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Academic Achievement of High School Students Having Differential Levels of Reasoning Ability

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Abstract

The main objective of the present research was to study the academic achievement of high school students having differential levels of reasoning ability. The sample comprised of 300 high school students out of which 150 male and 150 were female students. For the present study the Reasoning Ability Test (RAT) developed and standardized by L.N. Dubey was used to meet the objectives. To test the hypotheses one way ANOVA i.e. analysis of variance followed by 't' test has been used. The results revealed that male, female and total high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement. Further, the results also revealed that three groups of female, male and total high school students namely high vs. average, high vs. low and average vs. low differ significantly with respect to their mean academic achievement.

Introduction

Nowadays we are living in a competitive world and due to explosion of knowledge the last few decades are fast approaching towards a technocratic age. Due to this reason the parents and teachers focuses on the academic achievement of the students. Academic achievements are the end product of all educational processes. The academic achievement refers to the performance of the students in curricular as well as co-curricular activities. Achievement is the end product of learning and its level and performance are affected by psychological conditions like intelligence, mental health and reasoning ability etc. Reasoning basically is a process of thinking, involving inference by employing general principles. It is a form of controlled association which starts with some problems of interest to the reasoners and directed towards its solution. There is an unavoidable relationship between reasoning ability and academic achievement. Research findings have revealed a positive and significant relationship between reasoning ability and academic achievement. Many researchers like Jain (1979), Singh (1983), Chhikara (1985), Pandey (1985), Tyagi (1988), Ramachandran (1990), Nagailankim (1991), Muthumanickam (1992), Lalithabai (1993), Sumangala (1995), Dubey (2007), and Arumugarajan (2008) had reported positive and significant relationship between reasoning ability and academic achievement. Whereas Dubey (2010) found that formal reasoning is not related to achievement in English and Hindi. But no such study has been conducted in Mandi district of Himachal Pradesh which encouraged the investigator to take up the present study. The present study will be helpful to the educational planners and educational counsellors. The study will also be helpful in determining that whether the academic achievement and reasoning ability are independent of sex or not. The results will be helpful in restructuring curriculum of secondary education. Thus, the investigator in the present study had made an attempt to study the academic achievement of high school students having differential levels of reasoning ability. Therefore, the present study is fully justifiable.

Objectives of the study

The present study has been conducted keeping in mind the following objectives like:

1. To compare the academic achievement of high school students having high, average and low levels of reasoning ability.
2. To compare the academic achievement of male high school students having high, average and low levels of reasoning ability.
3. To compare the academic achievement of female high school students having high, average and low levels of reasoning ability.

Hypotheses of the study

The hypotheses formulated and tested in the present study were as follows:

1. The high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement.
2. The male high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement.
3. The female high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement.

Research Method

In the present study, descriptive survey method was used.

Sample

In the present study the sample of 300, Xth class high school students were selected purposively from district Mandi of Himachal Pradesh. These students were selected from six government schools of Mandi district. Finally, the sample consists of 300 (150 male and 150 female) high school students.

Tools used

In the present study a standardized tool called Reasoning Ability Test (RAT) developed and standardized by L.N. Dubey was used. This test consists of 60 items. First 40 questions were of number series and there were two answers in each question. One mark for each correct answer was awarded. In the same way for the remaining 20 questions, one mark for each correct answer was awarded. For ascertaining the academic achievement of the students the investigator has taken the marks scored by the each respondent in the class IX school examination 2010.

Statistical techniques used

In order to test the hypotheses of the present study, the investigator used one way ANOVA i.e. analysis of variance followed by 't' test.

Analysis and Interpretation of Data

A. Study of Significance of Difference among the Mean Scores on Academic Achievement of high school students having Differential Levels of Reasoning Ability.

The present study aimed to find out whether the academic achievement of high school students having differential levels of Reasoning Ability differs or not. The data were obtained from secondary school students to find out the difference in the mean academic achievement of high school students having differential levels of reasoning ability. Further, the investigator categorized the high school students into three categories on the basis of their reasoning ability scores.

As such, the students scoring 44 or above, in between 14-43 and 13 or below than it were considered as the students having high, average and low levels of reasoning ability respectively. In order to find out the differences in academic achievement scores of the students having high, average and low levels of reasoning ability, their respective scores on academic achievement were taken into consideration and the significance of difference among the mean values of these three levels of scores have been calculated by means of adopting one way analysis of variance or f-test. The results obtained subsequently have been presented in table-1.

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Table-1
Significance of Difference among the Mean Scores on Academic Achievement of high school students having Differential Levels of Reasoning Ability

Sources of variation	Sum of squares	df	Mean square	F - ratio
Between group	304567.53	2	152283.76	18.26**
Within group	2476838.47	297	8339.52	
Total	2781406	299		

The above table-1 shows that the sum of squares between groups and within groups have been found to be 304567.53 and 2476838.47 respectively and mean squares between groups and within groups have been found to be 152283.76 and 8339.52 respectively. The f-value has been found to be 18.26 being significant at 0.01 level of significance. It indicates that there is significant difference in the academic achievement of high school students having differential levels of reasoning ability.

Hence, the hypothesis that "The high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement" is accepted.

An analysis of the table-1 reveals that the high school students having differential levels of reasoning ability differs significantly on their academic achievement. But it is not clear that which of the two groups differs. Therefore, it is necessary to calculate the significance of mean difference of the different groups such as high vs. average, high vs. low and average vs. low. The data pertaining to the significant of mean difference between the mean scores of the respective groups have been presented in the table-2.

Table-2
Significance of Mean Difference in the Academic Achievement of high school students belonging to Different Levels

Category	N	M	SD	SED	df	t	Remarks
High vs. Average	33	430.76	112.51	20.57	246	3.58	Sig. at 0.01
	215	357.21	92.77				
High vs. Low	33	430.76	112.51	21.66	83	5.67	Sig. at 0.01
	52	307.96	67.15				
Average vs. Low	215	357.21	92.77	11.22	265	4.39	Sig. at 0.01
	52	307.21	67.15				

From the analysis of table-2 it is concluded that the three groups namely high vs. average, high vs. low and average vs. low differs significantly on their academic achievement as the obtained 't' ratio of the respective groups are found to be significant at 0.01 level with df value 246, 83 and 265 respectively. Therefore, we can infer that the reasoning ability of high school students is having some bearing on the academic achievement.

B. Study of Significance of Difference among the Mean Scores on Academic Achievement of Male high school students having Differential Levels of Reasoning Ability

The present study aimed to find out whether the academic achievement of male high school students having differential levels of Reasoning Ability differs or not. The data were obtained from secondary school students to find out the difference in the mean academic achievement of high school students

having differential levels of reasoning ability. Further, the investigator categorized the male high school students into three categories on the basis of their reasoning ability scores.

As such, the male students scoring 34 or above, in between 10-33 and 9 or below than it were considered as the students having high, average and low levels of reasoning ability respectively. In order to find out the differences in academic achievement scores of the male students having high, average and low levels of reasoning ability, their respective scores on academic achievement were taken into consideration and the Significance of Difference among the Mean values of these three levels of scores have been calculated by means of adopting one way analysis of variance or f-test. The results obtained subsequently have been presented in table-3.

Table-3
Significance of Difference among the Mean Scores on Academic Achievement of Male high school students having Differential Levels of Reasoning Ability

Sources of variation	Sum of squares	df	Mean square	F - ratio
Between group	138051.3	2	69025.65	9.40**
Within group	1079980.44	147	7346.81	
Total	1218031.74	149		

The above table-3 shows that the sum of squares between groups and within groups have been found to be 138051.3 and 1079980.44 respectively and mean squares between groups and within groups have been found to be 69025.65 and 7346.81 respectively. The f-value has been found to be 9.40 being significant at 0.01 level of significance.

It indicates that there is significant difference in the academic achievement of high school students having differential levels of reasoning ability. Hence the hypothesis that "The male high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement" is accepted.

An analysis of the table-3 reveals that the high school students having differential levels of reasoning ability differs significantly on their academic achievement. But it is not clear that which of the two groups differs. Therefore, it is necessary to calculate the significance of mean difference of the different groups such as high vs. average, high vs. low and average vs. low. The data pertaining to the significant of mean difference between the mean scores of the respective groups have been presented in the table-4.

Table-4
Significance of Mean Difference in the Academic Achievement of male high school students belonging to Different Levels

Category	N	M	SD	SED	df	t	Remarks
High vs. Average	36	375.75	98.11	18.40	134	2.92	Sig. at 0.01
	100	322.09	84.32				
High vs. Low	36	375.75	98.11	27.11	48	4.03	Sig. at 0.01
	14	266.50	80.92				
Average vs. Low	100	322.09	84.32	23.21	112	2.40	Sig. at 0.05
	14	266.50	80.92				

From the analysis of table-4 it is concluded that the three groups namely high vs. average, high vs. low and average vs. low differs significantly on their academic achievement as the obtained 't' ratio of the respective groups are found to be significant at 0.01 level with df value 134, 48 and at 0.05 with df 112 respectively. Therefore, we can infer that the reasoning ability of high school students is having some bearing on the academic achievement.

C. Study of Significance of Difference among the Mean Scores on Academic Achievement of Female high school students having Differential Levels of Reasoning Ability

The present study aimed to find out whether the academic achievement of female high school students having differential levels of Reasoning Ability differs or not. The data were obtained from secondary school students to find out the difference in the mean academic achievement of high school students having differential levels of reasoning ability. Further the investigator categorized the female high school students into three categories on the basis of their reasoning ability scores.

As such, the male students scoring 42 or above, in between 18-41 and 17 or below than it were considered as the students having high, average and low levels of reasoning ability respectively. In order to find out the differences in academic achievement scores of the female students having high, average and low levels of reasoning ability, their respective scores on academic achievement were taken into consideration and the Significance of Difference among the Mean values of these three levels of scores have been calculated by means of adopting one way analysis of variance or f-test. The results obtained subsequently have been presented in table-5.

Table-5

Significance of Difference among the Mean Scores on Academic Achievement of Female high school students having Differential Levels of Reasoning Ability

Sources of variation	Sum of squares	df	Mean square	F – ratio
Between group	263915.43	2	131957.72	17.94**
Within group	1080831.90	147	7352.60	
Total	1344747.33	149		

The findings of the present study in the above table-5 show that the sum of squares between groups and within groups have been found to be 263915.43 and 1080831.90 respectively and mean squares between groups and within groups have been found to be 131957.72 and 7352.60 respectively. The f-value has been found to be 17.94 being significant at 0.01 level of significance.

It indicates that there is significant difference in the academic achievement of high school students having differential levels of reasoning ability. Hence the hypothesis that "The female high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement" is accepted.

An analysis of the table-5 reveals that the high school students having differential levels of reasoning ability differs significantly on their academic achievement. But it is not clear that which of the two groups differs. Therefore, it is necessary to calculate the significance of mean difference of the different groups such as high vs. average, high vs. low and average vs. low. The data pertaining to the significant of mean difference between the mean scores of the respective groups have been presented in the table-6.

Table-6

Significance of Mean Difference in the Academic Achievement of Female high school students belonging to Different Levels

Category	N	M	SD	SED	df	t	Remarks
High vs. Average	22	471.18	87.89	20.62	112	4.27	Sig. at 0.01
	92	382.98	82.70				
High vs. Low	22	471.18	87.89	21.76	56	6.38	Sig. at 0.01
	36	332.19	66.43				
Average vs. Low	92	382.98	82.70	14.03	126	3.62	Sig. at 0.01
	36	332.19	66.43				

From the analysis of table-6 it is concluded that the three groups namely high vs. average, high vs. low and average vs. low differs significantly on their academic achievement as the obtained 't' ratio of the respective groups are found to be significant at 0.01 level with df value 112, 56 and 126 respectively. Therefore, we can infer that the reasoning ability of female high school students is having some bearing on the academic achievement.

Findings of the Study

After careful analysis of the obtained data and interpretation of the result with regard to the objectives and hypotheses of the study, the investigator reached at the following findings:

1. The high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement.
2. The three groups of high school students namely high vs. average, high vs. low and average vs. low differ significantly with respect to their mean academic achievement.
3. The male high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement.
4. The three groups of male high school students namely high vs. average, high vs. low and average vs. low differ significantly with respect to their mean academic achievement.
5. The female high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement.
6. The three groups of female high school students namely high vs. average, high vs. low and average vs. low differ significantly with respect to their mean academic achievement.

Educational Implications

On the basis of the above findings, the investigator is inclined to have the following educational implications for both the parents and teachers:

- The parents and teachers should provide conducive and free environment to the students in order to develop good academic achievement and reasoning ability.
- Teachers should provide tests like problem solving ability test, creative thinking test to increase and develop reasoning ability among students.
- Both the parents and teachers should provide proper guidance to the students mainly in adolescent age to maintain good academic career.
- The knowledge, expertise, resourcefulness and efficiency of teachers may also improve the academic achievement and reasoning ability. Skillful and trained teachers are the main ingredient of good academic achievement.
- Teachers of all schools give proper attention towards the academic achievement of the students in all subjects and also towards their reasoning ability.
- The teachers should assign different projects, assignments etc. so as to improve students' reasoning ability.
- Teachers should try to improve and develop reasoning ability among students by giving some additional exposure like seminars, experts' lectures, field trips, and additional training programmes.
- The learning experiences provided in the classroom should include such activities which provide opportunities for students to bring out analogies, to classify, to draw inferences, to arrive at generalizations and so on.

- The teachers should motivate the students to get engaged in such activities that would inculcate creative and critical thinking among students.
- Teachers should use proper teaching aids according to the level of the students which may be helpful in good academic achievement.
- The teacher and the school should provide not only the environment but also resources for the development of varied and related experiences.
- The elements of convergent and divergent thinking should be continuously stressed and applied to the solution of problems throughout the entire curriculum.
- Since reasoning ability emerged as the determiner of the academic achievement, the curriculum designers could take note of these findings that content areas should also cover reasoning components adequately.

Conclusion

We can conclude by saying that education is the process of development. Academic achievement is an aspect of behaviour which is important for students engaged in the process of education. Academic achievement is end product of all the education processes and reasoning is one of basic ingredient of educational process. Above stated findings of the study reveals that the high school students having high, average and low levels of reasoning ability differ significantly with respect to their mean academic achievement. Therefore, we can say that reasoning ability is related to academic achievement and in order to raise the academic achievement of the students' teachers should pay attention towards exploring new methods to increase and develop reasoning ability.

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