C H A P T E R IV

RELATIONSHIP BETWEEN STUDENTS' ACHIEVEMENT THROUGH THE MULTIMEDIA INSTRUCTIONAL STRATEGY AND THEIR INTELLIGENCE

In the earlier chapter, the effectiveness of the instructional strategy as a whole and of its individual components has been established. As stated in Chapter I, development of a duly validated multimedia instructional strategy was the main objective of the present investigation. The effectiveness of the strategy was also studied by examining relationship between students' intelligence and their achievement. This aspect of the study has been put in terms of the objective 'To study the relationship between students' achievement and their intelligence' in Chapter I. The present chapter pertains to the study of the above objective. The methodology followed for studying this aspect, results and discussions thereof, are presented in the following.

DESIGN

The above objective includes two aspects, namely, (1) studying the relationship between students' intelligence and their achievement; and (2) studying how students belonging to different levels of intelligence have performed through the strategy. For studying these aspects, data in respect of students' intelligence and achievement

were to be obtained. The first aspect of the objective included studying relationship between students' intelligence and their achievement through the index of coefficient of correlation. The second aspect included categorizing students into different groups in terms of their intelligence scores, and studying the significant difference in their achievement.

INSTRUMENT UTILIZED FOR MEASURING INTELLIGENCE

Dr. Madhukar Patel's Intelligence Test (MPIT) was used to measure intelligence of students. This test is a non-verbal culture free group test and measures 'General Factor' of intelligence. There are 80 items of four different types, viz., series, synthesis, analogy and classification in the test. It has been standardized for 14+ age group of students in Gujarat State. Reliability of the test through split-half method ranges from 0.88 for grade VIII to 0.93 for grades IX and X. Reliability through other methods such as test-retest, K-R formula 20, Rulon, etc., vary from 0.92 to 0.97. Concurrent validity coefficient ranges from 0.65 to 0.80, when measured against other verbal and non-verbal tests of intelligence developed in the State of Gujarat.

SAMPLE

All the four groups of students, viz., experimental group, control group 1, control group 2 and control group 3 described in Section II of Chapter III constituted the sample for studying this objective. However, responses of only 39

students of the control group 1 and 42 students each of control groups 2 and 3 have been utilized, since others did not take either comprehensive test-I or intelligence test, or in a few cases, both. The responses of all the 45 students of experimental group have been utilized.

DATA COLLECTION

Data in respect of students' intelligence were obtained by administering the intelligence test (MPIT) to all the four groups of students. To experimental group and control group 1, the test was administered at the end of the academic year 1978-79, and to the control groups 2 and 3, it was administered at the end of the academic year 1977-78.

As regards students' achievement, two sets of achievement scores obtained during validation phase of the strategy have been utilized. The two sets of achievement scores utilized are: (a) experimental group students' combined comprehensive test scores (scores of comprehensive tests - I and II combined together); and (b) scores of the experimental and all the control groups' (1, 2 and 3) students on comprehensive test-I.

In the following are presented analysis of the data, results and discussion.

ANALYSIS OF THE DATA, RESULTS AND DISCUSSION

The relationship between experimental group students'

total achievement through the strategy (combined comprehensive test score) and their intelligence was studied using Pearson's Product-Moment coefficient of correlation. The obtained 'r' is 0.403 at df 43, which is positive and significant at 0.01 level. This positive and significant correlation indicates that students' achievement through the strategy as a whole and their intelligence are related. It may be mentioned here that a similar finding has been noticed by Alter (1962), Lambert (1962), Woodruff, et al. (1966), Goel (1970), Bhusan (1973), Kapadia (1974), Govinda (1975), Sansanwal (1978) and Seshadri (1979). Ofcourse, there has been a difference between the studies quoted above and the present one. In the above studies (Alter, 1962; Lambert, 1962; Woodruff, et al., 1966; Goel, 1970; Bhusan, 1973; Kapadia, 1974; and Govinda, 1975) the relationship found is between intelligence and achievement through PLM as a sole component of instruction, or through instructional strategies (Sansanwal, 1978 and Seshadri, 1979) wherein PLM has been utilized as a major instructional component supplemented with other components of instruction such as library work, discussion, etc. The present study differs from the above in not having PLM as a major instructional component in the strategy, or in other words, the achievement studied is not solely through PLM alone. On the other hand, as it may be recalled from earlier chapters, various instructional components have been logically sequenced and utilized in appropriate combinations in the strategy to achieve the instructional objectives delineated

for various units of the course. Even with such an arrangement, the relationship found between students' achievement and their intelligence substantiates the findings of the earlier studies. Since intelligence and achievement through the strategy are related, a logical step would be to study how students belonging to different levels of intelligence have achieved through the strategy. How this has been studied is described in what follows.

In order to understand the achievement of students belonging to the different levels of intelligence, the students of the experimental group were divided into three groups, viz., high, middle and low by computing P_{25} and P_{75} percentile positions for their scores on intelligence test. The low group consisted of students whose scores were falling below Quartile 1 (P_{25}) and high group consisted of students whose scores were falling above Quartile 3 (P_{75}). Those students whose scores were falling between P_{75} and P_{25} were considered to be belonging to middle group. Their corresponding combined comprehensive test scores were separated. The mean differences in the total achievement (combined comprehensive test score) of the experimental group students belonging to the three levels of intelligence have been studied using the statistical technique ANOVA. The results are presented in Tables 4.1 and 4.2.

TABLE 4.1

ANOVA for Achievement of Experimental Group Students Belonging to High, Middle and Low Levels of Intelligence - Combined Comprehensive Test Score

Source of variation	Degrees of freedom	Sum of squares	Mean square	Obtained 'F' value
Between groups	2	3806.42	1903.21	
Within groups	42	7031.13	171.49	11.09**
Total	44	10837.55		

** Indicates significance at 0.01 level

TABLE 4.2

Significance of Difference Between the Mean Achievement of Experimental Group Students belonging to High, Middle and Low Levels of Intelligence - Combined Comprehensive Test Score

	Mean	S.D.	High group	Middle group	Low group
High group (N = 10)	83.50	7.1		2.30*	5.54**
Middle group (N = 23)	74.95	13.89			3.38**
Low group (N = 12)	58.17	13.79			

* Indicates significance at 0.05 level
** Indicates significance at 0.01 level

It may be observed from Table 4.1 that the obtained 'F' value of 11.09 is significant at 0.01 level, which indicates that the three groups of students belonging to

three levels of intelligence differ in their mean achievement. When the mean achievement of specific pairs are compared using t-test, all the three t-values obtained are found significant (vide Table 4.2). By looking into the means of the three groups, it may be observed that students belonging to high intelligence level have performed better than middle and low intelligence groups students. Similarly, the higher mean in respect of middle intelligence group indicates the superior performance of middle intelligence group students as compared to the low intelligence group students. The inference that could be drawn from the above results is that within the experimental group, the strategy has affected the achievement of students belonging to different levels of intelligence differentially. To further examine the effect of the strategy on the achievement of experimental group students belonging to different levels of intelligence, their achievement on comprehensive test-I has been compared with the achievement of students belonging to corresponding levels of intelligence in the control groups. A description of which is given below.

As the experimental group was divided into high, middle and low intelligence groups, the students belonging to control groups 1, 2 and 3 also were categorized into high, middle and low intelligence groups by calculating P_{25} and P_{75} percentile positions for their scores on the intelligence test. The achievement scores of students belonging to high, middle and low levels of intelligence of

the experimental and the three control groups on comprehensive test-I were separated. The mean differences in the achievement of students belonging to experimental, control groups 1, 2 and 3 at each level of intelligence have been studied using statistical technique ANOVA. The results and discussions in respect of these comparisons are presented in what follows.

TABLE 4.3

ANOVA for the Achievement of High Intelligence Level Students Belonging to Experimental and Control Groups on Comprehensive Test-I

Source of variation	Degrees of freedom	Sum of squares	Mean square	Obtained 'F' value
Between groups	3	15659.18	5219.73	70.06**
Within groups	36	742.4	74.51	
Total	39	16401.58		

** Indicates significance at 0.01 level

TABLE 4.4

It may be observed from Table 4.3 that the 'F' value obtained is significant at 0.01 level, which indicates that the high intelligence level students belonging to the four groups differ with regard to their mean achievement. The 't' values for significance of difference between means for

TABLE 4.4

Significance of Difference Between the Mean Achievement of High Intelligence Group Belonging to Experimental and Control Groups on Comprehensive Test-I

	Mean	S.D.	Experimental group	Control group 1	Control group 2	Control group 3
Experimental group (N = 10)	83.40	8.62		9.44**	14.34**	14.38**
Control group 1 (N = 9)	37.22	12.19			0.11 N.S.	0.56 N.S.
Control group 2 (N = 11)	36.73	6.05				1.16 N.S.
Control group 3 (N = 10)	39.40	4.45				

** Indicates significance at 0.01 level.
N.S. indicates not significant.

specific pairs are presented in Table 4.4. From the 't' values and means presented in Table 4.4, it can be made out that the performance of high intelligence level students of the experimental group on comprehensive test-I is superior to that of the control groups. The high intelligence level students belonging to the three control groups do not differ with regard to their mean achievement. These results reflect that the strategy has been effective in influencing the achievement of high intelligence level students of the experimental group.

TABLE 4.5

ANOVA for the Achievement of Middle Intelligence Level Students Belonging to Experimental and Control Groups on Comprehensive Test-I

Source of variation	Degrees of freedom	Sum of squares	Mean square	Obtained 'F' value
Between groups	3	32875.40	10958.47	99.03**
Within groups	85	9405.79	110.66	
Total	88	42281.19		

** Indicates significance at 0.01 level.

TABLE 4.6

Significance of Difference Between the Mean Achievement of Middle Intelligence Level Students Belonging to Experimental and Control Groups on Comprehensive Test-I

	Mean	S.D.	Experimental group	Control group 1	Control group 2	Control group 3
Experimental group (N = 23)	73.60	14.32		13.17**	13.02**	11.29**
Control group 1 (N = 21)	25.00	9.95			2.24*	3.52**
Control group 2 (N = 20)	30.75	6.16				1.82 N.S.
Control group 3 (N = 25)	34.76	8.60				

** Indicates significance at 0.01 level.
* Indicates significance at 0.05 level.
N.S. indicates not significant.

12 From the Table 4.5, it could be observed that the obtained 'F' value is significant at 0.01 level, which indicates that the middle intelligence level students belonging to the four groups differ with regard to their mean achievement. In Table 4.6 are presented 't' values for significance of difference between means for specific pairs. Observing the Table 4.6 for 't' values and means, it can be noticed that the performance of middle intelligence level students of the experimental group on comprehensive test-I is superior to that of the control groups. Between control groups, the mean achievement of middle intelligence level students belonging to control group 1 differs significantly at 0.05 level from that of control group 2, and at 0.01 level from that of control group 3, indicating thereby the superior performance of middle intelligence level students of the control group 1. The middle intelligence level students of control groups 2 and 3 do not differ with regard to their mean achievement. The superior performance of middle intelligence level students of experimental group in comparison to the control groups indicates that the strategy has been effective in influencing the achievement of middle intelligence level students of experimental group.

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TABLE 4.7

ANOVA for the Achievement of Low Intelligence Level Students Belonging to Experimental and Control Groups on Comprehensive Test-I

Source of variation	Degrees of freedom	Sum of squares	Mean square	Obtained 'F' value
Between groups	3	5360.14	1786.70	14.79**
Within groups	35	4228.94	120.83	
Total	38	9589.08		

** Indicates significance at 0.01 level.

TABLE 4.8

It may be observed from Table 4.7 that the 'F' value obtained is significant at 0.01 level, which indicates that the low intelligence level students belonging to the four groups differ in their mean achievement. The 't' values for significance of difference between means for specific pairs are given in Table 4.8. From the 't' values and means presented in Table 4.8, it can be made out that the performance of low intelligence level students of the experimental group on comprehensive test-I is superior to that of the control groups. Between control groups, the mean achievement of low intelligence level students belonging to the control group 1 differs significantly at 0.01 level from that of

TABLE 4.8

Significance of Difference Between the Mean Achievement of Low Intelligence Level Students Belonging to Experimental and Control Groups on Comprehensive Test-I

	Mean	S.D.	Experimental group	Control group 1	Control group 2	Control group 3
Experimental group (N = 12)	51.83	14.83		6.54**	3.79**	3.72**
Control group 1 (N = 9)	20.44	6.55			3.57**	3.70**
Control group 2 (N = 11)	32.72	8.83				0.11 N.S.
Control group 3 (N = 7)	33.14	6.99				

** Indicates significance at 0.01 level.
N.S. indicates not significant.

the control groups 2 and 3, indicating thereby the superior performance of the low intelligence level students of the control group 1. The low intelligence level students of the control groups 2 and 3 do not differ with regard to their mean achievement. The superior performance of low intelligence level students of the experimental group in comparison to that of the control groups indicate that the strategy has been effective in influencing the achievement of low intelligence level students of the experimental group.

The inference that could be drawn from the above comparisons is that the developed strategy has not only been effective in influencing the achievement of high and middle intelligence level students of the experimental group, but also the achievement of low intelligence level students. In other words, the strategy has proved effective in influencing the achievement of the experimental group students belonging to different levels of intelligence consistently. This is evident from the fact that the performance of the experimental group students at all the three levels of intelligence is significantly superior in comparison to that of the control groups (refer Tables 4.3 to 4.8). These findings confirm the effectiveness of the instructional strategy arrived at through the comparison of the performance of experimental group students with that of the control groups - groups considered as a whole without dividing them into different levels of intelligence on

16 comprehensive test-I in Section II of Chapter III under the heading 'external validation', indicating thereby that the higher mean achievement noticed in favour of the experimental group (refer Tables 3.16 and 3.21 in Section II of Chapter III) is not only because of the higher performance of students belonging to any one level of intelligence, but also because of the consistently superior performance of students belonging to all the three levels of intelligence.

What can be concluded from the analysis and discussion presented so far is (1) intelligence does have a significant and positive correlation with the achievement; and (2) intelligence has influenced the achievement of experimental group students. Owing to the influence of intelligence, the instructional strategy has differential effect on students' achievement within the experimental group, although, the strategy has proved effective in influencing the achievement of experimental group students belonging to different levels of intelligence consistently. The implication of these findings is that necessary measures are to be adopted in the instructional strategy to minimise the effects of individual differences due to intelligence on achievement. These measures, as discussed in Section II of Chapter III, may include diagnosing learning difficulties in students, organizing remedial instruction in the form of individual tutoring, or through alternative modes of instruction to meet the differential needs of the individual learners, making the

17 strategy flexible in terms of time required by the individual learners to master the concept, etc. As it has been already mentioned in Section II of Chapter III, in the developed strategy attempts to incorporate these measures were not made, as it had to work under restricted time and fixed syllabus. Perhaps, an incorporation of such measures in the strategy may lead to achievement of mastery learning.