The Effect of Using Electronic Mind Mapping on Achievement and Attitudes in an Introduction to Educational Psychology Course

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Abstract

The study aimed to investigate the effects of electronic mind mapping on achievement and attitudes in an educational psychology course. This study used a quasi-experimental research design with pre-test and post-test control groups. The study sample consisted of 65 students, 34 students in the control group and 31 in the experimental group. The experimental group was taught using electronic mind mapping, while the control group was given traditional classroom instruction. To achieve the study objective, an achievement test and electronic mind mapping attitude scale were used. The results of the study showed a statistically significant difference between the two groups in achievement test scores and attitudes, in favor of the experimental group attributed to using electronic mind mapping.

Keywords: *electronic mind mapping, achievement, attitudes*

Introduction

Among many different methods that may be used in the constructivist approach, one of the most interesting and influential aids is mind mapping, which was developed by Tony Buzan in the late 1960s. Mind maps are representational tool constructs representing an individual's ideas, concepts, and information about a certain topic that he/she has in mind, using graphs, keywords, images and

diagrams in a two-dimensional environment to illustrate relationships between them (Balim, Everkli & Aydin, 2007; Everkli, Inel & Balim, 2010)

Biktimirov and Nilson (2006) defined mind mapping as “visual, non-linear representations of ideas and their relationships.” Despite comprising a network of connected and related concepts, mind mapping can equally encompass the connection of any idea with another or others. The creation of a mind map requires free-form, spontaneous thinking to fulfill the aim of finding creative associations between ideas. Mind maps are, therefore, essentially association maps. The modern formalized mind mapping techniques are commonly attributed to Tony Buzan, whose technique incorporated the use of lines of differing thickness, colors, diagrams and pictures, as a method of knowledge memorization and recollection. Mind mapping is generally used in the association of ideas, although it is also used to aid memory retention despite the possibly marginal advantages (Farrand, Hussain & Hennessy, 2002). Thus, although creating an association of ideas is the main use of mind mapping, it is generally accepted that remembering a diagram is easier than remembering a description.

This concept is, however, disputed by others who hold the opinion that the format in which knowledge or information is presented is secondary to the learning process (Pressley et al., 1998). In support of the mind map technique, Buzan & Buzan (2000) and Weideman & Kritzinger (2003) claim that the brain is directed along a learning pathway by showing relationships and concepts together through keywords. Trevino (2005) supports the technique which Buzan expounded as using the brain totally. This claim is accepted by Margulies (1991), who agrees that the mind mapping method as a learning technique stimulates and integrates functions of the left and right brain hemisphere processes at the same time, while Practor (2002) points out an additional student aid because it is also an excellent note-taking technique. However, Boley (2008) states that mind maps are relatively less known and used as an alternative creative technique to concept maps. Warwick and Kershner (2006) challenge this statement, noting frequent instances of interchangeability in the use of both mind maps and concept maps and saying that in recent years the emphasis has moved from concept maps to mind maps, which are two dimensional visual tools whereby a central idea or concept is visually linked to associated ideas or concepts illustrated graphically. Mueller, Johnston, Bligh and Wilkinson (2002) and Streible (2003) define mind maps as a central idea with associated thoughts and concepts presented as linkages which, by using this technique, illustrate visually the relationships between complex ideas and processes.

Zhao (2003) gives a comprehensive definition of mind maps as visual tools for developing complex conceptual structures displayed in a format that helps indi-

viduals use critical thinking and creativity to absorb new information, described by Rostron (2002) as a topic, idea, or concept displayed in a visual representation technique using keywords, shapes, and images. This is a particularly effective technique since the brain naturally uses its merging and correlation function to remember and associate information or ideas. Mind maps are a practical learning aid for young children as well as adults – only basic materials such as a large sheet of paper and a few colored pencils being required to produce them by hand. Following the fairly recent acknowledgement of the importance of visual presentation of knowledge, appropriate software for learning and teaching techniques has been developed, at the forefront of which there is Mind Manager Software, launched by Mindjet Software, aiding thinking and organization of information in a visual, nonlinear way to develop ideas and jot down notes of any relevant tangential thoughts associated with the initial key article (Edsman, 2008).

The current study

Thinking skills are essential in all aspects of life and they are constantly required in the preparation of teaching techniques and diversification of teaching strategies that encourage and motivate students to think, and consequently should be at the top of the educational goals in teaching students thinking techniques. There have been few studies in the Arab world and Jordan in particular, in the field of electronic mind mapping as a way of learning and retaining knowledge at the meta-cognitive level. Therefore, the current study is designed to answer the following specific questions:

Question One: Is there any effect of the electronic mind mapping method on student achievement scores in the Introduction to Educational Psychology course?

Question Two: Is there any effect of the electronic mind mapping method on student attitudes toward the Introduction to Educational Psychology course?

Methodology

Participants

Participants in the current study were 65 (20 male, 45 female, mean age 20 years) students of the Faculty of Educational Science at the Hashemite University in Jor-

dan, registered for an Introduction to Educational Psychology course in the first semester of the academic year 2016/2017. The participants were randomly assigned to two study groups (34 in the control group and 31 in the experimental group).

Instruments

Achievement test

The dependent variable in the current study is the student achievement test before and after the experiment, which comprised 30 multiple-choice items about a unit of learning theory. The highest score was 30 and the lowest was 0. The difficulty coefficients ranged from 0.55 to 0.83 and their discrimination coefficient values ranged from 0.25 to 0.70. The Cronbach alpha for the total achievement test was 0.83.

Electronic mind mapping attitude scale

The electronic mind mapping attitude scale was developed by the researcher. It consisted of 17 items (e.g., Using electronic mind mapping in class has increased my achievement, I love using electronic mind mapping), rated on a 5-point scale from strongly agree (5) to strongly disagree (1). The Cronbach alpha for the total electronic mind mapping attitude scale was 0.85.

Electronic mind mapping class plan

The third unit of learning theory in the introduction to educational psychology course was prepared based on the electronic mind mapping model and implemented in the experimental group while the control group was taught the same content using traditional methods. The researcher asked the students to create mind maps by using a computer program for the learning theory and to submit them to the researcher after a topic teaching session and gave advice to the students regarding the mind mapping that they had created. The current study was conducted over a period of four weeks. The class met for 45 minute sessions three times a week.

Data collocation and analysis

The participants were chosen and divided into two groups by random selection, the control group being taught the theory of learning subjects with the use of

traditional methods, while the experimental group was taught the subjects of the theory of learning using the electronic mind mapping method. Both the control and experimental groups were given the achievement test and mapping attitudes scale before and after the experiment. Analysis of the study questions used means, standard deviation, independent sample t-test, and ANCOVA.

Results

Based on the data obtained by the achievement test, the students' mean and standard deviation for pre-test scores for the control and experimental groups are presented in Table 1.

Table 1. Means and standard deviation for the results of achievement test pre treatment

Achievement Test	Group	N	Means	S.D	df	t	p
	Control	34	11.96	6.07	63	0.504	0.61
	Experimental	31	12.64	4.74			

As seen in Table 1, the mean score for the control group pretest was 11.96 and standard deviation was 6.07, while the mean score of the experimental group was 12.64 and standard deviation 4.74. Independent sample t-test results showed that there were no significant differences between the control and experimental groups ($t=0.504$, $P=>0.05$) in the achievement test score.

Study question one: Is there any effect of electronic mind mapping methods on student achievement score in the Introduction to Educational Psychology course?

Means and standard deviations of the student achievement scores on the post-test were calculated and they are presented in Table 2.

Table 2. Means and standard deviation for the results of achievement test after treatment

Achievement test	Group	N	Means	S.D
	Control	34	15.93	5.35
	Experimental	31	20.76	4.85

Table 2 shows that there are differences between the control group and the experimental group in the student achievement scores. To determine the signifi-

cance of the differences, ANCOVA was conducted, and the values are presented in Table 3.

Table 3. ANCOVA determining the significance of the differences between the control group and experimental group in achievement scores

Source	Sum of squares	df	Means square	F	Sig.	Partial Eta squared
Achieve 1	730.181	1	730.181	49.869	0.00	.44
Method	313.059	1	313.059	21.381	0.00	.25
Error	907.808	62	14.642			
Corrected total	2016.154	64				

(*Statistical Significance Level of 0.05)

Table 3 shows that there are statistically significant differences in the achievement post-test between the control and experimental groups due to the electronic mind mapping method.

Study question two: Is there any effect of the electronic mind mapping method on student attitudes toward the Introduction to Educational Psychology course?

Means and standard deviations of the student attitudes toward the Introduction to Educational Psychology course scores on the post-test were calculated and the values are presented in Table 4.

Table 4. Means and standard deviation for the results of attitudes toward the Introduction to Educational Psychology course after treatment

Attitudes	Group	N	Pretest		posttest	
			Means	S.D	Means	S.D
	Control	34	24.90	6.39	31.74	10.06
	Experimental	31	27.17	5.21	64.76	16.10

Table 4 shows that there are differences between the control group and the experimental group in the student attitudes toward the Introduction to Educational Psychology course. To determine the significance of the differences, ANCOVA was conducted, whose results are presented in Table 5.

Table 5. ANCOVA determining the significance of the differences between the control group and experimental group in the students' attitudes toward the Introduction to Educational Psychology course

Source	Sum of squares	df	Means square	F	Sig.	Partial Eta squared
Attitudes	835.473	1	835.473	4.813	0.00	0.07
Method	15575.572	1	15575.572	89.726	0.00	0.59
Error	10762.581	62	173.590			
Corrected Total	27173.63	64				

(*Statistical Significance Level of 0.05)

Table 5 shows that there are statistically significant differences in the attitudes toward the Introduction to Educational Psychology course achievement post-test between the control and experimental groups due to the electronic mind mapping method.

Discussion

The study aimed to investigate the effects of electronic mind mapping on student achievement and attitudes to the Introduction to Educational Psychology course. The results showed that there is a statistically significant difference between the two groups in achievement test scores and attitudes in favor of the experimental group.

The mind mapping technique is based on the constructivism concept, which focused on how humans make meaning in relation to the interaction between their experiences and their ideas; mind mapping makes the student become involved in concepts, information and events through discussion, asking questions and obtaining information. Mind maps are student aids in expanding critical and lateral thinking skills, assimilating new information, developing their conceptual schemas and finding solutions through practice.

The experimental group prepared mind maps concerning the unit Learning Theory illustrated means of illustrating and capturing the mental constructions used by the students, and their understanding.

The preparation of mind maps with regard to the learning theory subjects is expected to facilitate and enhance student learning by enabling their correlation of diverse subjects and concepts. One of the various teaching techniques in which the students are actively involved under teacher guidance is the use of constructive

learning in practicing the mind mapping technique, which is thought to be more effective than traditional methods in developing student skills and success in knowledge acquisition and retention.

Although traditionally drawn on white paper using colored pens or pencils, computer technology is used today to create electronic mind maps, which are easy and practical to make, revise, review, and save, as well as producing attractive presentations.

Reporting on the mean achievement scores of students using the mind map technique in science classes in a constructivist learning environment, Dhindsa and Makrimi-Kasim (2007) noted significantly higher scores than those obtained by students who were taught in the traditional manner. Also, Buzan and Buzan (2003) reported that students' achievement in science was improved by using a mind map technique.

Compared to most traditional methods that emphasize "knowledge transmission from expert teacher to novice students", the mind map teaching technique, which involves students' active participation in the learning process, is therefore more student-centered and supports the hypothesis that the mind map technique can improve students' ability to enhance their knowledge-structure organization, and consequently improve their learning outcomes.

However, the valuable result of the mind map teaching technique used in a constructivist learning environment, particularly the students' organization of knowledge, is not yet clearly understood.

Students taught environmental contents with the use of traditional methods often experience difficulty in comprehending some of the concepts and their correlation with related information studied in previous courses. This conclusion is fully supported by the evidence of results from the academic achievement test results, which show that the experimental group students obtained higher grades than those of the control group.

The results of the present study are confirmed by research undertaken by others in the field including Abi-El-Mona & Adb-Ei-Khalick (2008); Amma (2005); Harkirat, Makarimi & Anderson (2011), in which the academic achievement of the students taught with the use of constructive learning techniques based on preparing mind maps is higher than that of the traditionally taught students.

In light of the presented study results, the following relevant suggestions and recommendations are made:

1. Student teachers should be given pre-service training courses in the use of the electronic mind mapping technique; this would be beneficial to both teachers and students.

2. The present study sample consisted of university students, but similar studies are recommended to assess achievement results of younger pupils taught mind mapping using the hand drawing method, as well as students in other grades being taught to use the electronic mind mapping technique.

References

- Abi-El-Mona, I., & Abd-El-Khalick, F. (2008). The Influence of Mind Mapping on Eighth Graders' Science Achievement. *School Science and Mathematics*, 108 (7): 298–312.
- Amma, C. (2005). Effectiveness of Computer Based Mind Maps in the Learning of Biology at the Higher Secondary Level. *Paper presented at the ICDE International Conference, New Delhi*, November, 19–23.
- Balim, A.G., Evrekli, E., & Aydın, G. (2007). "Fen ve teknoloji öğretiminde zihin haritalama tekniği ve mind manager programı uygulamaları" [Mind Mapping Technique and Mind Manager Programme Applications in Science and Technology Teaching] Paper presented at the VII International Educational Technologies Conference in Famagusta, Turkish Republic of Northern Cyprus, May 3–5.
- Biktimirov, E.N., & Nilson, L.B. (2006). Show Them the Money: Using Mind Mapping in the Introductory Finance Course. *Journal of Financial Education*, 32(Fall), 72–86.
- Boley, D.A. (2008). Use of Pre-made Mind Maps to Enhance Simulation Learning. *Nurse Educator*, 33 (5): 220–223.
- Buzan T. (1974). *Using Both Sides of Your Brain* New York: E.P. Dutton.
- Buzan, T., & Buzan, B. (2000). *Mind Map Book* London: BBC Books.
- Buzan, T., & Buzan, B. (2003). *The Mind Map Book*. Rev Ed. London. BBC.
- Dhindsa, H.S. & Makrimi-Kasim. (2007). Constructivist-visual mind mapping teaching approach and science students achievement. In S.M. Stewart, J.E. Olearski, & D. Thompson (Eds), *Proceedings of the 3rd annual conference for middle east teachers of science, mathematics and computing* (pp. 357–372). Abu Dhabi, UAE: METSMaC.
- Edsman, I. (2008). Toolkit for Freelancers. *The Journal of the European Medical Writers Association*, 17 (4), 205–207.
- Evrekli, E., Inel, D., & Balim, A.G. (2010). Development of a Scoring System to Assess Mind Maps. *Procedia – Social and Behavioral Sciences* 2 (2): 2330–2334.
- Farrand, P., Hussain, F., & Hennessy, E. (2002). Efficacy of the 'mind map' study technique. *Medical Education*, 36(5), 426–431.
- Harkirat, S.D., Makarimi, K., & Anderson, O.R. (2011). Constructivist-visual mind map teaching approach and the quality of students' cognitive structures. *Journal of Science and Technology*, 20(2), 186–200.
- Margulies, N. (1991). *Mapping Inner Space: Learning and Teaching Mind Mapping* Zephyr: Tucson.
- Mueller, A., Johnston, M., Bligh, D., & Wilkinson, J. (2002). Joining Mind Mapping and Care

- Planning to Enhance Student Critical Thinking and Achieve Holistic Nursing Care. *International Journal of Nursing Terminologies and Classifications*, 13 (1): 24–27.
- Practor, T. (2002). *Creative Problem Solving for Managers*. London: Taylor & Francis Group E-Library.
- Pressley, M., Van Etten, S., Yokoi, L., Freebern, G., & VanMeter, P. (1998). The meta-cognition of college studentship: A grounded theory approach. In J.D.D.J. Hacker, & A.C. Graesser (Ed.), *Meta-cognition in Theory and Practice* (pp.347–367) Mahwah, N.J.: Erlbaum.
- Rostron, S.S. (2002). *Accelerating Performance: Powerful New Techniques for Developing People* Milford: Kogan Page.
- Streibel, B.J.(2003). *The Manager's Guide to Effective Meetings*. Blacklick: McGraw-Hill Professional.
- Trevino, C. (2005). *Mind Mapping and Outlining: Comparing Two Types of Graphic Organizers for Learning Seventh-grade Life Science*. PhD dissertation, Texas Tech University.
- Warwick, P., & Kershner, R. (2006). Is There a Picture of Beyond? Mind Mapping, ICT and Collaborative Learning in Primary Science” *In Teaching and Learning Primary Science with ICT*, edited by P. Warwick, E. Wilson, and M. Winterbottom, 108–127. Maidenhead: Open University Press/McGraw-Hill.
- Weideman, M., & Kritzinger, W. (2003). *Concept Mapping – A Proposed Theoretical Model for Implementation as a Knowledge Repository* New York: ICT in Higher Education.
- Zhao, Y. (2003). The use of a constructivist teaching model in environmental science at Beijing Normal University. *China Papers*, 2, 78–83.