PRESENCE OF FLUID INTELLIGENCE (G_F) AND CRYSTALIZED INTELLIGENCE (G_C) AMONG SECONDARY STUDENTS: AN APPROACH TO DESCRIBE INTELLIGENCE

Dr. Bapi Mishra

Assistant Professor, Department of Education, University of Gour Banga, Malda Email: <u>dr.bapimishra@yahoo.com</u>

Abstract:

Man is a best creation of God due to the presence of general mental ability in maximum level to regulate the environmental systems in respect to the basic requirements of the society. Intelligence is an essential factor to do anything in respect to fulfill own desirability in the changeable environment. On the basis of applicability of intelligence, it has been classified into different types by different scholars of the world. Cattel has classified general mental ability into two important types namely Fluid General Ability (G_f) and Crystalized General Ability (G_c) respectively. Fluid intelligence is considered as an ability to deal with more difficult tasks or problems; it helps to perfect use own ability in respect to analyse psychological facts, to justify them as per their reality based consideration. It is an ability to maintain effective connection between cognition and construction through perfect application of own efficiency. Crystalized intelligence is an ability to utilize learned knowledge and experiences and also to develop skills properly in respect to the nature of knowledge based study. In this study, a descriptive methodology of study has been implemented to find out the actual status of both G_f and G_c among secondary students. When a student can use G_f in maximum level, then he/she will be more efficient to deal with the different academic activities. Similarly, G_c of a student will help to develop own desirable achievement level in academic activities. Presence of fluid and crystalized intelligence has been assessed in above average level among secondary students. Inappropriate level of said intelligences has been found; insignificant mean difference has been found in this study.

Keywords: General Mental Ability, Fluid General Ability (G_f) and Crystalized General Ability (G_c)

1.0.INTRODUCTION

General mental ability is an ability of an individual which plays an effective role to perform all mental functions for the appropriate development of cognitive behaviour. Every mental operation needs the presence of general mental ability or intelligence. Intelligence is a common factor of every psychological operation by which an individual will be able to sustain own existence in this always changing society. It helps to differentiate the human essence from other living creatures of the world for its appropriate application as per the requirement of the situation. It is an ability which helps to build an effective personality pattern of an individual which is more effective to integrate psychophysiological systems; it is essential to know own abilities as well as potentialities; to identify own ability to meet the requirement of the change. In the development of an effective personality, proper identification & application of intelligence will be required to develop an effective dynamic organisation of psychological and physiological systems to meet the changeable requirement of the environment. In the case of proper development of individual integrated form of personality in respect to the requirements of adjustment, intelligence plays an important role. To be fit in these always changing environments, an individual will be needed to participate appropriately. Participation of an individual, with perfect utilization of general mental ability, will help to adjust with the change. It is an urge of life being having a basic target of life for existence. It is associated with the matter of proper survival of the human essence in this changing world. By using general mental ability, an individual will be able to be fit in the change as per the own basic characteristics. Intelligence has been classified by Cattel (on the basis of its effective operations in terms of the needs of life) into two fundamental types -one is Fluid intelligence (G_f) and another is Crystalized Intelligence (G_c). G_f is a type of general ability of an individual which helps to specify the higher order application of intelligence. G_f is ability which helps to apply own abstract reasoning process, problem solving operation, deductive & inductive thinking, effective visualization of the idea, and effective recognition of learned concepts. It is ability to analyse anything as per the logical systems of the fact which help to examine appropriately as well as to verify the actual base of logical pattern of the reality or corresponding issues. To assimilate the own concept in respect to the factors perceived in a specific situation, this ability helps to integrate own ideas for effective communication. To make an effective bonding with different concepts, this ability helps to cognitive integration. To find out the actual cues by observing as well as analyzing the corresponding facts of a problem, fluid intelligence will be participate and will help to solve the problems by creating some effective cues against the difficulty of a problem. To conduct the experimental treatments regarding any abstract concepts, $G_{\rm f}$ plays an important role to execute the effective policies found from the practical systems of inductive as well as deductive analysis of any facts. In the process of deductive as well as inductive reasoning, this general mental ability plays an important role in this regard. Abstract visualization is an efficient cognitive operation of an individual which helps to construct any idea for the effective development of human cognition. To make an effective integration between cognition and construction, appropriate application of visualization will be required which needs to apply G_f in practical level. G_f is an ability which helps to specify the nature of application of general mental ability as per the difficulty of psychological application regarding the issue of corresponding solution of the problem. It is an ability which is basically used in the case of higher level of mental operations namely abstract thinking, reasoning and evaluating the concepts. G specifies to use general mental abilities in respect to develop vocabulary & general knowledge, to develop analogies or relationships, to develop skills and to acquire effective education. It is an ability which basically specifies a tendency to effective application of learned knowledge in the practical situation, acquired experiences and skills as per the situations characteristics. As per the basic characteristics of a situation and it corresponding aspects, a specific behavioural treatment will be required. In this condition, an individual will apply own learned knowledge as per the situational variations; to do this task, an individual will apply general mental intelligence; according to Cattell that intelligence will be known as crystalized intelligence. In the case of psychological construct, Gf plays an important role to regulate all psychological operations to cultivate individual concepts for the effective development of Individual concepts. Effective uses of individual cognition, an individual will be able to produce a lot of new concepts by which an individual will be able to apply higher order psychological operations. G_f specifies the deliberate as well as controlled psychological operations to solve any problem in novel ways (McGrew, 2009). Similarly, G_c specifies the applicability of acculturation process in respect to nurture cultural knowledge (McGrew, 2009). It helps to acquire the knowledge of language, information and cultural concept in a specific manner (*McGrew*, 2009). To find out the nature of G_f and G_c of secondary school students, presents study has been designed. This study will help to identify the nature of intellectual operations in respect to appropriate development of individual intellect. Concept regarding the applicability of G_f of secondary students, a policy maker for education system will be able to design an effective education system for developing perfect applicability in favour of problem solving trends as well as perfect utilization of learned knowledge, experience and skills in respect to the objectives of education system.

2.0.OBJECTIVES OF THE STUDY

At the end of the study, investigator wants -

- To measure the presence of G_f and G_c of secondary students.
- To find out different characteristics of G_f and G_c.
- To determine the mean difference in respect to predetermined strata of the study.

3.0.Tools Description:

A scale to assess the presence of G_f and G_c of secondary students has been developed; it has two fundamental phases 1st phase has designed on the basis of G_f and 2nd phase has designed on the basis of G_c . Each phase has 15 items to describe the nature of said types of general mental ability. With the help of content validity, reliability coefficient (through test re-test method), scoring key as an objectivity of a test and an interpretational index has been developed as a norm of said test, those characteristics of the applied test has been developed. The Interpretational index has been developed and presented below.

Serial No	Raw Score	Interpretation
1.	61-75	High
2.	53-60	Above Average
3.	38-52	Moderate
4.	22-37	Below Average
5.	Below 22	Low

 Table -1 Interpretational Index for G_f (Fluid Intelligence)

In table -1, score has been specified to interpret the actual performance of fluid intelligence. This ability will help to find out the higher level of intellectual ability.

Serial No	Raw Score	Interpretation
1.	61-75	High
2.	53-60	Above Average
3.	38-52	Moderate
4.	22-37	Below Average
5.	Below 22	Low

 Table -2 Interpretational Index for G_c(Crystalized Intelligence)

In table -2, score has been specified to interpret the actual performance of crystalized intelligence. This ability will help to find out the knowledge based study of general mental ability.

Serial No	Raw Score	Interpretation
1.	135 -150	High
2.	105 - 134	Above Average
3.	76-104	Moderate
4.	46-75	Below Average
5.	Below 45	Low

Table -3 Interpretational Index for Gf&Gc

In table -3, score related to combine assessment of said intelligences have been specified to interpret the corresponding results.

4.0. Analysis and Interpretation:

Descriptive analysis of the said variable has specified some important characteristics of the variables to draw the related decisions. Corresponding aspects of the analysis has illustrated below.

	GfUB	GfUG	GfRB	GfRG	GfURBA N	GfRURA L	GfMALE	GfFEMAL E	GfTOTA L
Ν	50	50	50	50	100	100	100	100	200
Mean	56.800	63.1800	60.8800	62.2200	59.9900	61.5500	58.8400	62.7000	60.7700
Std. Error of Mean	.91652	.74433	.99617	1.60033	.66916	.94017	.70392	.87934	.57819
Median	57.500	63.5000	63.0000	64.0000	61.0000	63.0000	59.5000	63.5000	62.0000
Mode	60.00	66.00	67.00	62.00	59.00 ^a	67.00	60.00 ^a	62.00	67.00
Std. Deviation	6.4807	5.26323	7.04400	11.3160	6.69161	9.40167	7.03917	8.79336	8.17688
Skewness	201	473	551	-2.910	431	-2.477	276	-3.163	-1.877
Std. Error of Skewness	.337	.337	.337	.337	.241	.241	.241	.241	.172
Kurtosis	571	.323	780	12.710	268	12.124	825	18.099	9.778
Std. Error of Kurtosis	.662	.662	.662	.662	.478	.478	.478	.478	.342
P ₂₅	52.00	60.00	55.00	60.00	56.00	58.00	53.25	60.00	57.00
P ₅₀	57.50	63.50	63.00	64.00	61.00	63.00	59.50	63.50	62.00
P ₇₅	61.25	67.00	67.00	68.50	65.00	67.00	65.00	67.00	66.75

 Table -4
 Descriptive Analysis of Gf (Fluid Intelligence)

Dimension wise analysis of fluid intelligence has been analyzed in this case. It has been found that urban boy secondary students are lower performer group in respect to the application of fluid intelligence; but, higher performer group is rural boy secondary students. Above average performance has been found in this regard.



From the figure -1, it has been found that values of mean, median and mode are nearer to each other which specified the presence of basic characteristics of normality of said distribution regarding the application of fluid intelligence.



From the figure -2, it has been found that values of standard error of mean, skewness, standard error of skewness, and standard error of kurtosis have shown very low which specifies the presence of normality of the distribution.



From the figure -3, it has been found that value of standard deviation has been found in lower level which specifies the nature of low scattered distribution within the corresponding distribution.



From the figure -4, it has been observed that values of three fundamental percentile points are nearer to one another which specifies the little quartile deviations within the distribution.

From the above analysis of the corresponding data, it has been interpreted that the corresponding result is highly representative. Responses provided by secondary students regarding fluid intelligence have been specified the above average performance of said sample. Urban female secondary students are higher performer group than urban male secondary students regarding the application of fluid intelligence. Similarly, rural female students have performed slight higher that rural male students. In the case of locality wise analysis of said data, it has been found that rural secondary students are higher performer group than urban students. Female students are higher performer group in respect to deal with fluid intelligence.

-	. Table - 5 Descriptive Anarysis of Oc (Crystanzed Intengence)										
	GcUB	GcUG	GcRB	GcRG	GcURBA N	GcRURA L	GcMALE	GcFEMA LE	GcTOTA L		
Ν	50	50	50	50	100	100	100	100	200		
Mean	56.9800	62.0600	62.0000	62.920	59.5200	62.4600	59.4900	62.4900	60.9900		
Std. Error of Mean	1.09190	.71737	1.02698	1.1661	.69826	.77439	.78721	.68246	.53038		
Median	58.0000	63.0000	63.5000	63.000	61.5000	63.0000	61.0000	63.0000	62.0000		
Mode	50.00 ^a	63.00	58.00 ^a	61.00 ^a	63.00	69.00	58.00	63.00	63.00		
Std. Deviation	7.72087	5.07258	7.26187	8.2458	6.98263	7.74391	7.87208	6.82464	7.50075		
Skewness	431	895	847	685	832	717	573	677	660		
Std. Error of Skewness	.337	.337	.337	.337	.241	.241	.241	.241	.172		
Kurtosis	039	1.215	.430	.406	.597	.369	088	1.019	.374		
Std. Error of Kurtosis	.662	.662	.662	.662	.478	.478	.478	.478	.342		
P ₂₅	51.00	60.00	58.00	58.00	54.00	58.00	53.00	60.00	57.00		
P ₅₀	58.00	63.00	63.50	63.00	61.50	63.00	61.00	63.00	62.00		
P ₇₅	63.25	65.00	68.00	69.00	65.00	68.00	65.75	66.00	66.00		

Descriptive nature of crystalized intelligence has been presented below.

. Table - 5 Descriptive Analysis of Gc (Crystalized Intelligence)

Dimension wise analysis of crystalized intelligence has been analyzed in this case. It has been found that urban boy secondary students are lower performer group in respect to the application of crystalized intelligence; but, higher performer group is rural boy secondary students. Above average performance has been found in this regard. Corresponding aspects of descriptive characteristics have been presented below.



From the figure -5, it has been observed that values of mean, median and mode are nearer to one another that represent the normality of the distribution.



From the figure -6, it has been observed that values of standard error of mean, skewness, standard error of skewness, kurtosis and standard error of kurtosis have specified the normality of the distribution. Corresponding measurements are limited within +1 to -1.



From the figure -7, it has been observed that value of standard deviation regarding crystalized intelligence in respect to different predetermined strata of the study. This result has specified the lower level scatter distribution of individual responses.



From the figure -8, it has been observed that least difference in respect to percentile points has been found that has specified that there exist lower level of quartile deviation.

From the above analysis of the characteristics found from the analysis of crystalized intelligence, it has been interpreted that the corresponding result is highly representative. Responses provided by secondary students regarding crystalized intelligence have been specified the above average performance among different groups of sample. Urban female secondary students are higher performer group than urban male secondary students regarding the application of crystalized intelligence. Similarly, rural female students have performed slight higher that rural male students. In the case of locality wise analysis of said data, it has been found that rural secondary students are higher performer group than urban students. Male students are higher performer group in respect to deal with crystalized intelligence.

General mental ability has been analyzed in terms of two different segments of the test collectively which has been presented below.

	Α	В	С	D	Ε	F	G	Н	Ι
N	50	50	50	50	100	100	100	100	200
Mean	114.04	123.44	122.880	125.94	118.7400	124.4100	118.4600	124.6900	121.5750
Std. Error of Mean	1.8828	2.1485	1.86540	2.2474	1.49765	1.46108	1.39135	1.55184	1.06269
Median	114.00	126.50	127.500	128.00	122.5000	128.0000	121.0000	127.0000	124.0000
Mode	105.0 ^a	131.00	128.00	115.0 ^a	122.00 ^a	128.00	128.00	131.00	128.00 ^a
Std. Deviation	13.314	15.192 8	13.1903	15.891 7	14.97649	14.61084	13.91346	15.51844	15.02876
Skewness	206	-3.889	601	807	-1.925	659	344	-2.178	-1.250
Std. Error of Skewness	.337	.337	.337	.337	.241	.241	.241	.241	.172

 Table - 6 Descriptive Analysis of Gf &Gc

Kurtosis	641	20.403	727	.562	7.369	.057	795	9.407	3.997
Std. Error of Kurtosis	.662	.662	.662	.662	.478	.478	.478	.478	.342
P ₂₅	104.75	121.75	114.50	117.00	109.25	115.00	107.00	119.25	114.00
P ₅₀	114.00	126.50	127.50	128.00	122.50	128.00	121.00	127.00	124.00
P ₇₅	125.00	131.00	132.50	135.50	129.00	134.00	130.00	133.00	131.00

 $*A \rightarrow Gf \& Gc \text{ of } UB, B \rightarrow Gf \& Gc \text{ of } UG, C \rightarrow Gf \& Gc \text{ of } RB, D \rightarrow Gf \& Gc \text{ of } RG, E \rightarrow Gf \& Gc \text{ of } URBAN, F \rightarrow Gf \& Gc \text{ of } RURAL, G \rightarrow Gf \& Gc \text{ of } MALE, H \rightarrow Gf \& Gc \text{ of } FEMALE, I \rightarrow Gf \& Gc \text{ of } TOTAL \text{ sample,}$

On the basis of mean score of the strata wise descriptive analysis of the said variable, it has been found that there exists the slight deviation among the strata. Rural girl students are the higher performer group; as same as scattered distribution has been identified in the case of descriptive characteristics.



From the figure -9, it has been observed that the above said distribution has the normality which is more representative to express the actual reality related to the matter of fluid as well as crystalized intelligences.

To find out the mean difference in respect to the strata of this study, corresponding analysis has been done and presented below. Difference in terms of fluid intelligence and crystalized intelligence has been done.

-			ired Differen				
		Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2- tailed)
Pair 1	FIUB - FIUG	-6.38	8.11874	1.14816	-5.557	49	0
Pair 2	FIRB - FIRG	-1.34	13.07999	1.84979	-0.724	49	0.472
Pair 3	FIURBAN - FIRURAL	-1.56	11.42151	1.14215	-1.366	99	0.175
Pair 4	FIMALE - FIFEMALE	-3.86	11.12284	1.11228	-3.47	99	0.001

 Table -7 Strata wise Mean Difference Regarding G_f(Fluid Intelligence)

In the cases of pair I and 4 significant mean differences has been found similarly, in other cases insignificant mean difference has been identified. This result has been found in the case of fluid intelligence. Gender wisesignificant mean difference has been found regarding the effective application of fluid intelligence by the secondary students.

		Ра	ired Differen				
		Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2- tailed)
Pair 1	CIUB - CIUG	-5.08	9.14919	1.29389	-3.926	49	0
Pair 2	CIRB - CIRG	-0.92	10.29928	1.45654	-0.632	49	0.531
Pair 3	CIURBAN - CIRURAL	-2.94	10.34732	1.03473	-2.841	99	0.005
Pair 4	CIMALE - CIFEMALE	-3	9.91479	0.99148	-3.026	99	0.003

 Table : 5.20. Strata wise Mean Difference regarding Gc (crystalized Intelligence)

In the cases of pair 1, 3 and 4 significant mean differences has been found similarly, in other cases insignificant mean difference has been identified. This result has been found in the case of crystalized intelligence. In this case, locality as well as gender wise significant mean difference has been found in respect to reflect the crystalized intelligence in academic activities.

5.0. Conclusion:

Fluid intelligence is an effective general mental ability which helps to do higher level of psychological operations. Among samples of the study, the above average performance regarding the presence of fluid intelligence has been identified. Corresponding distribution has reflected normality of the distribution. Crystalized intelligence is one kind of general mental ability which helps to nurture cultural aspects of corresponding language of culture through the effective practice of acculturation. It is directly related with the academic activities. In this study presence of crystalized intelligence has been identified in above average level. The said distribution has the normality to explain the reality. In the case of practice of fluid intelligence, gender wise mean difference has been found; but, in the case of locality, insignificant difference has been found. From this result it has been concluded that locality is not a determinant to nurture fluid intelligence but gender is a factor to regulate effective reflection of said ability in action. In the case of crystalized intelligence, both gender and locality wise mean difference have been found in terms of the practice in respect to deal

with the practical activities. Therefore, in the case of effective nurturing crystalized intelligence, both gender and locality are two fundamental determinants.

Reference

Cattell, R.B. (1987). *Intelligence: Its Structure, Growth and Action*; North-Holland: New York, NY, USA.

Carroll, J.B. (2005).The three-stratum theory of cognitive abilities. In *Contemporary Intellectual Assessment*, 2nd ed.; Flanagan, D.P., Harrison, P.L., Eds.; Guilford Press: New York, NY, USA, pp. 69–76

McGrew, K.S. (2009). CHC theory and the human cognitive abilities project: Standing on the shoulders of the giants of psychometric intelligence research. *Intelligence*, *37*, 1–10.