

Styles of Learning and Thinking of Adolescents Aspiring Career in Engineering and Medical Field

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Introduction

Individuals differ in their style of learning and thinking. The left hemisphere dominance is always favoured for science enthusiast. The science further divides into two prominent pathways of engineering and medical field for a science aficionado. Before deciding the career pathway, one comes across interesting and life changing questions of have it or not? Such as, quantitative aptitude, fascination about innovations and technology, practical and applied sense of work, inclination towards research and findings, and finally satisfaction. Both engineering and medical are scientific subjects that allow exposure to various technical subjects and skill sets, varying in degree of requirement. Both subjects need problem solving, decision making, innovation, project or health management, team work and communication. Both have become creative profession in a time of rapid social and technological changes. From an educational perspective, development of problem solving and creativity both are essential requisites of learning and thinking. Problem solving and creativity are the backbone of left and right hemispheric specialization knowledge of brain. Studies have shown that young men and women have different styles when it comes to choosing a career (Mihyeon, 2009). Engineering has traditionally done an exceptional job at educating the left brain – logic, problem solving rather cultivating the right brain – a foci of creativity, artistic skills and humanities. Several research studies regarding the motivations and hopes of the medical students show that the most common motivation are altruism, the desire to help other (Prka, Danic & Glavas, 2002).

Yilmaz-Soylu & Akkoyunlu (2002) found that though all human beings had common bio-socio-psychological characteristics in learning process, yet individual preferences concerning on the way of giving meaning and acquiring information may vary. Therefore the information which becomes the subjective life of an individual after giving being processed may have individual specific differences in ensuring his way of learning and remembering. For such specific reasons, it is important to study the student's learning style to understand the teaching / learning process. Styles of learning and thinking play a major role among of all the factors that influence an individual to choose a stream of career. Styles depend upon cerebral dominance of an individual in retaining & processing different modes of information in his own style of learning and thinking.

Style indicates the hemispheric function of the brain and students learning strategy and information processing are based on the preferences of the brain area (Venkataraman, 1990). Hemisphericity is the cerebral dominance of an individual in retaining and processing modes of information on his/her own style of learning and thinking (Raina,1984). The concept of right brain and left brain thinking was developed from the research in the late 1960s of an American biologist turned psychologist, Roger W. Sperry. He discovered that the human brain has two very different ways of thinking. One (the right brain) is visual and processes information in an intuitive and simultaneous way, looking first at the whole picture then the details. The other (the left brain) is verbal and processes information in an analytical and sequential way, looking first at the pieces then putting them together to get the whole. Brain hemisphericity is the tendency 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). Research has 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, Ehrman, & Lavine, 1991; Springer & Deutsch, 1993; Torrance, 1988). Findings of researchers conducted during the last two decades have shown that the human left cerebral hemisphere is to be specialized for primarily verbal,

analytical, abstract, temporal and digital operations (Bogen, 1989; Gazzaniga, 1990). The same investigations revealed that the right cerebral hemisphere is to be specialized for primarily non-verbal holistic, concrete, creative, analogical and aesthetic functions. Kim, Mihyeon (2009) in his a study showed that thinking-styles are a factor in student's career decision-making. Also, they are different among students enrolled in different programs. Therefore, teachers, parents and counsellors should recognise these different thinking styles in students as a factor in their career choices.

Every individual's decision to make a career is distinct in their styles of learning and thinking. A study investigated the different styles of learning and thinking of the male – female and recommended – not recommended job applicants applied to become an officer in Indian Armed Forces. These job applicants were from engineering background of education. Findings of the study were whole brain oriented male applicants were more often recommended, while right brain oriented female applicants were more often recommended for the Armed Forces. Significant gender differences were found in verbal left hemisphere, class preference whole hemisphere, learning preference left hemisphere, learning preference whole hemisphere, interest whole hemisphere, logical/fractional whole hemisphere, divergent/convergent left hemisphere, divergent/convergent whole hemisphere, creative whole hemisphere, problem solving whole hemisphere and imagination whole hemisphere Kowal, Rajavarapu, Katiyar & Shukla. A (2018).

Garcia & Hughes (2000) in their study concluded that students with better results prefer to learn and think in a certain way. Student's with thinking styles prefers to work independently with no planning of strategies, ideas or task. The same happen with those students showing a style in learning directly related to experience. The result of this study confirms that thinking and learning style were interrelated and also that the student's academic achievement was influence by their style. It must be taken into account that the thinking and learning style is complex since both styles are influence by many variables, variables which should be research in depth. There is no doubt that educators and educational psychologist must encourage thinking as a part of the learning process. Only in this way they can guarantee that schooling brings about one of their major objectives: the creation of learners who knows how to learn. Hence, a research question arises whether within the same (science) subject; do the students employ different styles of learning and thinking?

Aim

The aim of the research paper was to study styles of learning and thinking of adolescents aspiring career in engineering and medical field.

Hypothesis

There will be no difference in styles of learning and thinking of adolescents aspiring career in engineering and medical field.

Methodology

Sample

A sample of 100 male students, 68 engineering and 32 medical fields of career, aspiring to get selected in Indian Institute of technology (IIT) / state engineering colleges and National eligibility- cum- entrance test (NEET) / State medical colleges was collected at various coaching institutes at Kota, Rajasthan through random sampling. Kota is a major coaching hub for competitive examination preparations for engineering and medical entrance examination and entices thousands of students from entire nation. The sample collected was from different socio-economic and demographic background of the country, India. Average age range of the sample was 13 to 17 years.

Tool

For the study Style of Learning and Thinking (SOLAT) tool developed by Venkatraman (1990), was used to measure the functions of right and left hemisphere. The tool consisted of fifty items under following dimensions:-

Learning Styles (1 to 25 items)

- | | |
|-------------------------|----------------|
| (a) Verbal | 1 to 5 items |
| (b) Content preference | 6 to 10 items |
| (c) Class preference | 11 to 15 items |
| (d) Learning preference | 16 to 20 items |
| (e) Interest | 20 to 25 items |

Thinking Style (26 to 50 items)

- | | |
|--------------------------|----------------|
| (a) Logical/fractional | 26 to 30 items |
| (b) Divergent/Convergent | 31 to 35 items |
| (c) Creativity | 36 to 40 items |
| (d) Problem Solving | 41 to 45 items |
| (e) Imagination | 46 to 50 items |

Reliability of the tool

The reliability coefficient of correlation for right hemisphere function was found to be 0.89. For the left hemisphere was found to be 0.65 and for integrated function was 0.71.

Validity of the tool

The concurrent validity of the tool was established with the standardised SOLAT Tool constructed by Paul Torrence. The correlation between the two test scores was 0.842 for the right hemisphere; 0.621 for left hemisphere and 0.678 for the integrated part.

Procedure

The SOLAT test was administered to the engineering and medical students at various institutes of Kota (Rajasthan). A rapport was established and they were made comfortable. They were duly informed about the research purpose. The data was collected in different batches as per their stream through a proper printed questionnaire and all were given ample time to read, ponder upon and respond.

Results

The table1 reveals dominant style of learning of 62 engineering and 38 medical students. The engineering students showed right hemisphere dominance (39.32%) and least in whole hemisphere (6.12%). Medical students also showed right hemisphere dominance (23.48%) and least in whole hemisphere (3.84%). The table also revealed that engineering students have higher percentage of dominant style of learning in right, left and whole hemisphere in comparison to medical students.

Table 1: Showing Dominant Style of Learning of Engineering and Medical Aspirants.

Hemisphere Dominance		Right Hemisphere	Left Hemisphere	Whole Hemisphere
	N = 100	%	%	%
Engineering	62	39.32	26.84	6.12
Medical	38	23.48	17.16	3.84

The table 2 reveals dominant style of thinking of 62 engineering and 38 medical students. The engineering students showed right hemisphere dominance (41.8%) and least in whole hemisphere (2.88%). Medical students also showed right hemisphere dominance (25.8%) and least in whole hemisphere (2.48%). The table also revealed that engineering students have higher percentage of dominant style of thinking in right, left and whole hemisphere in comparison to medical students.

Table 2: Showing Dominant Style of Thinking of Engineering and Medical Aspirants.

Hemisphere Dominance		Right Hemisphere	Left Hemisphere	Whole Hemisphere
	N = 100	%	%	%
Engineering	62	41.8	22.08	2.88
Medical	38	25.8	13.48	2.48

The table 3 reveals overall dominant style of learning and thinking of 62 engineering and 38 medical students. The engineering students showed right hemisphere dominance (40.56%) and least in whole hemisphere (4.5%). Medical students also showed right hemisphere dominance (24.64%) and least in whole hemisphere (3.16%). The table also revealed that engineering students have higher percentage of dominant style of learning and thinking in right, left and whole hemisphere in comparison to medical students.

Table 3: Showing Dominant Style of Learning and Thinking of Engineering and Medical Aspirants.

Hemisphere Dominance		Right Hemisphere	Left Hemisphere	Whole Hemisphere
	N = 100	%	%	%
Engineering	62	40.56	24.46	4.5
Medical	38	24.64	15.32	3.16

Table 4 reveals that, though there was a difference of dominance of learning in engineering students in comparison to medical students but it was not significant at any of the hemisphere and dimensions of learning.

Table 4		Comparison of the Different Styles of Learning between Engineering and Medical Aspirants.																																																																																																																																																																																																						
<i>Styles of Learning</i>	Stream	N	Mean	Std. Deviation	Std. Error Mean	t	df	Difference between Mean																																																																																																																																																																																																
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	1.00	38	2.50	.97	.15				Verbal Left Hemisphere	0.00	62	3.11	1.16	.14	-1.37	98	Not Significant	1.00	38	3.42	.94	.15	Verbal Whole Hemisphere	0.00	62	.90	.91	.11	-0.76	98	Not Significant	1.00	38	1.05	.98	.15	Content Preference Left Hemisphere	0.00	62	3.11	1.10	.14	0.58	98	Not Significant	1.00	38	2.97	1.21	.19	Content Preference Right Hemisphere	0.00	62	2.32	1.19	.15	0.35	98	Not Significant	1.00	38	2.23	1.14	.18	Content Preference Whole Hemisphere	0.00	62	.67	.97	.12	1.27	98	Not Significant	1.00	38	.44	.68	.11	Class Preference Left Hemisphere	0.00	62	3.08	.99	.12	0.70	98	Not Significant	1.00	38	2.94	.76	.12	Class Preference Right Hemisphere	0.00	62	2.24	1.06	.13	-0.10	98	Not Significant	1.00	38	2.26	.94	.15	Class Preference Whole Hemisphere	0.00	62	.32	.62	.07	0.48	98	Not Significant	1.00	38	.26	.55	.08	Learning Preference Left Hemisphere	0.00	62	3.32	1.05	.13	-0.92	98	Not Significant	1.00	38	3.52	1.10	.17	Learning Preference Right Hemisphere	0.00	62	1.66	1.02	.12	-0.21	98	Not Significant	1.00	38	1.71	1.27	.20	Learning Preference Whole Hemisphere	0.00	62	.08	.27	.03	-1.55	98	Not Significant	1.00	38	.23	.71	.11	Interest Left Hemisphere	0.00	62	3.82	1.03	.13	1.53	98	Not Significant	1.00	38	3.50	1.00	.16	Interest Right Hemisphere	0.00	62	1.48	1.06	.13	-0.74	98	Not Significant	1.00	38	1.65	1.23	.20	Interest Whole Hemisphere	0.00	62	.48	.71	.09	-0.27	98	Not Significant	1.00
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For Stream read 0.00 as Engineering Students and 1.00 as Medical Students

Table 5

reveals

that, though there was a difference of dominance of thinking in engineering students in comparison to medical students but it was not significant at any of the hemisphere and dimensions of learning.

<i>Table 5</i>		Comparison of the Different Styles of Thinking between Engineering and Medical Aspirants.						
<i>Styles of Thinking</i>	Result	N	Mean	Std. Deviation	Std. Error Mean	t	df	Difference between Mean
Logical / Fractional Left Hemisphere	0.00	62	3.58	.85	.10	0.009	98	Not Significant
	1.00	38	3.57	.94	.15			
Logical / Fractional Right Hemisphere	0.00	62	1.85	1.02	.12	0.31	98	Not Significant
	1.00	38	1.78	.99	.16			
Logical / Fractional Whole Hemisphere	0.00	62	.43	.84	.10	-0.52	98	Not Significant
	1.00	38	.52	.82	.13			
Divergent / Convergent Left Hemisphere	0.00	62	3.48	1.15	.14	1.41	98	Not Significant
	1.00	38	3.10	1.50	.24			
Divergent / Convergent Right Hemisphere	0.00	62	1.59	1.10	.14	-1.73	98	Not Significant
	1.00	38	2.05	1.50	.24			
Divergent / Convergent Whole Hemisphere	0.00	62	.16	.41	.05	-1.08	98	Not Significant
	1.00	38	.28	.76	.12			
Creative Left Hemisphere	0.00	62	3.53	1.03	.13	-0.64	98	Not Significant
	1.00	38	3.68	1.29	.21			
Creative Right Hemisphere	0.00	62	1.66	1.05	.13	1.70	98	Not Significant
	1.00	38	1.28	1.06	.17			
Creative Whole Hemisphere	0.00	62	.20	.54	.06	0.75	98	Not Significant
	1.00	38	.13	.41	.06			
Problem Solving Left Hemisphere	0.00	62	2.85	1.22	.15	-1.41	98	Not Significant
	1.00	38	3.21	1.21	.19			
Problem Solving Right Hemisphere	0.00	62	2.08	1.14	.14	1.01	98	Not Significant
	1.00	38	1.84	1.12	.18			
Problem Solving Whole Hemisphere	0.00	62	.06	.30	.03	-1.75	98	Not Significant
	1.00	38	.21	.52	.08			
Imagination Left Hemisphere	0.00	62	3.40	1.31	.16	0.03	98	Not Significant
	1.00	38	3.39	1.15	.18			
Imagination Right Hemisphere	0.00	62	1.70	1.20	.15	-0.75	98	Not Significant
	1.00	38	1.89	1.18	.19			
Imagination Whole Hemisphere	0.00	62	.29	.55	.07	-1.46	98	Not Significant
	1.00	38	.47	.68	.11			

For Stream read 0.00 as Engineering Students and 1.00 as Medical Students

Discussion

The results showed that there exists a dominance of right, left & whole hemisphere of engineering students in compared to medical students in styles of learning and thinking. Both streams of students exhibited same pattern of dominance in styles of learning and thinking, dominance of right hemisphere and least whole hemisphere. There was no significant difference found in any hemispheres and dimensions of styles of learning and thinking in between engineering and medical students. Thus this study concludes that among men there were no different styles of learning and thinking when it comes to choosing a career within same science stream of subject. Both engineering and medical students showed same styles of learning and thinking. This study provided an insight in relation to the findings of Mihyeon, 2009 that choosing a career requires different styles but same styles were found when choosing a career within a stream of same subject. This study also refute the traditionally understanding a career of engineering as a left brain arena, rather both engineering and medical have focused on right hemisphere dominance and became creative profession in a time of rapid social and technological changes. Both engineering and medical are scientific subjects that allow exposure to various technical subject and skill sets, varying in degree of requirement. Both subjects need problem solving, decision making, innovation, project or patient management, team work and communication.

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