hermus, 2007). As noted by Supon and Ruffini (2008), in mind mapping, educators have no limitations for expressing their ideas about the notions of visual and linear structure.

Mind mapping is a creative note-taking method that eases us to remember much information. Buzan and Buzan (1993) state that “mind mapping is a powerful graphic technique, which provides a universal key to unlock the potential of the brain” (p. 1). The mind mapping technique imitates the thinking process, namely possible for us to move from one topic to another topic back and forth. Recording the information through symbols, pictures, emotional meaning, and colors, is the same as our brains process it. A pattern that at least consists of a picture, symbol, and color will not just help the students to understand the vocabulary knowledge but also make the students feel good and enjoyable and attract their brain which at last leads them to have interest in mastering vocabulary knowledge.

4.1 Benefits of Mind Maps

Novak and Purkey (2001) argue that the representation of objects and events visually leads to the following benefits:

- Learners can recognize visual symbols quickly and easily.
- Learners can easily scan the texts to find a word or phrase due to the use of minimum text.
- Visual representation makes it possible to develop a holistic understanding which isolated words fail to do so.

The use of mind mapping can be advocated due to various theoretical reasons. These links are normally hidden and implicit in the text, with students overlooking them. Engaging in the construction of maps of their knowledge, learners usually embark on sustained and high-level thinking on the topic they are learning. This provides support for that thinking as well as for later reflection and knowledge refinement.

Wilson et al. (2002) believe that mind maps serve as powerful instruments, making important contributions to learning as well as to the longer retention of the learned materials. Mind mapping helps the students to compensate for their lack of prior knowledge, strengthening their memory processing.

Novak and Purkey (2001) maintain that a mind map contributes to the content in the following three ways: (a) It provides the learners with a depiction of a model plan of text organization, giving them a mental plan thereby they can comprehend and compose while reading and writing, (b) It paves the way for both instructors and learners to make a connection between their previous knowledge and the current knowledge through a visual or graphic array. This helps students to form new knowledge constructs, and (c) mind mapping enables the students to integrate their knowledge into a network of propositions with a unified meaning.

Graphic organizers, which are similar to semantic maps, also known as structured overviews, can be used as a pre-reading activity (Wilson et al., 2002). Graphic organizers are in the shape of schematic diagrams and give main concepts and additional terms, which offer information to students before they start reading the text (Wilson

et al., 2002). To use graphic organizers, a teacher should first identify the main goals and concepts that he or she is going to teach. Then students can try to find the keywords put them into a diagram and find the relationship between and among the words. The background knowledge of the learners related to a topic can be activated by using graphic organizers and they can be used by students to reflect on and assess their achievement (Chamot & O'Malley, 1994).

As Smith (2002) elaborated graphic organizer assists learners "to create, to share, to disagree and to respect one another's ideas. They can construct "new meaning and appreciate one another's thinking and learning styles". In this way wide range of students with variable abilities can benefit from "visual and verbal information", provided by graphic organizers. In addition, they encourage learners to cooperate with their classmates and organize or relate their ideas to build a meaningful perspective out of the context (pp. 7-8).

Numerous studies are devoted to testifying the advantages of mind mapping in education, but there are lack of conclusive results representing the effect of mind mapping on teaching and learning. "A mind map is an outline in which the major categories radiate from a central image and lesser categories are portrayed as branches of larger branches" (Budd, 2004, p. 36).

5. Mobile-Assisted Language Learning

Mobile-assisted language learning (MALL) is considered an offshoot of computer-assisted language learning (CALL) which emerged as the result of rapid developments in the field of technology (Zhang, 2012). Highlighting such developments, Carol (2003) notes that previously learners would come together in a language lab to practice English, however, nowadays the affordances provided by the Internet have given learners learning opportunities beyond the computer lab and through more advanced versions of computers and also portable devices.

As a newly developed type of learning, mobile-assisted language learning (MALL) plays an important role in enhancing learning through the use of a handheld mobile device (Pegrum, 2014). Consequently, with the development of MALL, much research and focus has been devoted to investigating the possible influence of the use of mobile devices on learning (Zhang, 2012).

As mentioned by Keezhatta and Omar (2019), more specifically, MALL is considered a subset of both Mobile Learning (m-learning) and computer-assisted language learning (CALL), and it has undergone developments to shore up learners' L2 learning through increased use of mobile technologies such as mobile phones (cellphones), MP3 and MP4 players, PDAs, among others (Carol, 2003). Using MALL, learners can access L2 learning materials and engage in communication with their teachers and peers at any time, anywhere (Pegrum, 2014)

In the words of Zhang (2012), MALL is described as an expansion of electronic learning by making use of mobile computational devices including personal digital assistants (PDAs), and cell phones. Such type of learning found its way into e-learning as a subset of distant learning (Georgiev, Georgieva, & Smrikarov, 2004). The studies conducted on mobile learning (O'Malley et al., 2005) have attested to the positive outcomes of learning opportunities through mobile devices. Zhang (2012) has defined mobile learning as learning across multiple contexts through social and content interactions through making use of personal electronic devices. Furthermore, mobile learning spawns some value-added features including adaptability to changing settings and its on-demand nature, among others. Moreover, Pegrum (2014) described m-learning as the application of mobile technologies (such as mobile phones and hand-held computers) to improve the learning process. This is concerned with the delivery of digitalized materials to wireless phones in work and education.

Improving L2 learning via MALL brings about new dynamics that cannot be provided through the traditional classroom (Hazaea & Alzubi, 2016). MALL provides learners with ubiquitous access to learning anytime and anywhere. This makes it possible for the users to engage in hands-on exercises of L2 skills just before or just after a conversation in the target language they are learning (Zhang, 2012). Handheld delivery also provides dynamics for collaborative learning since users can share the language learning process in small synchronous groups (Carol, 2003). According to Klopfer et al. (2002), mobile devices are characterized by 4 qualities, yielding unique educational affordances:

- Portability- given that mobile devices are small and have low weight, they can be carried to different sites or moved around within a site.
- Social interactivity in the context of MALL, data can be exchanged with other learners face-to-face.
- Context sensitivity- through mobile devices, data can be gathered and responses can be made to real or simulated data unique to the specific location, environment, and time.
- Connectivity- it is possible to create a shared network by connecting mobile devices to data collection devices, other devices, or to a common network.
- Individuality- It is possible to customize scaffolding tailored to individual learners for difficult activities.

Poor sound and display quality along with very limited devices and download speeds are considered as the biggest constraints for earlier MALL (Hazaea & Alzubi, 2016). Newly introduced integrated PDA devices have bridged the gap by taking advantage of new developments such as better speeds, larger screens, as well as functions and capacities similar to laptop computers (Pegrum, 2014). As PDA devices have given way to smartphones, in particular those based on iOS and Android, the constraints pointed out earlier have largely been eliminated (Zhang, 2012).

Earlier research aimed at exploring MALL dealt mainly with the application of cell phone technology and communication through text messaging (Towns & Loo, 2012). Only by the introduction of smartphones could interactive software and rich media be used for L2 learning based on mobile applications. Then, in 2010, the development of new multimedia-capable, Wi-Fi-connected tablet devices enormously facilitated the launch of mobile language learning tools (Pegrum, 2019).

Crompton (2013) has defined mobile learning as learning across multiple contexts through social and content interactions through making use of personal electronic devices. Furthermore, mobile learning spawns some value-added features including adaptability to changing settings and its on-demand nature, among others. Moreover, Rosman (2008) described m-learning as the application of mobile technologies (such as mobile phones and hand-held computers) to improve the learning process. This is concerned with the delivery of digitalized materials to wireless phones in work and education. Mobile learning or m-learning is described as an expansion of e-learning by making use of mobile computational devices including personal digital assistants (PDAs), and cell phones. Such a type of learning found its way into e-learning as a subset of distant learning (Georgiev, Georgieva, & Smrikarov, 2004). The studies conducted on mobile learning (O'Malley et al., 2005; Traxler, 2005) have attested to the positive outcomes of learning opportunities through mobile devices.

Seemingly, the development of mobile learning has been accelerated by the ubiquitous availability of this technology at almost any location and time (Kukulska-Hulme & Traxler, 2005). As stated by Ebner, Stickel, Scerbakov, and Holzinger (2009), a phenomenal increase in the free wireless network access points influences how end users engage with digital devices, transforming traditional e-learning into a new phenomenon called "Ubiquitous learning". By comparison, e-learning occurs far away from the classroom and confines students to static desktop learning, whereas m-learning takes place at an unfixed point and time, concentrating on accessibility and flexibility.

Due to ubiquity, i.e. easy accessibility anywhere, learners find it easier to interact in learning tasks outside the formal educational settings. It is worth noting, however, that ubiquity can be realized only by benefitting from sufficient network capacity, which allows the learners to obtain online access to the learning content. The PC with an internet connection cannot go far enough when it comes to e-learning in locations such as the workplace, classroom, or home. In contrast, a wireless mobile device makes it possible for students to access information even when they are on the move, or when they have no access to a hard-wired device. Due to the easy accessibility of m-learning, students can access and exploit the content in places and times they find most convenient. These features, namely, ubiquity and flexibility, contribute to deconstructed learning, providing the students with greater access regardless of concurrent activities (Corbeil &Valdes-Corbeil, 2007).

6. Competitive Learning

Johnson and Johnson (1989) maintain that in a competitive situation, learners work against each other to attain a goal, and in the end, only one or a few end up attaining the goal. In such a context, students see their achievement would come through if other students failed to achieve their goals. According to Coakley (1994), competition is the social process realized when people receive rewards based on how their performances stand out in comparison with those of others doing the same task. Competitive learning is inspired by the individual's desire to take part in a competition among individuals or groups (Coakley, 1994).

Competitive learning often has to do with extra-curricular activities aimed at improving the educational system. It can also be viewed as a contest in that several people participate, with only a few individuals winning and others losing (Webster, 2008). Alternatively, competitive learning may result in some negative consequences, with one student winning and the other(s) losing (Akinbobola, 2009). Therefore, the learners are motivated competitively to go against each other in a win-lose situation (Lin, 1997).

7. Cooperative Learning

Today, cooperative learning has turned into a common mode of instruction in the L2 learning classroom, aimed at improving student–student interaction (Namaziandost & Çakmak, 2020). This method dates back to the 1970s when Israel and the United States embarked on devising and investigating collective learning in classroom contexts (Kessler, 1992).

It is claimed that cooperative learning is the best choice for all learners since it focuses on the active cooperation between learners with diverse abilities and backgrounds (Tsai, 1998). The new studies reveal promising results regarding the effect of cooperative learning on academic performance, social behavior, and effectual progress (Namaziandost et al., 2020).

The effective organization and coordination of these components in the learning process lead to the improvement of cooperative learning. This, in turn, leads to the academic success of the learners as well as their engagement, accountability, and language skills (Hashemifardnia et al., 2018).

8. Discussion and Conclusions

Some investigations have been conducted to shed light on the effect of the mind map (electronic or traditional) on reading comprehension, with all of them showing that mind maps impact reading comprehension positively.

MalekZadeh and Bayat (2015) carried out a study to explore the impact of the mind map on figuring out and comprehending the ideas in English texts. This investigation was carried out on students at one of the Iranian Universities. The results showed the positive effect of the mind map in enhancing students' English reading comprehension. E-mind maps were found to develop reading comprehension skills among EFL learners.

In their investigation, Stankovic, Besic, Papic, and Aleksic (2011) sought to explore the use of the mind map in teaching. The results indicated the mind map is the most powerful tool one can use to enhance reading comprehension. This was because the mind map allowed the learners to see the relations and connections among the main ideas and the sub-ideas besides the details and notes associated with these ideas.

Peng (2011) investigated reading comprehension skills and the results showed that an e-mind map enhanced reading comprehension as it combined the two parts of the brain. It makes a connection between language, lexical items, logical operations, and analysis, bridging the disparate functions of brains (creativity, images, construction, and imagination from the other).

Benavides (2010) concluded that e-mind maps improved reading comprehension and achievement. It also made it easier for the learners to correct errors and easily change the design style among learners.

The results of a strand of studies (e.g., Kim & Kim, 2012; Liu, Chen, & Chang, 2010) showed that the mind map can be used as an effective strategy teachers and learners can use to improve their reading comprehension level. An investigation conducted by Siriphanich and Laohawiryanan (2010) revealed the same results. They sought to

find out how learners benefited from mind maps to enhance their reading comprehension skills. Furthermore, they could forge the appropriate links between images and drawings.

In their study, Gomez and King (2014) showed that components of the mind map including images, symbols, and links enabled the learners to link the vocabulary in the texts with the images and symbols. These factors were found to be very effective in facilitating the learners' understanding and recall of the texts. The effect of the E-mind map is not confined to the direct improvement of reading comprehension. It also makes an indirect contribution to improving it (Ellozy & Mustafa, 2010; Al-Jarf, 2009).

Research results show that electronic mind maps can result in the following (Siriphanich & Laohawiriyanon, 2010; Bidarra, Kommers & Guimaraes, 2000):

- Developed critical reading skills enhanced learners' writing in English
- Organized content
- Raised motivation for learning English
- An increase in the level of reasoning and critical thinking.

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