The Effectiveness of Electronic Mind Maps in Developing Academic Achievement and the Attitude towards Learning English among Primary School Students

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Abstract

The present study aimed to identify the effect of using electronic Mind Maps on the academic achievement of the fifth-grade primary female students in the English language curriculum compared to the traditional teaching method adopted in the teacher's guide. It also aimed to indicate the attitudes of the fifth-grade female students towards the use of electronic Mind Maps in understanding the study unit adopted in this study. The study utilized the quasi-experimental method applied to two groups: experimental and control. The population of the study consisted of the fifth-grade of primary school female students, who studied in Ashbeelya Private School in Riyadh for the academic year 2016/2017, and the participants' ages ranged from 10 to 12 years. The sample of the study is consisted of 30 fifth-grade female students, divided into experimental group (15 students) and control group (15 students). The study resulted that there were statistically significant differences between the mean scores of the experimental group and the control one in the post achievement test scale in favor of the experimental group. The effect size of using Mind Maps was high. There were statistically significant differences between the mean scores of the experimental and control group scores in the post achievement test of the attitude towards learning English in favor of the experimental group.

Keywords: electronic mind maps, academic achievement, attitude, English language learning

1. Introduction

Authors are continuously interested in improving and developing learning and education. They utilize advanced and effective educational strategies and means that focus on the learners and effectively organize their reception of information and knowledge. Therefore, graphic organizers, such as Mind Maps invented by Tony Buzan, assist memory improvement and retrieval of information in the same way the human mind works. Buzan believes that they are used as schemas to represent, organize, generate, and classify words, ideas, and tasks. They also help study, read, solve problems, and make decisions. They depend on the sequence of neural cells where brain cells spread and articulated (Abdulbaset, 2016). Buzan was motivated by recognizing that the educational systems largely focus on operating only one hemisphere of the brain, i.e. the left hemisphere (Elabady & Jradat, 2015).

Additionally, learners considered the main aim of education where developing their scientific thinking abilities and utilizing their human mind power in organizing ideas are amongst its most significant objectives. E-Mind Maps can be utilized to define the overlapping relationships among the various items and details of the subject. Accordingly, information saving and retrieval can be facilitated through using I Mind Maps software to create relations among information, connect old and new knowledge, and correct errors without duplication saving the time and effort of the learner. E-Mind Maps are an active learning strategy that participates in improving memory, generating creative ideas, using both brain hemispheres, and organizing information in a way that helps read, retrieve information, and connect concepts through lines or arrows that represent the relation of concepts by words or phrases that are written on the lines that connect two concepts. They can be used as methodological or educational means as well as an evaluation style (Elsaeed, 2012).

There are two types of Mind Maps: a. Traditional Mind Maps drawn manually by using paper and pen or on the board and b. Electronic Mind Maps that apply the same steps through using computer software that

automatically generate flow branches of ideas derived from the central one. Moreover, ideas can be edited or moved while images and symbols can be added. E-Mind Maps are used to represent relations between ideas and information and require spontaneous thinking on creation (Abdulbaset, 2016). E-Mind Maps are more effective and attractive than traditional ones, since they depend on using professionally fast and specialized computer software which includes photos, colors, and drawings that attract the reader. Hence, some authors suggested using e-Mind Maps in an early education stage as they help students organize ideas and information (Davis, 2010). Additionally, their preparation does not require high skills since software contain drawings, cliparts, symbols, and images that can be easily inserted (Elabady & Jradat, 2015; Boyson, 2009). Using e-Mind Maps as a graphic interface helps freely express ideas and display interrelationships between concepts and content in a visual non-linear structure (Ruffini, 2008; Trevino, 2005). Accordingly, this strategy can be used in teaching English, as an important subject, and accomplishing its objectives that were defined by the educational policy in Saudi Arabia.

1.1 Statement of the Problem

The field visits and application showed weak explanation of the lesson by the teacher. As a result, Students did not respond or understand the lesson and obtained Low grades in English in working papers and assessment exams. Many female students, with different achievement levels, expressed their negative attitudes towards learning English because of the difficulty of understanding, memorizing vocabulary, or speaking. Therefore, students' weak achievement requires identifying effective teaching methods based on active learning that unleashes their potential. Consequently, I Mind Maps software applied to identify its effect on the achievement of the participants compared to the effect of the traditional method that depends on the teacher guide.

1.2 Questions

The present study is an attempt to answer the following questions:

1) Are there statistically significant differences between the mean scores of the experimental group of fifth-grade primary female students and the control one in the post academic achievement test scale in English language subject attributed to using e-Mind Maps in teaching (At Work) study unit at the level of (0.05)?

2) What are the attitudes of fifth-grade primary female students towards using e-Mind Maps in teaching a study unit of the English language curriculum?

1.3 Objectives

The current study aims to identify the effect of using e-Mind Maps on the academic achievement of the fifth-grade primary female students in the English language curriculum compared to the traditional teaching method adopted in the teacher's guide. It also aims to explore the attitudes of the fifth-grade female students towards the use of e-Mind Maps in understanding the study unit adopted in this study.

1.4 Significance

The present study is of significance because it tackles e-Mind Maps technique and its effect on the fifth-grade female students. The use of e-Mind Maps technology enhances motivation and achievement among the female students in English. It also enhances the motivation of female teachers towards using modern techniques by observing the high achievement and interaction of their female students. It may participate in changing the attitudes of female students to study English from negative to positive ones. On affirming the effectiveness of e-Mind Maps, it may participate to give the female students new distinctive technical skills. Additionally, it may attract the attention of decision makers in the Ministry of Education to develop the teaching methods using modern techniques in the academic achievement in the various subjects. It can participate in holding workshops and giving training courses to develop the educational process through involving new techniques that help enhance the educational level.

2. Methodology

The author utilized the quasi-experimental method, as shown in the following design:
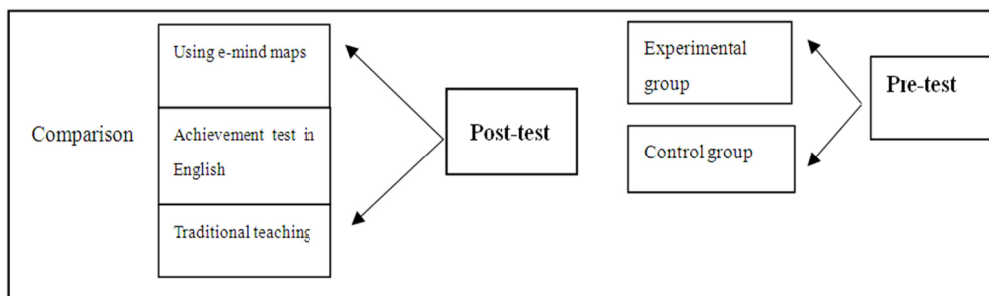
Population:

The population of the study consisted of the fifth-grade primary female students, who studied in Ashbeelya Private School in Riyadh for the academic year 2016/2017, where the participants' ages ranged from 10 to 12 years.

2.1 Sampling

The sample of the study consisted of 30 fifth-grade primary female students, divided into experimental group 15 and control group 15 students.

Table 1. Mann-Whitney test to show the significance of differences between mean responses in the pre-achievement test

	Study groups	No.	Mean ranks	Total ranks	Critical Value (z)	Significance level
Achievement test	Control group	15	13.77	206.50	-1.079	0.285
	Experimental group	15	17.23	258.50		Insignificant

The table shows that there were no statistically significant differences between the experimental and control groups on the scores of the pre-achievement test at the level of 0.05. It reached 0.285 showing the equivalence of the two groups and their validity to the experiment.

Controlling the attitude towards English language learning: To make sure that the two groups (i.e. control and experimental) are equivalent in the scale of attitude towards English language learning, it was applied to a pilot sample, as shown in the following table:

Table 2. Mann-Whitney test to show the significance of differences between mean responses in the scale of attitude towards English language learning

	Study groups	No.	Mean ranks	Total ranks	Critical Value (z)	Significance level
Scale of the attitude towards English language learning	Control group	15	13.23	198.50	-1.414	0.161
	Experimental group	15	17.77	266.50		Insignificant

The table shows that there were no statistically significant differences between the experimental and control groups on the scores of the scale of attitude towards English language learning at the level of 0.05. It reached 0.161 showing the equivalence of the two groups in the attitude scale and their validity to the experiment.

3. Tools

I. Achievement test

The achievement test applied to English language subject, considering appropriateness to the curriculum, the female students' chronological age, and the primary stage. It comprised two parts; grammatical rules 10 questions and grammars 8 questions. Firstly, a teacher guide prepared and designed using e-Mind Maps strategy for the experimental group. It consisted of:

a) The introduction covering introducing the guide, its objective, and the appropriate teaching method of each unit.

b) An overview of e-Mind Maps strategy to teach the suggested unit.

c) Time plan of teaching the unit (grammatical rules and grammar) as the classes required to teach each lesson were defined using e-Mind Maps to be 5 classes, 45 minutes each, for 5 weeks.

d) Educational tools and means utilized by the teacher.

After completing the preparation of the teacher guide, it was submitted to a group of reviewers specialized in curriculum and instruction of English, some female educational supervisors and teachers of English language to judge the formulation of objectives, teaching plans, formatting lessons according to e-Mind Maps, and any other additions. According to their opinions, the required modifications were made and the guide of the experimental group in its final form was prepared. Secondly, the pre-achievement test applied on 4/2/2017 to the experimental and control groups in cooperation with their teacher. Then, the answers were collected, corrected, and scored in the correction form. Thirdly, the proposed study unit was taught to the experimental group using e-Mind Maps and to the control one by the traditional method. A meeting was held with the experimental group to give instructions to begin the experiment. Finally, the post-achievement test conducted to the experimental and control groups on 8/3/ 2017. Then, data were collected and the appropriate statistical processing conducted.

II. The attitude towards English language learning' scale

A questionnaire designed to measure the attitudes of fifth-grade primary female students towards English language learning. It consisted of 33 items, with 3-14-18-22-23-26-27-28-32-33 in the reverse direction. They are given (strongly agree = 1, agree = 2, disagree = 3) and the other items are positive and corrected in a reverse way to the negative ones.

3.1 Internal Validity

After checking the external validity of the tool, a field application of the tool conducted to the sample to verify the internal validity of the scale by calculating Pearson Correlation Coefficient between the score of each item and the total score.

Table 3. Pearson Correlation Coefficient of the individual items of the scale of attitude towards English language learning to the total score

No.	Correlation coefficient	No.	Correlation coefficient
1	0.716**	18	0.729**
2	0.622**	19	0.629**
3	0.624**	20	0.672**
4	0.630**	21	0.761**
5	0.446*	22	0.652**
6	0.480**	23	0.523**
7	0.430*	24	0.515**
8	0.404*	25	0.479**
9	0.697**	26	0.532**
10	0.609**	27	0.603**
11	0.748**	28	0.420*
12	0.693**	29	0.593**
13	0.396*	30	0.725**
14	0.457*	31	0.407*
15	0.561**	32	0.378*
16	0.620**	33	0.423*
17	0.404*	-	-

** Significant at a level of (0.01) and less.

* Significant at a level of (0.05) and less.

Table 3 shows that the values of correlation coefficient of each item with that of the total score of the scale were positive and statistically significant at the level of 0.05 or 0.01 and less, indicating their validity to the scale.

3.2 Reliability

To measure the reliability of the tool (the scale), Cronbach's alpha calculated and reached 0.829, indicating that

the scale of attitude towards English language learning has a high degree of reliability to be used in the field application.

4. Statistical Methods

The study utilized the quasi-experimental method to measure the differences between the means of the two groups, i.e. experimental and control. Cronbach's alpha calculated to check the reliability of the tools. Pearson Correlation Coefficient obtained to check the validity of the tool (the attitude towards English language learning) to define the relation between the items and the total score. Wilcoxon test utilized to identify the statistically significant differences in the scores of the participants in the pre- and post-tests. Mann-Whitney test applied to identify the statistically significant differences in the scores of the participants of the experimental and control groups in the post-test and the equivalence of the groups in the pre-test. Effect size (Eta square) obtained to measure the effect of using e-Mind Maps in modern teaching on developing the achievement test of the fifth-grade primary female students. Frequencies and percentages utilized to define the responses of participants to the items of "the attitude towards English language learning". Arithmetic mean calculated to identify the increase and decrease of the responses of participants to the items of "the attitude towards English language learning". Standard deviation calculated to define the deviations of the items of "the attitude towards English language learning" from their arithmetic mean.

5. Review of the Literature

Elradady (2009) aimed to investigate the effectiveness of using the computational Mind Maps in developing the learning skills of the students of Administrative Sciences College in Naif Arab University for Security Sciences by using software in the administrative tasks after graduation. The author utilized the action, descriptive, and survey approaches. Results revealed that students had a middle level of computer skills and high positive attitudes towards its use. They strongly agreed on the effectiveness of the computational mind map in developing learning skills, such as information organization, taking notes, memorization, discussion, presentation, and revision. The author recommended using this strategy in teaching. Boyson (2009) aimed to investigate the effectiveness of using Mind Maps in education and learning. The sample consisted of 9 students. Using Mind Maps took three forms: as a means of note taking to develop the teacher's information, as a means of presentation, and using them in the lesson and homework. The study concluded that the Mind Maps helped 80% of the students in memorizing information. In addition, 72% of them benefited in finding the interrelation of topics, while 75% of them benefited in revision. The author suggested using e-Mind Maps early because they help students organize ideas during revision.

Nong et al. (2009) aimed to investigate the impact of the digital mind mapping compared to traditional methods on the academic achievement and attitudes in teaching and learning. It was applied to (90) first-year students at Teacher Training Institute in Thailand who were divided into two groups; experimental and control. Digital mind mapping, traditional teaching, and mental drawing on paper were utilized, respectively. Then, pre- and post-tests were done. The study revealed that students preferred mind mapping. Additionally, computer-based Mind Maps were critically effective in illustrating the relationships among concepts, ideas classification, building new knowledge, problem-solving, critical thinking, and collaborative learning. Students interacted freely and expressed their creative thinking. They also increased students' self-confidence and motivation towards learning psychology. They used them for other subjects, e.g. philosophy, English as a foreign language, and literature. Waqad (2009) surveyed the effectiveness of using Mind Maps on the achievement of some topics in Biology at the cognitive levels among the first-grade secondary female students in Makkah. The quasi-experimental method applied on the study's population that comprised all first-grade secondary female students in Makkah, numbered 139. The study's sample consisted of 27 students in the experimental group and (28) ones in the control group. To verify thev hypothesis, a teacher guide was created to teach the selected two topics after content analysis, creating data collection tool, i.e. achievement test, pre-and-post-tests, and conducting statistical processing. The study concluded that there were no statistically significant differences at the level of memorization between the groups, while there were differences at the levels of understanding, application, analysis, synthesis, and the total cognitive levels. It recommended motivating teachers on using Mind Maps in teaching science, holding workshops, and training.

Elshahrany (2010) was conducted to investigate the impact of using e-maps in teaching 'Islam in Africa' unit on academic achievement and attitude towards them among the second-grade intermediate students. It applied the quasi-experimental method to a sample of 50 students who were divided into two groups; an experimental group that studied the unit using e-maps and a control one who studied it using the traditional method in the second semester of 2009/2010. It concluded that there were significant differences between the means of the two groups'

scores in the post-test in favor of the experimental group. Additionally, there were differences on the scale of the attitude in favor of the post-test of the experimental group. Accordingly, it recommended using e-learning methods in teaching geography as a key competence of geography teacher. Furthermore, teachers should be trained on them and they should be embedded in the plans of teacher preparation in the Colleges of Education.

Elqasemia (2010) aimed to investigate the effectiveness of using Mind Maps in teaching science on achievement and improving key learning processes among the third-grade basic students in Oman. The sample consisted of 103 students in Manart Alelm School for basic education in Northern Elbatenah. They were divided into two groups; an experimental group of 52 students who utilized Mind Maps strategy and a control one of 51 students who studied in the traditional way. A teacher guide, student notebook, achievement-test according to Bloom's taxonomy (memorization, understanding, and application), and test of the basic operations were prepared. Their reliability coefficients were calculated using Cronbach's alpha, scoring 0.83 and 0.85, respectively. Results revealed that there were no statistically significant differences in students' scores in the post-achievement test and the various cognitive levels. There were also no differences among students' scores in the post-test of the basic scientific operations and observation, classification, communication, measurement, prediction, inference, induction, conclusion, and using numbers skills. However, there were significant differences among students' scores in using spatial and temporal relations in favor of the experimental group students. Finally, there was a medium effect size of using Mind Maps in achievement and developing the basic scientific operations among the students of the experimental group. It recommended holding training workshops for science teaches to identify the educational advantages of using Mind Maps and how to utilize and apply them in teaching science. In addition, comparative studies should be conducted between using Mind Maps in teaching and other teaching strategies to investigate their effectiveness in achievement and developing learning operations.

Elawfy (2011) aimed to investigate the effectiveness of using e-Mind Maps in the achievement of English grammar for the second-grade secondary school. It utilized the quasi-experimental method based on two groups; an experimental group that was taught using e-Mind Maps and a control one that was taught traditionally. In addition, pre- and post-tests were done to the groups. It concluded that there were statistically significant differences between the means of the control and experimental groups' scores in the post-achievement test in favor of the experimental group. It recommended disseminating the culture of e-Mind Maps among teachers and students in the different stages as well as interest in modern learning methods supported with technology. Abi El-Mona and Abdel Khaliq (2012) aimed to assess the effect of using Mind Maps as a learning tool, measure the academic achievement of the eighth grade students, and identify the relationship between Mind Maps and concepts comprehension. The sample comprised 62 students and classes were given to each group. Participants in the experimental group were trained on Mind Maps for a science unit and multiple-choice question tests were utilized to measure student achievement. Results indicated that the experimental group got marks higher than those of the control one in the theoretical understanding and practical application.

Balim (2013) sought to identify the impacts of using technology and mind mapping in teaching science on academic achievement and the opinions of the experimental group on e-Mind Maps. The study utilized the quasi-experimental method with pre-and post-tests. It was applied to 64 students in the seventh grade; 33 males and (31) females in İzmir, Turkey. It concluded that the scores of the experimental group were higher than those of the control one that found difficulty in comprehending concepts. Interviews were done with 6 students of the experimental group who claimed that the modern method was more enjoyable and beneficial. It helped them organize activities and easily comprehend and retrieve information when required. Jbeili (2013) was conducted to investigate the impact of digital Mind Maps on academic achievement of the sixth grade students in Saudi Arabia. The sample consisted of 44 students who were divided into two groups. While the first group was taught using digital Mind Maps, the second used manual Mind Maps. An achievement test was designed to measure pre- and post-achievement. Results indicated that digital Mind Maps helped improve student achievement than the manual ones. In addition, they helped focus on one idea and avoid visual chaos by organizing information. Additionally, multimedia (video, audio, and cartoon) consolidated students' senses and improved their motivation to learning and interest. Using the keyboard and mouse enabled students to move among digital maps more easily and faster than the manual ones.

Awjan (2013) aimed to design and investigate the effectiveness of a learning program using Mind Maps in developing the skills of cognitive performance among the female students in the Bachelor stage at Princess Alia University College in Child Education in Islam course compared to the lecture strategy. It revealed the attitudes of the experimental group after its use. The quasi- experimental method was applied to a sample of female students enrolled in the summer course of Child Education in Islam in 2010/2011 numbered 35 students. Randomly, they were divided into an experimental group of 20 students who studied using the program of Mind

Maps and a control group of (15) students who studied in the lecture strategy. The study revealed that there were statistically significant differences in achievement and attitudes that could be attributed to utilizing Mind Maps. Safar et al. (2014) sought to investigate the expectations and attitudes of pre-service science teachers at the College of Education in Kuwait on using programming-related concept maps, using them in teaching science, and potential dangers. The descriptive approach was utilized and a questionnaire of 25 items was written to collect data on teachers' perspectives and attitudes towards Mind Maps and the related applications. The study revealed that the participants were satisfied with Mind Maps and the related applications in the various applications compared to the manual or ordinary applications. In addition, they were significant, easy, facilitating, and consolidating learning and achievement in science learning.

Elabady and Jradat (2015) aimed to investigate the impact of using e-Mind Maps on developing reading comprehension among the basic ninth grade students in English. The study was applied two classes of the ninth grade students of Irbid's schools, Northern Jordan. The experimental group comprised 30 students who studied using e-Mind Maps and the control one who studied in the traditional way. Data were collected relying on the reading comprehension test. After conducting statistical analyses, results indicated that the means of students' scores (α) were statistically significant at the level of 0.05 in the post-comprehension test in favor of the experimental group. In addition, the effect size resulting from using e-Mind Maps in the reading comprehension of the experimental group was medium. Accordingly, the study recommended holding training workshops for English language teachers, in particular, and teachers, in general, to train them on preparing e-Mind Maps and utilizing them in teaching. Hallen and Sangeetha (2015) were conducted to identify the effectiveness of Mind Maps compared to the traditional way in teaching English to the eighth level student. The sample comprised 60 students to whom the experimental method was applied and pre- and post-achievement tests were done. The study recommended that the experimental group was better than the control one as it achieved the objectives. This could be attributed to the attractiveness of Mind Maps that helped the experimental group acquire knowledge and improve understanding and application, indicating their effectiveness in motivating learning using images and colors.

Sabbah (2015) was conducted to identify the impact of Mind Maps. There was widespread dissatisfaction with the low achievement of students of Community College in reading in English courses and lack of interest in the participation in the academic activities. Thus, it aimed to investigate the impact of self-generated Mind Maps on reading comprehension. It was applied to 14 students of the experimental group who studied using the computerized Mind Maps and 8 students in the control one who used manual maps for 8 weeks. Pre- and post-achievement tests were done and the opinions of the experimental group were surveyed on using computerized Mind Maps in achieving reading comprehension. The participants expressed their better comprehension and enthusiasm to the computerized mind mapping because they resembled an interactive game that improved fun and joy by interchanging the ideas of the experimental group. They also claimed that this strategy had psychological benefits, ease of use, and enjoyment.

Rosciano (2015) argued that faculty members need to avoid the traditional education centered on the teacher and increase the implementation of an active educational student-centered environment. Creating scientific experiments that facilitate thinking, building knowledge, problem solving, and verification are vital. Using Mind Maps as a strategy of active learning is an innovative technique to facilitate learning. A student can illustrate his/her perspective, show contextual knowledge and innovation, and establish connection on a central topic using this activity. Mind mapping can be used to make notes, finish home works, prepare for the exams, analyze, and think about nursing practice. They can be made in nursing curricula as an alternative teaching experience. The study aimed to assess the effectiveness of mind mapping as an active learning strategy among nurses. It utilized a three-step cooperative approach: 1) Thinking silently on the asked questions, 2) Exchanging ideas with other group mates, and 3) Contribution with other in mind mapping. A formative assessment and discussions with the groups on Mind Maps were conducted by the author. Then, a questionnaire was distributed to assess maps as a learning strategy. Students expressed the role of this strategy in enriching discussions, exchanging experience, better peer learning, and consolidating learning.

Zahed (2016) aimed to define the effectiveness of a teaching strategy based on the integration of Cornel's model of writing lectures and Mind Maps on the development of the College of Education female students' achievement of "Special Teaching Methods (1)". The quasi-experimental method utilized to teach the course to an experimental group of (33) female students and using the interactive lecture of 32 female students. Both groups were in the fifth level at Home Economics Department, College of Education in Dilam, Prince Sattam bin Abdulaziz University. This strategy was applied for 13 weeks, 4 hours weekly in addition to a training course to the experimental group to train them on using Cornel model and mind mapping. Results indicated the

effectiveness of the strategy in developing the academic achievement of female students in Methods of Teaching Course on T-test and impact factor. In addition, there were statistically significant differences in favor of the experimental group. Many notes were made while applying the strategy, including: Increasing the effectiveness and commitment of the female students, control of the classroom, and time management for the experimental group compared to the control one. Finally, any recommendations were made, e.g. applying the teaching strategy based on the interaction of the student with the course, shifting the attention of the teacher to the student, helping hem deduct relations and connections among the information.

Merchie and Keer (2016) sought to identify the effectiveness of two educational strategies based on the curriculum of Mind Maps on the students of the fifth primary grade. The sample included 35 teachers and 644 students from 17 primary schools. It applied the quasi-experimental method to two groups: experimental and control. After 10 weeks, data were analyzed. Results revealed that the largest benefits students got were quality of designing graphs and greater interaction with the experiment. However, there were no statistically significant differences between the groups. Daghistan (2016) aimed to investigate the effect of e-Mind Maps on modifying lack of interest in Arabic in Kindergarten. It was applied to 40 children in 2 groups; an experimental group of 23 students and a control one of 17 students using the experimental method. It was noted that some Saudi children suffered from low learning due to the lack of attention and interest. It was a common problem among students during education and learning. Results indicated that there was lack of interest that was largely modified in favor of the experimental group. Accordingly, it recommended using e-Mind Maps in kindergarten education to avoid lack of interest.

Marouf (2010) aimed to examine students' attitudes towards English, sex differences on such attitudes, and their relation to achievement. It also aimed to investigate students' opinions towards the permanent classroom management and its relation to the attitude to English. Therefore, a questionnaire of 46 items was written to measure students' attitudes towards English. Another questionnaire of 38 items distributed on 8 domains was written to the teachers regarding class management and education organization. An achievement test done to the students of the first secondary grade in English. The descriptive and analytical method was adopted. A sample of 420 students of public and private secondary schools in Damascus was randomly selected besides a sample of 60 teachers of English there. T-students tests were adopted to measure the differences between the means and various semantic levels. In addition, Pearson test and another one to define the cohesion were done. It concluded that there were no significant differences at the level of (0.10) between the attitudes towards English and achievement between genders. However, there was a difference in the attitude towards English in favor of males, where T-students value was 87.102 and that of the females were 75.99. Additionally, there was a positive relation between the attitude towards English and class management with 0.059 on Pearson correlation.

Hawrany (2011) conducted a quasi-experimental study to examine the effect of using Mind Maps strategy on the achievement and attitude of the ninth-grade students towards Science in the public schools of Qalqilia, Palestine in the academic year 2010/2011. The study utilized three tools: a teacher guide to use Mind Maps in "chemical interaction" unit for the ninth grade, an achievement test of 36 items, and a scale of attitudes towards science of 26 items. Its sample consisted of 117 students in two schools who were intentionally selected. They were divided into two groups; a control group of 33 male and 27 female students who were taught using Mind Maps and an experimental of 30 male and 27 female students who were taught traditionally. The achievement test and scale of attitude towards teaching the unit were utilized. Results revealed that there were statistically significant differences among the means of students' scores that could be attributed to the teaching method. Furthermore, there were statistically significant differences that could be attributed to gender. There was no statistically significant difference to be attributed to the interaction between the teaching method and gender. Results also revealed statistically significant differences of the means of students' pre- and post-attitudes towards science. There was no statistically significant difference to be attributed to the interaction between the teaching method and gender. It recommended using Mind Maps in Education.

Elzaaby (2013) aimed to examine students' engagement in learning English to their relationship with the teachers of English and attitudes towards learning. To achieve its objective, a scale to measure this behavior was developed and another to identify the relation between students and teachers. It also used the scale of attitudes towards learning English developed by Elyamany (2008). It was applied to a sample of 303 students; 128 males and 175 females who were randomly selected from the first-grade secondary students in Amman. Results revealed that students had a medium score of engagement. There were no statistically significant differences at the level of ($\alpha \geq 0.05$) in the level of engagement between genders. Generally, student attitudes towards learning English were positive. There were also statistically significant differences at the level of ($\alpha \geq 0.05$) in the attitudes that could be attributed to gender in favor of the female students. Justice and respect on the scale of

relations were high, while participation was low. In addition, there were statistically significant differences at the level of (α ≥ 0.05) on participation in favor of male teachers and on justice in favor of the females. Care and confidence interpreted 18% of contrast in the level of engagement, while attitudes interpreted 7% and respect interpreted 1%.

Hariri (2013) sought to investigate the attitudes of English as foreign language teachers towards using e-Mind Maps to improve reading comprehension by applying a questionnaire. The sample of study comprised 30 students in business administration who joined an English course for 2 hours weekly over 16 weeks. Results revealed that the participants' attitudes were positive towards e-Mind Maps to consolidate their reading comprehension. It was an interesting tool although some of them expressed the difficulty of e-mind mapping compared to the manual one. It was also characterized by participation with other on the Internet to design e-Mind Maps. Awashrea (2015) sought to examine the attitudes of preparatory school students in Batna, Algeria towards learning English as a second language and their relation to gender. Its sample comprised 301 students who were randomly selected. A questionnaire to measure the attitude towards learning English in the first semester of the academic year 2012/2013. The study adopted the descriptive approach and applied T-test to analyze results. The attitudes of the participants towards learning English were negative and there were statistically significant differences to be attributed to gender in favor of the females. Therefore, it recommended forming positive attitudes towards learning English as a second language in Algeria.

6. Results and Discussion

The first question, "Were there statistically significant differences between the mean scores of the experimental group of fifth-grade primary female students and the control one in the post-academic achievement test scale in English language subject to be attributed to using e-Mind Maps in teaching (At Work) unit at the level of 0.05?" was tested. To identify if there were statistically significant differences at the level of (α ≤ 0.05) between the mean scores of the experimental and control groups in the post-achievement test, Mann-Whitney test utilized and results are shown in the following table:

Table 4. Mann-Whitney test showing the significance of differences between the mean scores of the experimental and control groups in the post-achievement test

	Study groups	No.	Mean ranks	Total ranks	Critical Value (z)	Significance level
Total score	Control group	15	10.10	151.50	-3.362	0.000*
	Experimental group	15	20.90	313.50		Significant

* Significant at the level of 0.05.

The table shows that the differences of the experimental and control groups' scores in the post-achievement test at the level of 0.05 were in favor of the experimental group, showing that the achievement test of the experimental group was better after using e-Mind Maps strategy. Mean ranks of the experimental group achieved 20.90 while the control one achieved 10.10. It also shows that the significance level of 0.000 is a statistically significant value at the level of ≤ 0.05. It illustrates that there were statistically significant differences at the level of ≤ 0.05 between the mean scores of the experimental and control groups in the post-achievement test in favor of the experimental group. This result can be interpreted that e-Mind Maps facilitated the memorization of previous information and provided the participants with feedbacks that fixed information in minds while mapping. The maps also allow fast revision of the topics before the test. They link the information to colors and material items that contribute to focusing the subject in mind. In other words, they link written information to drawings and symbols. Accordingly, the brain learns better when using both hemispheres.

This result is consistent with Balim (2013) argued that using e-Mind Maps helped organize activities and easily grasp and retrieve information, if needed. Moreover, Jbeili (2013) reported that digital Mind Maps helped focus on one idea and avoid visual chaos by organizing information. Additionally, multimedia (video, audio, and cartoon) consolidated students' senses and improved their motivation to learn. Using the keyboard and mouse enabled students to move among digital maps easily. Boyson (2009) claimed that e-Mind Maps helped (80%) of students focus on memorizing information and helped (75%) of them revise. Moreover, Elshahrany (2010) and Elawfy (2011) reported that there were statistically significant differences between the mean scores of the experimental and control groups in the post-achievement test in favor of the experimental group. This also consistent with Abi El-Mona and Abdel Khaliq (2012) that reported that the students in the experimental group obtained higher results than those of the control one. Hallen and Sangeetha (2015) argued that the experimental

group was better than the control one in accomplishing objectives. On the other hand, Elqasemia (2010) reported that there were no differences between the scores of the students in the experimental and control groups in the total post-achievement test.

Wilcokson test utilized to test if there were statistically significant differences at the level of ($\alpha \leq 0.05$) between the ranks of the experimental group on the scale of achievement test before and after using e-Mind Maps strategy. Results were as follows:

Table 5. Wilcokson test of interrelated sample of the significance of ranks of the experimental group on the pre- and post-achievement test

	Study group	No.	mean	Distribution	Mean ranks	Total ranks	Critical Value (z)	Significance level
Achievement test	Pre-test	15	23.8	Positive ranks	3.00	3.00	-3.239	0.001*
	Post-test		30.97	Negative ranks	8.36	117.00		Significant

* Significant at the level of 0.05.

Table 6 shows that the differences between the ranks of the experimental group of the achievement test before and after using e-Mind Maps were significant at the level of 0.05 in favor of the post-test. That is, the scores of the experimental group in the post-test were better. While they scored 30.97 at the post-test, they scored 23.8 in the pre-test. Additionally, 0.001 significance level was significant at ≤ 0.05, indicating that there were statistically significant differences at the level of ≤ 0.05 among the means of the experimental group on the scale of achievement test before and after e-Mind Maps strategy in favor of the post-test. This indicates the effectiveness of using e-Mind Maps strategy and its effective role on student achievement. It displays information in an organized way that facilitated understanding. It also considers individual differences among learners and provides feedback that helped fix information. Additionally, it helps learners become independent and aware of what they learn. Accordingly, it increases learners' achievement in English language subject. This is consistent with Elshahrany (2010) who indicated that there were statistically significant differences among the means of the experimental group's scores in favor of the post-test.

To test the impact of using e-Mind Maps on the academic achievement of the fifth-grade primary female students in the English language curriculum compared to the traditional teaching method adopted in the teacher's guide and defining the effect size in making difference of the achievement test, Eta Square (η^2) of (T) value was utilized. It provided a descriptive scale of the correlation of the samples under study. It indicated the percentage of variation of the dependent variable attributed to the independent one. Effect size indicated the difference of the two groups in standard units, as shown in Table 7:

Table 6. Arithmetic mean, number of female students, freedom degree, T-value, eta square η^2 and significance of post-achievement test

	Study groups	No.	Mean	Freedom degree	(T) value	Eta square ($\eta2$)	Effect size
Achievement test	Control	15	23.15	28	4.191	0.39	High effect
	Experimental	15	30.97				

Table 6 shows that the value of the calculated η^2 of the achievement test was 0.39, indicating that the effect size of the independent variable, i.e. using e-Mind Maps on the academic achievement of the fifth-grade primary female students in the English language curriculum, was 39%. It is a high degree. This is attributed to the fact that Mind Maps are effective tools in memory improvement, information retrieval, generating new and uncommon creative ideas. They help activate and use both hemispheres, organize information, and interrelate concepts. Accordingly, academic achievement among the students is developed in English. This is inconsistent with Elabady and Jradat (2015) and Elqasemia (2010) who reported that the effect size resulting from using Mind Maps in the achievement of the experimental group was medium.

The second question: "What are the attitudes of fifth-grade primary female students towards using e-Mind Maps in teaching a unit of the English curriculum?" To identify the attitudes of fifth-grade primary female students towards teaching a unit in the English language curriculum, frequencies, percentages, arithmetic means, standard deviations, and ranks of the responses to the items of the scale were calculated. Results were as follows:

Table 7. Responses of the participants towards using e-Mind Maps on teaching a unit of the English language curriculum in a descending order according to the mean agreement

No.	Item	Frequency	Agreement degree			mean	Standard deviation	Ranking
		Percentage	Strongly agree	Agree	Disagree			
33	English is important compared to other subjects.	Freq.	11 73.3	3 20.0	1 6.7	2.67	0.617	1
27	I hope to place English at the top of curricula.	Freq.	11 73.3	2 13.3	2 13.3	2.60	0.737	2
23	I early attend the English lesson.	Freq.	12 80.0		3 20.0	2.60	0.828	3
26	I think that there is a dire need to learn English.	Freq.	11 73.3	1 6.7	3 20.0	2.53	0.834	4
19	I feel that learning English helps a lot in travelling.	Freq.	9 60.0	3 20.0	3 20.0	2.40	0.828	5
28	I feel angry with any extra curricula activity not concerned with English.	Freq.	9 60.0	3 20.0	3 20.0	2.40	0.828	5
14	I am interested in paying attention in the English lesson.	Freq.	10 66.7	1 6.7	4 26.7	2.40	0.910	6
4	Learning English participates in community progress.	Freq.	8 53.3	4 26.7	3 20.0	2.33	0.816	7
22	I think that English does not matter with Arabic.	Freq.	9 60.0	2 13.3	4 26.7	2.33	0.900	8
6	Mastering English facilitates using mass media.	Freq.	9 60.0	2 13.3	4 26.7	2.33	0.900	8
20	Learning English helps be familiar with the traditions and customs of the foreign countries.	Freq.	8 53.3	3 20.0	4 26.7	2.27	0.884	9
18	I feel that English lesson time runs fast.	Freq.	8 53.3	3 20.0	4 26.7	2.27	0.884	9
13	I am alert to understand the explanation in the English lesson.	Freq.	6 40.0	6 40.0	3 20.0	2.20	0.775	10
15	I try to finish English assignments on time.	Freq.	7 46.7	4 26.7	4 26.7	2.20	0.862	11
9	The topics I study in English benefit in my daily life.	Freq.	7 46.7	4 26.7	4 26.7	2.20	0.862	11
3	I like to read books in English.	Freq.	7 46.7	4 26.7	4 26.7	2.20	0.862	11
16	I avoid being occupied with extra things while the teacher of English explains the lesson.	Freq.	8 53.3	2 13.3	5 33.3	2.20	0.941	12
32	I feel sad when the teacher of English is absent.	Freq.	7 46.7	3 20.0	5 33.3	2.13	0.915	13
8	The English lessons arise my curiosity to acquire new knowledge.	Freq.	7 46.7	3 20.0	5 33.3	2.13	0.915	13
1	I am interested in learning English.	Freq.	6 40.0	4 26.7	5 33.3	2.07	0.884	14
2	English helps better understand life.	Freq.	7 46.7	2 13.3	6 40.0	2.07	0.961	15
11	I seek to learn English more deeply.	Freq.	8 53.3		7 46.7	2.07	1.033	16
12	I like to develop my skills in speaking and writing in English.	Freq.	6 40.0	3 20.0	6 40.0	2.00	0.926	17
10	My life skills are increased when mastering English.	Freq.	6 40.0	3 20.0	6 40.0	2.00	0.926	17

31	I enjoy when answering the activities of English lessons.	Freq.	6 40.0	2 13.3	7 46.7	1.93	0.961	18
21	Learning English gives me better communication with the world.	Freq.	6 40.0	2 13.3	7 46.7	1.93	0.961	18
29	I feel at ease when learning English.	Freq.	6 40.0	1 6.7	8 53.3	1.87	0.990	19
7	Learning English is interesting and exciting.	Freq.	5 33.3	3 20.0	7 46.7	1.87	0.915	20
24	I feel comfortable when studying English.	Freq.	4 26.7	4 26.7	7 46.7	1.80	0.862	21
5	I like to spend more time learning English.	Freq.	4 26.7	4 26.7	7 46.7	1.80	0.862	21
17	I do not speak to my classmates in the class of English in irrelevant topics.	Freq.	4 26.7	4 26.7	7 46.7	1.80	0.862	21
25	English language satisfies my desires and needs.	Freq.	3 20.0	4 26.7	8 53.3	1.67	0.816	22
30	I hope to become an English teacher.	Freq.	4 26.7	2 13.3	9 60.0	1.67	0.900	23
	General mean					2.15	0.504	

Table 7 illustrates that the agreement of the participants to "using e-Mind Maps in teaching the curriculum of English" achieved an arithmetic mean 2.15 out of 3.00, which was ranked second on the triple scale 1.67 out of 2.33, indicating "agreement" on the study's tool. It is clear that the participants varied in agreement on using e-Mind Maps in teaching English language curriculum from 1.67 to 2.67 that were ranked second and third on the triple scale indicating (agree/ strongly agree), respectively. Thus, results show that the participants strongly agreed on 7 items; 33, 27, 23, 26, 19, 28, and 14 that were organized in a descending order, as follows:

1) Item 33 "English is important compared to other subjects" was ranked first with an arithmetic mean of 2.67 out of 3 and a standard deviation of 0.617.

2) Item 27 "I hope to place English at the top of curricula" was ranked second with an arithmetic mean of 2.60 out of 3 and a standard deviation of 0.737.

3) Item 23 "I early attend the English lesson" was ranked third with an arithmetic mean of 2.60 out of 3 and a standard deviation of 0.828.

4) Item 26 "I think that there is a bad need to English" was ranked fourth with an arithmetic mean of 2.53 out of 3 and a standard deviation of 0.834.

5) Items 19 and 28 "I feel that learning English helps a lot in travelling" and "I feel angry with any extra curricula activity that is not concerned with English" were ranked fifth with an arithmetic mean of 2.40 out of 3 and a standard deviation of 0.828.

6) Item 14 "I am interested in paying attention in the English lesson" was ranked sixth with an arithmetic mean of 2.40 out of 3 and a standard deviation of 0.910.

Results reveal that the participants agreed on (26) items, the most significant of which were 4, 22, 6, 20, 18, and 13 that were organized in a descending order, as follows:

1) Item 4 "Learning English participates in community progress" was ranked first with an arithmetic mean of 2.33 out of 3 and a standard deviation of 0.816.

2) Items 22 and 6 "I think that English does not matter with Arabic" and "Mastering English facilitates using mass media" were ranked second with an arithmetic mean of 2.33 out of 3 and a standard deviation of 0.900.

3) Items 20 and 18 "Learning English helps be familiar with the traditions and customs of the foreign countries" and "I feel that English lesson time runs fast" were ranked third with an arithmetic mean of 2.27 out of 3 and a standard deviation of 0.884.

4) Item 13 "I am alert to understand the explanation in the English lesson" was ranked fourth with an arithmetic mean of 2.20 out of 3 and a standard deviation of 0.775.

Results reveal that the participants have positive attitudes towards learning English that could be attributed to the following:

- They like to master English because of its importance. They strongly agreed on "English is important compared to other subjects", "I hope to place English at the top of curricula", "I think that there is a dire need to learn English" and " learning English helps when travelling abroad" as the first international language. They also agreed on "learning English helps be familiar with the traditions and customs of the foreign countries". This result is consistent with Elzoghby (2013) indicated that students have positive attitudes towards English learning because "it helps when travelling abroad" and "it helps be familiar with the customs, traditions, and cultures of the communities that speak in English".

- Utilizing interesting and attractive modern teaching methods, e.g. e-Mind Maps, increase their attitudes towards learning English. The students strongly agreed on "I early attend the lesson of English", "I am interested in paying attention in the English lesson", "I feel that the time of the English lesson runs fast" "I pay attention when the teacher explains". This matched Elabady and Jradat (2015) that indicated that students showed positive attitudes towards the modern teaching methods and techniques to get rid of the boredom of the traditional class. In addition, Hawrany (2011) argued that using Mind Maps as an educational technology participated to forming positive attitudes towards science curriculum.

The positive attitudes of the participants towards English can be attributed to the reliance of e-Mind Maps on inserting images and shapes as well as using colors easily and flexibly in a creative computerized environment. The computer attracted them, since it is supported with various elements of excitement that motivate them to learn English while having positive attitudes. Additionally, Nong (2009) reported that e-Mind Maps increase learning motivation. Davies (2010) also reported that Mind Maps represent a good way of understanding complicated issues because the organized images and graphs are more comprehensible than words. Generally, results are consistent with Elzaaby (2013) indicating that students have positive attitudes towards English. They also matched Hariri (2013) who reported that participants have positive attitudes towards e-Mind Maps as an interesting tool to consolidate their reading comprehension in English. On the other hand, these results are inconsistent with Awashrea (2015) who reported that participants have negative attitudes towards English.

To verify the hypothesis stating that "there were no statistically significant differences (at the level of $\alpha \leq 0.05$) between the post-tests of the experimental and control groups on the scale of the attitude towards learning English, Mann-Whitney test utilized. Results are shown in the following table:

Table 8. Mann-Whitney test showing the significance of mean differences of the post-tests of experimental and control groups in "the attitude towards English language learning"

	Study groups	No.	ranks mean	Total ranks	Critical Value (z)	Significance level
Scale of the attitude towards English language learning	Control group	15	11.27	169.00	-2.236	0.008* Significant
	Experimental group	15	19.73	296.00		

* Significant at the level of 0.05.

The table shows that the differences between the mean ranks score of the groups in the post-test on the scale of the attitudes towards English language learning at the level of 0.05 were in favor of the experimental group. It showed that the scale of the experimental group was better after using e-Mind Maps strategy. The mean rank of the experimental group achieved 19.73 while the control one achieved 11.27. It also shows that the significance level of 0.008 is a statistically significant value at the level of ≤ 0.05. It illustrates that there were statistically significant differences at the level of $\leq (0.05)$ between the mean rank scores of the groups in the post-test of the scale towards English language learning in favor of the experimental group. This result can be attributed to the significance of using e-Mind Maps and their effective role in teaching English. They depend on inserting images and shapes and using colors easily and effectively and can be linked to many applications, e.g. presentations and documents that made them flexible in offering information. Additionally, they are supported with many attractive elements. Accordingly, English became easier and the motivation of students increased to learn while having positive attitudes towards it. Jbeili (2013) reported that linking digital Mind Maps to multimedia (video, audio, and cartoon) consolidates using the various senses and increases motivation to learn. In addition, using the keyboard and mouse enables students to move among digital maps easily. This is consistent with Elshahrany

(2010) who indicated that there were statistically significant differences of the attitudes scale's scores in favor of the post-test of the experimental group. It is also consistent with Hawrany (2011) that reported that there were statistically significant differences of the means of students' attitudes on the scale of the pre-and post-attitude towards science.

7. Conclusion

The study concluded that there were statistically significant differences between the mean scores of the experimental group and the control one in the post achievement test scale in favor of the experimental group. The effect size of using Mind Maps was high. There were statistically significant differences between the mean scores of the experimental and control group scores in the post achievement test of the attitude towards learning English in favor of the experimental group.

8. Recommendations

The following recommendations were made:

- Disseminating the culture of using e-Mind Maps among the officials, in general, and English teachers, in particular.

- Guiding students to use e-Mind Maps while studying their lessons.

- Holding training courses to teachers on using e-Mind Maps in teaching English.

- Creating and holding workshops that discuss utilizing e-Mind Maps in teaching English texts and other skills on the various levels and inviting teachers of English to attend and benefit.

- Conducting experimental researches that tackle the effectiveness of using e-Mind Maps in the academic achievement in English language subject among primary stage students.

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