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Brain-Compatible Learning: A Medium for Improving Proficiency in English

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ABSTRACT

The purpose of this study employing a pre-test post-test control group research design is to investigate the impact of the intervention in brain-compatible learning principles on young adult learners' proficiency in English. The study was carried out with the participation of 53 university preparatory students aged 18-21. So as to elucidate the influence of the brain-compatible learning intervention on participants' English language proficiency, the participants in the experimental group attended 300 English lessons planned in accordance with brain-compatible learning principles while the control group was simultaneously taught in accord with traditional teaching methods. The results of the proficiency exam administered at the outset of the study and the one conducted at the end of the intervention were used in order to explore whether any differences regarding English language proficiency between the experimental and control group occurred following the intervention. A semi-structured interview was conducted with the experimental group participants to learn about their perceptions of the brain-compatible learning intervention. The findings obtained from the analysis of the exam results reveal that the experimental group outperformed the control group in the post-proficiency exam, which indicates that implementing brain-compatible learning principles in lessons can enable students to improve their proficiency in English more. The analysis of the responses given in the interview yields participants' positive perceptions about the brain-compatible learning intervention.

Key Words: Brain-compatible learning, young adult learners, English language proficiency, brain-compatible learning principles.

1. Introduction

The need to find out new approaches and methods to foster student learning appears to be understandable as the complaints put into words by students and teachers regarding students' low level of proficiency in English are kept in sight. Being coined by Hart (1983) and introduced into the literature in the 1990s, brain-compatible learning has been resorted with a view to orchestrating teaching in accord with how the human brain learns (Caine & Caine, 1994). The US president George H. W. Bush and the congress declared the 1990s as the decade of the brain. The name attributed to the 1990s becomes meaningful when what happened during that decade is taken into consideration as stated by Lombardi (2008):"Experts recognize that we have learned more about the brain in the last

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decade than in all the time preceding" (p. 219). With the help of the developments in brain imaging technologies such as x-rays, computerized axial tomography (CAT) scans, PET, fMRI, and electroencephalography (EEG), more has been learned about what happens in the human brain whilst learning, though there still remains a lot to be unearthed with regards to the workings of the human brain.

Rooted in the findings on brain research, brain-compatible learning has been defined as learning in compliance with how the human brain learns (Caine & Caine, 1994; Hart, 1983; Jensen, 1995, 2000; Sousa, 1998), and targets doing instructional planning in various subject areas including English language teaching to boost student learning. The major criticism directed by the advocates of brain-compatible learning towards traditional teaching methods is ruling out the brain (Kaufman, Robinson, Bellah, Akers & Haase-Wittler, 2008). Nonetheless, turning a blind eye to the findings originating from imaging technology may not be logical bearing in mind the significance of coming up with new theories and methods to augment the effectiveness of language teaching, and its counterpart, language learning. As suggested by Gura (2005), educators need to devise practical teaching practices by conceiving the brain's development. In correlation with what has been proposed by the proponents of brain-compatible learning approach with respect to overcoming the incongruity between the way the brain inherently learns and the way the brain is forced to learn, the number of research aiming at exploring ways to bridge the gap between neuroscience and educational practice has gained momentum in past years (Ansari, Coch, & De Smedt, 2011; Edelenbosh, Kupper, Krabbendam & Broerse 2015; Hruby, 2012; Koch, Timmerman, Peiffer, & Laurienti, 2013; Samuels, 2009).

Brain-compatible learning approach is applied to the classroom environment by tailoring instructional planning and transferring it into practice through the medium of brain-compatible learning principles. The principles introduced by Jensen (2000) and Caine and Caine (1994) have been widely appllied in the research undertaken to explore the impact of brain-compatible learning on student learning. Even though the principles advanced by these scholars have different names, aiming at igniting the human brain's natural learning is the common point between them. Table 1 displays the brain-compatible learning principles and their implications for education which are proposed by Caine and Caine (1994) and have been employed in this study.

Table 1. 12 Brain-Compatible 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 through patterning	Perceiving and creating patterns 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 and wholes simultaneously	Embedded details into wholes and parts.

7	Learning involves both focused and peripheral perception	Deepening students' attention and learning from the context unconsciously
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 challenge and inhibited by threat associated with helplessness and/or fatigue.	Supportive, empowering and intrinsically challenging environment.
12	Each brain is uniquely organized.	Integrating individual talents into teaching

Considering the principles demonstrated in Table 1, the link between brain-compatible learning approach and constructivism becomes evident. Constructivists state that knowledge is attained by adding new information to already existing knowledge frames (Brooks & Brooks, 1999; Peters, 2000). Depending on this definition of constructivism, Merrill (2008) propounds constructivists challenge the notion that there is an objective reality to be transmitted by teachers to all learners. In line with what is purported by Merrill (2008), Tippins, Tobin, and Hook (1993) put forth "It is an active process in which learners construct knowledge in a way that makes personal sense. And it is a subjective process, as learners draw on their own background experiences to make sense" (p. 223). The principle *learning is developmental* also underscores the significance of taking into account background knowledge in new learning experiences just as the emphasis placed by constructivists on the role of prior experiences in learning. The connection between constructivist learning theory and brain-compatible learning approach could be more obvious as the importance attached to individual differences in both is kept in sight. In addition to constructivism, the principle *the brain/mind is social* reveals the bridge that could be built between brain-compatible learning approach and social constructivism because the influence of social factors on learning is underpinned in social constructivist theory (Phillips, 1995).

Literature encompasses studies delving into the influence exercised by brain-compatible learning on student achievement in various subject areas (Akyürek & Afacan, 2013; Bello, 2007; Blackburn, 2009; Duman, 2010; Freeman & Wash, 2013; Getz, 2003; Lucas, 2003; McNamee, 2011; Özden & Gültekin, 2008; Rehman, 2011; Saleh, 2011) other than English language learning. The research carried out by Bello (2007) explores whether brain-compatible learning exerts impact on fifth grade students' achievement in mathematics and the findings report that brain-compatible learning has a positive impact on increasing the students' grades in mathematics. Similarly, the findings of the study carried out by Akyürek and Afacan (2013) reveal the positive impact of brain-compatible learning on the academic achievement of eight grade students in science lesson.

A meagre amount of research has been conducted heretofore in order to explore the influence of brain-compatible learning on students' English language proficiency. The results of the research conducted by Huang (2006) to examine the relation between applying brain-compatible learning strategies and students' English language proficiency indicate the positive correlation between employing brain-compatible learning strategies and students' achievement levels in English. Another study done by Baş (2010), likewise, show the positive influence of brain-compatible learning on sixth

grade students' achievement levels in English. Considering the limited number of studies having been done up till now on investigating the impact of brain-compatible learning on improving students' English language proficiency, the findings attained from this study could be illuminating, and additionally, may motivate practitioners and researchers to conduct more studies in order to gain deeper insights into the relation between brain-compatible learning intervention and increase in students' English language proficiency.

2. Methodology

Based on pre-test post-test control group research design, this study was conducted with the participation of 53 B1 level young adult learners aged 18-21. The participants were enrolled in foreign language preparatory school in a state university and exposed to 19 hours of English lesson every week. The lessons the students in the experimental group (N: 27) attended were planned under the light of the brain-based learning principles introduced by Caine & Caine (1994) while the control group participants (N: 26) were exposed to traditional teaching methods such as lecture method. Two experts having specialised in brain-compatible learning approach and implementation of brain-compatible learning principles in classroom environment were asked to evaluate the appropriateness of five lesson plans to brain-compatible learning approach. Besides, two lessons were observed by one of the experts to examine how brain-compatible learning principles were implemented in the classroom environment, and twenty lessons were video recorded to reflect on the way brain-compatible learning principles were employed and investigate students' reactions towards the applied principles.

The intervention in brain-compatible learning in the experimental group lasted four and half months. The participants took a proficiency exam at the beginning of the intervention. Subsequent to the intervention, the participants took the post-proficiency exam, and then, an interview was carried out to unearth experimental group participants' perceptions of the brain-based learning intervention. The results gained from the pre- and post-proficiency exam were analysed by ANOVA to investigate whether there was any statistically significant difference between the experimental and control group in terms of English language proficiency following the intervention. In addition, MAXQDA 11 was employed for the content analysis of the interview administered subsequent to the post-proficiency exam.

3. Findings and Discussion

On the purpose of seeking an answer to the question of if there exists a statistically significant difference between the experimental and control group regarding their proficiency in English following the brain-compatible learning intervention, the results of the pre- and post-proficiency exam are compared by means of employing ANOVA. Table 2 demonstrates the ANOVA results.

Table 2. ANOVA Results of Pre- and Post-Proficiency Exams

Sources of Variance	Sum of Squares	df	Mean Square	F	P
Between-Subjects	5486,104	56			
Group	848,618	1	848,618	9,333	,004
Error	4637,486	51	90,931		
Within-Subjects	26857,022	53			
Proficiency exams	21291,674	1	21291,674	242,339	,000
Group*Pre/post proficiency	1084,539	1	1084,539	12,344	,001
Error	4480,809	51	87,859		
Total	32343,126	109			

As seen in Table 2, the p value for between-subjects group factor ,004, indicates that there is a statistically significant difference between the experimental and control group as ,004 is smaller than ,05. The p value for within subjects pre- and post-proficiency exam means that a statistically significant difference exists between the pre- and post-proficiency exam results of the participants no matter in which group the participants are in that ,000 is smaller than ,05. The p value of within-subjects pre- and post-proficiency exam results by group provides information about whether there is a statistically significant difference between the change observed in the pre- and post-proficiency exam results in the experimental and control group. Because the p value is ,001, there exists a statistically significant difference in the common effect of the repeated measures of the proficiency exams and the group in which the participants are taught on the participants' proficiency exam results. This shows that being taught either in the experimental or the control group does have different effects on the participants' performance on the proficiency exams. The mean value the experimental group had on the post-proficiency exam, which is 77,98, is higher than the mean value of the control group, 65,92 as displayed in Table 2. This means that the experimental group performed better on the post-proficiency exam in contrast to the control group. In line with these findings, the study carried out by Huang (2006) also reports the positive impact of brain-compatible learning strategies on Taiwanese participants' achievement levels in English. Another research depicting increase in participants' achievement levels as a consequence of being taught in compliance with brain-compatible learning approach is done by Baş (2010). In that study, the experimental group outperformed the control group in the post test. Related literature entails studies aiming at investigating the effect of brain-compatible learning intervention on students' achievement levels in science lesson. The studies conducted by Akyürek & Afacan (2013) and Özden & Gültekin (2008) indicate the positive influence of the brain-compatible learning intervention on student success in science lesson as the experimental group in both studies performed better in the post test. In addition to these studies, the research done by Saleh (2011) shows that the participants in the experimental group had a better conceptual understanding of Newtonian physics than the ones in the control group. The correlation between brain-compatible learning intervention and student achievement level in mathematics has been explored too. The studies conducted by Rehman (2011) and Bello (2007) present the positive impact of brain-compatible learning principles on students' achievement levels in mathematics. Similarly, the studies carried out by Duman (2010) and Çengelci (2007) report that the students being trained in accordance with brain-compatible learning principles outperformed the control group participants in social studies.

Not all the studies having been done so far yield positive influence of brain-compatible learning intervention on target subject area. The research done by Getz (2003) shows no statistically significant difference between the experimental and control group participants' writing skills. Contrary to the findings of this study, but similar to results of the study by Getz (2003), the studies done by Blackburn (2009) and McNamee (2011) do not indicate a statistically significant difference between the experimental and control group in reading proficiency.

A semi-structured interview was conducted following the post-proficiency exam to learn about experimental group participants' perceptions of the brain-compatible learning intervention. So as to understand the difference, if any, between how they perceived their proficiency in English at the beginning of the study and following the intervention, the participants were asked in the background information questionnaire how they perceived their English language proficiency at the outset of the study. Table 3 presents the descriptive statistics of the collected data.

Table 3. Overall Proficiency in English at the Outset of the Study

Overall proficiency in English	**N**	**%**
Excellent	0	0
Good	4	14,8
Fair	23	85,2
Poor	0	0

As demonstrated in Table 3, the majority of the experimental group conceived their proficiency in English as fair. Their thoughts about their level of proficiency were found out at the end of the training by asking in the semi-structured interview the question of what they thought about their proficiency level after being exposed to the brain-compatible learning environment. Table 4 illustrates the experimental group participants' thoughts concerning the improvement in their proficiency level.

Table 4.Experimental Group Participants' Ideas about Their Proficiency Level after the Intervention

Category	**N**	**%**
Improvement in proficiency	27	100
No improvement in proficiency	0	0
Total	27	100

As seen in Table 4, all of the participants stated that their proficiency improved after being taught in a brain-compatible learning environment. On the purpose of gaining deeper insights into how the brain-compatible learning intervention influenced their proficiency, the participants were asked to provide details about the relation between the intervention and their current level of proficiency. Table 5 displays the content analysis of the participants' responses.

Table 5. Participants' Explanations Regarding the Improvement in Their English Proficiency

Category	**N**	**%**
Improvement in four skills	11	40,7
Abolition of grammar-based teaching	4	14,8
Abolition of memorization	4	14,8
Motivating teacher	3	11,1
Attitude change towards English	3	11,1
Comprehension-based lessons	1	3,7
Improvement in speaking	1	3,7
Total	27	100

As shown in Table 5, 40,7% of the participants stated that their proficiency in four skills improved due to the brain-compatible learning intervention. Four of the participants highlighted that their level of proficiency in English improved owing to the abolition of grammar-based teaching in the brain-compatible lessons. Four of the participants noted that abolition of memorization during the brain-compatible learning intervention helped them improve their language proficiency. Three of the participants stated that the teacher conducting the brain-compatible lessons was a motivating teacher and the lessons done by a motivating teacher enabled the improvement in their proficiency level. 11,1% of the participants stated that their level of proficiency in English improved because the brain-compatible lessons changed their attitudes towards English and this helped them study harder and comprehend better in enjoyable lessons. One of the participants stated that the lessons were comprehension-based lessons and since comprehension was paramount, their proficiency level in English improved. One of the participants expressed how the brain-compatible lessons contributed to the improvement in her level of proficiency by mentioning the improvement in her speaking skill.

4. Conclusion

This study targets examining the influence that might be exercised by brain-compatible learning on young adult learners' overall proficiency in English. The students in the experimental group being exposed to an intervention in brain-compatible learning principles performed better in the post-proficiency exam in comparison to the control group being taught conventionally. In addition, the findings obtained from the qualitative data indicate that the experimental group participants had positive perceptions of the brain-compatible learning intervention. The results show that even though establishing a brain-compatible learning environment may not be considered as a panacea to overcome all the problems faced in Turkey regarding students' low level of proficiency in English, brain-compatible learning approach is an approach on which further investigations could be done. In addition to this, young adult learners having been taught English according to traditional teaching methods may eradicate their prejudices concerning not being capable of learning English no matter how much effort they put into learning it after witnessing the facilitative effect of brain-compatible learning principles on maximizing student learning. Apart from all these, practitioners and researchers might intend to replicate this study so as to explore the influence of brain-compatible learning intervention on young learners' proficiency in English. Since young learners are prospective young adult and adult learners, they could fine-tune the initiatives they will take to learn English in reference to brain-compatible learning principles. They, additionally, might attempt to learn subjects other than English via resorting to brain-compatible learning principles. Taking into consideration the meagre amount of research examining the effect of brain-compatible learning on English language proficiency, further research is required in this area.

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