The Relationship between Brain Dominance and Japanese Language Academic Achievement

Hui-Suan Wei, Tajularipin Sulaiman, Roselan Baki, and Samsilah Roslan

***Abstract* - The discovery of the different functions of the left and right brain has opened up a new understanding of human behaviour where the left and right brain were found to work on different tasks. This study aimed to explore the relationship between brain dominance and Japanese Language Academic Achievement. This is a descriptive study employed quantitative research methodology by using correlational analysis. Purposive sampling was used to collect data via questionnaires from 281 Multimedia University students ranged from Diploma to undergraduate study. Positive correlation was found between Left-brain and Japanese Language Academic achievement ($r. = 0.299$, $p < .05$) and Right-brain Dominance and Japanese Language Academic Achievement ($r. = 0.315$, $p < .05$). However, the strength of the relationship revealed weak relationship. Right-brain Dominance showed slightly higher correlation with Japanese Language Academic Achievement. The theory of the left and right brain suggested that right brain is dominant for spatial abilities, recognition, visual imaginary and music. Therefore, Japanese language learning at the beginner's level focuses on the writing system and basic sentence structure. As Japanese writing is a kind of hieroglyphics and developed from the image or picture of the subject, therefore, ability to imagine and spatial intelligence is very much appreciated in learning the language.**

***Key words* -- Japanese language teaching and learning, Left-brain Dominance, Right-Brain Dominance, Foreign language learning**

I. INTRODUCTION

The importance of foreign language is evident when a country's development is highly dependent on the transfer of foreign technology. Foreign language is an important medium in accessing information and technology from the east and west Graduates with the required competency of communication in foreign languages have the extra advantage as more opportunities are open to them when working in diverse working environments. To fulfil the needs of the workforce and to prepare Young Malaysians so as to be ready to face global challenges, foreign language learning therefore has been introduced to the formal national education system in Malaysia. One of the foreign languages taught in the Boarding and selected schools are Japanese Language.

Tremendous research in the teaching and learning of foreign languages has been done. In fact, how a second language is learned has been debated over the years. Research in cognitive approaches of second language acquisition (SLA) has been done, argued and discussed. The cognitive approach views learning in relation to the processes in the brain that underpin language acquisition. Research showed that SLA has established its position as a branch of cognitive science (Wakabayashi, 2003). Many psychological theories hypothesize that cognitive mechanisms are responsible for the language process of human learning.

Previc (1991) in his research "A General Theory Concerning the Prenatal Origins of Cerebral Lateralization in Humans" found that the left half of the brain account for speech perception and language functions, while the right half takes care of the visual spatial functions. The same finding for right brain hemisphere and language function was discovered by Young (2012). Other research has found that each side of the brain appears to be specialized for different cognitive functions. The functions of the left cerebral hemisphere are auditory, verbal, analytic thinking, logical, abstract, convergent and deductive whereas the right side is visual, motoric (tactual/kinaesthetic), non-verbal, intuitive, creative, divergent, concrete, musical, spatial, holistic and inductive (Kane& Kane, 1979). This discovery has opened up a new understanding of human behaviour whereby left and right brain work on different tasks as well as learning.

The two halves of the brain functions refer to the cognitive functions of left-hemisphere dominance and right-hemisphere dominance (Wade and Tavris, 2012). They work on different tasks of a person. in the Left-brain and Right-brain hemisphere dominance theory, the right hemisphere of the brain is best at expressive and creative tasks (Nielsen, Zielinski, Ferguson, Lainhart and Anderson, 2013), it is superior in spatial-visual ability, art and music and good in audio recognition (Sperry, 1982). Some of the abilities associated with the right hemisphere include recognizing faces, expressing emotions, music, singing, reading emotions, colour, images, intuition and creativity. Whereas the left hemisphere is more intuitive and holistic; it comprehends visual imagery and make sense of what we see (Wade and Tavris, 2012). The left-hemisphere is associated with logical, symbolic and sequential tasks, language, logic, critical thinking, numbers, calculations, and reasoning that involve rational and analytical thinking.

In Malaysia's institute of Higher Education context, the uniqueness of the students' social background in the classroom is a challenge to lecturers when teaching a foreign language. The students in the university are comprised of Malaysian and international students. Malaysian students consist of Malay, Chinese, Indian and other indigenous races from East Malaysia whereas the international students are mostly from China, Africa, India, Saudi Arabia, Iran, and many other countries. This composition adds to an interesting combination of

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multiracial and multicultural context in the classroom. The researcher has been teaching Japanese Language for more than 15 years and found that social background contributes to the advantages or disadvantages of foreign language learning. Anyway, since it is not possible to cater the teaching to each individual's social background, teaching strategies that take into account the students' learning ability will be helpful.

Individual learn in a different way. The Cognitive learning ability and the functional use of specific language learning and strategies have been distinguished because of one's cognitive, metacognitive and affective/social aspects (Oxford, 1990). Therefore, this study aimed to explore the relationship between brain dominance and Japanese Language Academic Achievement. Furthermore, the study explores the effect of Left-brain Dominance and Right-Brain Dominance on Japanese Language Academic Achievement among foreign language students learning Japanese.

II. METHODOLOGY

This is a descriptive study employed survey design. Correlational analysis was used to explore the relationship between brain dominance and Japanese Language Academic Achievement by using SPSS 2.0. Purposive sampling was used in this study for its' specific characteristics i.e. First, the subject was Japanese language students at the beginners' level. Second, the subject was offered as an elective subject. Third, the text book used was "Minna no Nihongo" and fourth, the students had studied lesson 1 to lesson 6 of the text book in 36 face to face classroom learning that not more than 42 hours of learning.

The instruments used to collect the data of Left-brain Dominance and Right-brain Dominance was adopted from The Directive™ Communication Coloured Brain inventory in 5 Likert-scale which was developed by Arthur F. Carmazzi (2002). Coloured Brain is an Accredited Methodology by the American Institute of Business Psychology (https://coloredbrain.com/benefits-of-colored-brain) aimed at learning the foundations of Genetic Brain Communication and Processing. The Right-brain was measured by Blue and Green Coloured Brain and the Left-brain was measured by Red and Purple Coloured. Each of the sub-constructs consists of 10 items Brain (Table I). The second instrument that used to measure the students' Japanese Language Academic Achievement was collected from the students' final examination scores in continuous scale. The questionnaires were validated by the expert in Educational Psychology and Cronbach's α (alpha) was used as a measure of the internal consistency or reliability of an instrument (Creswell, 2014) in pilot study. It was found that reliability of the variables ranged from 0.866 to 0.902 which indicated the instruments was highly reliable. Descriptive and inferential statistics were used to examine the correlation between the variables by using Statistical Package for Social Sciences (SPSS) Version 14.0.

Table I shows the Brain-dominance variables and the measurement of the items of sub-construct.

TABLE I: LIST OF VARIABLES AND ITEMS OF SUB-CONSTRUCT

Variable	Sub construct	Item Number
Left Brain Dominance (LBD)	Purple (PUP)	10
	Red (RED)	10
Right Brain Dominance (RBD)	Green (GRE)	10
	Blue (BLU)	10
Total		161

III. ANALYSIS

In the process of data preparation, data screening was done and the distribution of the variables was examined. The results showed that there were minimal amount of missing data and the missing data were replaced by using the median for each measurement item. The analysis of the skewness and kurtosis of the data showed a normal distribution of the variables whereby the skewness ranged from -1.128 to 0.727 and the kurtosis ranged from -1.182 to 1.818 all 181 items.

The descriptive data was generated to provide a better understanding of the mean and standard deviation of the variables. The results indicated that the respondents' perception toward the Left-brain Dominance and Right-brain Dominance were above the average whereby the Left-brain Dominance was mean = 3.651, SD = 0.638 and Right-brain Dominance was mean = 3.514, SD = 0.703. Japanese Language Academic Achievement was measured in continuous scale whereby the mean for this variable was 63.190 which is above the passing mark (50 percent out of one hundred). The standard deviation of Japanese language was 19.205 which showed huge variability among the score of the respondents.

TABLE II: DESCRIPTIVE STATISTICS FOR MULTIPLE INTELLIGENCES, LEARNING STYLES, LEFT- BRAIN DOMINANCE, RIGHT-BRAIN DOMINANCE AND JAPANESE LANGUAGE ACADEMIC ACHIEVEMENT

Constructs	Mean	Standard Deviation
2nd Order Constructs / Main Constructs		
• Left Brain Dominant (LBD)	3.651	0.638
• Right Brain Dominant (RBD)	3.514	0.703
• Japanese Language Result (JLR)	63.190	19.205

Factor loading of each item were examined to assessment the uni-dimensionality of the variable, identify and eliminate the items. The Table III and Table IV present the standardized factor loading of Left-brain dominance and Right-brain Dominance respectively. The cut-off point

for the standardized factor loading is above 0.6 for each item. The items above 0.6 should be removed.

TABLE III: FACTOR LOADING OF LEFT-BRAIN DOMINANCE

Construct	Item	Factor Loading
Left-Brain Dominance	PUP1	0.716
	PUP2	0.720
	PUP3	0.764
	PUP4	0.678
	PUP5	0.782
	PUP6	0.778
	PUP7	0.757
	PUP8	0.784
	PUP9	0.791
	PUP10	0.744
	RED1	0.792
	RED2	0.725
	RED3	0.761
	RED4	0.763
	RED5	0.770
	RED6	0.743
	RED7	0.765
	RED8	0.806
	RED9	0.756
	~~RED10~~	0.007[c]

As shown in Table III, the standardized factor loadings of the items for Left-brain Dominance indicated that one of the initial standardised factor loadings (RED10) was below the cut-off point of 0.6. Therefore, the item was removed from the model as recommended by Hair et al. (2009). The standardized factor loadings of the remaining items were all above 0.6 and thus were accepted and remained in the model.

TABLE IV: FACTOR LOADING OF RIGHT-BRAIN DOMINANCE

Construct	Item	Factor Loading
Green (GRE)	GRE1	0.804
	~~GRE2~~	0.128[c]
	GRE3	0.814
	GRE4	0.765
	GRE5	0.789
	GRE6	0.811
	GRE7	0.802
	GRE8	0.831
	GRE9	0.783
	GRE10	0.789
Blue (BLU)	BLU1	0.762
	BLU2	0.743
	BLU3	0.759
	BLU4	0.719
	BLU5	0.780
	BLU6	0.825
	BLU7	0.759
	BLU8	0.773
	BLU9	0.815
	BLU10	0.771

As shown in Table IV, the standardized factor loadings of the items for Right-brain Dominance indicated that one of the initial standardised factor loadings (GRE2) was below the cut-off point of 0.6. Therefore, the item was removed from the model as recommended by Hair et al. (2009). The standardized factor loadings of the remaining items which were all above 0.6 were accepted and remained in the model.

One item was deleted from each of brain dominance. These two deleted items was not relatively high compared to the total items in the constructs (40 items). Furthermore, their removal did not significantly change the content of the constructs as they were conceptualized. The standardized factor loadings of the remaining items were all above 0.6, ranging from 0.678 to 0.919. Therefore, the uni-dimensionality of the construct was achieved.

Discriminant validity was examined to indicate to what extent the construct is different from other constructs. Discriminant validity was assessed by comparing the correlations with the square root of the variables. The results showed the correlation between Left-brain Dominance and Right-brain Dominance is r. = 0.518, $p < .05$ and Left-brain Dominance and Japanese Language Academic Achievement is r. = 0.299, $p < .05$ (Table V); the relationship between Right-brain Dominance and Japanese Language Academic Achievement is r. = 0.315, $p < .05$. All correlations were less than the square root of the average variance extracted by the indicators, demonstrating good discriminant validity between these factors (Kline, 2005).

TABLE V: CORRELATION OF THE VARIABLES AND DISCRIMINANT VALIDITY

	LBD	RBD	JLAA
Right-brain Dominance (RBD)	0.518	**0.905**	
Japanese Language Academic Achievement (JLAA)	0.299	0.315	**1.000**

Note: Diagonals bolded entries represent the square root of the average variance extracted while the other entries represent the correlations.

The Correlation between Brain Dominance and Japanese Language Academic Achievement

Referring to Table V, the results showed the correlation between Left-brain Dominance and Japanese Language Academic Achievement is r. = 0.299, $p < .05$ and the relationship between Right-brain Dominance and Japanese Language Academic Achievement is r. =0.315, $p < .05$. As claimed by Salkind (2011), the relationship between variables can be described as very week if the correlation

coefficient is less than 0.20, weak if the correlation coefficient ranges from 0.20 to 0.39, moderate if it ranges from 0.40 to 0.59, strong if it ranges from 0.60 to 0.79, and very strong if the correlation coefficient ranges from 0.80 to 1.0. Therefore, the relationship of Left-brain dominance and Right-brain Dominance was weak.

Left Brain Dominance has positive effect on Japanese Language Academic Achievement

The t-value and p-value of Left Brain Dominance (LBD) in predicting the Japanese language academic achievement (JLAA) were 3.041 and 0.003 respectively. It means that the probability of getting a t-value as large as 3.041 in absolute value is 0.003. In other words, the regression weight for Left Brain Dominance (LBD) in the prediction of Japanese language academic achievement (JLAA) is significantly different from zero at the 0.01 level (two-tailed). Therefore, Right-Brain Dominance has positive effect on Japanese Language Academic Achievement.

Right Brain Dominance has Positive Effect on Japanese Language Academic Achievement

The t-value and p-value of Right-brain dominance (RBD) in predicting the Japanese language Academic Achievement (JLAA) were 3.054 and 0.002 respectively. It means that the probability of getting a t-value as large as 3.054 in absolute value is 0.002. In other words, the regression weight for Right-Brain Dominance (RBD) in the prediction of Japanese language academic achievement (JLAA) is significantly different from zero at the 0.01 level (two-tailed). Therefore, Right-Brain Dominance has positive effect on Japanese Language Academic Achievement.

The academic achievements also indicated that Right Brain Dominance (RBD) is the most significant predictor of Japanese language academic achievement (JLAA) with the path coefficient of 0.179.

IV. CONCLUSION

As a matter of fact, individuals learn differently; hence, the results of learning may differ vastly from one individual to another. It is the educators' responsibility to ensure that every student maximizes his or her intellectual potential in the learning process. The results indicated that Right-brain Dominance is a better predictor of Japanese Language Academic Achievement. According to Carmizzi's characteristics of brain colour, the right brain processes information by associating the past and present occurrences, and deal with creative and innovative situation. The theory of the left and right brain claims that the right brain is dominant for spatial abilities, recognition, visual imaginary and music.

Japanese language learning at the beginner's level focuses mainly on the writing system and basic sentence structure. As Japanese writing is a kind of hieroglyphics and developed from the image or picture of the subject, ability to imagine and spatial intelligence is very much appreciated in learning the language. Moreover, the structure of Japanese language sentences is SOV structure (subject-object-verb) compared to English which is SVO (subject-verb-object). The words are connected by the language element called particles. All words in a sentence are in the order that the most important verb will be the last word. This is the most important sentence structure that a Japanese language student learns at the beginner lever.

In general, our brain hemispheres process information in different ways. The two sides of the brain work together to make the input meaningful; however, we have a natural tendency towards certain way of thinking in our everyday lives. However, knowing of self-tendency in using the brain dominance may help to escalate the effect of learning.

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