International Journal of Academic Research and Development
ISSN: 2455-4197
Impact Factor: RJIF 5.22
www.academicsjournal.com
Volume 3; Issue 2; March 2018; Page No. 43-50

Effect of instructional strategy on academic achievement in relation to cognitive styles & achievement motivation at secondary stage

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Abstract
In this modern age achievement is considered to be a key factor for personal and social progress. The whole system of education revolves round academic achievements of students in the school. Academic Achievement of a child is affected by various factors such as instructional strategy, cognitive styles and achievement motivation. The present study was planned to study the effect of multimedia instruction on academic achievement in relation to cognitive styles & achievement motivation of 9th grade students in English. A sample of 64 students was selected by using multi-stage sampling for the present study. The investigators used Group Embedded Figure Test by Witkin *et al*. (1971) to identify the cognitive styles; Achievement Motivation Scale by Deo and Mohan (2011) to test Achievement Motivation; Multimedia Instructional Package developed by investigators; and an Achievement test in English developed by investigators. Levene's Test for Homogeneity of variance was implemented to test the homogeneity of the data obtained and was further analyzed by using ANOVA with 2×2×2 factorial design. Findings of the study revealed that the main effects of cognitive styles, achievement motivation and instructional strategy on academic achievement were to be found significant. A significant interaction effects of cognitive styles and achievement motivation; cognitive styles and instructional strategy & achievement motivation and instructional strategy on academic achievement of students were found. The triple interaction effect of cognitive styles, achievement motivation and instructional strategy on academic achievement was also found to be significant.

Keywords: instructional strategy, cognitive styles, achievement motivation, academic achievement

Introduction
Instructional strategy means the organization of suitable instructional components with functions specified in relation to the specific goals to be achieved. Multimedia instructional strategy has become popular in the ever changing world of computers. Multimedia is media and content that uses a combination of different content forms. It includes a combination of text, audio, still images, animation, video or interactivity content forms. It merges multiple levels of learning into an educational tool that allows for diversity in curricula presentation. Now the question arises what is the use of multimedia in education? The answers to this question could be sought through an understanding of the capabilities of the medium. With multimedia, the process of learning becomes more goal oriented, more participatory, flexible in time and space, unaffected by distances and tailored to individual learning styles, and increased collaboration between teachers and students. Multimedia makes learning friendly and fun-oriented without fear of inadequacies or failure. The pedagogical strength of multimedia is its natural information-processing abilities that we already possess as humans. It has been observed worldwide that applications of multimedia have resulted into higher strides of achievement for the learners. Studies conducted by Adegoke (2011) [1] examined the effect of multimedia instruction on senior secondary school students' and found that students under multimedia instruction performed better than the lecture group. Aloraini (2012) [2] also find out the positive impact of multimedia on students' academic achievement. Maree, *et al*. (2013) [10] showed significant effect of multimedia instructional strategy on academic achievement. Satyaprakasha & Sudhanshu (2014) [13] found that multimedia significantly promoted achievement with respect to knowledge, understanding, application and total achievement. Sharma & Priyamvada (2017) [14] also found significant effect of multimedia instructional strategy on academic achievement. The literature related with the use of multimedia suggests that multimedia learning is a sense-making activity in which the learner seeks to build a coherent mental representation from the presented material.

Researches in the field of cognitive styles have shown cognitive styles as a main factor having significant effect on achievement. Cognitive styles can be defined in general terms as consistent individual differences in the ways people experience, perceive, organize, recall and process information (Goldstein & Blackman, 1978) [6]. According to (Kogan (1970) [8], "Cognitive styles can be most directly defined as individual variation in modes of perceiving, remembering, and thinking, or as distinctive ways of apprehending, storing, transforming, and utilizing information". They have also been viewed as a self-consistent mode of functioning which individuals show in their perceptual and intellectual activities, and an expression of psychological differentiation within characteristic modes of information processing (Witkin &

Goodenough, 1981) [16]. A number of cognitive styles have been identified and studied over the years. Field independence versus field dependence is probably the most well known style. Field dependence-independence refers to the degree "to which the organization of the prevailing field dominates perception of any of its parts" (Witkin *et al*., 1971). It is an articulation of an individual's cognitive psychological structure to isolate contextual information (Witkin & Goodenough, 1981) [17]. It is defined as "the degree to which a learner's perception or comprehension of information is affected by the surrounding perceptual or contextual field" (Jonassen & Grabowski, 1993) [7]. Messick (1976)) expresses this dimension as: "… a consistent mode of approaching the environment in analytical, as opposed to global, terms. It denotes a tendency to articulate figures as discrete from their backgrounds and a facility in differentiating objects from embedding contexts, as opposed to a countertendency to experience events globally in an undifferentiated fashion." (p.14) It is evidenced by the research conclusions of the various studies conducted by Geetanjali (2006) [5], who found that cognitive style had a significant effect on students' achievement; more the field independence of students, higher the academic achievement. Jantan & Masran (2007) also find out the positive and significant effect of cognitive styles on achievement. Onyekuru (2015) [12] investigated the relationship among field-dependence-field-independence cognitive style and academic achievement of students and found that field independent students had a higher mean achievement than the field dependent students.

Achievement motivation is a primary condition to achieve something. It is a strong motive characterized by ambition, high level of energy, strong desire for independence. It is a stable learned characteristic in which satisfaction comes from striving for and achieving a level of excellence. Achievement Motivation is a drive to excel in learning tasks combined with capacity to experience tried in accomplishment. The concept of Achievement Motivation was first popularized by Murray, Later David McClleland and Atkinson concentrated on the study of achievement motivation. People who strove for excellence in a field for the sake of achieving and not for some reward are considered to have a high need for achievement. This need has labeled as n-achievement for convenience. So the need for achievement or n-Ach was defined as the desire or tendency to do things rapidly and to accomplish something difficult to master, manipulate, organize physical objects, human beings or ideas. This is to do things rapidly and independently as possible to overcome obstacles and obtain a high standard to excel oneself to rival and surpass others and to increase self-regard by the successful exercise talents (Murray,1938). It is important both for parents and educators to understand why promoting and encouraging achievement motivation from an early age is imperative. It is a consistent striving force of an individual to achieve success to certain standard of excellence in the competing situation. The development of early academic achievement motivation has significant implications for later academic careers. The prediction of relationship between academic achievement and achievement motivation has been the primary objective of many investigators. From those studies the findings on n-Ach and its relationship with academic achievement are available. Busato *et al*.(2000) [4], Krishnamurty (2001), Bansal *et al*. (2006) [3], Umadevi (2009) [15], Yusuf (2011) [18] etc. have shown the positive and significant relationship between n-Ach and school performance.

Variables Involved

In the present study, academic achievement has been taken as the dependent variable, whereas variables such as cognitive styles, achievement motivation and instructional strategy constituted the independent variables.

Objectives of the Study

1. To study the effect of cognitive styles on academic achievement of students.
2. To study the effect of achievement motivation on academic achievement of students.
3. To study the effect of instructional strategy on academic achievement of students.
4. To study the interaction effect of the variables of cognitive styles and achievement motivation on academic achievement of students.
5. To study the interaction effect of the variables of cognitive styles and instructional strategy on academic achievement of students.
6. To study the interaction effect of the variables of achievement motivation and instructional strategy on academic achievement of students.
7. To study the interaction effect of the variables of cognitive styles, achievement motivation and instructional strategy on academic achievement of students.

Hypotheses of the Study

$H0_1$ There exists no significant effect of cognitive styles on academic achievement of students.

$H0_2$ There exists no significant effect of achievement motivation on academic achievement of students.

$H0_3$ There exists no significant effect of instructional strategy on academic achievement of students.

$H0_4$ There exists no significant interaction effect of the variables of cognitive styles and achievement motivation on academic achievement of students.

$H0_5$ There exists no significant interaction effect of the variables of cognitive styles and instructional strategy on academic achievement of students.

$H0_6$ There exists no significant interaction effect of the variables of achievement motivation and instructional strategy on academic achievement of students.

$H0_7$ There exists no significant interaction effect of the variables of cognitive styles, achievement motivation and instructional strategy on academic achievement of students.

Design and Methodology

The present study employed experimental method. The study was dealt with three phases that have been explained below:

1 Main Effect Phase: In this phase, the main effects of cognitive styles (Field Independent and Field Dependent), achievement motivation (High achievement motivation and

Low achievement motivation) and instructional strategy (Multimedia Instruction and Traditional Instruction) on academic achievement of students were studied separately. Each of the three independent variables (cognitive styles, achievement motivation and instructional strategy) was varied at two levels as:

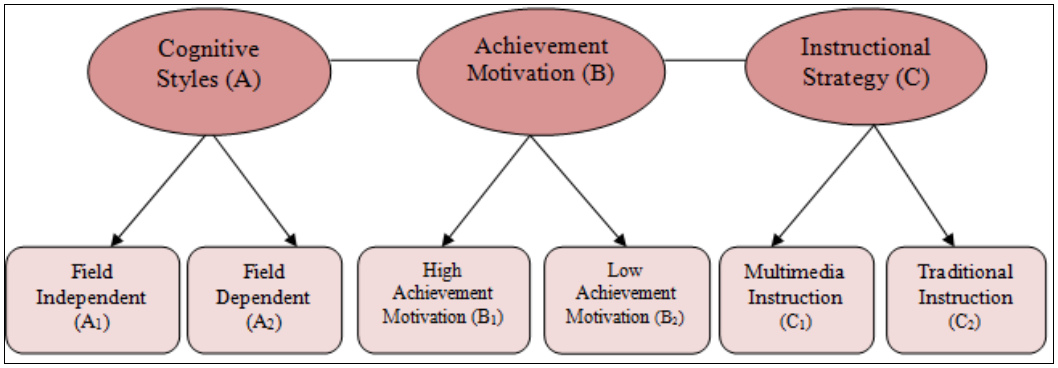

Fig 4

2. Double interaction phase: In this phase, an attempt was made to find out the interaction effects of cognitive styles & achievement motivation; cognitive styles & instructional strategy; and achievement motivation & instructional strategy on academic achievement of students.

3. Triple interaction phase: A combined interaction effect of all the independent variables i.e. cognitive styles, achievement motivation and instructional strategy on the dependent variable i.e. academic achievement was also studied.

Population

The population of this study refers to all students studying in C.B.S.E. affiliated Public Schools of Gohana (Dist. Sonepat).

Sample

The sample of the study was selected through multi-stage sampling. At the first stage, all the students studying in 9th class of Om Public School, Gohana were selected. At the second stage, the tool of Cognitive Style was administrated to the students and two groups belonging to field independent and field dependent categories were formulated. (Students who scored above 8 were considered to be field independent and students who scored 8 or less than 8 were considered to be field dependent). At the third stage, the tool of Achievement Motivation was administrated and two groups (High Achievement Motivation and Low Achievement Motivation) were formulated in accordance with Kelly's (1939) consideration of taking up Top and Bottom 27% groups. Then on the basis of randomization two groups were formed i.e. experimental group and control group. Experimental group consisted of 32 students and control group also consisted of 32 students. As a result, for application of Three way ANOVA (2×2×2) 64 students comprised the final sample.

Tools Used

- Group Embedded Figure Test (GEFT) (Witkin *et al*., 1971) to identify the cognitive styles;
- Achievement Motivation Scale (n-Ache) (Deo and Mohan, 2011) to test Achievement Motivation;
- Multimedia Instructional Package developed by investigator;
- Achievement test in English developed by investigator

Statistical techniques used

The main effects and interaction effects of the variables i.e. cognitive styles, achievement motivation and instructional strategy was computed by using Three Way Analysis of Variance (ANOVA) with 2×2×2 Factorial Design and further by 't'-test wherever F-value was found to be significant. To test the assumption of homogeneity of variance before applying Three Way ANOVA, the Levene's Test for Homogeneity of variance was used.

Results and Discussion

The objectives of the study were to find the main and interaction effects of cognitive styles, achievement motivation and instructional strategy on the academic achievement of students. For this, the data was subjected to analysis of variance of a (2×2×2) factorial study. The variables such as cognitive styles was coded as A [Field Independent (A1) and Field Dependent (A2)]; achievement motivation as B [high achievement motivation (B1) and low achievement motivation (B2)]; and similarly, instructional strategy as C [multimedia instruction (C1) and traditional instruction (C2)]. The means and S.D's of different sub-samples have been presented in Table-1; the summary of ANOVA (2×2×2) has been presented in Table-2.

Table 1: Means and S.D's of Sub Samples of 2×2×2 Design for Academic Achievement of Students with respect to Cognitive Styles, Achievement Motivation and Instructional Strategy

Cognitive Styles (A)	Achievement Motivation (B)	Instructional Strategy (C)	N	Mean	S.D
Field Independent	High Achievement Motivation	Multimedia Instruction	8	58.75	1.03
		Traditional Instruction	8	49.00	2.00
	Low Achievement Motivation	Multimedia Instruction	8	49.25	2.25
		Traditional Instruction	8	36.87	1.72

Field Dependent	High Achievement Motivation	Multimedia Instruction	8	47.62	2.32
		Traditional Instruction	8	35.37	2.72
	Low Achievement Motivation	Multimedia Instruction	8	54.87	0.99
		Traditional Instruction	8	29.75	1.03

Table 2: Summary of three way ANOVA (2×2×2 Factorial Design) for academic achievement of students with respect to cognitive styles, achievement motivation and instruction strategy

Source of Variance	Df	Sum of Squares (SS)	Mean sum of Squares (MS)	F-ratios
Main Effects				
A (Cognitive Style)	1	689.063	689.063	196.875**
B (Achievement Motivation)	1	400.000	400.000	114.286**
C (Instructional Strategy)	1	3540.250	3540.250	1011.500**
Two way Interaction				
A × B Interaction	1	540.563	540.563	154.446**
A × C Interaction	1	232.563	232.563	66.446**
B × C Interaction	1	240.250	240.250	68.643**
Three way Interaction				
A × B × C Interaction	1	105.063	105.063	30.018**
Between Cells	7	5747.750	……..	
With in cells	56	196.000	3.500	
Total	63	5943.750		

**Significant at 0.01 level

The data was further analyzed in three phases that have been given below:

- **Main effect phase**
  On perusal of the Table-2, F-ratios i.e. 196.875; 114.286; and 1011.500 for the main effects of cognitive styles; achievement motivation; and instructional strategy on academic achievement are found to be significant at 0.01 level which lead to the conclusion that cognitive styles; achievement motivation and instructional strategy have shown their significant effects on academic achievement. Therefore, the null hypotheses Ho_1, Ho_2 and Ho_3 (already mentioned above) are rejected.
- **Double interaction phase**
- **Cognitive Styles (A) × Achievement Motivation (B)**
  As depicted in the Table-2, the F-ratio (154.446) for interaction between cognitive styles and achievement motivation is found to be significant at 0.01 level which leads to the inference that cognitive styles and achievement motivation do interact with each other. Therefore, the null hypothesis Ho_4 is rejected. Further, it is subjected to 't'-test computation to find out the difference in the mean scores for academic achievement of different groups for cognitive styles and achievement motivation have also been represented in Table-3.

Table 3: 't'- values for mean scores of academic achievement of groups of cognitive styles (A) × Achievement Motivation (B)

Groups	N	Mean	Std. Deviation	Std. Error Mean	't' value
A_1B_1 vs. A_1B_2	16	53.8750	5.26466	1.31617	5.086**
	16	43.0625	6.67801	1.66950	
A_1B_1 vs. A_2B_1	16	53.8750	5.26466	1.31617	5.765**
	16	41.5000	6.78233	1.69558	
A_1B_1 vs. A_2B_2	16	53.8750	5.26466	1.31617	3.295**
	16	42.3125	13.01137	3.25284	
A_1B_2 vs. A_2B_1	16	43.0625	6.67801	1.66950	.657^{NS}
	16	41.5000	6.78233	1.69558	
A_1B_2 vs. A_2B_2	16	43.0625	6.67801	1.66950	.205^{NS}
	16	42.3125	13.01137	3.25284	
A_2B_1 vs. A_2B_2	16	41.5000	6.78233	1.69558	.221^{NS}
	16	42.3125	13.01137	3.25284	

Significant at 0.01 level; Significant at 0.05 level; NS-Not significant
A_1B_1 = Field Independent students with High Achievement Motivation;
A_1B_2 = Field Independent students with Low Achievement Motivation;
A_2B_1 = Field Dependent students with High Achievement Motivation;
A_2B_2 = Field Dependent students with Low Achievement Motivation;

A close perusal of the Table-3 reveals that t-values for all the groups are found to be significant at.01 level except the groups such as A_1B_2 vs.A_2B_1; A_1B_2 vs. A_2B_2; A_2B_1 vs. A_2B_2 are found to be insignificant with respect to their academic achievement.

- **Cognitive Styles (A) × Instructional Strategy (C)**

As found in the Table-2, the F-ratio (66.446) for interaction

between cognitive styles and instructional strategy is found to be significant at 0.01 level leading to the conclusion that cognitive styles and instructional strategy do interact with each other. Therefore, the null hypothesis Ho_5, "There exists no significant interaction effect of the variables of cognitive styles and instructional strategy on academic achievement of students" is rejected. It is concluded that there is significant interaction effect of cognitive styles and instructional strategy on academic achievement of students.

Table 4:'t'- values for Mean Scores of Academic Achievement of groups of Cognitive Styles (A) × Instructional Strategy (C)

Groups	N	Mean	Std. Deviation	Std. Error Mean	't' value
A_1C_1 vs. A_1C_2	16	54.0000	5.18973	1.29743	5.312**
	16	42.9375	6.51633	1.62908	
A_1C_1 vs. A_2C_1	16	54.0000	5.18973	1.29743	1.980*
	16	51.2500	4.12311	1.03078	
A_1C_1 vs. A_2C_2	16	54.0000	5.18973	1.29743	13.673**
	16	32.5625	3.52077	.88019	
A_1C_2 vs. A_2C_1	16	42.9375	6.51633	1.62908	4.312**
	16	51.2500	4.12311	1.03078	
A_1C_2 vs. A_2C_2	16	42.9375	6.51633	1.62908	5.603**
	16	32.5625	3.52077	.88019	
A_2C_1 vs. A_2C_2	16	51.2500	4.12311	1.03078	13.787**
	16	32.5625	3.52077	.88019	

Significant at 0.01 level;* Significant at 0.05 level; NS-Not significant
A_1C_1=Field Independent students taught through Multimedia Instruction;
A_1C_2=Field Independent students taught through Traditional Instruction;
A_2C_1=Field Dependent students taught through Multimedia Instruction;
A_2C_2=Field Dependent students taught through Traditional Instruction

A close perusal of the Table-4 reveals that t-values for all the groups are found to be significant at.01 level with respect to their academic achievement.

- **Achievement Motivation (B) × Instructional Strategy (C)**
  As evident from Table-2, the F-ratio (68.643) for interaction between achievement motivation and instructional strategy is significant at 0.01 level which shows that achievement motivation and instructional strategy do interact with each other. Therefore, the null hypothesis Ho_6 is rejected. Further, it is subjected to 't'-test computation to find out the difference in the mean scores for academic achievement of different groups for achievement motivation and instructional strategy have also been represented in Table-5.

Table 5:'t'- values for Mean Scores of Academic Achievement of groups of Achievement Motivation (B) x Instructional Strategy (C)

Groups	N	Mean	Std. Deviation	Std. Error Mean	't' value	
B_1C_1 vs. B_1C_2	16	53.1875	6.00243	1.50061	4.616**	
	16	42.1875	7.40467	1.85117		
B_1C_1 vs. B_2C_1	16	53.1875	6.00243	1.50061	$.654^{NS}$	
	16	52.0625	3.35596	.83899		
B_1C_1 vs. B_2C_2	16	53.1875	6.00243	1.50061	11.083**	
	16	33.3125	3.92800	.98200		
B_1C_2 vs. B_2C_1	16	42.1875	7.40467	1.85117	4.859**	
	16	52.0625	3.35596	.83899		
B_1C_2 vs. B_2C_2	16	42.1875	7.40467	1.85117	4.235**	
	16	33.3125	3.92800	.98200		
B_2C_1 vs. B_2C_2	16	52.0625	3.35596	.83899	14.517**	
	16	33.3125	3.92800	.98200		

Significant at 0.01 level; NS - Not significant
B_1C_1 = High Achievement Motivation students taught through Multimedia Instruction;
B_1C_2 = High Achievement Motivation students taught through Traditional Instruction;
B_2C_1 = Low Achievement Motivation students taught through Multimedia Instruction;
B_2C_2 = Low Achievement Motivation students taught through Traditional Instruction.

A close perusal of the Table-5 reveals that t-values for all the groups are found to be significant at.01 level except the group B_1C_1 vs. B_2C_1 is found to be insignificant with respect to their academic achievement.

- **Triple interaction phase**
  Cognitive Styles × Achievement Motivation × Instructional Strategy (A×B×C)
  The Table-2 indicates that the F-ratio (30.018) for

interaction between cognitive styles, achievement motivation and instructional strategy is significant at 0.01 level which leads to the inference that cognitive styles, achievement motivation and instructional strategy do interact with one other. Thus hypothesis Ho_7 "There exists no significant interaction effect of the variables of cognitive styles, achievement motivation and instructional strategy on academic achievement of students" is rejected. It, further, shows that there is at least a particular combination of cognitive styles, achievement motivation and instructional strategy which has an effect on academic achievement of the students. In order to find out that particular combination, 't'-test is employed to find out the difference in mean scores of academic achievement for different groups that have been presented in the Table-6

Table-6:'t'-values for Mean Scores of Academic Achievement of groups of Cognitive Styles (A) × Achievement Motivation (B) × Instructional Strategy (C)

Groups	N	Mean	Std. Deviation	Std. Error Mean	't' value
$A_1B_1C_1$ vs. $A_1B_1C_2$	8	58.75	1.03510	0.36596	12.246**
	8	49.00	2.00000	0.70711	
$A_1B_1C_1$ vs. $A_1B_2C_1$	8	58.75	1.03510	0.36596	10.841**
	8	49.25	2.25198	0.79620	
$A_1B_1C_1$ vs. $A_1B_2C_2$	8	58.75	1.03510	0.36596	30.731**
	8	36.87	1.72689	0.61055	
$A_1B_1C_1$ vs. $A_2B_1C_1$	8	58.75	1.03510	0.36596	12.359**
	8	47.62	2.32609	0.82240	
$A_1B_1C_1$ vs. $A_2B_1C_2$	8	58.75	1.03510	0.36596	22.701**
	8	35.37	2.72226	0.96247	
$A_1B_1C_1$ vs. $A_2B_2C_1$	8	58.75	1.03510	0.36596	7.648**
	8	54.87	0.99103	0.35038	
$A_1B_1C_1$ vs. $A_2B_2C_2$	8	58.75	1.03510	0.36596	36.033**
	8	29.75	1.03510	0.36596	
$A_1B_1C_2$ vs. $A_1B_2C_1$	8	49.00	2.00000	0.70711	0.235^{ns}
	8	49.25	2.25198	0.79620	
$A_1B_1C_2$ vs. $A_1B_2C_2$	8	49.00	2.00000	0.70711	12.979**
	8	36.87	1.72689	0.61055	
$A_1B_1C_2$ vs. $A_2B_1C_1$	8	49.00	2.00000	0.70711	1.268^{ns}
	8	47.62	2.32609	0.82240	
$A_1B_1C_2$ vs. $A_2B_1C_2$	8	49.00	2.00000	0.70711	11.408**
	8	35.37	2.72226	0.96247	
$A_1B_1C_2$ vs. $A_2B_2C_1$	8	49.00	2.00000	0.70711	7.445**
	8	54.87	0.99103	0.35038	
$A_1B_1C_2$ vs. $A_2B_2C_2$	8	49.00	2.00000	0.70711	24.177**
	8	29.75	1.03510	0.36596	
$A_1B_2C_1$ vs. $A_1B_2C_2$	8	49.25	2.25198	0.79620	12.334**
	8	36.87	1.72689	0.61055	
$A_1B_2C_1$ vs. $A_2B_1C_1$	8	49.25	2.25198	0.79620	1.420^{ns}
	8	47.62	2.32609	0.82240	
$A_1B_2C_1$ vs. $A_2B_1C_2$	8	49.25	2.25198	0.79620	11.108**
	8	35.37	2.72226	0.96247	
$A_1B_2C_1$ vs. $A_2B_2C_1$	8	49.25	2.25198	0.79620	6.466**
	8	54.87	0.99103	0.35038	
$A_1B_2C_1$ vs. $A_2B_2C_2$	8	49.25	2.25198	0.79620	22.253**
	8	29.75	1.03510	0.36596	
$A_1B_2C_2$ vs. $A_2B_1C_1$	8	36.87	1.72689	0.61055	10.495**
	8	47.62	2.32609	0.82240	
$A_1B_2C_2$ vs. $A_2B_1C_2$	8	36.87	1.72689	0.61055	1.316^{ns}
	8	35.37	2.72226	0.96247	
$A_1B_2C_2$ vs. $A_2B_2C_1$	8	36.87	1.72689	0.61055	25.570**
	8	54.87	0.99103	0.35038	
$A_1B_2C_2$ vs. $A_2B_2C_2$	8	36.87	1.72689	0.61055	10.009**
	8	29.75	1.03510	0.36596	
$A_2B_1C_1$ vs. $A_2B_1C_2$	8	47.62	2.32609	0.82240	9.676**
	8	35.37	2.72226	0.96247	
$A_2B_1C_1$ vs. $A_2B_2C_1$	8	47.62	2.32609	0.82240	8.110**
	8	54.87	0.99103	0.35038	
$A_2B_1C_1$ vs. $A_2B_2C_2$	8	47.62	2.32609	0.82240	19.858**
	8	29.75	1.03510	0.36596	

$A_2B_1C_2$ vs. $A_2B_2C_1$	8	35.37	2.72226	0.96247	19.038**
	8	54.87	0.99103	0.35038	
$A_2B_1C_2$ vs. $A_2B_2C_2$	8	35.37	2.72226	0.96247	5.463**
	8	29.75	1.03510	0.36596	
$A_2B_2C_1$ vs. $A_2B_2C_2$	8	54.87	0.99103	0.35038	39.590**
	8	29.75	1.03510	0.36596	

Significant at 0.01 level; NS - Not significant

$A_1B_1C_1$ = Field independent students with high achievement motivation taught through Multimedia Instruction
$A_1B_1C_2$ = Field independent students with high achievement motivation taught through Traditional Instruction
$A_1B_2C_1$ = Field independent students with Low achievement motivation taught through Multimedia Instruction
$A_1B_2C_2$ = Field independent students with Low achievement motivation taught through Traditional Instruction
$A_2B_1C_1$ = Field Dependent students with High achievement motivation taught through Multimedia Instruction
$A_2B_1C_2$ = Field Dependent students with High achievement motivation taught through Traditional Instruction
$A_2B_2C_1$ = Field Dependent students with Low achievement motivation taught through Multimedia Instruction
$A_2B_2C_2$ = Field Dependent students with Low achievement motivation taught through Traditional Instruction

A close perusal of the Table-6 reveals that t-values for all the groups are found to be significant at.01 level except the groups such as $A_1B_1C_2$ vs. $A_1B_2C_1$; $A_1B_1C_2$ vs. $A_2B_1C_1$; $A_1B_2C_1$ vs. $A_2B_1C_1$; $A_1B_2C_2$ vs. $A_2B_1C_2$; are found to be insignificant with respect to their academic achievement.

Findings of the study

- Both experimental and the control group students, found comparatively matching, with no significant difference in academic achievement on pre-test.
- Students having field independent cognitive style have better academic achievement in comparison to students having field dependent cognitive style.
- Students having high achievement motivation have better academic achievement in comparison to students having low achievement motivation.
- Students taught through multimedia instruction have better academic achievement in comparison to students taught through traditional method of instruction.
- There found to have significant interaction effect of cognitive styles and achievement motivation on academic achievement of students.
- A significant interaction effect of cognitive styles and instructional strategy was reported on academic achievement of students.
- Significant interaction effect of achievement motivation and instructional strategy was on academic achievement of students.
- There was found a significant interaction effect of cognitive styles, achievement motivation and instructional strategy on academic achievement of students.

Educational Implications

The present study shows that in changing from a traditional 'chalk and talk' method to multimedia instruction not simply enriches class room teaching, it also significantly improves the academic achievement of students. It also implies that multimedia instruction prove to be more tangible in its effectiveness on achievement than the traditional method of instruction. It seems more practical and is widely acceptable to students. The findings of the present study are not only useful to researchers in terms of further research but they also have applications to the classroom practices and organizational management of schools. The conclusions of this study may also help the teachers, parents, guidance workers to identify the low achievers, diagnose their problems and provide guidance to improve their performance. The result of the present study can benefit educators, administrators and instructional designers who can incorporate multimedia instructional strategy in school curriculum that can prove to be effective teaching and learning strategy in diverse subject areas. Along with general academic achievement, multimedia instructional package can help students develop other important skills like creative thinking, comprehension, critical analysis and synthesis of knowledge.

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