



UNIVERSITI PUTRA MALAYSIA

**BRAIN HEMISPHERICITY, CREATIVE THINKING AND CRITICAL
THINKING OF MALAYSIAN SCIENCE AND ARTS STUDENTS**

CHUA YAN PIAW

FPP 2002 15

**BRAIN HEMISPHERICITY, CREATIVE THINKING AND CRITICAL THINKING
OF MALAYSIAN SCIENCE AND ARTS STUDENTS**

By

CHUA YAN PIAW

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirement for the Degree of Doctor of Philosophy**

April 2002





This thesis is dedicated

*to my beloved wife Bok Kai Wa and my three lovely daughters
Yee Pei, Wan Kin and Jing Kin*

&

to the memory of my parents



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

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Chairman: Professor Sharifah Md. Nor, Ph.D

Faculty: Educational Studies

The purposes of this study were: (1) to explore the nature of brain hemisphericity, creative thinking and critical thinking abilities of Malaysian students, (2) to compare brain hemisphericity, creative thinking and critical thinking abilities of the students in terms of academic major, gender and ethnicity variables, and (3) to ascertain the relationships between brain hemisphericity and creative thinking; and between brain hemisphericity and critical thinking. The subject of this study consisted of 216 form-six students (109 science major and 107 arts major) from twenty-seven secondary schools of the state of Selangor. Three instruments were used to appraise brain hemisphericity, creative thinking and critical thinking. The instruments were Your Styles of Learning and Thinking, Torrance Tests of Creative Thinking and Watson-Glaser Critical Thinking Appraisal.



The results demonstrated that the majority of the students were right hemisphere dominants, and they preferred to use only one of their hemispheres in learning and thinking (right hemisphere 54.6%, left hemisphere 36.6%, and whole brain 8.8%).

Descriptive analysis on creative thinking abilities indicated that the students were relatively fluent in producing ideas, and the ideas they created were likely to be original. However, they have less ability to evaluate and elaborate the ideas creatively, and tend to leap to the conclusions about the ideas they create prematurely.

Significant results of ANOVA analysis included: (1) relatively, science major students were left hemisphere dominants, and they have more critical thinking skills, while arts major students were right hemisphere dominants, and they were more creative in thinking, (2) relatively, females were left hemisphere dominants, and more critical in thinking, while males were right hemisphere dominants and more creative in thinking. No significant difference in brain hemisphericity existed between Malay, Chinese and Indian respondents.

The results demonstrated that in terms of creative thinking, Malay students scored significantly higher than Chinese and Indian students on overall creative thinking and originality. In terms of critical thinking, although Chinese



students scored significantly higher than Malays on inference scale, the results indicated that critical thinking index is independent of ethnicity.

Besides that, the data showed that the levels of creative thinking and critical thinking abilities of the Malaysian science major and arts major students fell below the norms of American students of similar age and education level. These results imply that most of Malaysian form-six students need to improve their creative and critical thinking skills.

The results of correlation analysis indicated a significant positive correlation between left hemisphere scale and critical thinking index. The results also ascertained the speculation of some writers and researchers that there was a positive relationship between right hemisphere scale and creative thinking index.

The findings strongly suggest that educators should enhance their understanding of individual differences in learning and thinking, and their thinking abilities before trying to enhance and improve the learning and thinking process of the students in classroom. It seems imperative for educators to recognise students' brain hemisphericity and improve current curriculum to include higher order thinking process in teaching and learning, toward a more balanced whole brain learning and thinking.

The findings also suggest answers for current issues why Malaysian male students were doing less well in schools compared to the females. The “left hemisphere, exam-oriented” teaching methods, evaluation and examination systems in schools did not suit and did not encourage the right hemisphere dominant and creative male students.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**HEMISFERISITI OTAK, PEMIKIRAN KREATIF DAN PEMIKIRAN KRITIKAL
PELAJAR-PELAJAR ALIRAN SAINS DAN SASTERA MALAYSIA**

Oleh

CHUA YAN PIAW

April 2002

Pengerusi: Profesor Sharifah Md. Nor, Ph.D

Fakulti: Pengajian Pendidikan

Tujuan kajian ini ialah: (1) meneroka keadaan semula jadi hemisferisiti otak, kemahiran berfikir kreatif dan kemahiran berfikir kritikal pelajar-pelajar Malaysia, (2) membanding hemisferisiti otak, kemahiran berfikir kreatif dan kemahiran berfikir kritikal pelajar-pelajar berdasarkan aliran akademik, jantina dan ethnic, (3) menentukan perhubungan antara hemisferisiti otak dan kemahiran berfikir kreatif; dan antara hemisferisiti otak dan kemahiran berfikir kritikal. Subjek kajian ini terdiri daripada seramai 216 orang pelajar tingkatan enam (109 orang pelajar aliran sains dan 107 orang pelajar aliran sastera) daripada 27 buah sekolah menengah dalam negeri Selangor. Tiga instrumen digunakan untuk menguji hemisferisiti otak, pemikiran kreatif dan pemikiran kritikal. Instrumen-instrumen tersebut ialah "Your Styles of Learning and Thinking", "Torrance Tests of Creative Thinking", dan "Watson-Glaser Critical Thinking Appraisal".



Dapatan kajian menunjukkan bahawa kebanyakan pelajar secara dominan cenderung menggunakan otak kanan, dan kebanyakan mereka suka menggunakan hanya sebelah otak untuk belajar and berfikir (otak kanan 54.6%, otak kiri 36.6%, dan seluruh otak 8.8%).

Analisis deskriptif tentang pemikiran kreatif menunjukkan bahawa pelajar-pelajar tersebut berupaya menghasilkan idea-idea baru yang asli dengan lancar. Walau bagaimanapun, mereka kurang berupaya menghuraikan idea-idea tersebut secara kreatif, dan cenderung membuat keputusan secara pramatang tentang idea-idea tersebut.

Dapatan kajian analisis ANOVA yang signifikan termasuk: (1) pelajar aliran sains secara dominan cenderung menggunakan otak kiri dan mempunyai kemahiran berfikir yang lebih kritikal, manakala pelajar aliran sastera adalah secara dominan cenderung menggunakan otak kanan dan mempunyai kemahiran berfikir yang lebih kreatif, (2) secara relatif, pelajar perempuan secara dominan cenderung menggunakan otak kiri dan mempunyai pemikiran yang lebih kritikal, manakala pelajar lelaki secara dominan cenderung menggunakan otak kanan dan mempunyai pemikiran yang lebih kreatif. Perbezaan hemisferisiti otak yang signifikan tidak wujud antara responden berbangsa Melayu, Cina dan India.

Hasil kajian menunjukkan bahawa dari segi pemikiran kreatif, pelajar Melayu secara signifikan memperoleh skor yang lebih tinggi berbanding dengan pelajar-pelajar berbangsa Cina dan India. Dari segi pemikiran kritikal, didapati pelajar berbangsa Cina secara signifikan memperoleh skor skala inferensi yang lebih tinggi berbanding dengan pelajar berbangsa Melayu, namun, hasil kajian menunjukkan bahawa indeks pemikiran kritikal adalah bebas daripada faktor bangsa.

Di samping itu, data kajian juga menunjukkan bahawa tahap kemahiran pemikiran kreatif dan kritikal pelajar aliran sains dan sastera di Malaysia adalah lebih rendah daripada norma pelajar Amerika yang mempunyai taraf pendidikan dan umur yang sama. Dapatan kajian ini memberi implikasi bahawa pelajar tingkatan enam di Malaysia perlu meningkatkan kemahiran pemikiran kreatif dan kritikal mereka.

Hasil kajian analisis korelasi menunjukkan bahawa terdapat hubungan positif yang signifikan antara skala otak kiri dan indeks pemikiran kritikal. Hasil kajian juga telah mengenalpastikan spekulasi sesetengah penulis dan pengkaji bahawa terdapat hubungan positif yang signifikan di antara skala otak kanan dengan indeks pemikiran kreatif.

Dengan secara tegas, hasil kajian ini mencadangkan bahawa para pendidik harus meningkatkan pemahaman mereka tentang perbezaan individu dalam

pembelajaran dan pemikiran, dan kemahiran berfikir mereka sebelum berusaha meningkatkan dan memperbaiki proses pembelajaran dan pemikiran pelajar di dalam bilik darjah. Oleh itu, adalah mustahak bagi para pendidik mengenali hemisferisiti otak pelajar, dan memperbaiki kurikulum semasa untuk menerapkan proses pemikiran yang bertaraf tinggi ke dalam proses pengajaran dan pembelajaran, ke arah pembelajaran dan pemikiran seluruh otak yang lebih seimbang.

Hasil kajian juga mencadangkan jawapan kepada isu semasa tentang mengapa pelajar lelaki di Malaysia mencapai keputusan yang kurang baik di sekolah berbanding dengan pelajar perempuan. Kaedah pengajaran yang “berorientasikan peperiksaan dan otak kiri”, dan sistem penilaian dan peperiksaan di sekolah didapati kurang menggalakkan dan kurang sesuai kepada pelajar-pelajar lelaki yang kreatif, yang secara dominan cenderung belajar dan berfikir menggunakan otak kanan.

ACKNOWLEDGEMENTS

Many people have played an important role in the development of this thesis. First of all, I wish to express my deepest gratitude and appreciation to my wife, Bok Kai Wa for her encouragement, patience, understanding, and love throughout my graduate education. Similar appreciation is extended to my three daughters, Yee Pei, Wan xin and Jing xin for given me peace of mind while preparing this thesis.

I wish to record here my gratitude and thanks to the members of my thesis Supervisory Committee, in particular, Professor Datin Dr. Sharifah Md. Nor, the chairman of the Supervisory Committee, for gave me freedom to follow my own research interests, and for keep on calling me very early in the morning, to wake me up from sleeping, just to say “Hi, Chua, what is your progress, don’t forget to do your thesis...”. Her encouragement and willingness to give her time I need, is really beyond work.

Similarly, I am deeply grateful for Professor Dr. Othman Dato’ Hj. Mohamed, my Supervisory Committee member, who discussed with me like an old friend for hours, just because the words “Power Analysis”. He was extremely supportive of this thesis, and offering numerous good suggestions for my consideration. These suggestions have been invaluable.

Special thanks also go to Dr. Rohani, my Supervisory Committee member, for giving suggestions and insightful comments at various stages of this study. Her assistance is gratefully acknowledged. It is a pleasure to work with such a wonderful team of professional.



I would also like to thank Professor Dr. Kamariah Abu Bakar, the Dean of Faculty of Educational Studies, Universiti Putra Malaysia for given me the word "Torrance", from where I found the research sources and developed the inspiration of my study. Besides that, I would like to take this opportunity to thank Associate Professor Dr. Aida Suraya Hj. Md. Yunus, the chairman of my viva voce meeting, and Dato' Professor Dr. Zalizan Mohd. Jelas, the Dean of Faculty of Education, Universiti Kebangsaan Malaysia, for the constructive criticisms and suggestions in perfecting the writing and reporting styles of this study. Their guidance is deeply appreciated.

Last but by no means least, I owe thanks to the staffs and officers at the Graduate School Office and the Graduate Studies Office of Faculty of Educational Studies, UPM, for their generosity. Also, I would like to thank all of the participating respondents of this study, who cooperated in making this research study successful.

Finally, I remain solely responsible for any errors and shortcoming contained in this study.



I certify that an Examination Committee on 18th April 2002 to conduct the final examination of Chua Yan Piaw on his Doctor of Philosophy thesis entitled "Brain Hemisphericity, Creative Thinking and Critical Thinking of Malaysian Science and Arts Students" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

Chua Yan Piaw

Date: April 18, 2002



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