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Styles of Learning and Thinking

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The present study is aimed at examining the hemispheric preferences for information processing and styles of learning and thinking in children. A sample of 250 students of class VIII which included both boys and girls from five English medium schools were selected. The tool Styles of Learning and Thinking was administered. Results revealed that there was significant difference in the right and left (brain) hemisphere preference for information processing among children and that boys were more right hemispheric oriented and girls were more left hemispheric oriented in information processing. Significant difference in the styles of learning and thinking and concept preference among right hemisphere and left hemisphere dominant children was also observed with respect to both genders.

What happens to us in life depends on not just 'how we' think, but 'how well' we think and learn. Of all the factors that influence an individual, his styles of learning and thinking play a major role. Parents and teachers are able to perceive children and their natural tendencies of how they think, act and learn in different ways and in different situations. For example, one child may welcome structure in learning while another may welcome new ways of doing things. One child may perform tasks in an orderly and systematic pattern and another may perform tasks in an unsystematic pattern. This is due to individual differences in their style of learning and thinking. In academic institutions, learning and teaching processes are mismatched. Teaching and thinking styles of the teachers and learning and thinking styles of students differ because learning differences are not tied up to the understanding and thinking abilities of students. Many educators are still perplexed about the styles of students in learning and thinking process; what effect these styles have on children's performance in schools and why attention should be given to children's performance to assess their levels of ability.

Styles depend upon cerebral dominance of an individual in retaining and processing different modes of information in his/her own style of learning and thinking. Style indicates the hemisphericity functions of the brain and students' learning strategy and information processing are based on the preferences of the brain area (Venkataraman 1994). 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). Researches 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; Fitzerald & Hattie, 1993). The same investigations revealed that the right cerebral hemisphere is to be specialized for primarily non-verbal holistic, concrete, creative, analogic and aesthetic functions. The differences in preference of the two hemispheres for information processing have been referred to as styles of learning and thinking (SOLAT) by Torrance. Styles are propensities rather than abilities. They are the ways of directing the intellect which an individual finds comfortable. The styles of learning and thinking are as important as levels of ability and we ignore to identify and develop then in students at an early and appropriate stage. Torrance and others have developed the SOLAT tool based on the hemisphericity functions of the brain. It identifies hemisphericity dominance by way of studying the hemisphere functions. It indicates a student's learning strategy and brain hemisphere preference in problem-solving.

Objectives:

- To measure right hemisphere and left (brain) hemisphere preferences for information processing in children.
- To find the differences in the right hemisphere and left hemisphere preferences for information processing in boys and girls.
- To measure styles of learning and thinking in right hemisphere and left hemisphere dominant children.
- To find the difference in the styles of learning and thinking in right hemisphere and left hemisphere dominant boys and girls.

Method

Sample

The sample consists of 250 students of Class VIII which included both boys and girls from five English medium schools.

Tools

SOLAT (Styles of Learning and Thinking) developed by Venkataraman (1994) is used in the present study. It is a modified version of the tool developed by Torrance. It identifies hemisphericity dominance by way of studying the hemisphere functions. It indicates the learning and thinking styles and brain hemisphere preference.

Results and Discussion

Right and Left (brain) Hemisphere Preference for Information Processing in Children

Table 1 shows the number of children who preferred the right brain (R), the left brain (L) and whole brain (W) irrespective of gender. It indicates that the calculated χ^2 value 166.016 with degree of freedom 2 is highly significant at 0.000 level. Thus there is a significant difference in the right hemisphere and left (brain) hemisphere preference for information processing among children.

Right and Left (brain) Hemisphere Preference for Information Processing in Boys and Girls

Table 1 Chi-Square Table for the Hemisphericity Preference for Information Processing in Children

Brain	Observed N	Expected N	Residual	Hemisphere
Right Hemisphere	178	83.3	94.7	Chi-square 166.016
Left Hemisphere	50	83.3	-33.3	df(2)
Whole Hemisphere	22	83.3	-33.3	P .000
Total	250			

Table 2 shows gender-wise hemisphere preference. From the values calculated through gender hemisphere cross tabulation, it is clear that overall right hemisphere dominates among children for information processing. The table indicates that boys are more right hemisphere oriented and girls are more left hemisphere oriented in information processing.

Styles of Learning and Thinking among Right Hemisphere and Left Hemisphere Dominant Children

Table 2. Gender hemisphere Cross Tabulation to find the Hemisphere Preference for Information Processing in Boys and Girls

Gender	Hemisphere Preference			Total
	Right	Left	Whole	
Boys	102 (77.9%)	21 (16.0%)	8 (6.1%)	131 (100%)
Girls	76 (62.9%)	29 (24.4%)	14 (11.8%)	119 (100%)
Total	178 (71.2%)	50(20%)	22 (8.8%)	250 (100%)

Table 3 shows the hemispheric preference and styles of learning and thinking accordingly.

It is indicated that the χ^2 value 6.449 with df 1 is significant at 0.0000 level. So there is a significant difference in the style of learning and thinking among right hemisphere and left hemisphere dominant children.

Styles of Learning and Thinking and Hemispheric Preference among Boys and Girls

Table 4 shows the preferences of styles of learning and thinking in the left and right hemisphere dominant boys and girls.

It is indicated that the χ^2 value 256.0117 with df 1 is highly significant at 0.0000 level. So there is a significant difference between the right hemisphere learning and thinking styles and left hemisphere learning and thinking styles for information processing in boys and girls.

Table 3. Preference of Styles of Learning and Thinking among Children

	Right Hemisphere										Left Hemisphere									
	Learning Style					Thinking Style					Learning Style					Thinking Style				
	Content preference	Class Preference	Learning Preference	Interest	Logical Fractional	Conceptual Receptive	Creative	Problem Solving	Imagination	Verbal	Context Preference	Class Preference	Learning Preference	Interest	Logical Fractional	Conceptual Receptive	Creative	Problem Solving	Visualization	
231 Total)	523	411	486	291	409	425	500	479	376	154	95	131	144	102	93	136	106	93	113	
130 Mean)	2.94	2.31	2.73	2.76	2.30	2.39	2.81	2.69	2.11	3.08	1.9	2.62	2.88	2.04	1.86	2.72	2.12	1.86	2.26	

Table 4: Preference of Styles of Learning and Thinking in Right and Left Hemisphere DominantBoys and Girls

	Right Hemisphere										Left Hemisphere									
		Learning Style				Thinking Style					Learning Style					Thinking Style				
	Verbal	Content preference	Class Preference	Learning Preference	Imagination	Logical fractional	Convergent/ Divergent	Creative	Problem Solving	Imagination	Verbal	Conduct Preference	Class Preference	Learning Preference	Imagination	Logical/ Fractional	Convergent/ Divergent	Creative	Problem Solving	Imagination
Boys Total	126	315	240	284	303	240	246	282	284	219	60	44	56	52	27	43	57	44	39	47
Mean	1.23	3.09	2.22	2.78	2.97	2.35	2.41	2.76	2.78	2.15	2.86	2.10	2.67	2.48	1.29	5.05	2.71	2.10	1.86	2.24
Girls Total	107	209	185	202	189	170	180	218	195	156	94	51	75	92	75	50	79	62	54	66
Mean	1.41	2.75	2.43	2.66	2.49	2.24	2.37	2.87	2.57	2.05	3.24	1.76	2.50	3.17	2.59	1.72	2.72	2.14	1.86	2.28

It is indicated that in learning style χ^2 value 82.33 with df 1 at 0.000 level is highly significant. So there is a significant difference in right hemisphere and left hemisphere learning style for information processing in boys and girls. In thinking style χ^2 value 42.229 with df 1 at 0.0000 level is highly significant. So there is a significant difference in the right and left hemisphere thinking style for information processing in boys and girls.

Table 5 shows the preference for learning and thinking of concepts among the hemispheric dominance in boys and girls.

Table-5: Difference in the Preference for Learning and Thinking Concepts among Right and Left Hemisphere Dominance in Boys and Girls

Learning Style																	
Verbal				Content Preference			Class Preference			Learning Preference			Interest				
	R*	L*		R	L		R	L		R	L		R	L			
Boys	126	60	χ^2 = 8.45 df = 1 P =0.0003	315	44	χ^2 = 6.28 df = 1 P= 0.0122	240	86	χ^2 = 7.57 df = 1 P= 0.0122	284	52	χ^2 = 22.25 df = 1 P= 0.0000	303	27	χ^2 = 42.19 df = 1 P= 0.0000		
Girls	107	94		209	51		185	75		202	92		189	75			

Thinking Style																	
Logical/ Fraction				Convergent/ Divergent			Creative			Problem Solving			Imagination				
	R	L		R	L		R	L		R	L		R	L			
Boys	240	43	χ^2 = 4.66 df = 1 P =0.0309	246	57	χ^2 = 10.4 df = 1 P= 0.0013	282	44	χ^2 = 7.801 df = 1 P= 0.0052	284	39	χ^2 = 9.54 df = 1 P= 0.0020	219	47	χ^2 = 9.89 df = 1 P= .0017		
Girls	170	50		180	79		218	62		195	54		156	66			

Learning Style: The concept 'Verbal' shows, χ^2 value 8.45 with df 1 which is highly significant at 0.00036 level; the concept 'Content Preference', the χ^2 value 6.28 with df 1 at 0.0122 level is significant; the concept 'Class Preference' shows χ^2 value 7.57 with df 1 which is significant at 0.0059 level; the concept 'Learning Preference' shows χ^2 value 22.25 with df 1 at 0.000 level which is highly significant; the concept 'Interest' shows χ^2 value 42.19 with df 1 and is significant at 0.0000 level. This shows that there is a significant difference in the preference for concepts of learning styles among right hemisphere and left hemisphere dominant boys and girls.

Thinking Style: The concept 'Logical / Fractional' shows χ^2 value 4.66 with df 1 at 0.0309 level and is significant; the concept 'Convergent /Divergent Thinking' shows χ^2 value 10.40 with df 1 at 0.0013 level and is significant; the concept 'Creative Thinking' shows χ^2 value 7.801 with df 1 at 0.0052 level and is significant; the concept 'Problem Solving' shows χ^2 value 9.54 with df 1 at 0.0020 which is significant; the concept 'Imagination' shows χ^2 value 9.89 with df 1 at 0.0017 level and is significant. This shows that there is a significant difference in the preference for concepts of thinking styles among right hemisphere and left hemisphere dominant boys and girls.

In the light of above χ^2 values it is concluded that there is a significant difference in the preference for learning and thinking styles of concepts among right hemisphere and left hemisphere dominant boys and girls. Thus it is concluded that there is a significant difference in the styles of learning and thinking among right hemisphere and left hemisphere dominant boys and girls.

Out of 250 children taken for the present study 178 (71.2%) children preferred right hemisphere, 50 (20%) children preferred left hemisphere and 22 (8.8%) preferred whole brain for information processing. Psychological and split-brain researches show that the two hemispheres have specialized complementary functions. The left hemisphere apparently specializes in sequential logical, verbal, symbolic, convergent production and logic functioning (Raina, 1984; Rubenzer, 1998). The studies of Hunter (1996) and Sperry (1998) concludes that the right hemisphere has a great neuronal capacity to deal with informational complexity. The right hemisphere has a greater ability to process many modes of information with a single cognitive task. While the left hemisphere is superior in tasks which require fixation upon a single mode of representation or execution.

Interpretation of complex visual patterns analysis of voice intonation, face processing, awareness of body position, spatial orientation and the perception of fine and gross motor activities, dreaming, imagery, creativity and music come under the realm of right hemisphere (Venkataraman, 1994). Samples in this study are more right hemisphere oriented and they tend to exhibit these qualities. The left hemisphere specializes in sequential logical, verbal, symbolic, convergent production and logic functioning (Venkataraman, 1994). Those who were left hemisphere oriented tend to exhibit these qualities. But in no way the one hemisphere is superior over the other. Differences in brain functions is what causes individual differences in learning and thinking styles (Torrance and Reynolds, 1980).

Results indicate that gender plays a role in hemisphere preference for information processing. In right hemisphere preference, boys dominated while in left hemisphere preference, girls dominated. This has been observed by Jangaiah (1998) on a study on learning and cognitive styles for the same age-group. In total, right hemisphere dominated in hemisphericity preference among children.

There is a difference in the styles of learning and thinking among children. Children who preferred right hemisphere for information processing were more "content preferred" in learning style and "creative" in thinking style. Those children who preferred left hemisphere for information processing were more "verbal" in their learning style and "convergent and divergent" in their thinking style. Right hemisphere preference for the concepts of learning style is in the following order, Content Preference, Interest, Learning Preference, Class Preference and Verbal. The preference for the concepts of learning style in left hemisphere is in the following order, Verbal, Learning Preference, Class Preference, Interest and Content Preference. In right hemisphere the preference for the concepts of thinking style are the following, Creative Thinking, Problem Solving, Convergent/ Divergent Thinking, Logical/Fractional and Imagination. In the left hemisphere, it is Convergent/Divergent Thinking, Creative, Imagination, Problem Solving and Logical/ Fractional. Reynolds and Torrance (1978) concluded that teacher-directed learning tends to favour students with a left hemisphere style of learning, while self-directed learning favours right hemispheric learners. Such a conclusion may not be possible here, but the probability of such a case may exist since the components of each hemisphere styles are so.

Results indicate that there are gender differences with respect to the styles of learning and thinking; the right brain learning and thinking style and left brain learning and thinking style; the right and left hemisphere learning style and right and left hemisphere thinking style; and the preference for each concept under learning and thinking styles for right and left hemisphere.

The boys who are more right hemisphere oriented preferred learning styles of concepts in the order of Content Preference followed by Interest, Learning Preference, Class Preference and Verbal. The boys who are left hemisphere oriented preferred learning styles of concepts in the order of Verbal, Class Preference, Learning Preference, Content Preference and Interest. Under thinking styles, those boys with right hemisphere preference showed preference for concepts in the order of Problem Solving, Creativity, Convergent/Divergent, Logical/ Fractional and Imagination respectively. The boys who were left hemisphere oriented in their preference of concepts of thinking styles showed the order of preference as, Convergent/ Divergent, Imagination, Creativity, Logical, Fractional and Problem Solving respectively. The preference of conceptualization bears close resemblance to the description given by Springer and Deutsch (1989).

Among the girls who preferred right hemisphere for information processing in learning style, they preferred the concept Content Preference followed by Learning Preference, Interest, Class Preference and Verbal. Among the girls, who preferred the right hemisphere for information processing, in learning style of concepts the order of preference is Verbal, Learning Preference, Class Preference, Interest and Content Preference respectively. Pask (1986) too found that females (similar age group) of the right hemisphere dominance showed greater preference for learning styles of concepts that are more verbal followed by other concepts. In the concepts of thinking style the girls who preferred left hemisphere for information processing showed the order as Convergent and Divergent Thinking, Imagination, Creativity, Problem Solving and Logical/ Fractional respectively. Those who showed right hemisphere preference in thinking style among girls showed preference for Creative Thinking followed by Problem Solving, Convergent/Divergent Thinking, Logical/ Fractional and Imagination. The right and left hemispheres have their own peculiarities and significance. But for an individual to function better, an integrated function of both the

hemispheres is necessary (Kane & Kaane, 1999).

The two hemispheric functions may be activated thereby influencing the styles of learning and thinking. Researches done by Reynolds and Torrance (1978), Pask (1986) and Gazzaniga (1989) indicate that it is possible to modify a person's preferred style of learning and thinking over relatively brief period (six to ten weeks). It is also possible to control the general direction of the changes in the styles of learning and thinking with the knowledge of styles of learning and thinking mechanism. It may also be possible to train individuals to modify their information processing procedures to best fit their demands of the cognitive tasks (Jangaiah, 1998).

Conclusion

To conclude it is essential to identify the styles of learning and thinking of children in order to facilitate the process of learning and teaching. Since the focus is on child-centred pedagogy giving primacy to the child's experiences, voices, thoughts and participation in learning which the National Curriculum Framework (2005) reiterates in its chapter on 'Learning and Knowledge', it becomes necessary to change our approach to teaching. In fact, knowledge of the child's information processing styles would enhance teaching and make the exercise fruitful. The teaching techniques in the schools can be undertaken in consonance with the students' style of learning and thinking. Further it would enable the teacher to organize the teaching and learning procedures in such a way that they tone up and activate the hemisphere functions of the brain in students. Different teaching techniques and methodologies can be adopted to activate and influence the hemisphere functions of the brain (Samples, 1978; Raina, 1984).

References

Bogen, J.E. (1989). The other side of the brain-II, an appositional mind. *Bulletin of the Los Angeles Neurological Society, 49*, 135-162.

Fitzgerald, D. & Hattie, J.A. (1993). An evaluation of your style of learning and thinking inventory. *British Journal of Educational Psychology, 63,* 336-346.

Gazzaniga, M.S. (1989). Hemispheric lateralisation of the human brain. *UNCLA Educato, 22*, 9-12.

Gazzaniga, M.S. (1990). The bisected brain. New York : Applenton-Century Crofts.

Hunter, M. (1996). Right brained kids in left brained schools. *Journal of Today's Education, 38*, 45-68.

Jangaiah, C. (1998). Learning styles. Hyderabad: Booklinks Corporation.

Kane, N. & Kaane, M. (1999). Comparison of right and left hemisphere function. *The Gifted Child Quarterly, 46*, 157-67.

National Curriculum Framework (2005). New Delhi: National Council of Educational Research and Training.

Pask, G. (1986). Styles and strategies of learning. British Journal of Educational Psychology, 56, 128-148.

Raina, M.K. (1984). Education of the left and right hemispheres-implications of hemispheric specialization. Madras: Allied Publishers.

Reynolds, C.R. & Torrance, E.P. (1978). Perceived changes in styles of learning and thinking (hemisphericity) through direct and indirect training. *Journal of Creative Behaviour, 12*, 245-52.

Rubenzer, R. (1998). The left and right hemisphere model for information processing: possible implications for education. New York: Columbia University Press.

Samples, R.E. (1978). Are you teaching only one side of the brain ? *Learning, 23*, 24-30.

Sperry, R.W. (1998). Left brain-right brain. *Saturday Review*, February 1998, pp.18-20.

Springer, S.P. & Deutsch, G. (1989). Left brain – right brain. San Francisco: WH Free Man and Co.

Torrance, E.P. & Reynolds, C.R. (1980). Technical manual for your style of learning and thinking, form C. Athens, Georgia : University of Georgia Press.

Venkataraman, D. (1994). Styles of learning and thinking – administrator's manual. New Delhi : Psycom Services.

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