



## IMPROVING KNOWLEDGE RETENTION VIA ESTABLISHING BRAIN-BASED LEARNING ENVIRONMENT

**Gülten Koşar<sup>1i</sup>,  
Hasan Bedir<sup>2</sup>**

<sup>1</sup>Department of Foreign Languages/  
Social Sciences University of Ankara,  
Hükümet Meydanı No: 2 Ulus, Ankara, Turkey

<sup>2</sup>Department of English Language Teaching/  
Çukurova University, Çukurova Üniversitesi  
Rektörlüğü 01330 Balcalı, Sarıçam, Adana, Turkey

### **Abstract:**

This study aims at investigating the impact of brain-based learning on the retention of English language knowledge amongst young adult learners. The participants were subjected to an intervention in brain-based learning principles for approximately four and a half months. The results of the proficiency exams administered at the beginning of and following the intervention were analysed in an effort to explore whether brain-based learning intervention exerts impact on the improvement of participants' proficiency in English. With a view to examining knowledge retention, the results of the retention exam administered six months after the post-proficiency exam were analysed. An interview was conducted both after the post-proficiency and the retention exam to gain insights into the participants' views of the brain-based learning intervention. The findings attained from the analysis of both quantitative and qualitative data yield that establishing a learning environment compatible with brain-based learning principles enables knowledge retention.

**Keywords:** English language learning, brain-based learning, knowledge retention, young adult learners

### **1. Introduction**

Recent years have seen an upsurge of interest in learner-centeredness which has marked a paradigm shift in the world of education (Brown, 2003; Harrington & Gabert-

---

<sup>i</sup> Correspondence: email [gencoglugulten@gmail.com](mailto:gencoglugulten@gmail.com)

This study reports on the partial findings of the PhD dissertation entitled "The Influence of Brain-Compatible Learning on English Language Proficiency of Adult Learners" and authored by the first author.

Quillen, 2015; McCombs, 1997, Milambiling, 2002; Richmond, Morgan, Slattery, & Venzke, 2013; Richmond, Slattery, Morgan, Mitchell, & Becknell, 2016b; Saville, Zinn, Brown, & Marchuk, 2010; Weinberger & McCombs, 2001); that is to say, taking into account, learner characteristics, engaging students in the learning process, and promoting collaboration among students have been brought into the forefront. Keeping in sight the rising popularity of learning, comprehending what it encompasses appears to be of high significance. Brain-based learning approach conceives learning as an active process in which creativity is fostered through challenges (Lucas, 2003). Learning involves a permanent change in behaviour (Domjan, 1998; Flaharty, 1985; Gordon, 1989) resulting from constructing knowledge through drawing on experience and practice; knowledge retention, hence, is an integral part of learning now that constructed knowledge cannot be used when needed unless it is retained. Besides, Houston (2001) claims that retention process cannot be thought separately from the learning process. Knowledge retention is also instrumental in English language learning given that expanding vocabulary repertoire or capability of recalling appropriate expressions in a new context is essential in order for having a good command of English.

## **2. Literature Review**

### **2.1 Knowledge Retention**

High degree of attention to be attached to knowledge retention in English language learning could be elucidated by taking into consideration the ease to forget what is learned. Dwelling on two different types of memory might help understand what is required for knowledge retention to take place. When a stimulus is perceived, it is first routed to primary memory with short-term storage. As long as adequate rehearsal takes place, long-term storage can be ensured. Review of literature reveals that the necessity of rehearsal for the transfer of the newly acquired knowledge from short term memory to long term memory is highlighted particularly in information-processing approach to memory. (Allison, 2014). Attention and noticing plays a crucial role to encode stimulus into long term memory and attention is put forth as a prerequisite for learning to occur by scholars such as Schmidh (2001). Knowledge retention could be enabled so long as students engage in learning through collaboration and are actively engaged in the learning process, and through chunking, word associations, recall by category, stimulus or cue selection, verbal and visual coding (Allison, 2014). The studies in which the impact of cooperative learning has been investigated reveal that cooperative learning enables knowledge retention (Eskitürk, 2009; Moore, 2008; Slavin, 2011; Tran, 2014; Webb, 2008). In addition, the study conducted by Korkmaz Toylucu and Tay (2016) reports that cooperative learning and systematic teaching enable knowledge retention in social studies. Given the findings of these studies, the way teaching is carried out in classes is a precursor of whether students can retain what is covered in lessons. One of the approaches that can be resorted to on the purpose of stimulating knowledge retention is brain-based learning approach in that the principles through which brain-

based learning is applied to classroom environment could support students in retaining knowledge (Lucas, 2003).

## 2.2 Brain-based Learning

Brain-based learning has been considered as one of the salient topics of the 21st century (Aldridge, 2012), and this increase in the interest in brain-based learning approach can make sense providing the initiatives embarked on by the proponents of brain-based learning to build a bridge between educational practices and how the brain learns are kept in sight. Brain-based learning has been defined as calibrating teaching in accordance with the way the human brain naturally learns (Caine & Caine, 1994, p. 44). Since brain-based learning could optimize student learning, last 30 years have witnessed several scholars having carried out research into the impact of brain-based learning on improving students' knowledge of different subjects areas including English language learning (Akyürek & Afacan, 2013; Baş, 2010; Bello, 2007; Blackburn, 2009; Duman, 2010; Getz, 2003; Huang, 2006; Lucas, 2003; McNamee, 2011; Özden & Gültekin, 2008); Rehman, 2011; Saleh, 2011).

The 12 brain-based learning principles introduced into the literature by Caine & Caine (1994) are addressed in order to set up an environment where knowledge retention could be achieved. Besides proposing the principles rooted in brain-based learning, Caine & Caine (2000) have identified the implications of the principles for education, which are demonstrated in Table 1 below.

**Table 1:** 12 Brain-Based Learning Principles and Their Implications for Education

No	Principle	Implication for education
1.	All learning engages the physiology.	Use of different senses and body
2.	The brain/mind is social.	Stimulating social interaction
3.	The search for meaning is innate.	Enhancing comprehension by taking into account learners' interests purposes, and ideas
4.	The search for meaning occurs	Perceiving and creating patterns through patterning and associating new patters with what they already understand.
5.	Emotions are critical to patterning	Eliciting appropriate emotions before, during and after their experiences with a text.
6.	The brain/mind processes parts	Embedded details into wholes and wholes simultaneously and parts.
7.	Learning involves both focused	Deepening students' attention and peripheral perception and learning from the context unconsciously
No	<b>Principle</b>	<b>Implication for education</b>
8.	Learning is both conscious and unconscious.	Giving sufficient time to reflect on and process experiences.
9.	There are at least two approaches to memory.	Engaging in multiple ways to remember.
10.	Learning is developmental	Taking into account individual differences in maturation, learning and prior experiences.
11.	Complex learning is enhanced by and/or	Supportive, empowering and challenge and

	fatigue.	inhibited by threat intrinsically challenging associated with helplessness environment.
12.	Each brain is uniquely organized.	Integrating individual talents into teaching

As seen in Table 1, *the brain/mind is social, organizing and categorizing newly learned information and the search for meaning is innate* are among the principles proposed by Caine and Caine (1994), which could contribute to knowledge retention in English language classes. In addition, the place of emotions in patterning and learning has been highlighted in one of the principles, which could occupy a central place in stimulating knowledge retention. The principles of *associating what is newly learned with the already existing ones* may stimulate knowledge retention as well, in that it promotes making sense out of new experiences via addressing background knowledge.

Apart from the studies exploring the effect of brain-based learning principles on different subject areas, review of the related literature depicts that a number of research has been done heretofore so as to depict teachers' and learners' perceptions of brain-based learning (Acvı & Yağbasan, 2010; Burkett; 2014; Martin, 2006; Muscella 2014; Wachob, 2012, Weimer, 2007). The literature, nevertheless, entails scarce research (Baş, 2010; Huang, 2006) that has been conducted with a view to investigating the influence of brain-based learning on improving learners' proficiency in English, and no research aiming at investigating the impact of brain-based learning approach on the retention of English language knowledge, which has been the motive for the researcher to conduct this research.

### 3. Methodology

This study, which was conducted with the participation of 27 young adult learners aged 18-21, employs a mixed-methods research design. The participants were enrolled in prep-school education in a state university and exposed to 19 hours of English lesson every week. The lessons the students attended were planned under the light of the brain-based learning principles introduced proposed by Caine & Caine (1994). In order to ascertain that the lessons were designed in accord with the principles, two experts in this field were asked to evaluate the appropriateness of five lesson plans to brain-based learning approach. In addition, two lessons were observed by one of the experts to examine how brain-based learning principles were implemented in the classroom environment, and twenty lessons were video recorded to reflect on the way brain-based learning principles were employed and gain deeper insights into the students' reactions towards the applied principles. The participants were taught in accord with brain-based learning principles for four and half months. The students took a proficiency exam at the beginning of the intervention. Following the intervention, the participants took the post-proficiency exam, and then, an interview was carried out to unearth participants' perceptions of the brain-based learning intervention. Six months after the post-proficiency exam the retention exam was administered. To find out whether there was a change in the participants' views on the brain-based learning intervention and to reveal participants' thoughts about if the brain-based learning intervention could enable

knowledge retention, another interview was conducted. The results attained from the pre- and post-proficiency exam were analysed by paired samples t-test to investigate whether there was improvement in the participants' English language proficiency subsequent to the intervention. On the purpose of exploring the impact of the intervention in brain-based learning principles on the participants' knowledge retention the results of the post-proficiency and retention exam were compared by using paired samples t-test. Besides, Maxqda 11 was employed for the content analysis of the interviews administered subsequent to both the post-proficiency and retention exam.

#### 4. Results and Discussion

The results of the pre- and post-proficiency exam were compared to each other to find out if there was an increase in the participants' proficiency level following the intervention. Table 2 demonstrates the results.

**Table 2:** Comparison of the Pre- and Post-Proficiency Exam Results

Exam	N	M	Sd	df	t	p
Pre	27	43.2326	2.34248	26	-24,799	,000
Post	27	77.9815	7.25958			

As displayed in Table 2, p value .000 indicates a statistically significant difference between the pre- and post-proficiency exam results, which means that participants' proficiency in English increased subsequent to the brain-based learning intervention. The study conducted by Baş (2010) reveals similar results in that experimental group participants having been taught in accord with brain-based learning principles in English language classes outperformed control group participants in the post test. Another research carried out by Huang (2006) reports a positive correlation between employing brain-based learning strategies and students' achievement levels in English. The influence exercised by brain-based learning on writing skill has also been investigated in a study by Hoge (2002), the findings of which reveal that setting a brain-based learning environment helps students become better writers. The study conducted by Cowan (2009) in order to examine the influence of brain-based reading programme on students' reading skill reports the positive impact of the reading programme designed in accordance with brain-based learning on participants' reading skills. Likewise, the studies done in subject areas other than English language teaching (Bellah et al., 2008; Bello, 2007; Duman, 2010; Rehman, 2011; Saleh, 2011) reveal the increase in student learning following brain-based learning intervention. Contrary to the studies depicting improvement in participants' knowledge of target subject areas, the findings attained from the analysis of the data in the study conducted by McNamee (2011) show that brain-based learning intervention does not have an impact on students' reading achievements as a statistically significant difference does not exist between the control and experimental group. The researcher explains the insignificant difference between the experimental and control group by the absence of sensitive assessment measures.

The interview conducted after the post-proficiency exam provides information concerning the participants' views of the brain-based learning intervention. Table 2 below displays the findings attained from the content analysis of the participants' responses.

**Table 3:** Participants' Views of the Brain-Based Learning Intervention

Category	N	%
More effective than traditional methods	22	81.5
More logical learning method	2	7.4
Teaches how to learn English	2	7.4
More enjoyable	1	3.7

As shown in Table 3, an overwhelming number of the participants, 22 participants, stated that the brain-based lessons were more effective in comparison to the traditionally conducted lessons they had attended before being taught in accordance with brain-based learning principles. 7.4% of the participants remarked that since brain-based learning was more logical, the intervention was effective for them. Another 7.4% of the participants denoted that they learnt how to learn English by means of the brain-based learning intervention, and thus, they thought that the intervention in brain-based learning was efficient. One of participants noted that the brain-based learning intervention was efficient in that the brain-based lessons were more enjoyable. The findings related to the participants' perceptions of the brain-based learning intervention are similar to the studies aiming to explore students' perceptions of brain-based learning. In the research carried out by Weimer (2007), and Avcı and Yağbasan (2010), the findings indicate that the participants had positive views about brain-based learning because engaged learning and students' active participation is enabled by brain-based learning.

The results of the post proficiency and delayed exam were analysed on the purpose of seeking an answer to the research question of whether brain-based learning could enable knowledge retention. Table 4 below displays the numerical values attained from the analysis.

**Table 4:** Comparison of the Post-Proficiency and Retention Exam Results

Exam	N	M	S	sd	t	p
Post-Proficiency	27	77.98	7.260	26	-.447	.658
Retention	27	78.72	6.952			

Table 4 demonstrates that there is not a big difference between the mean values for the post-proficiency and retention exam, 77.98 and 78.72 respectively. A slight decrease in standard deviation value for the retention exam can be seen in Table 4 because it is 7.260 for the post-proficiency exam, but 6.952 for the retention exam. The p value .658 indicates that no statistically significant difference is found between the participants' performance on the post-proficiency and retention exam. The p value shows that brain-based learning principles can be employed by teachers and learners as a method to enable knowledge retention. Weimer (2007) is one of these researchers conducting a

study on the perceptions of middle school teachers and learners of brain-based learning regarding its influence in accomplishing the long-term memory enhancement. The findings yielded by mixed methods research design revealed the parallelism between the learners and teachers' perceptions of brain-based learning as a means of augmenting long-term memory enhancement.

With the purpose of unearthing participants' views of whether brain-based learning intervention can enable knowledge retention, an interview was conducted with the participants after the retention exam. In the interview, all the participants stated that the brain-based learning intervention enabled knowledge retention. Another question asked in the interview aimed at finding out if the participants wanted to continue applying brain-based learning principles. The students responded as "yes" and the following question was why they wanted to continue learning English by resorting to brain-based learning principles. Table 5 shows the content analysis of students' responses.

**Table 5:** Reasons for Continuing Applying Brain-Based Learning Principles

Category	N	%
More effective	16	59.3
Enables retention of knowledge	9	33.3
Increases motivation	1	3.7
Increases concentration	1	3.7
Total	27	100

As seen in Table 5, 9 of the students pointed out that because brain-based learning enables knowledge retention, they would like to go on applying brain-based learning principles. 16 out of 27 participants pointed out that they would continue employing brain-based learning principles because of their being more effective than traditional teaching methods. Increased level of motivation and concentration enabled by brain-based classroom environment has been verbalized as the two other reasons for the projected use of brain-based learning principles.

The statistical analysis of the qualitative and quantitative data reveals that brain-based learning intervention enables knowledge retention. Due to the scarcity in the number of the research into whether brain-based learning approach leads to knowledge retention, it is not possible to compare the findings of this study with those of others.

## 5. Recommendations

Further research in which participants are from different age groups is also required to compare the impact of brain-based learning on young and adults learners' English language proficiency. Particularly the ones young learners will take part may produce innovative results in the field of English language teaching as so long as the results indicate the positive influence of brain-based learning on improving proficiency in English and knowledge retention, young learners could demonstrate a tendency to

continue employing brain-based learning principles in the following years of their education life.

## 6. Conclusion

The purpose of this study was to examine the probable impact of brain-based learning approach on young adult learners' English language knowledge retention. The findings revealed that orchestrating teaching in accordance with brain-based learning principles helped the participants retain the knowledge they were exposed to during the intervention. This study could motivate researchers and practitioners to conduct similar studies for the major criticism, in Turkish context, regarding English language teaching is students' incapability to remember what they learn when necessary even only after a short period of time. This study, in the light of the findings, revealed that making amendments in teaching practices according to brain-based learning principles might enable retention of knowledge.

## References

1. Allison E S, 2014. Memory retention in second language acquisition and instruction: Insights from literature and research. *The IAFOR Journal of Language Learning*, 1(1), 1-13.
2. Avcı D E, Yağbasan R, 2010. The views of students related to brain-based learning. *Kastamonu Eğitim Dergisi*, 18(1),1-18.
3. Baş G, 2010. Effects of brain based learning on students' achievement levels and attitudes towards English lesson. *Elementary Education Online*, 9(2), 88-507.
4. Bellah K A, Robinson J S, Kaufman E K, Akers C, Wittler H, Martindale L, 2008. Brain-based learning: A synthesis of research. *NACTA Journal*, 15-22.
5. Bello D M, 2007. The effect of brain-based learning with teacher training in division and fractions in fifth grade students of a private school. PhD Thesis, Capella University.
6. Brown D M, 2003. Learner-centered conditions that ensure students' success in learning. *Education*, 124, 99-104.
7. Burkett L, 2014. Brain-based learning: A study on how teachers implement strategies in the traditional classroom. PhD Thesis, Capella University.
8. Cowan W, 2009. Brain-based reading model for students who struggle with reading. PhD Thesis, Walden University.
9. Caine R N, Caine G, 1994. *Making connections: Teaching and the human brain*, New York: Innovative Learning Publications.
10. Caine R N, Caine G, 2000. 12 brain/mind natural learning principles. Retrieved February 12, 2014, from <http://www.cainelearning.com/wp-content/uploads/2014/04/12-Brainmind-principles-expanded.pdf>.



11. Domjan M, 1998. *The principles of learning and behaviour*, Pacific Grove, CA: Brooks/Cole.
12. Eskiturk M, 2009. The effect of cooperative learning activities which take the base critical thinking ability to academic success in social science lesson. MA Thesis. Canakkale Onsekiz Mart University.
13. Flaharty C, 1985. *Animal learning and cognition*, New York: Knopf.
14. Gordon W C, 1989. *Learning and Memory*, Pacific Grove, CA: Brooks/Cole.
15. Harrington C M, Gabert-Quillen C A, 2015. Syllabus length and use of images: An empirical investigation of student perceptions. *Scholarship of Teaching and Learning in Psychology*, 1, 235–243. <http://dx.doi.org/10.1037/stl0000040>
16. Hoge P T, 2002. The integration of brain-based learning and literacy acquisition. PhD Thesis, Georgia State University.
17. Houston J P, 2001. *Fundamentals of learning and memory*, 4th ed, Fort Worth, TX: Harcourt Brace Jovanovich College Publishers.
18. Huang H Y, 2006. Brain-based strategies used to teach English as a foreign language (EFL) in Taiwan high schools, colleges, and universities. PhD Thesis, Spalding University.
19. Korkmaz T S, Tay B, 2016. The Effect of Cooperative Learning Method and Systematic Teaching on Students' Achievement and Retention of Knowledge in Social Studies Lesson. *Eurasian Journal of Educational Research*, 66.
20. Lucas R W, 2003. *The creative training idea book*, New York: American Management Association.
21. Martin K E, 2006. Perceptions of brain based learning from principals in the Bulloch county school system. PhD Thesis, Union Institute & University, Georgia.
22. McCombs B L, 1997. Self-assessment and reflection: Tools for promoting teacher changes toward learner-centered practices. *National Association of Secondary School Principals. NASSP Bulletin*, 81, 1-14.
23. McNamee M M, 2011. The impact of brain-based instruction on reading achievement in a second-grade classroom, PhD Thesis, Walden University.
24. Milambiling J, 2001. More than talk: A proposal for TESOL teacher education. *TESOL*, 10, 3-4.
25. Moore K D, 2008. *Effective instructional strategies: From theory to practice*, Thousand Oaks, CA: Sage Publications.
26. Muscella M W, 2014. Educators' perceptions of brain-based learning instruction within the diverse middle school inclusive classroom, PhD Thesis, North Central University.
27. Rehman A U, 2011. Effectiveness of brain-based learning method and conventional method in the teaching of mathematics at secondary level in Pakistan: An experimental study, PhD Thesis, International Islamic University.
28. Richmond A S, Boysen G A, Gurung R A R, Tazeau Y N, Meyers S A, Scitutto M J, 2014. Aspirational model teaching criteria for psychology. *Teaching of Psychology*, 41, 281–295, doi:10.1177/0098628314549699

29. Richmond A S, Boysen G A, Gurung R A R, 2016a. *The model teacher: An evidence-based guide for college and university teaching*, New York: Routledge.
30. Richmond A S, Morgan R K, Slattery J, Venzke B, 2013. How learner-centered are project syllabus syllabi? Poster presented at the annual convention of the American Psychological Association, Honolulu, HI.
31. Saleh S, 2011. The effectiveness of the brain based teaching approach in dealing with problems of form four students conceptual understanding of Newtonian physics. *Asia Pacific Journal of Educators and Education*, 26(1), 91-106.
32. Saville B K, Zinn T E, Brown A R, Marchuk K A, 2010. Syllabus detail and students' perceptions of teacher effectiveness. *Teaching of Psychology*, 37, 186-189.
33. Schmidt R, 2001. Attention. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 3-33), Cambridge, UK: Cambridge University Press.
34. Slavin R E, (2011). *Instruction Based on Cooperative Learning*. In R. E. Mayer & P. A. Alexander (Eds.), *Handbook of Research on Learning and Instruction* (pp. 344-360), New York: Taylor & Francis.
35. Wachob D A, 2012. Public school teachers' knowledge, perception and implementation of brain-based learning practices, PhD Thesis, University of Pennsylvania, Indiana.
36. Webb N M, 2008. Learning in small groups. In T. L. Good (Ed.), *21st Century education: A reference handbook* (pp. 203-211), Los Angeles: Sage.
37. Weimer C, 2007. Engaged learning through the use of brain-based teaching: A case study of eight middle school classrooms, PhD Thesis, Northern Illinois University.
38. Weinberger E, McCombs B L, 2001. The Impact of Learner-Centered Practices on the Academic and Non-Academic Outcomes of Upper Elementary and Middle School Students. Paper presented at the American Educational Research Association, Seattle.
39. Tran V D, 2014. The effects of cooperative learning on the academic achievement and knowledge retention. *International Journal of Higher Education*, 3(2), 131-140

Creative Commons licensing terms

Authors will retain the copyright of their published articles agreeing that a Creative Commons Attribution 4.0 International License (CC BY 4.0) terms will be applied to their work. Under the terms of this license, no permission is required from the author(s) or publisher for members of the community to copy, distribute, transmit or adapt the article content, providing a proper, prominent and unambiguous attribution to the authors in a manner that makes clear that the materials are being reused under permission of a Creative Commons License. Views, opinions and conclusions expressed in this research article are views, opinions and conclusions of the author(s). Open Access Publishing Group and European Journal of Physical Education and Sport Science shall not be responsible or answerable for any loss, damage or liability caused in relation to/arising out of conflict of interests, copyright violations and inappropriate or inaccurate use of any kind content related or integrated on the research work. All the published works are meeting the Open Access Publishing requirements and can be freely accessed, shared, modified, distributed and used in educational, commercial and non-commercial purposes under a [Creative Commons attribution 4.0 International License \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/).