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The Effects of Learners’ Brain Hemisphericity on their Degree of Vocabulary Retention: A Case Study of Iranian High School Students

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Abstract

This research investigates the effects of students’ brain dominance on the degree of their vocabulary retention. Forty five pre-intermediate students were randomly chosen through convenience sampling (15 right-brained, 15 left-brained, 15 both-brained). Participants were given 15 vocabularies to memorize for each session and this process continued for 4 sessions. To do this research, researchers made use of not only the Oxford placement test (2007), brain dominance inventory, some targeted vocabularies, but also vocabulary achievement tests as post-tests. By the Analysis of data it can be concluded that whole-brained learners had an advantage over left/right ones in vocabulary memorization.

Keywords: Brain dominance; vocabulary retention; convenience sampling; Left/right and whole brain dominance.

1. Introduction:

After Sperry’s (1977) groundbreaking research on his aphasic patients and coming up with his split brain model of intelligence, a fresh wave of research started to investigate if one’s brain hemisphericity contributes to learning and teaching languages. Some scholars maintained that left brained learners are different from right brained ones in

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terms of how they function in different educational contexts. Moreover, the left brained learners have an edge over the right brained ones in terms of logical, analytical, mathematical and also linear processing of information. On the other hand, right brained learners are claimed to benefit from visual, auditory, holistic and non-linear information processing. This paper aims to underpin the veracity of the argument that brain hemisphericity of the learners play a crucial role in the extent to which they assimilate new information.

2. Literature review

Researchers attribute the success of the students in assimilating the new information to many factors. One of the factors that is worth mentioning is students’ learning styles. Spada and Lightbown (2003) asserted that “learners have clear preferences for how they go about learning new material” (p.58). For this reason, teachers should discover the learning and cognitive preferences that students bring with them into the classroom and take those very learning preferences into account while teaching. Saleh (1997) asserted that prior to building the teaching and instructional practices, a full understanding of the students’ learning styles should be obtained. Teachers can promote learning conditions by utilizing visual, auditory and kinesthetic activities (Lightbown & spade, 2003). In so doing, students’ learning experiences will be promoted and they will learn elements of language through the channel that best fits their learning preferences.

Among the learning styles, brain hemisphericity, or to put it in more special terms, brain specialization has attracted the attention of some researchers. Tendero (2000) reported Sperry’s study (1977) in which he propounded his split-brain model of intelligence as a result of his works on aphasic patients. In his seminal work he attributed some functions to different hemispheres of the brain. Brain has two hemispheres that are assigned different functions. Hergenhahn& olson (2005) stated that body functions have been assigned to both hemispheres “evenly but in a crossed fashion” (Kok, 2010, p. 145). Simply put, the right hemisphere is in control of the left side of the body and vice versa. Using Tendero’s (2000) metaphorical statement about brain dominance, “In a sense, the body cannot serve two masters” (p. 8), We can state that often one side of the brain is dominant over the other.

In a similar vein, Brown (1994) maintained that “the left hemisphere is associated with logical, analytical thought, with mathematical and linear processing of information. The right hemisphere perceives and remembers visual, tactile and auditory images; It is more efficient in processing holistic, integrative and emotional information” (p.125). Krashen (1988) maintained that “left hemisphere is superior to the right in judging temporal order, deciding which of the two stimuli was presented first” (p.70). Brown (2007) reports Torrance’s study (1980) in which he enumerated some of the features of the left and right brain dominant learners:

- **Left-brain dominant learners:** Intellectual; remember names; respond to verbal instruction and explanations; experiment systematically and with control; make objective judgments; planned and structured; prefer established certain information; analytic readers; reliance on language in thinking and remembering; prefer writing and talking; prefer multiple choice tests; control feelings; not good at interpreting body language; rarely use metaphors; favor logical problem solving

- **Right-brain dominant learners:** Intuitive; remember faces; respond to demonstrated, illustrated or symbolic instructions; experiment randomly and with less restraint; make subjective judgments; fluid and spontaneous; prefer elusive uncertain information; synthesizing readers; reliance on images in thinking and remembering; prefer drawing and manipulating objects; prefer open-ended questions; more free with feelings; good at interpreting body language; frequently use metaphors; favor intuitive problem solving

Tendero (2000) reports Munzert’s study (1980) in which he points out that the functioning of the left and right hemispheres of the brain differ in the type of mental activities processed in them. According to Munzert (1980), on the one hand, the left hemisphere is the head-quarter for processing information that has to do with one’s intellect such as memory, language, logic, computation, classification, writing and analysis. On the other, the right hemisphere is responsible for controlling functions involved in intuition, attitudes and emotions, music, rhythm, physical coordination and activity (Tendero, 2000).
Having investigated the functions that each hemisphere of the brain is responsible for, many researchers came to the factitious realization that brain hemisphericity can best be described as dichotomous. They held the belief that people are either left brain dominant or right brain dominant. However, recently some scholars have warned us of the inadequacies of this dichotomy. In a similar vein, brain hemisphericity should not be viewed as dichotomous, rather, it should “operate on a continuum” (Saleh & Irannejad, 1995, cited in Saleh, 2001, p. 194). To put it simply, things should not be divided into black and white. Brain hemisphericity is no exception. According to Saleh & Irannejad (1995) people should be spread across the brain hemisphericity continuum.

3. Brain hemisphericity in second language education

Oflaz (2011) reported Morris’ (2005) study in which she maintained that left brain dominant learners are more comfortable in the classroom. The reason is that, in traditional schooling, much emphasis is put on analyzing and synthesizing language elements, something that left brain dominant students are good at. Revel (1992, cited in Oflaz, 2011) highlighted the fact that in many educational systems left brain dominant students are favored. On the contrary, in these contexts, right brain dominant students are, metaphorically speaking, smothered by teachers. “Creativity”, something that right brain dominant learners are claimed to be good at, “is seriously impaired” (Oflaz, 2011, p.1509).

Saleh (2001) names some studies revealing that if students are taught through methods that match their hemispheric preferences, they will obtain higher scores, compared to when they receive random teaching instruction without any attention to their hemispheric preferences whatsoever (Brennan, 1984; Dunn, Sklar, Beaudry, Bruno, 1990; Jarsonbeck, 1984). There are studies (Kolb, 1979; MacCarthy, 1996; Saleh, 2001) that show that students mostly choose their field of study based on their hemispheric preferences.

Brown (2007) reports a study by Krashen, Seliger, Hartnett, (1974) in which they investigated the relationship between student’s brain hemisphericity and teacher’s style of teaching. They found out that left brain dominant learners preferred deductive teaching, whereas right brain dominant students were more interested in inductive classroom environment. Breien-Pierson (1988) investigated the relationship between brain hemisphericity and composition writing process. They found support for difference in the way right and left brain dominant learners approached writing. It was suggested that right-brained learners better function in free writing, whereas left brained ones enjoy research paper and book reports.

Last but not least, Tendero (2000) investigated the effect of brain hemisphericity on four macro language skills compared to their age and gender. According to her research “the respondents’ hemispheric dominance was negatively and insignificantly correlated with their listening and speaking skills; but was positively, although not significantly, correlated with reading and writing skills” (vii).

As the preceding section has revealed, a number of issues concerning the effects of brain hemisphericity on different aspects of second language education have been investigated, but, to the best of researchers’ knowledge, nobody has worked on the relationship between brain hemisphericity and one’s degree of vocabulary retention. Vocabulary learning is deemed as one of the most integral aspects of second language education. Language is composed of many components, one of which is vocabulary. The more vocabulary one knows, the easier one can express one’s thoughts. As soon as researchers came to realize the significant role of vocabulary in language learning, they investigated what factors contributed to effective and long-term retention of words. This study investigates if students’ brain hemisphericity is one of those factors affecting vocabulary retention. Researchers interested in this sphere, can examine the effects of one’s brain hemisphericity on learning other language sub-skills. They are recommended to replicate this study in different contexts to verify or reject the extent to which the findings of this research can be generalized to other contexts.

4. Research Questions

1. Is there any relationship between students’ brain hemisphericity and their degree of vocabulary retention?
2. Does the brain dominance of learners affect their degree of vocabulary retention?
3. If yes, which part of the brain (left, right, both) contributes more to long-term retention of new vocabularies?

5. Method:

5.1. Participants:

Students whose age ranged from 15 to 17 were randomly chosen from 105 (male) high school students. They were chosen based upon their brain dominance and language proficiency. All of our participants were native speakers of Persian.

5.2. Materials and procedures:

To determine students’ proficiency researchers administered the oxford placement test (2007) to 105 (male) high school students. Davis’ brain dominance inventory was given to 80 students who, according to the oxford placement test (2007) were identified as pre-intermediate students. Students were classified into 3 groups (left-brained, right-brained, both-brained) based on the result of brain dominance inventory. 60 vocabularies were chosen based upon students’ proficiency level. Researchers decided to give the students 15 vocabularies per session. Students were asked to be prepared to answer orally what the targeted words meant. This process continued for 4 sessions, three days after the final session students were told to be ready for an immediate post-test which included 60 matching items. Three weeks later, delayed post-test was administered which was similar to the immediate post-test.

6. Results

Three brain dominance categories were distributed in a following way: 15 left brain dominants, 15 right brain dominants and 15 whole brained. One-way ANOVA was run to compare students’ degree of vocabulary retention and brain hemisphericity. It displayed that both (whole) brained learners are advantaged over right/left brained ones in terms of the extent to which they retain new vocabularies. As table 1 shows, although the proficiency level of all students was identified as pre-intermediate, they had different performance in both immediate and delayed post-test. According to table 1, both brained students showed much more degree of retention of vocabulary in both immediate and delayed post-test. Moreover, right brained learners displayed higher degree of retention than left brained ones in both tests. As table 1 indicates, the mean of post-test one is higher than that of post-test 2 because there was three weeks interval between the immediate and delayed post-tests. Some degree of attrition is justifiable because of the three-week interval between immediate and delayed post-test.

<table>
<thead>
<tr>
<th>Post-tests &amp; Brain Dominance</th>
<th>N</th>
<th>Mean</th>
<th>Std deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1-right brainers</td>
<td>15</td>
<td>60.8000</td>
<td>18.33108</td>
</tr>
<tr>
<td>P1-left brainers</td>
<td>15</td>
<td>59.1333</td>
<td>21.07086</td>
</tr>
<tr>
<td>P1-whole brainers</td>
<td>15</td>
<td>67.8667</td>
<td>20.25504</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>62.6000</td>
<td>19.83386</td>
</tr>
<tr>
<td>P2-right brainers</td>
<td>15</td>
<td>58.0000</td>
<td>17.77237</td>
</tr>
<tr>
<td>P2-left brainers</td>
<td>15</td>
<td>54.0667</td>
<td>20.12627</td>
</tr>
<tr>
<td>P2-whole-brainers</td>
<td>15</td>
<td>67.3333</td>
<td>20.32123</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>59.8000</td>
<td>19.81001</td>
</tr>
</tbody>
</table>

The result of between groups comparison shows that there is no significant differences in the degree of vocabulary retention between left, right, and both brained learners in both posttest 1 and posttest 2. Although the
performance of both brained learners was higher than their left/right brained counterparts, the result was not significance.

It is important to note that ANOVA did not tell us whether the differences between groups A, B and C are statistically significant with respect to each other. Due to the fact that one-way ANOVA was unable to portray whether the performance of each group; left, right and both was significantly different in posttest 1 and posttest 2, researchers utilized paired sample *t*-test to resolve the deficiency of ANOVA.

<table>
<thead>
<tr>
<th>Post-tests</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1- Between groups</td>
<td>644.933</td>
<td>2</td>
<td>322.647</td>
<td>.813</td>
<td>.450</td>
</tr>
<tr>
<td>P1- Within groups</td>
<td>16663.867</td>
<td>42</td>
<td>396.759</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17308.800</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2- Between groups</td>
<td>1392.933</td>
<td>2</td>
<td>696.467</td>
<td>1.843</td>
<td>.171</td>
</tr>
<tr>
<td>P2- Within groups</td>
<td>15874.267</td>
<td>42</td>
<td>377.959</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17267.200</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As table 3.1 shows there is significant difference between the performance of left brained learners in their posttest 1 and posttest 2, since the 2-tailed Sig value [.000] is less than [.05].

<table>
<thead>
<tr>
<th>Paired differences</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig(2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 posttest 1- posttest 2</td>
<td>1.88285</td>
<td>3.71715</td>
<td>6.548</td>
<td>14</td>
<td>.000</td>
</tr>
</tbody>
</table>

In a parallel fashion, table 3.2 demonstrates significant differences between the performance of right brained learners in their posttest 1 and posttest 2, since the 2-tailed Sig value [.000] is less than [.05].

<table>
<thead>
<tr>
<th>Paired differences</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig(2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 posttest 1- posttest 2</td>
<td>4.03134</td>
<td>6.10199</td>
<td>10.496</td>
<td>14</td>
<td>.000</td>
</tr>
</tbody>
</table>

On the contrary, as table 3.3 indicates both brained learners’ performance did not differ significantly in posttest 1 and posttest 2, since the 2-tailed Sig value [.056] is not less than [.05].

<table>
<thead>
<tr>
<th>Paired differences</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig(2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 posttest 1- posttest 2</td>
<td>-0.01515</td>
<td>1.08182</td>
<td>2.086</td>
<td>14</td>
<td>.056</td>
</tr>
</tbody>
</table>

7. Discussion and Conclusion

From the findings of this study, it can be concluded that learning should be approached through using learning styles that best fit one’s preferences. By actualization of this process, long-term retention of new information would be augmented. Among learning styles, brain hemisphericity has attracted the attention of many scholars. There is handsome consensus among scholars that the kind of trajectory learners choose to go about their learning is highly influenced by their learning styles in general, and brain hemisphericity in particular. The findings of this research
underpin the veracity of the argument that learning styles play an integral role in determining the degree of language achievement within learners. As the findings of this study uncovered, both-brained learners had an edge over the right and left brained ones, when it comes to vocabulary retention. The underlying reason for this phenomenon is that both-brained learners benefit from the two hemispheres of their brain simultaneously and equally, while dealing with new information.

References


