

## The Impact of Employing Computer-based Concept Mapping on Enhancing Reading Comprehension in EFL College Learners

Assoc. Profesor Abdullah M. Almelhi  
King Khalid University, Saudi Arabia

### Abstract:

The aim of this research was to identify the impact of employing computer-based concept mapping on improving reading comprehension in EFL college students in a reading course for EFL college learners. The sample was comprised of two EFL college students groups, each including 30 male students in a Southern Saudi Arabian university. The experimental group studied the reading course using computer-based concept mapping strategies through IMindMap for presenting the reading passages and themes while the control group studied the same passages and topics in the conventional method. A reading comprehension assessment was applied to both groups after the interventions. Statistical analysis revealed statistically significant differences in the mean scores of both groups ( $\alpha=0.05$ ) on posttesting to the good of the experimental group. Results also indicated a considerable effect size of using electronic concept mapping strategies in improving reading comprehension in EFL college readers. Recommendations for pedagogy included organizing training workshops for EFL language instructors to use CMC strategies and programs to teach reading skills through CMC strategies and advanced organizers. Further research recommendations were forwarded.

**Keywords:** Computer-based concept mapping, reading comprehension , college advanced reading, EFL learners

أثر توظيف استراتيجيات الخرائط المفاهيمية الحاسوبية في تحسين فهم المقروء لدى متعلمي اللغة الإنجليزية في المستوى الجامعي  
د/ عبد الله مفرح آل ملهي

### • المستخلص:

كان الهدف من هذا البحث هو تحديد أثر استخدام خرائط المفاهيم المعتمدة على الكمبيوتر على تحسين فهم المقروء لدى طلاب اللغة الإنجليزية كلغة أجنبية في مقرر القراءة لمتعلمي اللغة الإنجليزية كلغة أجنبية. تألفت العينة من مجموعتين من طلاب اللغة الإنجليزية تضم كل منهما ٣٠ طالبا وطالبة في إحدى جامعات جنوب المملكة العربية السعودية. درست المجموعة التجريبية دورة القراءة باستخدام استراتيجيات خرائط المفاهيم المستندة إلى الكمبيوتر من خلال برمجة IMindMap لتقديم مقاطع وموضوعات القراءة؛ بينما قامت المجموعة الضابطة بدراسة المقاطع والموضوعات نفسها بالطريقة التقليدية. تم تطبيق اختبار الفهم القرائي على كلتا المجموعتين بعد التدخل التجريبي. كشفت نتائج التحليل الإحصائي عن وجود فروق ذات دلالة إحصائية في متوسط الدرجات لكلتا المجموعتين (ألفا = 0.05) في الاختبار البعدي لصالح المجموعة التجريبية. أشارت النتائج أيضاً إلى وجود تأثير كبير في حجم استخدام استراتيجيات خرائط المفاهيم الإلكترونية في تحسين الفهم القرائي لدى طلاب اللغة الإنجليزية كلغة أجنبية. تضمنت التضمينات التربوية تنظيم ورش

عمل تدريبية لمعلمي اللغة الإنجليزية كلغة أجنبية لاستخدام استراتيجيات وبرامج خرائط المفاهيم والمنظمات المتقدمة في تعليم مهارات القراءة من خلال الحاسوب. كما وضعت الدراسة جملة من التوصيات البحثية المستقبلية الأخرى.

الكلمات المفتاحية: استراتيجيات الخرائط المعرفية الحاسوبية، فهم المقروء، المنظمات المتقدمة، طلاب اللغة الإنجليزية كلغة أجنبية

### • Introduction

*Reading comprehension is a significant language skill integral to overall language development; language comprehension is dispensable for all language and thinking skills and it is the ultimate goal of literacy (Ortlieb, 2013). The development of reading comprehension skills is essential for success in academic achievement.*

*EFL instructors in Saudi universities need to improve students' reading comprehension skills in English through employing effective reading comprehension cognitive and metacognitive strategies which not only activate schemata needed to decipher written texts, but also relate current learning to prior learning in structured and semi-structured classroom settings (Chamot, 2005; Oxford, 1990; Sadeghi & Langhroudy, 2012; Vandergrift, 2003; Wenden, 2002; Whittington, 2012).*

*Therefore, researchers, educational psychologists and pedagogues have studied effective strategies to improve reading comprehension. EFL pedagogy has always been after improving and developing language learning skills through following self-directed and permanent learning approaches acquired in the course of reading comprehension. Extant research (e.g., Brown, 2005; Culver, 2008; Murray, 2008; Noronha-Nimmo, 2008; Pan, 2006; Thampradit, 2006; Tapinta, 2006) revealed that effective EFL strategy-based learning can satisfy the needs of language learners and repair their language deficiencies, leading to facilitate learning in EFL settings. Reading comprehension is a complex process that takes place in the human brain. Reading comprehension is possible when learning materials is linked to the learners' life experiences and their prior knowledge, which requires some sort of schematization of graphemes and series of words (Moore & Lo, 2008; Lipson & Wixon, 2009; Zeki, 1993).*

*Available research mostly addressed the difficulties involved in internal mental representations or how schemata activation could be exploited to improve reading comprehension characteristically in EFL conditions, but not noticeably in EFL contexts. Prior research also addressed cognition and meta-cognition processes in other disciplines such as educational psychology or cognitive psychology, but rarely in EFL theory.*

For instance, Zeki (1993) suggested that visual imaging in the brain takes place because of retinal processing and outputting since "Ganglion cells are the sole source of visual input to the rest of the brain. They have center-surround receptive fields." According to Zeki's theory, the brain creates a visual world where visualization and comprehension take place simultaneously. Therefore, concept mapping is a new method that is used for ameliorating and expediting learning and comprehension. Concept mapping can help learners to develop learning autonomy and organize, expedite, retain and retrieve information in effective ways (Buzan & Buzan, 1996).

The use of concept mapping is some sort of advance organizers that assist in mental visualization that helps in reading comprehension, retaining and retrieving information (Buzan & Buzan, 1996; Tucker, Armstrong & Massad, 2010). Concept maps can efficiently be used as scaffolds for higher-order thinking skills (Holzman, 2004). Concept mapping not only helps in improving and organizing learning, but it can also help in enhancing long-term memory retrieval as well as cognitive processing of oral material (Farrand, Hussain & Hennessey, 2002). Previously, concept maps were done manually, but developmentally in a computer age, special software started to be used for computerizing concept mapping. Computerized concept mapping is more professional and attractive (Dara, 2010). Prior research on the effects of concept mapping in the traditional form and the computerized concept mapping indicated that computerized concept mapping has advantages over manually drawn concept maps (Dara, 2010; Nong, Pham & Tran, 2009). Computerized concept maps are more attractive, faster to produce and more professional, and therefore, prior research indicated that computerized concept mapping strategies could be effective in inducing reading comprehension (Stankovic, Besic, Papic & Aleksic, 2011). For instance, Peng (2011) showed that computerized concept maps improve reading comprehension by linking the functions of both brain hemispheres since computerized concept mapping includes word processing, logical processing of language and mathematical analysis. This eventually leads to improving creativity, mental visualization, comprehension, analysis, synthesis and mental imaging (Benavides, Rivera & Rubio, 2010; Siriphanich & Laohawiriyanon, 2010; Liu, Chen & Chang, 2010; Kim & Kim, 2012; Hofland, 2007).

- **Problem of the Study**

The researcher noticed that EFL adult learners are deficient in reading comprehension skills at the college level as is shown in reading courses grades. Guthrie & Klauda (2014) indicated that EFL college students need to develop cognitive processing strategies and techniques

such as computerized concept mapping strategies in order to enhance reading comprehension. Concept mapping using computer software helps relate prior knowledge to current knowledge in a way that helps improve analysis, elaboration, synthesis and evaluation by activating schemata (Siriphanich & Laohawiriyanon, 2010). Most EFL readers cannot link prior knowledge to current information and therefore fail to process new knowledge in effective ways. This study aimed to determine the following research question:

*Are there statistically significant differences between the experimental and control group participants on posttesting to the advantage of the experimental group due to using IMindMap for learning reading through CMC?*

- **Methodology**

- **Design**

*The study is a semi-experimental investigation in which the researcher employed a pretest, post-test control group design.*

- **Participants**

*This study was implemented in two classes per week over a period of one semester. Sixty majors at a southern university located in Southwestern Saudi Arabia were selected to participate in this study by convenience. To investigate the efficacy of different computerized concept maps on their reading comprehension, all participants were divided into two homogeneous groups.*

- **Procedure**

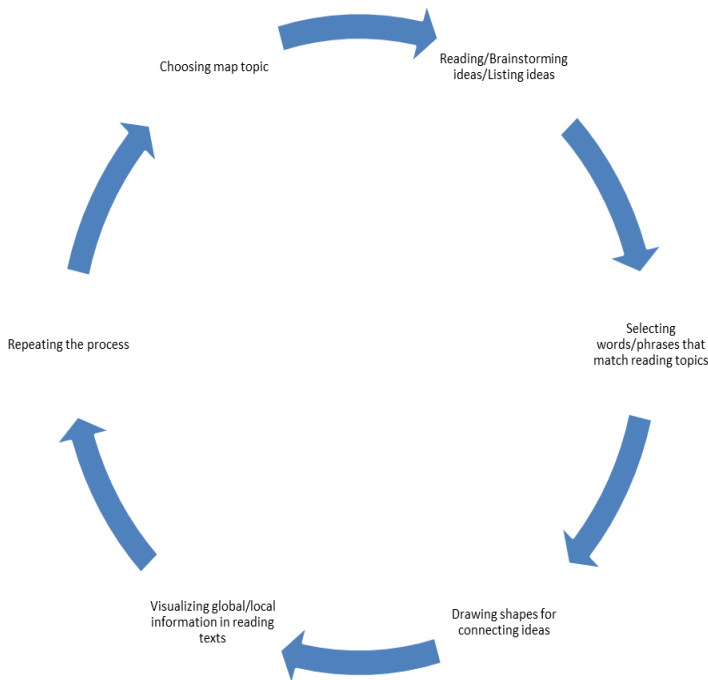
*They were all pretested on a reading comprehension test to obtain baseline scores for later comparison with posttesting mean scores.*

*The first experimental group received instruction into Reading IV, an advanced course in reading comprehension, through IMindMap, a software for generating concept maps. The participants were trained on the basics of IMindMap and they integrated it in their reading assignments in class and in home assignments. There were seven key points made in the teaching procedure:*

- *Decide the general topic or title of the map.*
- *Consider ideas related to the reading passages/assignments*
- *Select the words and phrases that fit in best with the general topic, and that will support the main ideas in the reading passage.*

- Draw and connect these words or phrases to the main topic with a line referring to the relationship.
- Repeat the process of brainstorming and branching for each of the subtopics students highlighted or circled until they form adequate ideas on the reading text to help them fully comprehend the text.
- Use the concept map to organize students' reading comprehension.
- Use the concept maps to refer to the text topics and subtopics as a visualization of global and local information in the reading text as they read and reread it.
- The control group received no-mapping reading instruction in the traditional way.

The instructional model can be shown as follows:



**Figure 1: The instructional model**

After the treatments were completed 10 weeks later, they were posttested on Version B of the Reading Comprehension Test.

- **Literature review**

*IMindMap software for computerized concept mapping learning was first developed by Tony Buzan, a brain researcher, in the 1970s (Buzan, 1977; 2005) as a specialized technique to make notes as brief as possible while being as interesting as possible. Therefore, it was used as a reading comprehension and writing assistant to extract briefings of reading material or brainstorm ideas for writing assignments. As of that time, mind-mapping has proven to be a simple way to make notes in a variety of ways (Brinkmann, 2003), and now millions of people use mind maps for brainstorming, project planning, decision making, and document drafting.*

*Thus, mind-mapping started to be employed as an effective way to get information into the human brain. It is a creative and logical means of recording and noting that literally "trains" our ideas (Buzan, 2005). The Mind Map also clearly shows how the points are linked together (Khoo, 2006).*

*Since the process of building a mind map engages the learner with the content, it is an active learning strategy that can be used during the lesson instead of traditional lectures (Willis and Miertschin, 2006). Using IMindMap software for mind mapping, students can be more actively involved in their learning process (Edwards and Cooper, 2010), improving students' critical thinking (Mueller et al., 2002). It is also important to pay attention to the use of symbols and symbols in mind maps.*

*To clarify the reasons that students become competent to hold self-confident presentations without notes can be traced back to mental mind mapping (Mento et al., 1999), since mind mapping combines not only words but also symbols and icons with specific key points.*

*Remarkably, mind mapping is also a technique for group-work brainstorming, as in reading or writing instruction, especially for adult learners, as ideas can be made as good as possible without interfering with the hierarchy of search engines (Murley, 2007). In addition, IMindMap software can be employed as a teaching tool and for the preparation and review of lectures. The technique allows quick writing and reviewing of notes. (Edwards and Cooper, 2010). An original and useful Mind Map will be created and given to students as a summary for the upcoming semester, tutorial or lecture. (Edwards and Cooper, 2010). Alternatively, reading instructors can train their students to receive, retain and retrieve relevant information from reading texts as they use ImindMap software for computerized concept mapping in reading classes. Mind mapping can display reading comprehension*

global and local information in the form of PowerPoint presentations (Murley, 2007).

• **Results**

The research question was to investigate the effectiveness of the computerized concept mapping versus traditional reading instruction treatments on the reading comprehension of the learners of different writing proficiencies.

The following table shows the participants' mean scores and standard deviations on pretesting and posttesting of reading comprehension.

*Table 1: Mean scores and standard deviations on reading comprehension pretesting.*

| Group        | Pretesting scores |        |      | Posttesting scores |      |               |           |
|--------------|-------------------|--------|------|--------------------|------|---------------|-----------|
|              | No                | Mean   | SD   | Mean               | SD   | Adjusted Mean | STD Error |
| Control      | 30                | 14.833 | 2.94 | 17.233             | 3.18 | 17.312        | 0.54      |
| Experimental | 30                | 15.167 | 3.21 | 19.667             | 3.31 | 19.588        | 0.54      |

The mean scores on posttesting for the experimental group were greater than those for the control group. To discover the statistical significance of these differences, ANCOVA was used the results of which are below summarized:

*Table 2: ANCOVA results.*

| Source of Variation | Type II Sum of Squares | df | Mean square | F      | Sig.  | Partial Eta Squared |
|---------------------|------------------------|----|-------------|--------|-------|---------------------|
| Pretest (Covariate) | 121.237                | 1  | 121.237     | 14.080 | 0.000 | 0.198               |
| Group               | 77.508                 | 1  | 77.508      | 9.002  | 0.004 | 0.136               |
| Error               | 490.797                | 57 | 8.610       |        |       |                     |
| Total               | 700.850                | 59 |             |        |       |                     |

ANCOVA results showed in Table 2 above indicate that there are statistically significant differences ( $\alpha=0.05$ ) between the experimental and control groups. By comparing the mean scores for both groups, the results show that the improvement occurred in the experimental group due to using computerized concept mapping.

For the effect size, Eta Squared value ( $\eta^2$ ) reached 0.1267, a value that indicates an average effect size, given total variance of the covariate (i.e., using IMindMap for computerized concept mapping in reading instruction). The value of  $\Delta(d)$  was found out to be 0.751, which indicates a considerably big effect size.

• **Conclusion**

Recently, EFL college students expect to use more digital media applications in everyday lives for their learning and these smart

*applications should be seamlessly integrated into their classroom experience. With this software, iMindMap for computerized concept mapping, EFL students can learn that reading is an exciting experience, and they would be able to visualize the entire reading text content remarkably. As a result, the learning process could be more interesting and entertaining, where it attracts students who are visual, auditory or kinesthetic learners. Indisputable, with iMindMap in the class, reading instruction can really impact the teaching and learning process through its ability to adapt to the learning styles of different students. Therefore, this study strongly recommends the use of iMindMap in class to improve the learning process of the new generation.*

*Since this study is only a semi-experimental investigation, it was limited to only one small population of EFL students, some selected topics of the reading curriculum and a specific computer mind-mapping tool. That's why, prospective research can be extended by applying the experimental research method.*

*In addition, future research can also analyze the impact of using iMindMap on student performance, both in the exam and in the exam the understanding of the reading topics, global understanding, local understanding and application of specific reading comprehension skills.*

• **References**

- Benavides, S., Rivera, F., & Rubio, M., (2010). Improving reading comprehension skills by using mind mapping software with students of bachelor's degree in English attending reading and writing in English II course. (Master thesis) Universidad de Oriente UNIVO. San Miguel, El Salvador.
- Brinkmann, A. (2003). Graphical knowledge display – mind mapping and concept mapping as efficient tools in mathematics education. *Mathematics Education Review*, 16, 35-48.
- Brown, Cindy (2005). An investigation of the influence of metacognition, reading comprehension skill, and background knowledge on studying. Unpublished PhD, Columbia University, Proquest, AAT 3159724.
- Buzan, T. (1977). *Making the Most of Your Mind*. Pan Book.
- Buzan, T. (2005). *The Ultimate Book of Mind Maps*. Thorsons, London.
- Buzan, T., & Buzan, B. (1996). *The mind-mapping book: How to use Radiant Thinking to maximize your brain's untapped potential*. London: BBC.



- Chamot, A. (2005). The Cognitive Academic Language Learning Approach (CALLA): An update. In P. Richard-Amato and M. Snow (eds), *Academic Success for English Language Learners* (pp. 87-101). White Plains, NY: Longman.
- Culver, Tiffany Fawn (2008). An investigation of study guides and quizzes to improve college students' reading compliance, comprehension, and metacognitive strategies. Unpublished PhD, Mississippi State University, Proquest Database, AAT 3315169.
- Dara, C. (2010). Hand Drawing Vs. Using Software Mind Mapping. Retrieved February 21, 2013 from <http://www.isoftwarereviews.com/hand-drawingvs-using-software-mind-mapping/>
- Edwards, S. and Cooper, N. (2010). Mind mapping as a teaching resource. *The Clinical Teacher*, 7(4), 236-239.
- Farrand, S., Hussain, F. & Hennessy, E. (2002). The efficacy of the mind map study technique. *Journal of Medical Educational*. 36(5), 426-431. Retrieved October 12, 2013 from
- <http://www.thinkbuzan.com/uk/articles/mindmappingworks>
- Guthrie, J., & Klauda, S.L. (2014). Effects of classroom practices on reading comprehension, engagement, and motivations for adolescents. *Reading Research Quarterly*, 49(4), 387-416.
- Hofland, C. (2007). Mind-mapping in the EFL classroom. Fontys Hogescholen: Fontys Teacher Training College Sittard.
- Holzman, S (2004). Thinking maps: Strategy-based learning for English language learner. Annual Administrator Conference 13th Closing the Achievement Gap for Education Learner Student, Sonoma Country Office of Education, California Department of Education.
- Khoo, A. (2006). *I Am Gifted, So Are You*. Marshall Cevendish Editions.
- Kim, S. Y., Kim, M. R. (2012). Kolb's Learning Styles and Educational Outcome: Using Digital Mind Map as a Study Tool in Elementary English Class. *International Journal for Educational Media and Technology*, 6(1), 4-13.
- Lipson, M., & Wixson, K. (2009). *Assessment and instruction of reading and writing difficulties, An interactive approach*. 4th Edition, Pearson Boston.
- Liu, P.L., Chen, C.J., & Chang, Y.J. (2010). Effects of a computer-assisted concept mapping learning strategy on EFL college students' English reading comprehension. *Computers & Education*, 54 (2), 436-445.

- Mento, A.J., Martinelli, P. and Jones, R.M. (1999). Mind mapping in executive education: applications and outcomes. *Journal of Management Development*, 18(4), 390-416.
- Moore, C., & Lo, L. (2008). Reading comprehension strategy: Rainbow dots. *The Journal of the International Association of Special Education*, 9(1). 124 -127.
- Mueller, A., Johnston, M., Bligh, D. and 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.
- Murley, D. (2007), "Technology for everyone ...: mind mapping complex information", *Law Journal Library*, 99 (1), 175-183.
- Murray, Bettina Patterson (2008). Prior knowledge, two teaching approaches for metacognition: Main idea and summarization strategies in reading. Unpublished PhD, Fordham University, Proquest database, AAT 3302116.
- Nong, B., Pham, T., & Tran, T. (2009). Integrate the digital mind-mapping into teaching and learning psychology. *Teacher Training Component – ICT. Vietnam*
- Noronha-Nimmo, Alda (2008). Effectiveness of skills- versus metacognitive strategy-based approaches on reading comprehension of college developmental students. Unpublished EdD, Florida International University, Proquest database, AAT 3319014.
- Ortlieb, E. (2013). Using Anticipatory Reading Guides to Improve Elementary Students' Comprehension. *International Journal of Instruction*, 6 (2), 145 -162.
- Oxford, R. (1990). *Language learning strategies: What every teacher should know*. New York: Newbury House Publishers.
- Peng, S. (2011). The effect of combining mind map and electronic picture-books on fourth-graders' reading comprehension ability and reading motivation. (Master's thesis). Taiwan: National Pingtung University of Education.
- Sadeghi, K. & Langhroudy, A. (2012). General and Specific Cognitive/Metacognitive Reading Strategies Used by Field-Dependent/Independent Iranian EFL Learners. *Dil ve Edebiyat Egitimi Dergisi*, 1 (3), 17-35.
- Siriphanich, P. & Laohawiriyanon, C. (2010). Using Mind Mapping Technique to Improve Reading Comprehension Ability of Thai EFL University Students. A paper presented in the 2nd International Conference on Humanities and Social Sciences April 10th, 2010

Faculty of Liberal Arts, Prince of Songkla University strategic teaching. Retrieved May 29, 2014 from

- <http://fs.libarts.psu.ac.th/research/conference/Proceedings2/article/4pdf/001.pdf>
- Stankovic, N., Besic, C., Papic, M., & Aleksic, V. (2011). The evaluation of using mind maps in teaching. *Technics Technologies Education Management*, 6 (2), 337-343.
- Tapinta, Pataraporn (2006). Exploring Thai EFL university students' awareness of their knowledge, use, and control of strategies in reading and writing. University of North Texas, Unpublished PhD, University of North Texas, Proquest, AAT 3254227.
- Tucker, J. M., Armstrong, G. R., & Massad, V. J. (2010). Profiling the mind map user: A descriptive appraisal. *Journal of Instructional Pedagogies*, 2(4), 1-13.
- Vandergrift, L. (2003). Orchestrating strategy use: Towards a model of the skilled L2 listener, *Language Learning*, 53: 461-94
- Wenden, A. (2002). Learner development in language learning. *Applied Linguistics*, 23: 32-55.
- Whittington, M. (2012). Motivating adolescent readers: A middle school reading fluency and prosody intervention. Trevecca Nazarene University, ProQuest, UMI Dissertations Publishing.
- Willis, C.L. and Miertschin, S.L. (2006). Mind maps as active learning tools. *Journal of Computing Sciences in Colleges*, 21(4), 266-272.
- Zeki, S. (1993). *A Vision of the brain*. London. Oxford Blackwell Scientific Publication.

