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Engaging Diversity Through Brain Hemispheric Orientation (BHO) Among College Students: Some Implications On Their Mathematics Performance.

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ABSTRACT

This study primarily sought empirical results to be used for a more complicated future research undertaking. This study categorized the students of the College of Teacher Education according to their left, right, or confluent brain hemispheric orientation through a preference scale. Also, these college students were classified with respect to their low, average, or high level of Mathematics performance basing from the grades in Mathematics subjects. Diversity in college students' gender, age, and ethnicity were analysed for their effect on the brain hemispheric orientation as well as their effect on their level of Mathematics performance. Likewise, this study investigated the influence of brain hemispheric orientation on the level of Mathematics performance of the college students. Findings revealed that there were significantly more left-brained than the combined number of right-brained and confluent-brained college students. There was numerically more college students who had average level than their counterparts with low level and high level of Mathematics performance. Results indicated that female college students outnumbered their male counterparts. The college students belonged to age range 16 to 34 years while 86% belonged to age bracket 16-21 years. The Visayan-college students dominated the student population. There were: significantly more female college students who were left-brained than their male counterparts; significantly more college students at age bracket (16-21) young who were left-brained than their counterparts in other age brackets; significantly more Visayans were left-brained than their counterparts in other ethnic groups. More female college students had high and average level of Mathematics performance than their male counterparts but the numerical difference did not show significant results. There were significantly more college students at age bracket 16-21 years with average level and low level of mathematics performance than their counterparts in other age brackets. More Visayan college students had average level and low level of mathematics performance and which outnumbered their counterparts in other ethnic groups. Gender was found to have not significantly affected the level of Mathematics performance but age, and ethnicity did significantly affect the level of Mathematics performance. Results revealed that brain hemispheric orientation of college students significantly explained their level of Mathematics performance.

INTRODUCTION

Brain hemispheric orientation (BHO) maybe considered left, right or confluent. The left brain hemisphere is the seat of logic and analysis, the right being the home of emotions and creativity, while confluence of both the left and the right makes the person enjoy what is best in life. This categorization helps to determine the personality and behaviour of individuals (1). This orientation allows educators to formulate activities that would suit the line of thinking, interests, preferences, and the motivation of their students. Educators will have the opportunity to engage diversity in brain hemispheric orientation and make use of this diversity in brain orientation to develop more talents in addressing and engaging diversity in its various forms.

In addition, there is a need to consider various types of experiences needed in order to develop cognitive and affective capacities complementing the right and left-brain hemispheres. If the student has the predisposition to use the left-brain, what other activities can be assigned so that the right brain cannot be abandoned? In the same manner that if the predisposition is to use the right brain, activities that activate the left brain can be very important. Besides, what would be the level of performance if the student is left-brained, if one is right-brained, or if one is confluent-brained? Can something be done in order to awaken the dormant hemisphere and be utilized in learning?

For mathematics teaching to be effective, it requires activities to be done by the students themselves. This is according to David Kolb in his Experiential Learning Theory. However, there are multifarious ways of letting students do assigned tasks which make or unmake their learning. The activities that Mathematics teachers present to their students help in motivating and making the subject matter interesting and meaningful. Joseph Bogen (1995) showed that hemisphericity had a crucial role in motivation being the gatekeeper of interest.

There is a lot of confusion about what the brain really and actually does. Two main reasons for the confusion maybe: that a lot of authors have just extrapolated from early researches in their writings, and that people being simplistic systems can be subject to categorization easily, Yves Dorfsman (1997). Most dramatic failure in post secondary education has been in the teaching of mathematical skills, Anita Kitchens (1991).

Due to emphasis on language and verbal processing, schools failed to give adequate stimulation to the right side of the brain and tend to discriminate against the right brain dominant students. Many books have already been written on how to use the hemispheres of the brain. However, these books dealt with medical researches. Many of the previous studies on brain hemispheric orientation were medical in nature but can be of much use to the social scientists. With the dearth of literature on linking the brain hemispheric orientation to the characteristics of individuals or groups of people and their level of performance in their area of endeavour, these medical research outputs can be the bases of concepts that will be able to explain the empirical data.

Roger Sperry (1964) revealed that the brain is divided into two halves referred to as the right and the left hemispheres. Each is unique and complete, and performs distinct functions. Understanding the phenomena of the two hemispheres, gives a clear indication that empirically academic knowledge, specific skills and techniques can be acquired, Michael Andrews (1992). Also, using both hemispheres of the brain cannot be avoided because of the link between the two. If a student finds interest and meaning in an activity, the student would likely prefer this over others. By so doing, the classification of that student can be aptly applied with respect to the orientation of the brain hemisphere used. What could be the activity that would allow the student to use his full potential in the attainment of effective learning?

Statement of the Problem

There is little empirical evidence that brain hemispheric orientation of a person is directly associated with Mathematics performance. Based on the premise, this study aimed to find preliminary results and some implications of engaging diversity in brain hemispheric orientation to the level of Mathematics performance among college students. Finding the profile of the Education students with respect to gender, age, and ethnicity were based on readings. Finding the effect of college students' attributes as diversity in gender, age, and ethnicity on the brain hemispheric orientation as well as its effect on the level of Mathematics performance was statistically treated in this investigation. Further, the diversity in brain hemispheric orientation was correlated with the level of Mathematics performance.

Significance of the Study

Results of this study will be beneficial to the following: Administrators will be provided with information as inputs to planning and deciding on the activities for the attainment of results that measure effectiveness and functional management of the teaching-learning process in Mathematics. Also, administrators will be provided with description of the status of Mathematics

learning in schools. Thus, if administrators are cognizant of the status of learning in Mathematics, then this is one of the alternatives that must be done.

Teachers will be given some guides on matching of activities of the students with their brain orientation. Addressing these diversities, matching would be a likely strategy to give justice to the brain users and have their learning effective.

Students may gain insights on coping mechanisms in improving their performance. Ideas especially when published can be supplied for the students to use. This will be an addition to the written articles for the use and consumption of students.

Researchers will have additional information on factors affecting the level of Mathematics performance. In this country there was not a published study that dealt with this idea. There will be added article on this that comes from the Philippines.

The stakeholders in education will have new dimensions in their search for new developments in education.

Conceptual Framework

The left hemisphere is the most activated side when we use analytical functions, look at details, and work with numbers, Leon Zalewski et al (2000). Much higher thought processes related to analysis and speech lodge in the left-brain. The left brained is organized and so views the right brained to be unreliable and disorganized. Thus, a left brained teacher would regard the right-brained student to be unreliable. The left brained are good at remembering names. Related to the left brain dominant hemisphere, were culture collectivism, low tolerance for ambiguity, and academic majors in business, science and engineering fields, Linda Williams (1983) exposed in her articles. In conjunction, Elaine De Castro (1998) revealed that learning styles can be auditory, visual and kinaesthetic with the left brain. The left brain specializes in academic aspects of learning such as language, math processes, logical thoughts, sequences and analysis.

The right hemisphere is where spatial perception takes place. It is activated if we look at the general pattern, a whole picture, and the general melody of a piece of music. Leon Zalewski et al (2000) wrote that the right brain is more aesthetic through which imagination and visual pattern recognition are processed. Linda Williams (1983) recommended the use of metaphor, visual thinking, fantasy, multi-sensory learning and direct experiences. Culture individualism and high tolerance of ambiguity were associated with the right brain. Those who major in literature, art, education, nursing, law and communication were associated with the right brain hemisphere (2). Yeap Lay Leng and Low Guat Tin (2002) posed that the right brain had greater risk for poor academic achievement. Elaine De Castro (1998) revealed that the learning styles can be made by activists, reflectors, theorists, and pragmatists. The right brained is principally concerned with creative activities utilizing rhymes, rhythm, music, visual impressions, colours and pictures. There is the metaphorical mind, looking for analogies, and patterns. This study would like to address Mathematics performance because in the schools, there are those who have the predisposition to use their right brain. However, use of images, metaphors, mental voyages, analogies, and music need both hemispheres. There is natural predetermination area for each function in the brain. They differ from one person to another due to influences from education, culture, experiences in life, surgery, and medical problems. Dominance of the brain hemisphere is due to genetic imprinting, early training, and cultural bias. Each dominant hemisphere depends on one's interest in either rational or intuitive object. Applying most instructions and experiences through a left-brain mode of input, we overload the memory bank with rationality at the expense of intuition, whereas, in the right brain mode of input the intuitive, creative, and spatial data are secured.

For integrated brain functioning promotes more effective and efficient learning. In this way the integrated brain functioning is capable of helping individuals, regardless of dispositions, use the neglected mode of learning, and integrate the brain as a prerequisite to fulfilment in life. Both can be effective if they are permitted to work in their own way. The left brain can do specific tasks, the right brain does respective specific tasks. This shows that specific hemisphere does specific

functions. Although brain dominance stays the same, there can be done to develop skills of the other half so that when needed, will be more effective. Joseph Bogen (2000) valued both brain hemispheres to be equally important and knew that emotion and feelings were lodged in the right brain but if one is emotionally involved, then both brain hemispheres will participate regardless of the subject matter or content. Versatile speakers show facts (left) and emotions (right) to keep the audience interested Amy Andres (3) A speaker does not stop in his delivery if there is a shift in the use of the specific brain. In mathematically gifted middle school youth, the left and right brain seem to work together better. Stephen Elliott et al (1996) indicated that the commitment of both hemispheres is actually needed. It is in this premise that this study would like to give solutions to.

Gender. In terms of gender, more women were left-brained, with verbal superiority in talking, reading earlier, and mastering languages more easily. Linda Williams (1983) had a study on gender, personality types, and temperament and language strategies. The results revealed that there were significant gender differences. Males were more toward left-brain than females. There were more females than males identified as feeling-oriented. There were more males than females identified as thinking-oriented. Females were more cognitive and metacognitive learners than males. More men were right brained, with spatial superiority, better in maze tasks, map reading, and mechanical work. This maybe culturally related. The preferred style of learning can be modified where art, music, and drama taught with emphasis on synaesthetic mentation on integrating visual, muscular and kinaesthetic use becomes natural process in developing the right hemisphere. Hemisity plays an important role in motivation and science teaching. In artificial intelligence, interest is valued. If one is not interested in certain things then one does not give that thing any attention. If it is interesting then the right brain makes a holistic sense. If the right brain succeeds, then it is processed to the left for analysis. This will pay attention to types of tasks that can make or unmake the learning, James Stout (4). Mathematics giftedness favour the boys over girls appearing an estimated 6 to 13 times more often Amy Andres (3).

Age. Stephen Elliott et al (1996) revealed that there was difference at various age levels between sexes in generating different strategies. Age 6-7 differs significantly from those at age 11-12. The younger is likely to respond to visual configuration reflective of the right compared to the older one who automatically responds to perceptual analysis reflective of the left where greater syntactical and semantic awareness occurs. The female dwell on language and male on spatial intelligence were found to be due to cultural values. The extent which educators should recognize the differences may matter in how much involvement with the other hemisphere and how much one interferes with the other. Pattern matching in cognitive explanations of learning and frequent references to the pattern match between cognitive capacities and the external world is discerned. Age, and culture influenced localization, Stephen Elliott, et al (1996), Roger Sperry (1965) favoured the left because of abstract thinking, interpretations of symbolic relationship, and in carrying out detailed analysis (5).

Mathematically gifted teens did better than the average Math ability teens and college students on tests requiring the two halves of the brain to cooperate, Harnam Singh and Michael O'Boyle (2004).

Ethnicity. Culture, ethnicity or race together with intelligence, language, education, maturity, and religious belief system affect brain hemisphericity, (5). There is art in teaching. There is survival of the self (left) and survival for others (right) (6). Being with human beings, the culture, race, or ethnicity influences cohabitation activities and decisions. Ethnicity has been conceived to affect brain hemispheric orientation and the level of the Mathematics performance of individuals. The study was conceptualized that diversity in terms of gender, age, and ethnicity might have significant contribution to the brain hemispheric orientation of the college students and the level of their Mathematics performance. In turn, the brain hemispheric orientation was conceived to affect the level of performance in Mathematics. Engaging in the diversity of these factors will have far-reaching effect in the improvement of the level of performance in Mathematics. The level of Mathematics performance maybe predicted once the diversity in gender, age, and ethnicity shall have been established.

Understanding the orientation of the brain, people become more efficient if one is consciously allowed and correctly emphasized the proper brain hemisphere used in every task. Benefit is attained from knowing which hemisphere to use during the particular stage of the activity. Propensity to use the dominant brain hemisphere is affected by genetics, childhood experience and family environment that lead to dominance (2).

Roger Sperry (1965) favoured the left because of abstract thinking, interpretations of symbolic relationship, and in carrying out detailed analysis (7).

Propensity to use the dominant brain hemisphere is affected by genetics, childhood experience, and family background (2).

Various expressions of exceptionality, gifted in Math, music or art is a by-product of a brain that has functionally organized itself in a qualitatively different way than the usual left-right asymmetry, Harnam Singh and Michael O'Boyle (2004).

This is aptly explained and put into a concrete structure which draws the relationship of the independent variables (gender, age, and ethnicity) to the moderator variable (brain hemispheric orientation) and eventually to the dependent variable (level of Mathematics performance). Further, the brain hemispheric orientation was analysed in its effect on the level of Mathematics performance.

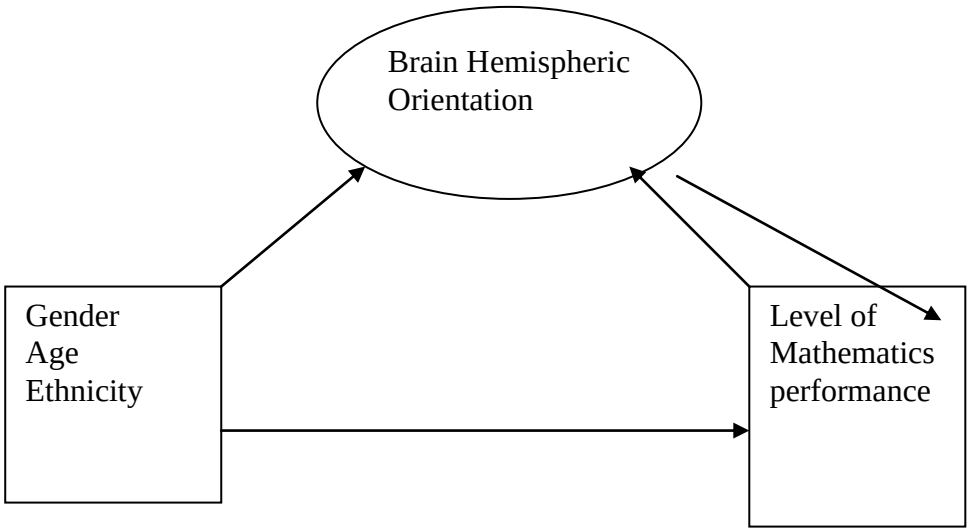

Figure 1. The schematic diagram showing the relationship of gender, age, and ethnicity to the brain hemispheric orientation and the level of Mathematics performance of college students.

Hypotheses of the Study

The study had hypotheses tested at 5% level of significance: Ho1: That gender, age, and ethnicity do not significantly affect brain hemispheric orientation of college students; Ho2: That gender, age, and ethnicity do not significantly affect the level of performance in Mathematics among college students. ; Ho3: That the brain hemispheric orientation does not significantly correlate with the level of performance in Mathematics.

Methodology

Participants. There were 150 college students who were the subjects of the investigation. There were 115 randomly selected freshmen and 35 Mathematics major students who participated in the study.

Procedure. This study was classroom-based. The instrument used was a preference inventory scale with a short questionnaire for the profile given to students during their class. The data

gathered were the preferred activities labelled a, b, c, d. For preferences a and b represent the left, while c and d represent the right. Counting all the preferences indicated that when the sum of a and b was greater than that of c and d then the individual is left-brained if other wise, then right-brained. When the sum of both a and b and c and d was equal then the individual was confluent.

Analysis Record of the responses to the instrument was taken. There is already the brain hemispheric orientation of each. The Mathematics grades were the basis for the classification of students with respect to their level of Mathematics performance. Gender, age, and ethnicity were the independent variables, the Brain hemispheric orientation was the moderator variable and the level of Mathematics performance was the dependent variable. For the profile, brain hemispheric orientation, and the level of Mathematics performance, the frequency and percentage were used. The X2 - test was used for determining the effect of gender, age, and ethnicity on brain hemispheric orientation and the level of performance in Mathematics. While the Contingency C test was used to test the significance of the Chi-Square. The correlation coefficient r was used to correlate the brain hemispheric orientation and the level of performance in Mathematics.

Results

Profile.

Gender. Results showed that among college students, females outnumbered their male counterparts.

Age. The college students' age ranged from 16 to 34 years old. Sixty-nine percent were categorized as young (16-21), 23% were middle (22-27), and eight percent were matured (28-34). The average age was 19.52.

Ethnicity. The diversity in ethnicity revealed that 94% of the college students were Visayans that dominated the student population compared to those coming from other ethnic groups.

Brain Hemispheric Orientation.

Among Education students, findings showed 83% were left, 8% were right and 9% were confluent brain hemispheric oriented individuals. The results showed that the left-brain hemispheric oriented college students outnumbered significantly their right-brained and-confluent brain hemispheric oriented counterparts. The left-brain hemispheric oriented college students preferred to read, write, analyse, speak, work with numbers, and other activities with analytical functions and sequential order. The right-brain hemispheric oriented students preferred the finer things in terms of creativity and aesthetics. These findings contradicted the findings in of Amany Saleh (2), that 94% of the Education students were right brained but confirmed the results of Bruce Morton (2003) that 56% of the 402 entering university students were left-brained. This result that Education students are more left brained was contradicted by Linda Williams (1983).

It is a good indication that there were more left brained college students because there are only few who had greater risk of having poor academic achievement, Yeap Lay Leng and Low Guat Tin (2002). The confluent -brained students make use of both brain hemispheres equally well. There were more confluent than the right -brained among college students. This indicated that there is judicious use of cognitive and effective dimensions among the confluent-brained , Joseph Bogen (2000), James Stout, and Linda Williams (1983). Results are shown in Table 1.

Table 1. Distribution of the college students with respect to their brain hemispheric orientation, 2005.

BRAIN HEMISITY ORIENTATION	FREQUENCY	PERCENT
Left	123	82
Right	12	8
Confluent	15	10
Total	150	100

Gender against Brain Hemispheric Orientation. Investigation on the diverse effect of gender of the college students on their brain hemispheric orientation indicated that there were significantly more female-left than their male-right and confluent counterparts. Among Education students, there were more males who were left-brained than their right-brained and confluent-brained counterparts. This confirmed the findings that there was significant gender difference, Linda Williams (1983). There were more females than males identified as feeling-oriented (right). There were more males than females identified as thinking-oriented (left). Females were more cognitive and metacognitive learners than males although there was no statistical significance. Stephen Elliott et al (1996) found that the females were good at language while males were good at spatial learning. Also indicating that this orientation maybe due to biological and cultural bases. Findings are shown in Table 2.

Table 2. Distribution of the college students with respect to gender across their brain hemispheric orientation, 2005.

GENDER	LEFT		RIGHT		CONFLUENT		TOTAL	
	F	P	F	P	F	P	F	P
Male	48	32	6	4	6	4	60	40
Female	75	50	6	4	9	6	90	60
Total	123	82	12	8	15	10	150	100

Age against Brain Hemispheric Orientation. Education students at young age bracket (16-21) who were left-brained (107 out of 129) were significantly more than any age bracket who were right-brained and confluent-brained individuals. Also, the college students were significantly younger who were left-brained than the middle and matured who were right-brained and confluent-brained counterparts. Stephen Elliott et al (1996) confirmed that in fact, there had been difference in various age levels and that the younger individual is more likely to respond to visual configuration (right) while the older ones will automatically respond to perceptual analysis (left). James Stout (1983) attributed hemisphericity to be linked to genetics and childhood experiences among others. Results are shown in Table 3.

Table 3. Distribution of the college students with respect to age across their brain hemispheric orientation, 2005.

AGE BRACKET	LEFT		RIGHT		CONFLUENT		TOTAL	
	F	P	F	P	F	P	F	P
16-21	107	71	10	7	12	8	129	86
22-27	14	9	0	0	3	2	17	11
28-34	3	2	1	1	0	0	4	3
Total	124	82	11	8	15	10	150	100

Ethnicity against Brain Hemispheric Orientation. There were significantly more Visayans who were left-brained who outnumbered those from other ethnic groups who were right-brained and confluent-brained complements. The results conformed with Bruce Morton in considering ethnicity, culture, race can be interchangeably used. Ethnicity really interests and motivates many

researchers throughout the world. There was attestation to the fact that among the left-brained there was cultural collectivism meaning that they exhibit the characteristics of the race or culture while the right brained had cultural individualism exhibiting the personal choices and individual identities. Results are shown in Table 4.

Table 4. Distribution of the college students with respect to ethnicity across their brain hemispheric orientation, 2005.

ETHNICITY	LEFT		RIGHT		CONFLUENT		TOTAL	
	F	P	F	P	F	P	F	P
Visayan	114	76	6	4	14	9	134	89
Ilocano	6	4	3	2	1	1	10	7
Maguindanaoan	3	2	3	2	0	0	6	4
Total	123	82	12	8	15	10	150	100

Level of Mathematics performance. Findings revealed that 38% of the college students had low level, 48% had average level, and 14% had high level of Mathematics performance. This showed that the college students who had average and high level of Mathematics performance outnumbered their counterparts with low level of Mathematics performance.

Gender against Mathematics performance. Investigating the influence of gender of the college students on the level of Mathematics performance, statistics revealed that gender did not significantly influence the level of Mathematics performance. This implied that diversity in terms of gender may not contribute to the level of Mathematics performance. This contradicted the findings of Joseph Bogen (1995), Harnam Singh et al (2004) that out of the 60 right-handed males, 18 were mathematically gifted, 18 teens and 24 college students had average math ability. Math giftedness seem to favour boys over girls appearing as estimated 6 to 13 times more often. For the gifted, the average Scholastic Aptitude Test math score for college-bound high school seniors was 500/800, but math gifted boys' average SAT was 620/800. Results are shown in Table 5.

Table 5. Distribution of the college students with respect to gender across their level of Mathematics performance, 2005.

GENDER	HIGH		AVERAGE		LOW		TOTAL	
	F	P	F	P	F	P	F	P
Male	9	6	23	15	28	19	60	40
Female	12	8	50	33	28	19	90	60
Total	21	14	73	48	56	38	150	100

Age vs. Mathematics performance. The Education students who were at age bracket (16-21) were significantly more with average level and low level of Mathematics performance than those with high level of performance in other age brackets. However, the findings showed that diversity in age did significantly influence the level of Mathematics performance. The younger college students with average to high level of Mathematics performance significantly outsmarted their complements at the middle to matured college students who had low level of Mathematics performance. This implied that diversity in age significantly influenced the level of Mathematics performance. Further, the learners if trained at an early age may grow to become better performers in Mathematics. This result has been supported by the work of Stephen Elliott et al (1996); Linda Williams (1983) that age and culture influence the localization of the brain. Also, reasons for hemisphericity were genetic imprinting, and early training. Results are shown in Table 6.

Table 6. Distribution of the college students with respect to age across levels of Mathematics performance, 2005.

AGE BRACKET	HIGH		AVERAGE		LOW		TOTAL	
	F	P	F	P	F	P	F	P
16-21	9	6	69	46	51	34	129	86
22-27	9	6	3	2	5	3	17	11
28-34	3	2	0	0	1	1	4	3
Total	21	14	72	48	57	38	150	100

Ethnicity vs. Mathematics performance. The diversity in ethnicity with regards to the level of Mathematics performance revealed that the Visayan college students who had average to high level of Mathematics performance significantly outdid their counterparts from Luzon and Mindanao, who had low level of Mathematics performance. This signified that diversity in ethnicity significantly influenced the level of Mathematics performance. This was confirmed by Stephen Elliott et al (1996), Yeap Lay Leng and Low Guat Tin (2002) that culture, and cultural bias affect level of Mathematics performance. Effectiveness lies in school culture among others, through a similar educational system. Results are shown in Table 7

Table 7. Distribution of the college students with respect to ethnicity across levels of Mathematics performance, 2005.

ETHNICITY	HIGH		AVERAGE		LOW		TOTAL	
	F	P	F	P	F	P	F	P
Visayan	17	11	65	43	51	34	134	89
Ilocano	3	2	4	3	3	2	10	7
Maguindnaoan	1	1	3	2	3	2	6	4
Total	21	14	72	48	57	38	150	100

Brain Hemispheric orientation vs. levels of Mathematics performance. The diversity in terms of the brain hemispheric orientation of college students was significantly related to the level of Mathematics performance. The left brained college students with average to high level of Mathematics performance significantly outperformed their counterparts who were right and confluent brain hemispheric orientation but with low level of Mathematics performance. This indicated that diversity in the brain hemispheric orientation of the college students significantly explained the level of Mathematics performance. This confirmed the results of Yeap Lay Leng and Low Guat Tin (2002) that the right-brained students have greater risk for poor academic performance.

Learning maybe intuitive or logical. Teaching students differently between the left and the right brain thinking may lead to negative classroom experiences which maybe responsible for difficulty in learning Mathematics. The most dramatic failure in the post secondary education has been in the teaching of Mathematical skills. Since the educational system in this country emphasises language and verbal processing, it has been found that in Calculus 709% of the unsuccessful were the left-brained although there was no significant difference between the left-brained and the right-brained, Anita Kitchens (1991). Whatever is the situation in the classroom, the teacher takes the risk of applying and implementing what is best for the students to experience whatever is the brain hemispheric orientation of the students. Results are shown in Table 8.

Table 8. Distribution of the college students with respect to brain hemispheric orientation across levels of Mathematics performance, 2005.

BRAIN HEMISITY	HIGH		AVERAGE		LOW		TOTAL	
	F	P	F	P	F	P	F	P
Left	15	10	58	39	49	33	123	82
Right	4	3	8	5	0	0	12	8
Confluent	1	1	6	4	7	5	15	10
Total	20	14	72	48	56	38	150	100

CONCLUSION

Based on the findings, it can be concluded that Education students have diverse brain hemispheric orientation and level of Mathematics performance. The Education students are generally left-brain hemispheric oriented individuals. Age and ethnicity affect both the brain hemispheric orientation and the level of Mathematics performance among Education students. Brain hemispheric orientation correlates with the level of Mathematics performance.

RECOMMENDATIONS

Based on the conclusions, the following are the suggestions: a similar study be done where the participants come from the elementary and high school levels; a further study be conducted to the tri-people (the highlanders, the lowlanders, and the settlers) of the region; a study be conducted to consider strategy-specific activities believed to enhance the brain hemispheric orientation among all levels in education; and conduct the study on a nationally wider scale and be able to have a good picture of the effect of these diversities.

IMPLICATIONS

Suggested activities that would suit the brain hemispheric orientation of the students shall be developed and experimented on a wider scale. A long term cross sectional study starting from the pre-school to the tertiary level might have improvement on the adeptness of students in Mathematics. Affective dimensions maybe used and thereby contribute to improved Mathematics performance. There is an urgent need to conduct this study in other countries to prove its far-reaching inter-racial effects and impact.

REFERENCES

Internet sources
http://www.education-world com/a_lesson/TM/WS_braintest.shtml
http://www. Ntlf.com/html/lib/umi/1997t.htm.
aandres@csustan.edu
http://www.james_harvey_stout.com
http:www.teachervision.fen.com/teaching-methods/curriculum-planning/3970.html
http://middlepath.com.au/eyesite/hemisphere/php
http://www.nobelprize.org/medicine/lureates1981/
Other internet sources
http://www.education-world com/a_tsl/archives/00_1/lesson0020.shtml
http://middlepath.com.au/eyesite/hemisphere.php
http://www.geocities.com/athens/acropolis/1892/
http://www.curug.ab.ca/dorfsmay/delirium/brain_hemis.html
http://faculty.valenciacc.edu./ffarguharson/learning_styles/cognitivedef.html
http://ric.uthscsa.edu/services

JOURNALS
Andrews, Michael. The consonance between right brain and affective, subconscious, and multi-sensory functions

Amany, Salek (2001) The relationship between brain hemisphericity and college students' choice of academic majors.

Bogen, Joseph et al (2000) Left brain learning over right brain learning. Journal 2.13
De Castro, Elaine 1998. Learning Styles. First Web Reports Dorfsman,Yves, 1997. Hemisphericity of the brain and its consequences on education., Dec. 5, 1997.

Kitchens, Anita et al (1991). Left and Right Brain Theory. Implications for Developmental Math Instruction. Review of Research in Developmental Education vol. 8 no.3.

Yeap Lay Leng & Low Guat Tin (2002). Learning style, the brain functioning domain of Students. National Institute of Education, Nangyang Technological University. Vol. 5 no. 6.
Morton, Bruce (2003) Sorting during higher education on hemisphericity. Journal of Brain Cognition.

Saleh, Amany 2001. Brain Hemisphericity and Academic Majors. College Student Journal. June
Singh, Harnam and Michael O'Boyle 2004. University of Melbourne, Neuropsychologyvol.18., no.2 April.

Williams, Linda (1983). Teaching for the Two sided mind: A guide to right brain left brain education. Englewood Cliffs, NJ. Prentice Hall.

Zalewski, Leon et al (2000) Using Cerebral dominance and their functions for Education Programs. Journal of General Psychology, January

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