

BRAIN HEMISPHERICITY AND STUDENT ACHIEVEMENT: A REFERENCE FOR COURSE DESIGN

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Abstract

This paper determined the effects of right, left and whole brain dominance on Computer Science students' academic achievement. Data were collected from 70 Bachelor of Science in Computer Science students of Jose Rizal Memorial State University, Katipunan Campus, and Zamboanga Del Norte. Statistical analyses revealed that BSCS students differ significantly in their hemispheric preference however there was no significant association between brain hemisphericity with academic achievement. Though in this study, the brain dominance does not affect academic achievement, there is still a need to formulate course design that integrates students' heterogeneous preferred learning activities.

Keywords: brain hemisphericity, computer science courses, learning styles, right and left brain

INTRODUCTION

The major objective of education is to help students develop intellectual tools and learning strategies, to be productive members in the society. Full understanding of learning styles is a essential tool that teachers should employ to help them appreciate their learners and to build their teaching and instructional practices to optimize their students' learning experiences in school (Saleh, 2001). Understanding brain behavior has been a significant phase of exploring the learning process. Brain behavior has especially been associated with learning styles and personality traits (Saleh, 2001). Investigation into an individual's brain behavior and relating it to his performances came primarily in the form of examining functions of the various parts of the individual's brain (Saleh, 2001; Baynes & Long, 2007).

Brain hemisphericity is the inclination of an individual to process information through the left hemisphere or the right hemisphere or in combination (Bradshaw & Nettleton, 1981; McCarthy, 1996; Springer & Deutsch, 1993). By finding out the brain dominance of the students and giving activities according to them, the teacher will progress the efficiency of his or her own teaching, raise the success rate and also advise the students on learning strategies and recalling.

Research has demonstrated that students are capable of mastering new skills if they are taught through instructional methods that complement their hemispheric preference (Boyle & Dunn, 1998; Dunn, Sklar, Beaudry, & Bruno, 1990). Several studies have found that students taught through methods that matched their hemispheric styles achieved statistically significant higher test scores than when they were taught through other teaching methods (Brennan, 1984; Dunn, Sklar, Beau&y, Bruno, 1990; Jarsonbeck, 1984).

Computer Science (CS) is a discipline that delves on how to use computers to solve real world problems. Therefore, it is fundamental to create an active learning environment to improve

students' comprehension and retention of material, allow students to take control and regulate their own learning, and eventually empower them with necessary skills to solve problems outside of the classroom. Active learning is especially effective for CS students who tend to be visual/intuitive learners (Briggs, 2005). To achieve our goal of keeping students engaged in an active learning environment throughout the teaching and learning process, it is important to continue our own inquiry on how people process information and subsequently learn in a deep and authentic way to effectively use appropriate, functional emerging instructional technologies to address the goal of applied understanding.

Only few studies on brain dominance and academic performance in computer science are available in the literature. Hence, this study aims to investigate the type of brain dominance among computer science students, and find out the influence of brain dominance on the student respondents academic performance with the aim of coming up with course designs.

CONCEPTUAL/THEORETICAL FRAMEWORK

This study is anchored on Ned Hermann Brain Dominance Theory where the brain is divided into four different systems and styles: analytical (left cerebral hemisphere; sequential (left limbic system); interpersonal (right limbic system); and imaginative (right cerebral hemisphere).

Studies have demonstrated that the left hemisphere operates in a linear, sequential manner with logical, analytical, propositional thought. On the other hand, the right hemisphere operates in a nonlinear, simultaneous fashion and deals with non-verbal information as well as dreams and fantasy (Iaccino, 1993; McCarthy, 1996; Oxford, 1996; Oxford, Ehrman, & Lavine, 1991; Springer & Deutsch, 1993; Torrance, 1988). The left hemisphere appears to be specialized for language, whereas the right hemisphere is specialized for visuo-spatial and appositional thought. Kinsella (1995), Oxford (1996), and Oxford, Ehrman, and Lavine (1991) maintained that left hemispheric dominants are highly analytic, verbal, linear and logical learners, whereas right-hemispheric dominants are highly global, visual, relational, and intuitive learners.

Academic achievement can be forecasted through gender (Steinberg, 1993 and Garicia, 2004); and age (Hawkins, 1987 and Kapadia, 1987).

Thus, this is the quest of this study to look into the Computer Science students' brain dominance and their academic achievement, and find out if their brain hemisphericity influence their academic achievement with the purpose of coming up with a comprehensive and effective course design that give activities to fill the gaps of the students by using methods and techniques that connect both sides of the brain.

The conceptual paradigm of the current research is shown in figure 1.

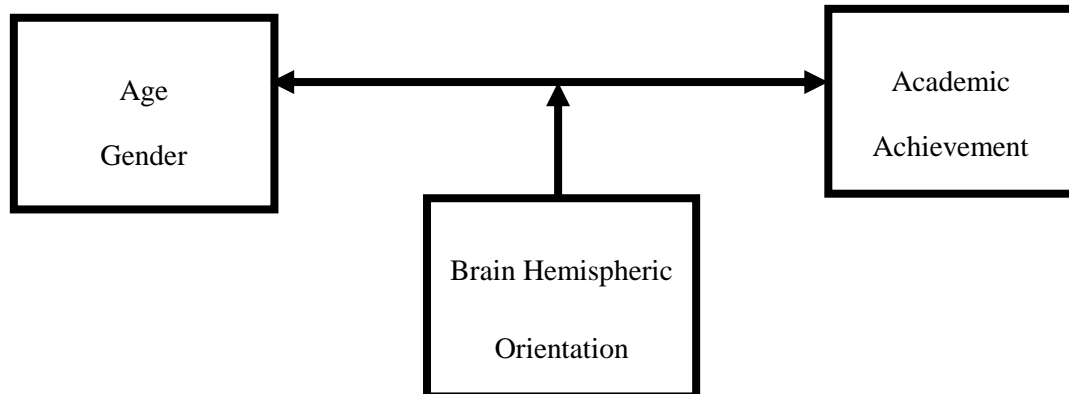


Figure 1: Conceptual Paradigm

METHODS

The study involved 70 Bachelor of Science in Computer Science students of Jose Rizal Memorial State University, Katipunan Campus, Zamboanga del Norte. The participants consisted of 28 first year, 17 second year, 12 third year and 13 fourth year students. The study looked into the correlation between brain dominance and academic achievement. Each student was given a Ned Hermann Brain Dominance Test's created by Education World 2000. The quiz consisted of ten questions with two options: The students read and encircled one of the options. Students' grades in major subjects (first semester 2014-2015) were used as the students' achievement. Descriptive statistics such as frequency, mean, standard deviation and percentage were generated. Pearson Product-Moment Correlation Coefficient Test was used to determine the correlation between brain dominance and the students' academic achievement.

RESULTS AND DISCUSSIONS

The brain hemispheric orientation varies significantly among the BSCS students (Fig.2 & Table 1). Majority (83%) of the BSCS students were left brain dominated. As claimed from several studies (Bakan, 1969; Dabbs, 1980; Kolb, 1979; Lavach, 1991; McCarthy, 1996; Rowe, Waters, Thompson, & Hanson, 1992; Witkin et al., 1977; Saleh, 2001), students majoring in areas such as business, engineering and science show a left-hemispheric dominance. The results appear to confirm that students choose to study subjects that accommodate their cognitive/learning style.

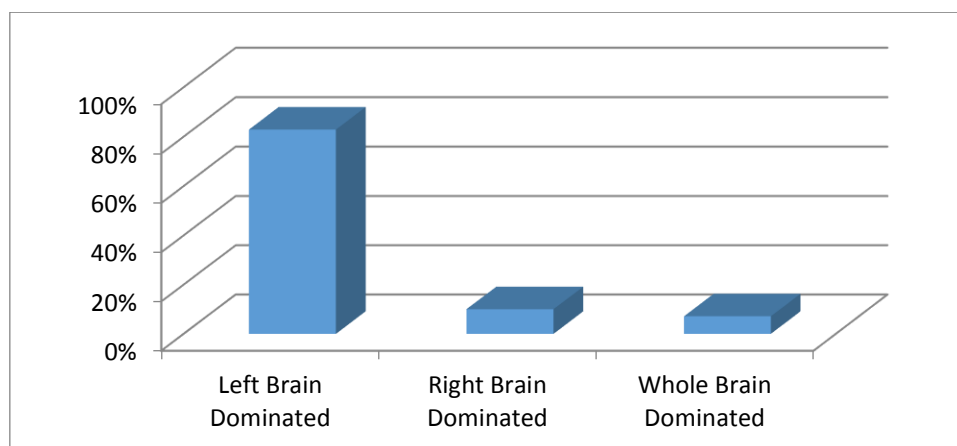


Figure 2: Students brain dominance

In terms of gender, investigation in the diverse effect of gender of the college students on their brain hemispheric orientation indicated that there were significantly more female left-brained than their right-brained and whole-brained counterparts. This confirmed the findings that there was significant gender difference, Linda Williams (1983). Females were more thinking-oriented (left), cognitive and metacognitive learners than males although there was no statistical significance. Stephen Elliot et al (1996) found that the females were good at language while males were good at spatial learning. Findings are shown in Table 1.

GENDER	LEFT		RIGHT		WHOLE BRAIN		Total	
	N	%	N	%	N	%	N	%
Male	28	40	2	3	2	3	32	46
Female	30	43	5	7	3	4	38	54
Total	58	83	7	10	5	7	70	100

Table 1: Distribution of students with respect to gender across brain hemispheric orientation

With regard to age, younger BSCS students (16-19 years old) were generally left-brained (60%) as revealed in table 2.

AGE BRACKET	LEFT		RIGHT		WHOLE BRAIN		Total	
	N	%	N	%	N	%	N	%
16-19	42	60	7	10	4	6	53	76
20-22	11	16	0	0	1	1	12	17
23-25	5	7	0	0	0	0	5	7
Total	58	83	7	10	5	7	70	100

Table 2: Distribution of students with respect to age across brain hemispheric orientation

The diversity in terms of the brain hemispheric orientation of BSCS students has no correlation to the academic achievement. 93% of the BSCS students were good in their academic achievement and only 6% were very good and 1% fair as shown in Table 3.

ACADEMIC ACHIEVEMENT	Excellent		Very Good		Good		Fair		TOTAL	
	F	P	F	P	F	P	F	P	F	P
Left	0	0	4	5.71	53	75.71	1	1.43	58	82.85
Whole	0	0	0	0	5	7.14	0	0	5	7.14
Right	0	0	0	0	7	10	0	0	7	10
Total	0	0	4	5.71	65	92.85	1	1.43	70	100

Table 3: Distribution of BSCS students with respect to brain hemispheric orientation across their academic achievement

The diversity in terms of the gender of BSCS students has slight correlation to the academic achievement. Male students are 41% good in their academic achievement and 3% were very good while female students, 51% were good 3% were very good and 1% fair. Results are shown in Table 4.

ACADEMIC ACHIEVEMENT	Excellent		Very Good		Good		Fair		TOTAL	
	F	P	F	P	F	P	F	P	F	P
Male	0	0	2	2.86	29	41.43	0	0	31	44.29
Female	0	0	2	2.86	36	51.43	1	1.43	39	55.72
Total	0	0	4	5.72	65	92.86	1	1.43	70	100

Table 4: Distribution of BSCS students with respect to gender across their academic achievement

The diversity in terms of the age of BSCS students has slight correlation to the academic achievement. BSCS students at 16-19 age brackets has 57% good in their academic achievement and only 1% of them were very good and fair. Middle age bracket (19-21) has 24% well in their academic achievement and 3% were very good. While 22-25 age bracket 11% good and 1% very good. Results are shown in Table 5.

AGE BRACKET	Excellent		Very Good		Good		Fair		TOTAL	
	F	P	F	P	F	P	F	P	F	P
16-18	0	0	1	1.43	40	57.14	1	1.43	42	60
19-21	0	0	2	2.86	17	24.29	0	0	19	27.15
22-25	0	0	1	1.43	8	11.43	0	0	9	12.86
Total	0	0	4	5.72	65	92.86	1	1.43	70	100

Table 5: Distribution of BSCS students with respect to age across their academic achievement

CONCLUSIONS

The birth of our research into brain dominance and student achievement was the result of our inquisition about whether the students brain dominance influence their academic achievement. It was found out that most respondents were left brain dominated. The participants displayed both similarities and differences in the percentage of brain dominance types with learners in other countries. The academic achievements of the respondents were good which means they have to extend more effort to achieve excellent ratings. Surprisingly, it was also found out that there was no correlation between brain dominance and academic achievement; this might be attributed to the fact that the respondents have comparable ratings. Though in this study, the brain dominance does not affect academic achievement. There is still a need to formulate course design that integrates students' heterogeneous preferred learning activities and fill in the gap between the role of brain dominance and its implications for teaching and learning.

We believe that the significance of our study could help enlarge the dimensions of research that examine the area of incorporating new technological in innovative learning strategies can be incorporated in curriculum. The faculty can adopt different types of techniques namely concept maps, abstractions, CAI, CBI, interactive whiteboard methods, blended instructions according to their learning style and the type of dominance which influences their learning at maximum level. More number of practical classes and demonstration methods can be adopted to improve their level of learning.

Arising from this research, it appears to be beneficial to conduct similar researches in different contexts and with larger samples in order to learn more about computer science students, the needs of the learners and empowering them.

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