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The Effect of Digital Mind Mapping on Developing EFL Reading Comprehension Skills among Preparatory School *Students*

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Introduction

Reading is a complex, personal thinking process which involves making meaning from what we read. According to Alyousef (2005), reading can be seen as an interactive process between a reader and a text. In this process, the reader interacts dynamically with the text as he/she tries to elicit the meaning and where various kinds of knowledge are being used, the reader can get the message, and the writer's meaning sense. In addition, Anderson (2003) claims that reading is an active, fluent process which involves the reader and the reading material in building meaning.

Torky (2006) noted that the main aim of teaching English in Egyptian schools is to help students to interact in English. Helping students learn meaningfully is a teacher's most important goal, as it is a process which students will use to facilitate their lifelong learning. Similarly, Crystal (2007) asserts that reading crucially involves appreciating the sense of what is written: we read for meaning. The essence of reading act is reading comprehension, which is the ultimate goal of the reading process.

Comprehension was also seen as the most mental skill that is connected with the learning process and directly affects the academic achievement and success in different academic subjects. Furthermore, comprehension is essential to students' success, not just in the context of school and exams, but, more importantly, for lifelong success. Reading comprehension is not only very important to students' reading skills but also it is a predictor of their future academic success. In spite of its importance, it becomes a primary challenge in teaching and learning of reading skill. Many students struggle with reading. Some students fail

to comprehend what they read and have less management of their comprehension process when they are reading; particularly when the material is unfamiliar, technical, or complex (Cooper et al, 2006).

Digital mind mapping is a useful strategy; it helps learners to learn, write down and organize their notes effectively and easily retrieved (Tucker, Armstrong & Massad, 2010). Also, it is an effective tool in helping low learners to improve their level of achievement (Holzman, 2004), improves cognitive processes and long-term memory of facts, encourages using deeper levels of factual processes and better reorganizing the memory (Farrand, Hussain & Hennessey, 2002).

Based on the advantages of the digital mind maps and its positive effects on reading comprehend

sion and the different aspects related to this process, this study was conducted to investigate the effect of digital mind mapping on developing EFL reading comprehension skills among preparatory school students. This study addressed a much-needed area; it concentrates on those who struggle to succeed in comprehension. Further, it presents a rational for implementing digital mind maps, investigating how far it improves reading comprehension.

Context of the Study:

In spite of the significance of reading comprehension at preparatory stage, first year preparatory school students greatly suffer from difficulties while reading a comprehension passage. Previous research on reading comprehension in Egypt reveals that most teachers are not aware of the importance of reading skill. El Mrasafy (2004) indicated that the weakness in the student's mastery of the reading skills might be

attributed to teacher's low proficiency, poor activities of textbook, and the adopted methods of teaching which do not motivate students to develop their reading comprehension skills adequately. Similarly, Fareh (2010) pointed out some of the challenges facing EFL programs in most Arab countries, claiming that teachers are improperly trained or using inadequate teaching methodology, and the activities are teacher-centered rather than learner-centered.

In accordance with the results of the previous studies and the reviewed related literature, it could be concluded that the problem felt in this study is the low level of reading comprehension among EFL preparatory school students, and lack of the ability to comprehend a reading comprehension passage. From the above, there is a pressing need to find effective ways of teaching reading to improve students' reading comprehension skills. Consequently, the researcher is going to investigate the effect of using digital mind mapping on developing reading comprehension skills among EFL Preparatory School Students.

Study questions:

The present study is an attempt to investigate the effect of digital mind mapping on developing EFL reading comprehension skills among preparatory school students. Thus, this study seeks answers to the following questions:

1- What is the effect of Digital Mind Mapping treatment on developing EFL reading comprehension skills among preparatory school students?

This main question can be divided into the following sub-questions:

(1-1) What is the effect of Digital Mind Mapping treatment on developing EFL literal comprehension skills among preparatory school students?

(1-2) What is the effect of Digital Mind Mapping treatment on developing EFL inferential comprehension skills among preparatory school students?

(1-3) What is the effect of Digital Mind Mapping treatment on developing EFL critical comprehension skills among preparatory school students?

Study Hypotheses:

Based on study questions, the following hypotheses are formulated:

1- There is no statistically significant difference between the literal comprehension skills mean scores of the experimental and control group students in the post reading comprehension test.

2- There is no statistically significant difference between the inferential comprehension skills mean scores of the experimental and control group students in the post reading comprehension test.

3- There is no statistically significant difference between the critical comprehension skills mean scores of the experimental and control group students in the post reading comprehension test.

4- There is no statistically significant difference between the overall reading comprehension skills mean scores of the experimental and control group students in the post reading comprehension test.

Significance of the Study:

The major significance of the current study is to take into account introducing digital mind mapping as one of the comprehension

strategies in teaching of comprehending text passages. The utilization of digital mind mapping will assist to change the complexity of the text passage into words for easier comprehending. Hence, students will be able to recognize and remember the comprehension passage better in making meaningful links, pattern, relationship among notions and information, aid students to expand their thinking skills, arranging of information and ideas, attain confidence in endeavoring comprehension questions. When students adapt the skills in comprehension; they will find it relatively easier to answer the comprehension questions.

Teachers, as well, may significantly benefit from this study. It may inspire them with new techniques and activities implementing this study's and other related web applications in teaching other language skills. This study may provide them with a reference for using digital mind mapping in other EFL contexts. Likewise, curriculum designers may make significant implementation of the study proposed instruction.

Definitions of Terms:

1. Reading Comprehension: Caldwell (2008) defines reading comprehension as the ability to understand completely and be familiar with a situation, facts, etc. Hence, comprehension is not a single unitary process; it starts from the moving of words on the page to meaning in the mind, the recognizing of individual words by using memory and knowledge of letter and sound patterns, matching the resulting pronunciations to meaning, and finally connects these words into idea units.

2. Digital Mind Mapping: Ruffini (2008) defines digital mind maps as computer generated mind maps, which can represent complex

information in an organized, easy to understand visual format. In addition, it is a powerful e-learning and organizational technique that can visually display main topics, subtopics, concepts, images and the interrelationships between them.

Review of Literature and Related Studies

1) Reading Comprehension:

Reading is one of the most important skills a student must possess and the basis of all English language skills. It is seen as the most mental skill that is connected with the learning process and directly affects the academic achievement and success in the different academic subjects. Hence, it has become a field of study for different educational and psych-educational researchers.

Reading Comprehension enables EFL learners to deeply and adequately understand the written language. Block, Gambrell and Presley (2002) defined reading comprehension as the thinking process used to make meaning of what a person reads. In accordance with the above definition Nakamoto, Lindsey and Manis (2008) defined reading comprehension as an active cognitive process which involves reasoning to construct meaning from a written text and understanding it effectively and comprehensively. In like manner, Anderson (2003) defined reading as the practice of using text to create meaning, also he defined reading comprehension as an active, fluent process which involves the reader and the reading material in building meaning.

In this study reading comprehension is defined as the process of constructing meaning by coordinating a number of complex processes which include word reading, word and world knowledge, and fluency. It

refers to the ability in interpreting the words, understanding the meaning and the relationships between ideas conveyed in a text.

Purpose of Reading Comprehension:

Reading becomes the basis of instruction in all aspects of language learning. Students will need reading in using textbooks for language courses, writing, revising, developing vocabulary, acquiring grammar, editing, and using computer-assisted language learning programs. In addition, Mikulecky (2008) emphasizes that reading instruction, therefore, is a crucial part of every second or foreign-language curriculum.

Duke and Carlisle (2011) believes that reading literacy is directly related to the reasons why people read. Broadly, these reasons include: a). reading for personal interest and pleasure; b). reading to participate in society; and c). reading to learn. For the young readers, emphasis is placed on reading for interest or pleasure and reading to learn. Further, Comprehension is crucial to the development of children's reading skills and thus to their ability to obtain an education. Unluckily, students do not realize how important is to be able to fully comprehend what they read. Being able to completely and accurately comprehend what we read is essential to gain the ability to learn, and succeed in college or university in order to get a majoring Degree.

Moreover, Grabe and Stoller (2002) categorize the purposes of reading under seven main headings: 1). reading to search for simple information; 2). reading to skim quickly; 3). reading to learn from texts; 4). reading to integrate information; 5). write texts; 6). critique texts; and 7). reading for general comprehension.

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Reading Comprehension and Web-Based Learning:

Web-based instruction (WBI) refers to the utilization of online resources, applications, and software for enhancing instruction and course delivery methods. On the other hand, any attempt to integrate these online resources for classroom instruction represents a form of WBI. In addition, Khan (1999) stated that web-based instruction (WBI) can be viewed as an innovative approach for delivering instruction to a remote audience, using the web as a medium. Besides, there are several new terms have recently been utilized in educational settings like Web-Based Training, Web-based teaching and learning, Web-based testing, Web-based communication, etc.

Reading comprehension is influenced by new technology and literacy. Clearly, a long tradition of book and print media is insufficient, students and teachers need to use new and varied forms of technology. The need for changes in the way we think about reading comprehension is inevitable (Coiro, 2003). In the same vein, Rand Reading Study Group (2002) pointed out that an explosion of alternative texts and electronic texts that incorporate hyperlinks and hypermedia introduce some complications in defining comprehension because they require skills and abilities beyond those required for the comprehension of conventional, linear print. These new reading environments bring out cognitive and aesthetic challenges to comprehension and there is a need for theoretical description of the comprehension process (Spires & Estes, 2002).

2) Digital Mind Mapping:

Today's teachers seeks to find new opportunities and ideas to help students comprehend, retain what they are learning, and promote a positive classroom environment. Wilson and Wallace (2000) presumed that a visual makes the task or situation appear more authentic and prompts the learner to find direct or indirect ways to play with the language and its structures. Thus, when students can visualize an image or a pictorial representation, they connect that image with different ideas processed in their mind in order to comprehend and learn. Visual images allow students to predict, infer, and deduce information from a variety of sources. Accordingly, it is important to investigate and analyze different visual strategies since learners and teachers benefit from these techniques to acquire a second language.

Therefore, researchers and educators have started to design and adapt mind maps in teaching, which reflect on internal processes and allow access to a vast world of information. Mind maps go under a variety of names: concept mapping, semantic mapping, knowledge mapping, think links, graphic organizers or cognitive maps (Svantesson, 1989). The traditional form of a mind map is drawn by hand, but with the emergence of specialized software, the digital mind maps started to appear (Dara, 2010).

Buzan (2000) defined mind mapping is a graphic representation of ideas, which usually generated via a brainstorming session, it shows these ideas around a central theme and how they are interlinked. Whereas, Al-Jarf's (2011) point of view the mind map technique is "a graphic organizer in which the major categories radiate from a central idea and

sub categories are represented as branches of larger branches" (p. 4). Besides, it is used as a visual tool that can help in generating ideas, taking notes, and organizing thoughts. Whereas, Jonassen (2000) defined mind mapping as one of the educational techniques that can help learners to have advanced thinking such as logical thinking and problem-solving abilities.

On the premise of the definitions above, digital mind mapping is perceived in this study as a tool to represent the students' understanding. Digital mind maps are visual frameworks such as figures, diagrams, or charts used to present structural knowledge spatially with the intention of empowering comprehension and learning.

Method

Participants:

This study was conducted on first year preparatory school students. Two intact classes were chosen at random from Mahlet Marhoum Preparatory school for Boys in El Gharbia Governorate in the first term of the year 2018/2019. Participants were assigned to experimental and control groups, 52 students of the experimental group and 51 students in the control one. As for the participants' characteristics, their ages ranged from 12 to 13 years old, they have been studying English for 6 years as English was taught starting from the first year primary school.

Study Design:

The design for the current study was the quasi-experimental design. This study was conducted on two groups: the experimental group and control group. The two groups were exposed to pre- and post tests of reading comprehension skills. The students' performance on the pre-

and post tests was analyzed later by applying the proper statistic measures.

Instruments:

The present study used the following instruments, which were used to assess the effect of digital mind mapping on the participants' reading comprehension skills:

1. A checklist to determine the most appropriate reading comprehension skills for the participants.

2. Two equivalent forms of pre and post reading comprehension tests were developed to measure first year preparatory students' reading comprehension skills.

The Reading Comprehension Tests:

To examine the effect of the digital mind mapping treatment on developing reading comprehension skills among first year preparatory school students, the researcher designed two equivalent forms of reading comprehension tests; one was used as a pre-test and the other as a post one.

The test consisted of three unseen and carefully selected reading passages extracted from https://www.ereadingworksheets.com. Each reading passage was followed by 10 comprehension items. The researcher used the multiple-choice questions as an imitation to the international e.g, TOEFL, IELTS, etc, and based on content analysis and the specifications set by the ministry of education for the first year preparatory examinations.

The total number of items was 30 with a total score of 30 marks, each question has one mark. Most of the vocabulary used was familiar;

however, it contained some new words to infer their meanings from the context. The test was administered to the study participants at the beginning of the first semester of academic year 2018-2019 as well as the semester end.

Test Validity:

The two forms of the reading comprehension tests were submitted to seven TEFL professors to judge the validity of the tests in terms of (a) suitability of the test to assess students' reading comprehension skills, (b) suitability to students' level, (c) to what extent each item measures the skill it is intended to measure and (d) equivalence of the two forms of the test. The jury members were also asked to modify any item when needed. Their suggestions were carefully taken into consideration when developing final test forms.

The construct validity of the reading comprehension test was obtained by measuring the correlation coefficients for the three dimensions of the test which are the literal, inferential, and critical reading comprehension skills.

Test Reliability:

The reliability of the test was calculated by using the SPSS program, and the resulting of Cronbach's Alpha was found to be reasonably high (0,755). Therefore, the test was considered reliable for the purpose of the current study.

The Digital Mind Mapping Instruction:

The current treatment was implemented during the first term of the academic year 2018/2019. The pre-test was administered to both experimental and control groups before the experiment. The treatment

lasted for 24 sessions, two hours a session, for twelve weeks. The researcher at first presented an orientation session for the students in order to be familiar with the mind mapping software (Mindomo) and the forum. The control group was taught using the recommended techniques of the Ministry of Education as planned in the curriculum; for the experimental group, it was taught using the proposed digital mind mapping instruction in the computer lab and the technology room. Digital mind mapping instruction was administered according to the procedures prescribed in the digital mind mapping based lesson plans prepared by the researcher.

By the end of the treatment, the researcher administered the post-test to both the control and experimental groups at the end of the first term. After that, the data obtained was statistically analyzed to indicate the differences between both groups.

Aims of the Treatment:

The main aim of the treatment was to develop first year preparatory school students' reading comprehension skills and vocabulary acquisition through using digital mind maps. Therefore, by the end of the treatment, students are expected to: 1) Identifying the main idea. 2) Providing details about the setting. 3) Identifying specific information. 4) Recognizing and recalling stated sequences. 5) Figuring out the meaning of unknown words from context clues. 6) Making Predictions. 7) Identifying the purpose of the writer. 8) Forming judgment and evaluation.

Duration of the Treatment:

The researcher at first presented an orientation session for the students in order to be familiar with the mind mapping software (Mindomo) and the forum. Then, each lesson took two sessions; however, some activities were handled as home assignments. The treatment lasted for twelve weeks.

The role of the Instructor:

During the treatment, the Instructor was required to adapt these different roles: 1) Facilitator. 2) Monitor. 3) Motivator. 4) Feedback provider. 5) Organizer. 6) Collaborator. 7) Assessor.

The Treatment Implementation:

Based on the previous roles of the teacher, the main aims of the treatment, and the basic guidelines of digital mind mapping based lesson, the researcher implemented this treatment through using the 5E's model as suggested by Bybee et al (2006). The 5E learning cycle promotes a classroom climate that is both student-focused and student-generated; therefore, constructivism is a major part of the 5E learning cycle. The model leads students through five phases of learning that are easily described using words that begin with the letter E: Engage, Explore, Explain, Extend, and Evaluate as follows:

Step (1) Engage: The teacher starts to attract student's interest and involve them in the learning process, through pre-assessing their prior understanding while they comment on a short relevant video they watch. Students are allowed to make connections between past and present learning experiences through discussions. This student-centered phase should be a motivational period that can create a desire to learn

more about the upcoming topic. The given video used to uncover student's prior understanding. The video format arouses student's curiosity and encourages them to ask their own questions.

Step (2) Explore: Students have a chance to build their own understanding. The teacher acts as a facilitator, providing materials and guiding the student's focus. The teacher presents challenging tasks to support students to generate and investigate questions, gather relevant information and develop ideas.

Step (3) Explain: In this stage, students build their own understanding and explain their own ideas. In addition, learners begin to communicate what they have learned and figure out what it means. They are actively learning through creating a digital mind map representing their own ideas.

Step (4) Extend: Students use their new knowledge and continue to explore its implications. At this stage, students expand on the concepts they have learned, make connections to other related concepts, and apply their understanding through: a) creating a digital mind map, b) completing a digital mind map, or c) identify the main idea and key ideas of a mind map.

Step (5) Evaluate: This stage is to determine how much learning and understanding has taken place. Assessment should be viewed as an ongoing process, with teachers making observations of their students as they apply new concepts and skills and looking for evidence that the students have changed or modified their thinking. Students may also have the opportunity to conduct self-assessment or peer-assessment.

Results and Discussions

Data of the study findings were analyzed using the Statistical Package for the Social Sciences (SPSS). Pupils' scores on the pre- and post- tests were statistically analyzed by applying the ANCOVA-test. Data relevant to study hypotheses are provided below.

Hypothesis One:

There is no statistically significant difference between the overall reading comprehension skills mean scores of the experimental and control group students in the post reading comprehension te

Discussion

The Overall Reading Comprehension Skills:

Students' progress may be due to the effectiveness of using digital mind mapping to develop reading comprehension skills. The significant improvement in reading comprehension skills in general can be attributed to many factors: the digital reading experience they were involved in, both inside and outside classroom, which was based on varied modes of presentations, topics, tasks and activities. Further, the activities used in the digital mind mapping instruction such as brainstorming, pre-assessing prior understanding, sharing ideas and experiences, discussions, and creating digital mind maps. These activities along with the videos and visual materials encouraged students to read more which helped them improve their reading comprehension skills.

The other possible factor that supports the findings of this study is the occurrence of constructivist learning through the use of the 5E's model. The 5E's model can be considered as a learning cycle that leads students through five phases of learning: Engage, Explore, Explain, Extend, and

Evaluate. It includes students in the learning process at every stage; it encourages them to form their own concepts and to construct their knowledge. Teaching based on the 5E's model states that learners can best learn through experiencing or when they are completely involved in the learning process, from where they derive their own understanding of knowledge or create new knowledge by starting from their everyday lives with the aim of learning known concepts in detail and elimination of conceptual errors (Bybee, 2006).

The Literal Reading Comprehension Skills:

Students' progress may be due to the effectiveness of using digital mind mapping to develop literal reading comprehension skills. This improvement can be traced to a range of characteristics related to digital mind mapping. One of these features is the use of multimedia that acquired students' attention, improved their motivation to learn, and aided students to add images, videos, icons, and audio records to the branches of the mind maps. Besides, the easy insertion of images, icons, and the use of colors in making the mind maps helped the students to distinguish between the branches and ideas in a flexible and creative environment without the restrictions of the traditional learning methods.

The Inferential Reading Comprehension Skills:

The significant difference between the experimental group and the control group in the inferential comprehension skills can be explained by the fact that the experimental group learned in a way that helped them speed up their learning process and find knowledge faster by drawing out a diagram that illustrates the basic concept of the main and sub

ideas in an organized way which facilitated understanding. On the contrary, members of the control group learned in the traditional way that focused on preserving and memorizing information. Besides, the increase of students' understanding may be due to the fact that digital mind maps link the texts' ideas with images, colors and shapes which help concentrates information in students' minds. Also, digital mind mapping considers individual differences among learners and provides feedback that helped fix information in their minds.

The Critical Reading Comprehension Skills:

Students' progress may be due to the effectiveness of using digital mind mapping to develop critical reading comprehension skills. This significant result means that digital mind mapping helped students to express their opinions, evaluate their colleges' thoughts, identify the purpose of the writer, and form judgments relevant to the reading topics. Those activities necessitate recalling students' own experience, personal thoughts and background knowledge and relating them to the reading text. Accordingly, this progress might be ascribed to various factors. One factor could be the reading materials, questions and activities that gave the students a chance to practice various and frequent critical skills by appealing on their logical which led to developing their critical comprehension skills.

Conclusion

The present study provided evidence for the effectiveness of using digital mind mapping in developing first year preparatory students' reading comprehension skills. The improvement in reading

comprehension skills included literal, inferential, and critical reading comprehension skills.

Besides, varying reading materials and the visual modes of presentation (video, images, mind mapping) might have made students more attentive and responsive to the tasks which helped developing their comprehension skills. Also, giving feedback individually and with the whole class helped students be aware of their mistakes, monitor their performance, and correct those mistakes themselves. Through this feedback, students' strengths in reading were fostered and possible suggestions for improvement were offered in a way that helped students develop their reading comprehension skills.

Furthermore, the change in the teacher's role from an authoritarian to a facilitator, a monitor and a motivator allowed students to share more responsibilities for their learning, express themselves freely and become the center of the learning process.

Moreover, digital mind maps helped students feel relaxed, stimulated their interest, increased engagement, and created a fruitful environment for learning to take place. Students felt more comfortable because they were not afraid of making mistakes in front of their colleagues. Accordingly, it helped students build confidence with their learning, and encouraged them to be active and autonomous learners.

Recommendations and Implications:

The current study provided evidence that Digital Mind Mapping instruction is effective in developing preparatory school students' reading comprehension skills. Thus, it is recommended that EFL teachers consider implementing the proposed digital mind mapping procedures

and activities, in addition to making use of the numerous potentials that digital mind maps offer.

More importantly, EFL teachers should be encouraged and trained on incorporating web based learning applications; e.g. (mind maps, wikis, blogs and Google apps) in their teaching contexts. Similarly, EFL students ought to be directed and given adequate training on using digital and online tools. In addition, students should be given fair opportunities to practice their reading comprehension skills in a collaborative manner.

Furthermore, it is recommended to conduct effective training workshops to introduce teachers to new methods of teaching including digital mind mapping and train them how to prepare and apply it in teaching of English language skills at different levels. Teachers are also suggested to shift to the new roles as facilitators, organizers, and monitors and not to intervene too much when students make mind mapping. Such intervention will make students lose their confidence and they may not enjoy the reading process anymore.

Delimitations of the Study:

The present study will be delimited to the following:

1- Two groups of 101 first grade preparatory school students at Mahlet Marhoum Preparatory school for Boys in El Gharbia Governorate.

2- Eight EFL Reading comprehension skills divided into 3 categories: (a). Literal comprehension skills (identifying the main idea, providing details about the setting, identifying specific information, recognizing and recalling stated sequences); (b). Inferential comprehension skills (figuring out the meaning of unknown words from context clues,

predictions); and (c). Critical comprehension skills (identifying the purpose of the writer, forming judgment and evaluation).

3- Digital mind mapping instruction.

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