



## Analyzing Influence of Customized Teaching Conforming to Child's Learning Nature on Academic Achievement and Cognitive Abilities of 12 year old Students

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### ABSTRACT

Effective learning can originate from classroom as evidenced by effective use of alternative teaching and learning models. Learning should free students from any bondage that would curb excitement and curiosity. The study was conducted on a sample of 461 students who were 12 years of age. Respondents were further categorised on the basis of gender and eventually into experimental and control group. Students in experimental group were given multiple intelligence based worksheets during the intervention programme. The intervention was provided for 12 months and respondents were assessed five times. Later, it was found that owing to the personalized instructions system to teach students in experimental group, there was witnessed significant soar in their cognitive abilities and academic achievement. In contrast, insignificant changes were witnessed among their control group counterparts after the intervention programme.

### 1. INTRODUCTION

In an educational process old ideas have led to stagnation paving its way through innovations and continuous reconstruction of experiences thereby taking a new meaning of education in the present times. This significantly emphasizes a quest

for quality and focusing on certain key areas in the realm of education. In a truly transition phase, we come across an educational set up where the old is becoming obsolete and the new is in the process of emergence and acceptance. Today education depends on quality of people produced and hence has the onus of producing knowledge based society rather than literacy based society and for this education can no longer remain conventional. Haggerty (1995) studied the relationship between multiple intelligences and achievement among engineering students. The results revealed that logical-mathematical intelligence was not necessarily the best predictor for their achievements and that no significant relation was found between multiple intelligences and achievement among students. Hoerr (1996) illustrated that every child possesses each of the multiple intelligences. However the extent to which each one carries these intelligences is different. The study concluded that on implementation of the multiple intelligences theory in schools, the students excel in their study areas. Greenhawk (1997) narrated the implementation of multiple intelligences at White Marsh Elementary School in Maryland. The findings suggested that the application of multiple intelligences raised student performance on standardized tests and produced a universal culture of achievement. Khandwalla (2001) compared the effectiveness of multiple intelligences based teaching strategies and traditional teaching in the teaching of English and History and found that the use of multiple intelligences in classroom was effective. Furnham, Tang, Lester, O'connor and Montgomery (2002) studied the academic achievement in among 12th grade students in regard to intelligence and inferred that intelligence was positively related to achievement. Habraken(2004) in his study observed that there is a plurality of intelligences and therefore students learn in different ways. According to him, if the primary intelligence is identified and students are taught as per their primary intelligence, it would lead to improvement in the academic performance. Marjoribanks (2005) found multiple intelligences as an effective tool for improving the teaching and learning processes. The study also concluded that such improvements in learning had a positive impact in achieving the higher grades in academics. Bumen (2007) explored the differences between multiple intelligences strategies and traditional teaching methods among students studying in 8th standard. The findings suggested that there was no significant difference noted in knowledge achievement between the students who were taught using multiple intelligences strategies and those who were taught using conventional methods. Watkins, Lei and Canivez (2007) carried a research to study intelligence and gender as predictors of academic achievement for undergraduate students. The results indicated that there were insignificant differences between math and verbal abilities among men and women. Douglas, Burton and Reese-Durham (2008) conducted a research to investigate the relation between self estimation, intelligence and academic achievement of school students. The study revealed that there was a significant relationship between academic achievement and self estimation of secondary school students. Besides,

there existed a high correlation between intelligence and academic achievement. Alghazo, Obeidat, Al-trawneh and Alshraideh (2009) executed a study on the relationship between multiple intelligences and academic achievement of students. The study notified that there was significant correlation between multiple intelligences and academic achievement. Hernández, Noruzi, and Sariolghalam (2010) believed that multiple intelligences based curriculum helped students to solve their practical and real life problems and also helped them to perform better toward excellence. The results indicated that multiple intelligences can enable students to become successful learners. Multiple intelligences based teaching increased student confidence, and academic performance. Afzalkhani, Naderi, Shariatmadari and Seif (2011) carried on a study and found that there existed a positive relationship between creativity and academic performance. Parmar (2012) conducted a research study on self estimation, adjustment and academic achievement of tenth and twelfth standard students. It was traced that self estimation level of urban group of students was found significantly higher and more positive than rural group of students but they were found to be insignificantly different in terms of their academic achievement. Another study was conducted by Stevens and Bavelier (2012) traced that selective attention skills are relevant for academic foundations and amenable to training, they represent an important focus for the field of education. It is argued that developmental differences in selective attention are related to the neural systems important for deploying selective attention and managing response conflict. In contrast, once effectively deployed, selective attention acts through very similar neural mechanisms across ages. In terms of maths, Hawthorne et al. (2014) examined the correlation between creativity and intelligence quotient and their impact on academic achievement and the findings indicated an insignificant relationship between creativity and performance. The result of the study commensurate with that found by Muhammad, Syed and Khalid (2015) who assessed the self-esteem and academic performance among university students after arising of several behavioral and educational problems. It was found that there was a significant relationship existed between self-esteem and academic performance. In this context, Maria and Jebaraj (2017) found that there is significant difference of self esteem in relation to academic achievement among the selected higher secondary school students. Those who have a realistic and perfect self estimation level have consistently higher academic achievement, while those who underestimate themselves refrain from attempting tasks confidently and therefore show lower performance. Likewise, the performance is lower than expected among those who overestimate themselves. Sener and Cokcaliskan (2018) carried a research to find out if there was any relationship between multiple intelligence and academic achievement of ninth standard students. The results revealed that there existed a positive but slightly significant relationship between the students' multiple intelligences dimensions and their academic achievement. Similar findings were

suggested by Dehaene et. al (2004), Dewey (2004), Dewey (2013), Dickerman (1911), Dunning et. al. (2003) Ehrlinger et. al (2016), Eysenck (2018), Freeman et. al. (1942), Friedman et. al (2003) and Gajda et. al (2017).

## 2. METHODOLOGY

The study was conducted on a sample of 461 students who were 12 years of age. Respondents were further categorised on the basis of gender and eventually into experimental and control group. The experimental group refers to the group under study which receives the intervention during the course of study to find out the variation and changes in the dependent variables precisely intelligence quotient, focus factor, decision making ability, creative quotient and academic achievement before, during and after the implementation of intervention program. The control group refers to the group under study which is refrained from the provision of any intervention during the course of study. Intervention included worksheets based on Gardner’s multiple intelligences. Each student was given worksheets according to his own natural learning style which was assessed during the programme. The control group refers to the group under study.

Table 1: Sampling Procedure

Age (years)	Total Sample	Gender	N	Place	n	Experimental Group	Control Group
12	461	M	232	Pb	135	66	69
				Chd	97	50	47
		F	229	Pb	131	63	68
				Chd	98	54	44

At the initial stage, rapport was built with the all the respondents following which they consent was taken. The respondents were encouraged to participate actively and the entire process was explained to them. On the first day of the programme, all the respondents were assessed prior to the intervention, this pre assessment was termed as TA-1. After the first intervention, the respondents in the experimental group were given customized tasksheets for three months. Students were to attempt two tasksheets daily on regular basis. These tasksheets were different for students with different dominant multiple intelligence which was assessed in TA-1. In this way, the respondents in experimental group received sheets based on their respective intelligences. However, the subjects in the control group were not given any such worksheets and were thus excluded from the intervention programme. After three months, TA-2 was conducted on respondents of both the experimental as well as the control group. After this, subjects in experimental group were given tasksheets for next three months while no intervention was given to control group. After this, TA-3 was conducted following which experimental group received next three months’ tasksheets. Later TA-4 was conducted and three months’ tasksheets



were given to experimental group. After this, TA-5 was conducted at the final level. In this way, five assessments were conducted in all, on all the respondents but the worksheets were given only to the subjects in experimental group. The entire programme was taken up in around 12 months.

### 3. RESULT AND DISCUSSION

There was insignificant difference between IQ in all cases except in case of IQ 5 of experimental and control group in Chandigarh while among females, no significant difference was found in their IQ in any of the tests. The mean value ranged from 96 to 107.4 in experimental group while it ranged from 95.36 to 100.8 in control group. The mean value of experimental group was significantly higher than the control group in all the tests. Among females, the mean value ranged from 83.68 to 93.43 in experimental group while it ranged from 82.16 to 87.08 in control group. The mean value of experimental group was significantly higher than the control group in all the tests.

Table 2: Details of intelligence quotient

	Place	Gp	n	Mean	SD	Place	M/F	n	Mean	SD	Gp	Place	n	Mean	SD
<b>Exp. and Control Group, Male</b>						<b>Gender wise, Experiment</b>					<b>Area wise, Male</b>				
IQ1	Ch	Ex	50	98.24	12.14	Ch	M	50	98.24*	12.14	Ex	Ch	50	98.24	12.14
			47	95.36	15.43		F	54	83.79	21.86			Pb	66	96.00
IQ2	Pb	Co	66	96.00	14.78	Pb	M	66	96.00*	14.78	Co	Ch	47	95.36	15.43
			69	96.74	14.60		F	63	83.68	20.19			Pb	69	96.74
IQ3	Ch	Ex	50	99.03	11.83	Ch	M	50	99.03*	11.83	Ex	Ch	50	99.03	11.83
			47	96.34	15.43		F	54	84.22	21.43			Pb	66	96.91
IQ4	Pb	Co	66	96.91	14.55	Pb	M	66	96.91*	14.55	Co	Ch	47	96.34	15.43
			69	97.49	14.60		F	63	85.00	19.80			Pb	69	97.49
IQ5	Ch	Ex	50	100.0	11.60	Ch	M	50	100.0*	11.60	Ex	Ch	50	100.0	11.60
			47	97.37	15.52		F	54	86.00	21.01			Pb	66	96.92
IQ6	Pb	Co	66	96.92	14.33	Pb	M	66	96.92*	14.33	Co	Ch	47	97.37	15.52
			69	98.75	14.65		F	63	86.99	19.42			Pb	69	98.75
IQ7	Ch	Ex	50	101.6	13.28	Ch	M	50	101.6*	13.28	Ex	Ch	50	101.6	13.28
			47	98.28	15.59		F	54	87.49	22.11			Pb	66	99.70
IQ8	Pb	Co	66	99.70	16.17	Pb	M	66	99.70*	16.17	Co	Ch	47	98.28	15.59
			69	99.70	14.65		F	63	88.02	20.95			Pb	69	99.70
IQ9	Ch	Ex	50	107.4*	13.89	Ch	M	50	107.4*	13.89	Ex	Ch	50	107.4	13.89
			47	99.30	15.90		F	54	92.54	23.03			Pb	66	105.4
IQ10	Pb	Co	66	105.4	17.02	Pb	M	66	105.4*	17.02	Co	Ch	47	99.30	15.90
			69	100.8	14.97		F	63	93.43	22.06			Pb	69	100.8
<b>Exp. and Control Group,</b>						<b>Gender wise, Control</b>					<b>Area wise, Female</b>				
IQ11	Ch	Ex	54	83.79	21.86	Ch	M	47	95.36*	15.43	Ex	Ch	54	83.79	21.86
			44	83.24	20.44		F	44	83.24	20.44			Pb	63	83.68
IQ12	Pb	Co	63	83.68	20.19	Pb	M	69	96.74*	14.60	Co	Ch	44	83.24	20.44
							F								

IQ2	Ch	Ex	54	84.22	21.43	Ch	M	47	96.34*	15.43	Ex	Ch	Pb	54	84.22	21.43
		Co	44	82.16	20.44		F	44	82.16	20.44			Pb	63	85.00	19.80
Pb	Ch	Ex	63	85.00	19.80	Pb	M	69	97.49*	14.60	Co	Ch	Pb	44	82.16	20.44
		Co	68	83.64	19.93		F	68	83.64	19.93			Pb	68	83.64	19.93
IQ3	Ch	Ex	54	86.00	21.01	Ch	M	47	97.37*	15.52	Ex	Ch	Pb	54	86.00	21.01
		Co	44	85.21	20.46		F	44	85.21	20.46			Pb	63	86.99	19.42
Pb	Ch	Ex	63	86.99	19.42	Pb	M	69	98.75*	14.65	Co	Ch	Pb	44	85.21	20.46
		Co	68	84.64	19.94		F	68	84.64	19.94			Pb	68	84.64	19.94
IQ4	Ch	Ex	54	87.49	22.11	Ch	M	47	98.28*	15.59	Ex	Ch	Pb	54	87.49	22.11
		Co	44	85.6	20.56		F	44	85.6	20.56			Pb	63	88.02	20.95
Pb	Ch	Ex	63	88.02	20.95	Pb	M	69	99.70*	14.65	Co	Ch	Pb	44	85.6	20.56
		Co	68	84.98	20.06		F	68	84.98	20.06			Pb	68	84.98	20.06
IQ5	Ch	Ex	54	92.54	23.03	Ch	M	47	99.30*	15.90	Ex	Ch	Pb	54	92.54	23.03
		Co	44	87.08	20.90		F	44	87.08	20.90			Pb	63	93.43	22.06
Pb	Ch	Ex	63	93.43	22.06	Pb	M	69	100.8*	14.97	Co	Ch	Pb	44	87.08	20.90
		Co	68	86.57	20.34		F	68	86.57	20.34			Pb	68	86.57	20.34

Table 3: Comparison of intelligence quotient

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
IQ	Mean	SD	Mean	SD	Mean	SD	Mean	SD
IQ1	98.24*	12.14	95.37	15.43	96.00*	14.78	96.75	14.60
IQ2	99.03*	11.83	96.35	15.43	96.91*	14.55	97.50	14.60
IQ3	100.0*	11.60	97.37	15.52	96.92*	14.33	98.75	14.65
IQ4	101.6*	13.28	98.28	15.59	99.70*	16.17	99.71	14.65
IQ5	107.4*	13.89	99.31	15.90	105.4*	17.02	100.90	14.97
Female								
IQ1	83.79*	21.86	83.25	20.44	83.68*	20.19	82.67	19.92
IQ2	84.22*	21.43	82.16	20.44	85.00*	19.80	83.65	19.93
IQ3	86.00*	21.01	85.21	20.46	86.99*	19.42	84.64	19.94
IQ4	87.49*	22.11	85.60	20.56	88.02*	20.95	84.98	20.06
IQ5	92.54*	23.03	87.08	20.90	93.43*	22.06	86.57	20.34

When the IQ of respondents in experimental group was compared gender wise, significant difference was found between males and females of Chandigarh as well as Punjab in all the tests. The same trend was seen among their control group counterparts in all the cases. Females had lower values as compared to males. The mean values among males ranged from 96 to 107.4 and among females, it ranged from 83.68 to 93.43. In control group, females had lower values as compared to males. The mean values among males ranged from 95.36 to 100.8 and among females, it ranged from 82.16 to 87.08. When comparison was made between

males of Chandigarh and Punjab, insignificant difference was found between their IQ in experimental as well as control group in all the tests. Similarly, no significant difference was found among females. The mean of IQ varied from 95.36 to 107.4 in Chandigarh while in Punjab it varied from 96 to 105.4. In case of females, the mean of IQ varied from 82.16 to 92.54 in Chandigarh while in Punjab it varied from 82.66 to 93.43.

Table 4: Details of focus factor

	Place	Gp	n	Mean	SD	Place	M/F	n	Mean	SD	Gp	Place	n	Mean	SD	
<b>Exp. and Control Group, Male</b>						<b>Gender wise, Experiment</b>					<b>Area wise, Male</b>					
<b>FF1</b>	Ch	Ex	50	53.93	15.36	Ch	M	50	53.93	15.36	Ex	Ch	50	53.93	15.36	
			47	50.46	14.52		F	54	52.00	14.79			Pb	66	50.93	17.38
	Pb	Ex	66	50.93	17.38	Pb	M	66	50.93	17.38	Co	Ch	47	50.46	14.52	
			69	51.41	15.82		F	63	52.99	13.24			Pb	69	51.41	15.82
	<b>FF2</b>	Ch	Ex	50	54.68	15.00	Ch	M	50	54.68	15.00	Ex	Ch	50	54.68	15.00
				47	51.44	14.52		F	54	52.99	14.50			Pb	66	51.79
Pb		Ex	66	51.79	17.13	Pb	M	66	51.79	17.13	Co	Ch	47	51.44	14.52	
			69	52.39	15.82		F	63	54.00	12.99			Pb	69	52.39	15.82
<b>FF3</b>		Ch	Ex	50	55.45	14.66	Ch	M	50	55.45	14.66	Ex	Ch	50	55.45	14.66
				47	52.21	14.68		F	54	53.27	14.22			Pb	66	52.66
	Pb	Ex	66	52.66	16.91	Pb	M	66	52.66	16.91	Co	Ch	47	52.21	14.68	
			69	53.25	15.87		F	63	54.06	12.73			Pb	69	53.25	15.87
	<b>FF4</b>	Ch	Ex	50	56.39	15.95	Ch	M	50	56.39	15.95	Ex	Ch	50	56.39	15.95
				47	52.69	14.73		F	54	58.07	15.63			Pb	66	52.99
Pb		Ex	66	52.99	18.21	Pb	M	66	52.99*	18.21	Co	Ch	47	52.69	14.73	
			69	53.75	15.94		F	63	59.24	14.04			Pb	69	53.75	15.94
<b>FF5</b>		Ch	Ex	50	57.48	16.68	Ch	M	50	57.48	16.68	Ex	Ch	50	57.48	16.68
				47	53.27	15.05		F	54	61.48	16.58			Pb	66	54.46
	Pb	Ex	66	54.46	19.07	Pb	M	66	54.46*	19.07	Co	Ch	47	53.27	15.05	
			69	54.40	16.19		F	63	62.93	15.00			Pb	69	54.40	16.19
	<b>Exp. and Control Group, Female</b>						<b>Gender wise, Control</b>					<b>Area wise, Female</b>				
	<b>FF1</b>	Ch	Ex	54	52.00	14.79	Ch	M	47	50.46	14.52	Ex	Ch	54	52.00	14.79
44				56.10	15.66	F		44	56.10	15.66	Pb			63	52.99	13.24
Pb		Ex	63	52.99	13.24	Pb	M	69	51.41	15.82	Co	Ch	44	56.10	15.66	
			68	56.37	14.19		F	68	56.37	14.19			Pb	68	56.37	14.19
<b>FF2</b>		Ch	Ex	54	52.99	14.50	Ch	M	47	51.44	14.52	Ex	Ch	54	52.99	14.50
				44	57.08	15.66		F	44	57.08	15.66			Pb	63	54.00
	Pb	Ex	63	54.00	12.99	Pb	M	69	52.39	15.82	Co	Ch	44	57.08	15.66	
			68	57.35	14.20		F	68	57.35	14.20			Pb	68	57.35	14.20
	<b>FF3</b>	Ch	Ex	54	53.27	14.22	Ch	M	47	52.21	14.68	Ex	Ch	54	53.27	14.22
				44	57.99	15.72		F	44	57.99	15.72			Pb	63	54.06
Pb		Ex	63	54.06	12.73	Pb	M	69	53.25	15.87	Co	Ch	44	57.99	15.72	
			68	58.30	14.23		F	68	58.30	14.23			Pb	68	58.30	14.23
		Ex	54	58.07	15.63		M	47	52.69	14.73		Ch	54	58.07	15.63	

FF4	Ch	Co	44	58.24	15.76	Pb	F	44	58.24	15.76	Co	Pb	63	59.24	14.04
		Ex	63	59.24	14.04		M	69	53.75	15.94		Ch	44	58.24	15.76
	Pb	Co	68	58.52	14.26	Ch	F	68	58.52	14.26		Pb	68	58.52	14.26
		Ex	54	61.48	16.58		M	47	53.27	15.05		Ch	54	61.48	16.58
FF5	Ch	Co	44	59.29	16.13	Pb	F	44	59.29	16.13	Co	Pb	63	62.93	15.00
		Ex	63	62.93	15.00		M	69	54.40*	16.19		Ch	44	59.29	16.13
	Pb	Co	68	59.65	14.59	Ch	F	68	59.65	14.59		Pb	68	59.65	14.59
		Ex	54	61.48	16.58		M	47	53.27	15.05		Ch	54	61.48	16.58

Table 5: Comparison of focus factor

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
FF	Mean	SD	Mean	SD	Mean	SD	Mean	SD
FF1	53.93*	15.36	50.47	14.52	50.93*	17.38	51.42	15.82
FF2	54.68*	15.00	51.45	14.52	51.79*	17.13	52.40	15.82
FF3	55.45*	14.66	52.22	14.68	52.66*	16.91	53.25	15.87
FF4	56.39*	15.95	52.69	14.73	52.99*	18.21	53.76	15.94
FF5	57.48*	16.68	53.27	15.05	54.46*	19.07	54.40	16.19
Female								
FF1	52.00*	14.79	56.11	15.66	52.99*	13.24	56.37	14.19
FF2	52.99*	14.50	57.08	15.66	54.00*	12.99	57.35	14.20
FF3	53.27*	14.22	58.00	15.72	54.06*	12.73	58.30	14.23
FF4	58.07*	15.63	58.25	15.76	59.24*	14.04	58.52	14.26
FF5	61.48*	16.58	59.29	16.13	62.93*	15.00	59.65	14.59

There was insignificant difference between FF of experimental and control group among 12 year old respondents. Similarly, insignificant difference was witnessed in all cases among females. The mean value ranged from 50.93 to 57.48 in experimental group while it ranged from 50.46 to 54.4 in control group. The mean value of experimental group was significantly higher than the control group in all the tests. Among females, the mean value ranged from 52 to 62.93 in experimental group while it ranged from 56.1 to 59.65 in control group. The mean value of experimental group was lower than the control group in all the tests. When the FF of respondents in experimental group was compared gender wise, significant difference was found between males and females of Punjab in their FF 4 and FF 5 while the difference was found to be significant only in FF 5 among their control group counterparts. Females had higher values as compared to males. The mean values among males ranged from 50.93 to 57.48 and among females, it ranged from 52 to 62.93. In control group, females had higher values as compared to males. The mean values among males ranged from 50.46 to 54.4 and among females, it ranged from 56.1 to 59.65. When comparison was made between males of Chandigarh and Punjab, insignificant difference was found between their FF in



experimental as well as control group in all the tests. Similarly, no significant difference was found among females. The mean of FF varied from 50.46 to 57.48 in Chandigarh while in Punjab it varied from 50.93 to 54.46. In case of females, the mean of FF varied from 52 to 61.48 in Chandigarh while in Punjab it varied from 52.99 to 62.93.

Table 6: Details of decision making ability

	Place	Gp	n	Mean	SD	Place	M/F	n	Mean	SD	Gp	Place	n	Mean	SD	
<b>Exp. and Control Group, Male</b>						<b>Gender wise, Experiment</b>					<b>Area wise, Male</b>					
<b>DMA1</b>	Ch	Ex	50	0.25	0.09	Ch	M	50	0.25	0.09	Ex	Ch	50	0.25	0.09	
		Co	47	0.23	0.08		F	54	0.27	0.08		Pb	66	0.24	0.10	
	Pb	Ex	66	0.24	0.10	Pb	M	66	0.24*	0.10	Co	Ch	47	0.23	0.08	
		Co	69	0.24	0.09		F	63	0.28	0.07		Pb	69	0.24	0.09	
	<b>DMA2</b>	Ch	Ex	50	0.41*	0.14	Ch	M	50	0.41	0.14	Ex	Ch	50	0.41	0.14
			Co	47	0.26	0.10		F	54	0.44	0.13		Pb	66	0.39	0.16
Pb		Ex	66	0.39*	0.16	Pb	M	66	0.39*	0.16	Co	Ch	47	0.26	0.10	
		Co	69	0.27	0.10		F	63	0.45	0.11		Pb	69	0.27	0.10	
<b>DMA3</b>	Ch	Ex	50	0.46*	0.16	Ch	M	50	0.46	0.16	Ex	Ch	50	0.46	0.16	
		Co	47	0.27	0.11		F	54	0.52	0.15		Pb	66	0.44	0.18	
	Pb	Ex	66	0.44*	0.18	Pb	M	66	0.44*	0.18	Co	Ch	47	0.27	0.11	
		Co	69	0.28	0.11		F	63	0.54	0.14		Pb	69	0.28	0.11	
<b>DMA4</b>	Ch	Ex	50	0.49*	0.17	Ch	M	50	0.49*	0.17	Ex	Ch	50	0.49	0.17	
		Co	47	0.27	0.11		F	54	0.57	0.17		Pb	66	0.46	0.20	
	Pb	Ex	66	0.46*	0.20	Pb	M	66	0.46*	0.20	Co	Ch	47	0.27	0.11	
		Co	69	0.28	0.11		F	63	0.59	0.15		Pb	69	0.28	0.11	
<b>DMA5</b>	Ch	Ex	50	0.51*	0.18	Ch	M	50	0.51*	0.18	Ex	Ch	50	0.51	0.18	
		Co	47	0.28	0.11		F	54	0.60	0.19		Pb	66	0.48	0.20	
	Pb	Ex	66	0.48*	0.20	Pb	M	66	0.48*	0.20	Co	Ch	47	0.28	0.11	
		Co	69	0.29	0.12		F	63	0.63	0.16		Pb	69	0.29	0.12	
<b>Exp. and Control Group, Female</b>						<b>Gender wise, Control</b>					<b>Area wise, Female</b>					
<b>DMA1</b>	Ch	Ex	54	0.27	0.08	Ch	M	47	0.23*	0.08	Ex	Ch	54	0.27	0.08	
		Co	44	0.28	0.08		F	44	0.28	0.08		Pb	63	0.28	0.07	
	Pb	Ex	63	0.28	0.07	Pb	M	69	0.24*	0.09	Co	Ch	44	0.28	0.08	
		Co	68	0.28	0.07		F	68	0.28	0.07		Pb	68	0.28	0.07	
<b>DMA2</b>	Ch	Ex	54	0.44*	0.13	Ch	M	47	0.26*	0.10	Ex	Ch	54	0.44	0.13	
		Co	44	0.35	0.12		F	44	0.35	0.12		Pb	63	0.45	0.11	
	Pb	Ex	63	0.45*	0.11	Pb	M	69	0.27*	0.10	Co	Ch	44	0.35	0.12	
		Co	68	0.36	0.10		F	68	0.36	0.10		Pb	68	0.36	0.10	
<b>DMA3</b>	Ch	Ex	54	0.52*	0.15	Ch	M	47	0.27*	0.11	Ex	Ch	54	0.52	0.15	
		Co	44	0.39	0.13		F	44	0.39	0.13		Pb	63	0.54	0.14	
	Pb	Ex	63	0.54*	0.14	Pb	M	69	0.28*	0.11	Co	Ch	44	0.39	0.13	
		Co	68	0.40	0.12		F	68	0.40	0.12		Pb	68	0.40	0.12	
<b>D</b>	Ch	Ex	54	0.57*	0.17	Ch	M	47	0.27*	0.11	Ex	Ch	54	0.57	0.17	
		Co	44	0.39	0.13		F	44	0.39	0.13		Pb	63	0.59	0.15	

DMA5	Pb	Ex	63	0.59*	0.15	Pb	M	69	0.28*	0.11	Co	Ch	44	0.39	0.13
		Co	68	0.40	0.12		F	68	0.40	0.12		Pb	68	0.40	0.12
	Ch	Ex	54	0.60*	0.19	Ch	M	47	0.28*	0.11	Ex	Ch	54	0.60	0.19
		Co	44	0.4	0.14		F	44	0.4	0.14		Pb	63	0.63	0.16
	Pb	Ex	63	0.63*	0.16	Pb	M	69	0.29*	0.12	Co	Ch	44	0.4	0.14
		Co	68	0.41	0.12		F	68	0.41	0.12		Pb	68	0.41	0.12

Table 7: Comparison of decision making ability

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
DMA	Mean	SD	Mean	SD	Mean	SD	Mean	SD
DMA1	0.25*	0.09	0.24	0.08	0.24*	0.10	0.24	0.09
DMA2	0.41*	0.14	0.26	0.10	0.39*	0.16	0.27	0.10
DMA3	0.46*	0.16	0.28	0.11	0.44*	0.18	0.29	0.11
DMA4	0.49*	0.17	0.28	0.11	0.46*	0.20	0.29	0.11
DMA5	0.51*	0.18	0.28	0.11	0.48*	0.20	0.29	0.12
Female								
DMA1	0.27*	0.08	0.28	0.08	0.28*	0.07	0.28	0.07
DMA2	0.44*	0.13	0.36	0.12	0.45*	0.11	0.37	0.10
DMA3	0.52*	0.15	0.39	0.13	0.54*	0.14	0.40	0.12
DMA4	0.57*	0.17	0.39	0.13	0.59*	0.15	0.40	0.12
DMA5	0.60*	0.19	0.40	0.14	0.63*	0.16	0.41	0.12

As clear from table that there was insignificant difference between 12 year old males of experimental and control group in DMA 1 in Chandigarh as well as Punjab. In all other subsequent tests, the difference was statistically significant. Similarly among females, the difference was statistically significant in DMA 2, DMA 3, DMA 4 and DMA 5. The mean value ranged from 0.24 to 0.51 in experimental group while it ranged from 0.23 to 0.29 in control group. The mean value of experimental group was significantly higher than the control group in all the tests. Among females, the mean value ranged from 0.27 to 0.63 in experimental group while it ranged from 0.28 to 0.41 in control group. The mean value of experimental group was lower than the control group in all the tests. When the DMA of respondents in experimental group was compared gender wise, significant difference was found in all the cases in Punjab. However, in Chandigarh, significant difference was observed only in case of their DMA 4 and DMA 5. When comparison was made between males and females in control group in both the places, significant difference was found in each case. Females had higher values as compared to males. The mean values among males ranged from 0.24 to 0.51 and among females, it ranged from 0.27 to 0.63. In control group, females had higher values as compared to males. The mean values among males ranged from 0.23 to 0.29 and among females, it ranged from 0.28 to 0.41. When

comparison was made between males of Chandigarh and Punjab in control group, no significant difference was found between DMA of males as well as females. The mean of DMA varied from 0.23 to 0.51 in Chandigarh while in Punjab it varied from 0.24 to 0.48. In case of females, the mean of DMA varied from 0.27 to 0.6 in Chandigarh while in Punjab it varied from 0.28 to 0.63.

Table 8: Details of creative quotient

	Place	Gp	n	Mean	SD	Place	M/F	n	Mean	SD	Gp	Place	n	Mean	SD
<b>Exp. and Control Group, Male</b>						<b>Gender wise, Experiment</b>					<b>Area wise, Male</b>				
CQ1	Ch	Ex	50	0.52*	0.06	Ch	M	50	0.52*	0.06	Ex	Ch	50	0.52	0.06
			47	0.37	0.06		F	54	0.56	0.06			Pb	66	0.54
	Pb	Ex	66	0.54*	0.08	Pb	M	66	0.54*	0.08	Co	Ch	47	0.37	0.06
			69	0.38	0.06		F	63	0.57	0.06			Pb	69	0.38
CQ2	Ch	Ex	50	0.64*	0.08	Ch	M	50	0.64*	0.08	Ex	Ch	50	0.64	0.08
			47	0.41	0.06		F	54	0.69	0.08			Pb	66	0.66
	Pb	Ex	66	0.66*	0.10	Pb	M	66	0.66*	0.10	Co	Ch	47	0.41	0.06
			69	0.42	0.06		F	63	0.70	0.07			Pb	69	0.42
CQ3	Ch	Ex	50	0.68*	0.08	Ch	M	50	0.68*	0.08	Ex	Ch	50	0.68	0.08
			47	0.45	0.07		F	54	0.73	0.08			Pb	66	0.70
	Pb	Ex	66	0.70*	0.10	Pb	M	66	0.70*	0.10	Co	Ch	47	0.45	0.07
			69	0.45	0.07		F	63	0.74	0.07			Pb	69	0.45
CQ4	Ch	Ex	50	0.72*	0.09	Ch	M	50	0.72*	0.09	Ex	Ch	50	0.72	0.09
			47	0.47	0.07		F	54	0.77	0.09			Pb	66	0.74
	Pb	Ex	66	0.74*	0.11	Pb	M	66	0.74*	0.11	Co	Ch	47	0.47	0.07
			69	0.48	0.07		F	63	0.78	0.08			Pb	69	0.48
CQ5	Ch	Ex	50	0.78*	0.09	Ch	M	50	0.78*	0.09	Ex	Ch	50	0.78	0.09
			47	0.48	0.07		F	54	0.84	0.09			Pb	66	0.81
	Pb	Ex	66	0.81*	0.12	Pb	M	66	0.81*	0.12	Co	Ch	47	0.48	0.07
			69	0.48	0.07		F	63	0.86	0.08			Pb	69	0.48
<b>Exp. and Control Group, Female</b>						<b>Gender wise, Control</b>					<b>Area wise, Female</b>				
CQ1	Ch	Ex	54	0.56*	0.06	Ch	M	47	0.37*	0.06	Ex	Ch	54	0.56	0.06
			44	0.40	0.05		F	44	0.40	0.05			Pb	63	0.57
	Pb	Ex	63	0.57*	0.06	Pb	M	69	0.38*	0.06	Co	Ch	44	0.40	0.05
			68	0.40	0.04		F	68	0.40	0.04			Pb	68	0.40
CQ2	Ch	Ex	54	0.69*	0.08	Ch	M	47	0.41*	0.06	Ex	Ch	54	0.69	0.08
			44	0.45	0.05		F	44	0.45	0.05			Pb	63	0.70
	Pb	Ex	63	0.70*	0.07	Pb	M	69	0.42*	0.06	Co	Ch	44	0.45	0.05
			68	0.45	0.05		F	68	0.45	0.05			Pb	68	0.45
CQ3	Ch	Ex	54	0.73*	0.08	Ch	M	47	0.45*	0.07	Ex	Ch	54	0.73	0.08
			44	0.48	0.06		F	44	0.48	0.06			Pb	63	0.74
	Pb	Ex	63	0.74*	0.07	Pb	M	69	0.45*	0.07	Co	Ch	44	0.48	0.06
			68	0.48	0.05		F	68	0.48	0.05			Pb	68	0.48
C	Ch	Ex	54	0.77*	0.09	Ch	M	47	0.47*	0.07	Ex	Ch	54	0.77	0.09
			44	0.51	0.06		F	44	0.51	0.06			Pb	63	0.78

CQ5	Pb	Ex	63	0.78*	0.08	Pb	M	69	0.48*	0.07	Co	Ch	44	0.51	0.06
		Co	68	0.51	0.05		F	68	0.51	0.05			Pb	68	0.51
	Ch	Ex	54	0.84*	0.09	Ch	M	47	0.48*	0.07	Ex	Ch	54	0.84	0.09
		Co	44	0.52	0.06		F	44	0.52	0.06			Pb	63	0.86
	Pb	Ex	63	0.86*	0.08	Pb	M	69	0.48*	0.07	Co	Ch	44	0.52	0.06
		Co	68	0.52	0.06		F	68	0.52	0.06			Pb	68	0.52

Table 9: Comparison of creative quotient

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
CQ	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CQ1	0.52*	0.06	0.38	0.06	0.54*	0.08	0.38	0.06
CQ2	0.64*	0.08	0.42	0.06	0.66*	0.10	0.42	0.06
CQ3	0.68*	0.08	0.45	0.07	0.70*	0.10	0.46	0.07
CQ4	0.72*	0.09	0.48	0.07	0.74*	0.11	0.49	0.07
CQ5	0.78*	0.09	0.48	0.07	0.81*	0.12	0.49	0.07
Female								
CQ1	0.56*	0.06	0.41	0.05	0.57*	0.06	0.41	0.04
CQ2	0.69*	0.08	0.45	0.05	0.70*	0.07	0.45	0.05
CQ3	0.73*	0.08	0.49	0.06	0.74*	0.07	0.48	0.05
CQ4	0.77*	0.09	0.52	0.06	0.78*	0.08	0.51	0.05
CQ5	0.84*	0.09	0.53	0.06	0.86*	0.08	0.52	0.06

As clear from the table that among 12 year old males, there were significant differences found between the CQ of experimental and control group in Chandigarh as well as Punjab. The same trend was witnessed in case of females. The mean value ranged from 0.52 to 0.81 in experimental group while it ranged from 0.37 to 0.48 in control group. The mean value of experimental group was significantly higher than the control group in all the tests. Among females, the mean value ranged from 0.56 to 0.86 in experimental group while it ranged from 0.4 to 0.52 in control group. The mean value of experimental group was significantly higher than the control group in all the tests. When the CQ of respondents in experimental group was compared gender wise, significant difference were found between males and females of Chandigarh as well as Punjab in all the tests. The same trend was seen among their control group counterparts. The mean values among males ranged from 0.52 to 0.81 and among females, it ranged from 0.56 to 0.86. In control group, females had higher values as compared to males. The mean values among males ranged from 0.37 to 0.48 and among females, it ranged from 0.4 to 0.52. When comparison was made between males of Chandigarh and Punjab, insignificant difference was found between their CQ in experimental as well as control group in all the tests. Similarly, no



significant difference was found among females. The mean of CQ varied from 0.37 to 0.78 in Chandigarh while in Punjab it varied from 0.38 to 0.81. In case of females, the mean of CQ varied from 0.4 to 0.84 in Chandigarh while in Punjab it varied from 0.4 to 0.86.

Table 10: Details of marks

	Place	Gp	n	Mean	SD	Place	M/F	n	Mean	SD	Gp	Place	n	Mean	SD
<b>Exp. and Control Group, Male</b>						<b>Gender wise, Experiment</b>					<b>Area wise, Female</b>				
<b>M1</b>	<b>Ch</b>	<b>Ex</b>	50	57.23	6.57	<b>Ch</b>	<b>M</b>	50	57.23*	6.57	<b>Ex</b>	<b>Ch</b>	50	57.23	6.57
			47	55.82	8.36		<b>F</b>	54	48.87	11.67			66	56.19	7.83
	<b>Pb</b>	<b>Ex</b>	66	56.19	7.83	<b>Pb</b>	<b>M</b>	66	56.19	7.83	<b>Co</b>	<b>Ch</b>	47	55.82	8.36
			69	56.53	7.82		<b>F</b>	63	58.78	10.75			69	56.53	7.82
<b>M2</b>	<b>Ch</b>	<b>Ex</b>	50	64.40*	8.18	<b>Ch</b>	<b>M</b>	50	64.40*	8.18	<b>Ex</b>	<b>Ch</b>	50	64.40	8.18
			47	56.71	9.57		<b>F</b>	54	58.57	13.23			66	63.80	9.89
	<b>Pb</b>	<b>Ex</b>	66	63.80*	9.89	<b>Pb</b>	<b>M</b>	66	63.80*	9.89	<b>Co</b>	<b>Ch</b>	47	56.71	9.57
			69	57.83	9.14		<b>F</b>	63	69.62	12.91			69	57.83	9.14
<b>Exp. and Control Group, Female</b>						<b>Gender wise, Control</b>					<b>Area wise, Male</b>				
<b>M1</b>	<b>Ch</b>	<b>Ex</b>	54	48.87	11.67	<b>Ch</b>	<b>M</b>	47	55.82*	8.36	<b>Ex</b>	<b>Ch</b>	54	48.87*	11.67
			44	48.48	10.68		<b>F</b>	44	48.48	10.68			63	58.78	10.75
	<b>Pb</b>	<b>Ex</b>	63	58.78*	10.75	<b>Pb</b>	<b>M</b>	69	56.53*	7.82	<b>Co</b>	<b>Ch</b>	44	48.48	10.68
			68	48.12	10.54		<b>F</b>	68	48.12	10.54			68	48.12	10.54
<b>M2</b>	<b>Ch</b>	<b>Ex</b>	54	58.57*	13.23	<b>Ch</b>	<b>M</b>	47	56.71	9.57	<b>Ex</b>	<b>Ch</b>	54	58.57*	13.23
			44	52.27	11.95		<b>F</b>	44	52.27	11.95			63	69.62	12.91
	<b>Pb</b>	<b>Ex</b>	63	69.62*	12.91	<b>Pb</b>	<b>M</b>	69	57.83*	9.14	<b>Co</b>	<b>Ch</b>	44	52.27*	11.95
			68	47.50	11.38		<b>F</b>	68	47.50	11.38			68	47.50	11.38

Table 11: Comparison of marks

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
Marks	Mean	SD	Mean	SD	Mean	SD	Mean	SD
M1	57.23*	6.57	55.82	8.36	56.19*	7.83	56.53	7.82
M2	64.40*	8.18	56.72	9.57	63.80*	9.89	57.84	9.14
Female								
Marks	Mean	SD	Mean	SD	Mean	SD	Mean	SD
M1	48.87*	11.67	48.48	10.68	58.78*	10.75	48.12	10.54
M2	58.57*	13.23	52.28	11.95	69.62*	12.91	47.50	11.38

As clear, there were insignificant differences found between the M 1 in Chandigarh and Punjab among 12 year old males. But in case of M 2, there was significant difference. The same trend was noticed among females. The mean value ranged from 56.19 to 64.4 in experimental group while it ranged from 55.82 to 57.83 in

control group. The mean value of experimental group was significantly higher than the control group in both the tests. Among females, the mean value ranged from 48.87 to 69.62 in experimental group while it ranged from 47.5 to 52.27 in control group. The mean value of experimental group was significantly higher than the control group in both the tests. When the marks of respondents in experimental group were compared gender wise, insignificant difference was found in M 1 of respondents in Punjab. In other cases, significant difference was witnessed. In control group significant difference was recorded in M 1 and M 2 in Punjab along with M 1 in Chandigarh. Females had lower values as compared to males. The mean values among males ranged from 56.19 to 64.4 and among females, it ranged from 48.87 to 69.62. In control group, females had lower values as compared to males. The mean values among males ranged from 55.82 to 57.83 and among females, it ranged from 47.5 to 52.27. When comparison was made between males of Chandigarh, highly insignificant difference was found. However among females, significant difference was found except in M 1 of control group. The mean of marks varied from 55.82 to 64.4 in Chandigarh while in Punjab it varied from 56.19 to 63.8. In case of females, the mean of marks varied from 48.48 to 58.57 in Chandigarh while in Punjab it varied from 47.5 to 69.62.

#### **4. CONCLUSION**

There was significant rise in the IQ of 12 years old male respondents of experimental groups in Chandigarh and Punjab. The mean value in Chandigarh increased from 98.25 to 107.40. In Punjab, the mean value rose from 96.01 to 105.40. Similarly, among females, significant increase was recorded. The mean value increased from 83.79 to 92.54 in experimental group of Chandigarh and it rose from 83.68 to 93.44 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts. There was significant rise in the FF of 12 year old male respondents of experimental groups in Chandigarh and Punjab. The mean value in Chandigarh increased from 53.93 to 57.49. In Punjab, the mean value rose from 50.93 to 54.47. Similarly, among females, significant increase was recorded. The mean value increased from 52.00 to 61.49 in experimental group of Chandigarh and it rose from 53.00 to 62.93 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts. There was significant rise in the DMA of 12 year old male respondents of experimental groups in Chandigarh and Punjab. The mean value in Chandigarh increased from 0.26 to 0.51. In Punjab, the mean value rose from 0.24 to 0.49. Similarly, among females, significant increase was recorded. The mean value increased from 0.28 to 0.61 in experimental group of Chandigarh and it rose from 0.28 to 0.63 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts. There was significant rise in the CQ of 12 year old male respondents of experimental groups in Chandigarh and Punjab. The mean value in Chandigarh increased from 0.53 to 0.79. In Punjab, the mean value

rose from 0.54 to 0.81. Similarly, among females, significant increase was recorded. The mean value increased from 0.57 to 0.85 in experimental group of Chandigarh and it rose from 0.58 to 0.86 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts. There was significant rise in the marks of 12 year old males of experimental groups in Chandigarh and Punjab. The mean value in Chandigarh increased from 57.23 to 64.40. In Punjab, the mean value rose from 56.19 to 63.80. Similarly, among females, significant increase was recorded. The mean value increased from 48.87 to 58.57 in experimental group of Chandigarh and it rose from 58.78 to 69.62 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts.

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