Multi-media Learning Achievements on Verbal-Imagery Dimension of Cognitive Styles among Elementary School Students

Dr. Ranjit Kaur
Assistant Professor, Department of Education, Chaudhary Devi Lal University, Sirsa, Haryana

Ms. Saroj Bala
Research Scholar, Department of Education, Chaudhary Devi Lal University, Sirsa, Haryana

Abstract

In the present era of technology, multi-media is used to provide computer based instruction to the learners. Because, it is presumed that multi-media information helps people to learn more and more in different situations and boost the awareness and knowledge among them. But, to use multi-media people use different kinds of cognitive styles to understand and process the information. The present paper is an attempt to establish the relationship of cognitive styles (verbal-imagery dimension) with multi-media learning among the students of an elementary school in terms of class, gender and age. A sample of 40 students was taken from 5^{th} to 8^{th} class having age group of 09 to 14 years from an elementary school of Sirsa by using systematic sampling technique. It is found that there is no significant correlation between verbal-imagery (VI) ratio in pretest and posttest sessions in terms of class, gender and age group of 11 to 13 years. However, there is a significant correlation between verbal-imagery (VI) ratio in pretest and posttest sessions among the students of 09 to 10 years. Further, it is found that there is small impact of multi-media intervention on learning outcomes of the students of elementary school. Therefore, it may be suggested that the contents of study material be prepared for the students of elementary school by using multi-media pedagogies based on their age, gender and grade.

Keywords: Bimodal, Cognitive, Correlation, Learning, Multi-media and Verbal-Imagery Ratio.

Introduction

Today, if we imagine about the classroom of 50 years ago then we can compare the changes in terms of advanced technologies. At those times, there were blackboards, maps on the walls, some models available in the science laboratories, tickets or cards in libraries to identify and issue the books to the stakeholders. But, today, we can see everything is replaced with latest technologies and software. As blackboards replaced with interactive boards, maps replaced with google maps, library tickets or cards

replaced with e-books and digital libraries. Hence, we can see the role of technology in every sphere of the society in general and in education in particular. Learners use audio, video, text, multi-media, etc. to learn everything by keeping distance from specific place meant for learning. Consequently, it can be stated that there is an impact of media on the learning achievements of learners. In order to understand the computer-based instruction instructions by the learner there should be a match between the characteristics of the learner and the content, method, and media of instructions. As we know, there are so many individual differences which influence learning and performance in an academic environment. Past studies showed that an individual's cognitive style affects learning and thinking in terms of perception and information processing because cognitive styles are associated with personality characteristics. In corollary, students with different cognitive styles or abilities learn more of less information. Further, they may use verbal or analytic dimension of cognitive styles. As we know, there is an important advantage of computer based instruction is the opportunity to deliver instruction based on student's cognitive style.

Technology is simply the means of conveyance by hardware or software of the symbol systems (audio, textual, graphical, pictorial, etc.) that a medium affords. Dynamics of access, retrieval and display represent a medium's processing capabilities. For example, broadcast radio uses the technology of a receiver to deliver a symbol system that is strictly auditory with limited processing capability (one cannot rewind, fast forward, or search a broadcast). The unique processing power of computers provides an excellent example of how technology can improve a learner's experience with any given content and thereby improve the transfer of knowledge. Afforded by no other medium, computers have the capability of creating dynamic, symbolic representations of non-concrete, formal constructs that are frequently missing in the mental models of novices. On the contrary, each medium and method of delivery (technology) possesses different characteristics that influence a person's engagement and experience with the content. With a dominantly constructivist outlook, learning happens through a person's experience and interaction with the world around them. Media and technology have a wonderful capacity for providing distinctive, unique and meaningful experiences can improve learning. As Salomon stated that if their unique symbolic capabilities are capitalized upon, each medium addresses itself to different constellations of mental skills, thus benefits learners of different aptitudes, and serves different educational ends (Vincent, 2006). These all happenings are measured in form of verbal-imagery and wholistic-analytic dimensions of cognitive styles used by the learners.

Review of Literature

Riding and Pearson (1994) found the relationship between intelligence, as measured by the short form of the British Abilities Scales, and the Wholist-Analytic and Verbal-Imagery style dimensions, as assessed by the Cognitive Styles Analysis. Researchers investigate the relationship with a sample of 119 (in total), 12-13-year-old middle school pupils (63 males and 56 females). They found nearly zero correlations between intelligence and the styles.

Riding, et al. (2003) studied the relationship between working memory, cognitive style and gender on overall learning behaviour and performance on a range of school subjects. A sample of 206 of 13 years old of a secondary comprehensive school was considered. They found that there was an interaction between working memory capacity and cognitive style for overall learning behaviour. With the Wholist-Analytic style dimension, memory made a marked difference for Analytics but had little effect for Wholists, and with the Verbal-Imagery dimension Verbalisers were affected but not Imagers. With the school subjects, these differed in terms of their sensitivity to gender, memory and style.

Riding and Douglas (1993) argued that the verbalisers who translate pictorial information into words or semantics representations present predominantly with left hemisphere activity. On the other hand, imagers, who represent semantic information in mental pictures whenever possible present with predominantly right hemisphere activity.

Riding and Cowley (1986) assessed 7-8-year-old pupils on three reading tests. The reading tests were different by virtue of the amount of context the task provided and the type of task performed. Test one required pupils to read aloud lists of words that got progressively more difficult until they had made a number of mistakes. Test two required subjects to read a sentence and insert a word within that sentence from a list of given words. Test three required subjects to read a passage for understanding and to answer eight comprehension questions about the passage. This final version used two tests of differing difficulty, easy and hard. Results indicated that for all three tests, male verbalisers excelled and male imagers performed poorly. The reverse was true for females. The results for males showed results consistent with their verbal imagery style with verbalisers doing well for the verbal based tests and imagers doing poorly. Females showed results that indicated that imagers performed better for reading tests, although one would expect the reverse characteristics according to their style. The results for these reading tests in terms of the style by gender interactions showed similar trends to the other studies presented above e.g. males performed as predicted by their verbal imagery style and females showed the reverse characteristics.

Charoula et al. (2009) investigated the extent to which two types of instructional materials and learner field dependence-independence affected learners' cognitive load, time spent on task, and problem-solving performance in a complex system with a computer-modeling tool. One hundred and one primary student teachers were initially categorized into field dependent, field mixed, and field-independent learners based on their performance on the Hidden Figures Test, and were then randomly assigned to two experimental conditions. One group received a static diagram and a textual description in a split format, and the second group received the same static diagram and textual description in an integrated format. MANOVA revealed that the split-format materials contributed to higher cognitive load, higher time spent on task, and lower problem-solving performance than the integrated-format materials. There was also an interaction effect, only in terms of students' problem-solving performance, between field dependence-independence and instructional materials, indicating that the facilitating effect of the integrated-format materials was restricted to the field-independent learners.

Objectives and Methodology

The objective of the paper is to know the relationship between cognitive styles (verbal-imagery dimension) and multi-media learning among the students of an elementary school based on age, gender and grade.

Hypothesis: There is no relationship between cognitive styles (verbal-imagery dimension) and multi-media learning among the students of an elementary school in terms of class, gender and age.

Research and Sample Design: The present study used time-series quasi-experimental design. There is no random assignment of students to the treatment. In this study, all the students get the treatment. Then the scores from pretest and posttest were compared to know the change (testing effect) based on the treatment occurring between the two measurements (McBride, 2010). In this study, an evaluation was done to determine whether a program (VICS and Extended CSA-WA software) or intervention (Multi-media learning format) has the intended effect on students under treatment in terms of Verbal-Imagery (Words and Pictures) of cognitive styles.

Table 1: Sample Profile of Elementary School Students

Grade			Gender		Total	Grade			Gender		Total
			Male	Female					Male	Female	
5	Age (Years)	12	1	0	1	7	Age (Years)	13	1	1	2
		11	1	0	1			12	4	3	7
		10	5	1	6			11	0	1	1
		9	1	1	2		Total		5	5	10

	Total		8	2	10					
6	Age (Years)	12	2	0	2	8	Age (Years)	14	0	1	1
		11	4	2	6			13	3	6	9
		10	0	2	2		Total		3	7	10
	Total		6	4	10					

Source: Survey.

Being the pre-post test design the data was collected from 40 elementary school students' before the intervention taken place (*i.e.* pre) and after the intervention taken place (*i.e.* post). The present study design looked at four groups of individuals who received the intervention, which were called the treatment groups because, the pre-post test design allowed to make inferences on the effect of intervention by looking at the differences in the pretest and posttest results. These 40 students were from the age groups 09 to 14 years (Mean age=11.5 years, S. D.=1.87) (Table 1).

Data Collection, Preparation and its Analysis

The objective was achieved through responses collected from responses given by 40 students of Satluj Public School, Sirsa on 232 stimuli with regard to Verbal (116)-Imagery (116) dimensions. The categories of stimuli were in form of Words (58) and Pictures (58): natural (26), manmade (26) and mixed (06) for Verbal task. On the other hand, categories of stimuli were in form of Words (58) and Pictures (58): bigger (26), smaller (26) and equal (06) for Imagery task.

After collection of data, the data was coded and edited. Then data was cleaned for further data analysis. During this process, it was found that the participants under this study did not give the correct responses as per the pre-requisite of *Verbal Imaginary Cognitive Styles Test and the Extended Cognitive Style Analysis -Wholistic-Analytic Administration Guide* that participant who have an error rate greater than 30 per cent should be excluded from the analysis as this my indicate that they did not take the test seriously (Peterson, 2005). Therefore, the scores of participants' ID numbered 11504/12504, 11509/12509, 11707/12707 and 11803/12803 have not been considered for further data analysis. Finally, the scores of 36 students on verbal and imagery tasks were considered for further analysis.

To analyze and interpret the data frequency distribution, cross tabulation, percentage, mean and Pearson correlation coefficient for exploratory data analysis and confirmatory data analysis.

Results and Discussions

According to Peterson (2005), scores are closer to 0 would indicate a tendency towards a verbal preference and scores that are closer towards 2 or above indicate a tendency for an imagery preference.

Further, the author suggested that VI style ratio between 0.8 and 1.0 probably suggest little or no style preference. The low VI ratio corresponds to verbaliser and a high ratio to an imager, with the intermediate position being described as bimodal (Riding & Rayner, 2007)

Accordingly, Table 2 was prepared by using the scores generated by VICS test or multimedia intervention as the responses given by students of elementary school. The table presents the proportions of median of responses of students on Verbal Stimuli and median of responses of students on Imagery which is termed as Verbal-Imagery (VI) ratio.

Accordingly, Table 2 was prepared by using the scores generated by VICS test or multimedia intervention as the responses given by students of Satluj Public School, Sirsa. The table presents the proportions of median of responses of students on Verbal Stimuli and median of responses of students on Imagery stimuli which are termed as Verbal-Imagery (VI) ratio.

When we put a light on left part of the Table 2 then we can see out of 08 students of 5^{th} class only 03 students preferred imagery style of thinking during pretest session all of these 03 students shifted to bimodal thinking style in posttest session.

And all of the students of 5^{th} class preferred to use bimodal style of thinking. It means there is an impact of intervention on the thinking styles of 5^{th} class students of Satluj Public School, Sirsa that they have shifted themselves from different styles of thinking to bimodal styles of thinking.

Table 2: Verbal-Imagery Cognitive Style Preferences among Students of Satluj Public School, Sirsa

ID	Age (Years)	Gender	VI Ratio	Style Preference	Tendency to Think	ID	VI Ratio	Style Preference	Tendency to Think	Effect of Multi-media Test
11501	09	F	1.11	No	Bimodal	12501	0.91	No	Bimodal	No
11502	10	M	1.18	No	Bimodal	12502	0.97	No	Bimodal	No
11503	10	M	1.54	Imagery	Imager	12503	1.14	No	Bimodal	Yes
11505	10	F	1.34	No	Bimodal	12505	1.03	No	Bimodal	No
11506	10	M	1.61	Imagery	Imager	12506	1.05	No	Bimodal	Yes
11507	11	M	1.41	No	Bimodal	12507	1.13	No	Bimodal	No
11508	10	M	1.21	No	Bimodal	12508	1.08	No	Bimodal	No
11510	09	M	1.61	Imagery	Imager	12510	0.99	No	Bimodal	Yes
11601	11	M	1.01	No	Bimodal	12601	0.59	Verbal	Verbaliser	Yes
11602	10	F	0.70	Verbal	Verbaliser	12602	0.65	Verbal	Verbaliser	No
11603	11	F	1.15	No	Bimodal	12603	0.95	No	Bimodal	No
11604	12	M	1.33	No	Bimodal	12604	0.82	No	Bimodal	No
11605	11	F	1.35	No	Bimodal	12605	5.83	Imagery	Imager	Yes
11606	12	M	1.27	No	Bimodal	12606	0.95	No	Bimodal	No
11607	11	M	1.37	No	Bimodal	12607	0.98	No	Bimodal	No
11608	10	F	1.12	No	Bimodal	12608	1.13	No	Bimodal	No
11609	11	M	1.21	No	Bimodal	12609	1.05	No	Bimodal	No
11610	11	M	0.89	No	Bimodal	12610	0.86	No	Bimodal	No
11701	12	M	1.29	No	Bimodal	12701	0.94	No	Bimodal	No

11702	11	F	0.82	No	Bimodal	12702	0.74	Verbal	Verbaliser	Yes
11703	12	M	1.19	No	Bimodal	12703	0.92	No	Bimodal	No
11704	12	M	0.86	No	Bimodal	12704	1.47	No	Bimodal	No
11705	12	F	1.13	No	Bimodal	12705	1.76	Imagery	Imager	Yes
11706	12	M	1.34	No	Bimodal	12706	0.99	No	Bimodal	No
11708	13	F	0.77	Verbal	Verbaliser	12708	0.69	Verbal	Verbaliser	No
11709	13	M	0.77	Verbal	Verbaliser	12709	0.74	Verbal	Verbaliser	No
11710	12	F	1.15	No	Bimodal	12710	0.84	No	Bimodal	No
11801	13	F	1.43	No	Bimodal	12801	0.78	Verbal	Verbaliser	Yes
11802	13	M	1.10	No	Bimodal	12802	0.96	No	Bimodal	No
11804	13	F	1.03	No	Bimodal	12804	0.87	No	Bimodal	No
11805	13	F	1.11	No	Bimodal	12805	1.06	No	Bimodal	No
11806	13	F	0.65	Verbal	Verbaliser	12806	1.52	Imagery	Imager	Yes
11807	14	F	1.34	No	Bimodal	12807	0.94	No	Bimodal	No
11808	13	F	1.17	No	Bimodal	12808	0.90	No	Bimodal	No
11809	13	M	1.21	No	Bimodal	12809	1.06	No	Bimodal	No
11810	13	M	1.35	No	Bimodal	12810	1.28	No	Bimodal	No

Notation used: In the participant's ID *e. g.* 11501/12501, the digit 1- denotes School, 1-denotes pretest session of experiment, 2-denotes posttest sessions of the experiment, 5-denotes grade of the participant *i.e.* 5^{th} and 01 denotes the Serial number of the participant who actively participated in the pretest and post-test sessions, F=Female and M=Male.
Source: Data generated through VICS and E-CSA-WA Tests and Processed through PASW 18.0

Further, the same may be observed from the correlation coefficient given in Table 3, which shows that there is medium correlation between the median of Verbal-Imagery ratio of pretest and posttest sessions *i.e.* r=.485, n=8, $p>.05$ (Pallant, 2005). As far as the achievement of the 6^{th} class students is concerned, Table 2 presents that out of 10 student of this class only 01 student preferred verbal style of thinking during pretest. But, he/she did not change his/her style of thinking in posttest session also. Moreover, it may also be observed that 02 students who preferred bimodal styles of thinking in pretest session, they shifted to verbal and imagery, respectively during posttest session. It means there is an impact of this intervention. These changes conceived medium correlation between median of Verbal-Imagery Ratio of pretest and posttest sessions *i.e.* r=.392, n=10, $p>.05$ (Table 3).

Table 3: Pearson Product Moment Correlation between Verbal-Imagery Ratios

Grade-wise				
Grade		Median of Verbal-Imagery Ratio (Posttest)		Degree of Association
5^{th}	Median of Verbal-Imagery Ratio (Pretest)	Pearson Correlation	.485	Medium
		Sig. (2-tailed)	.223	
		N	8	
6^{th}		Pearson Correlation	.392	Medium
		Sig. (2-tailed)	.263	
		N	10	

7th		Pearson Correlation	.219	Small
		Sig. (2-tailed)	.571	
		N	9	
8th		Pearson Correlation	-.613	Large
		Sig. (2-tailed)	.079	
		N	9	
Gender-wise				
Male	Median of Verbal-Imagery Ratio (Pretest)	Pearson Correlation	.221	Small
		Sig. (2-tailed)	.349	
		N	20	
Female		Pearson Correlation	.292	Small
		Sig. (2-tailed)	.273	
		N	16	
Age-wise				
09	Median of Verbal-Imagery Ratio (Pretest)	Pearson Correlation	1.000**	Large
		Sig. (2-tailed)	.	
		N	2	
10		Pearson Correlation	.786*	Large
		Sig. (2-tailed)	.036	
		N	7	
11		Pearson Correlation	.427	Medium
		Sig. (2-tailed)	.292	
		N	8	
12		Pearson Correlation	-.633	Large
		Sig. (2-tailed)	.092	
		N	8	
13		Pearson Correlation	-.074	Small
		Sig. (2-tailed)	.838	
		N	10	
14		Pearson Correlation	.[a]	Not Available
		Sig. (2-tailed)	.	
		N	1	
Overall				
Median of Verbal-Imagery Ratio (Pretest)		Pearson Correlation	.152	Small
		Sig. (2-tailed)	.375	
		N	36	
a. Cannot be computed because at least one of the variables is constant.				

** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed). r=±0.10 to ±0.29 (small), ±0.30 to±0.49 (medium) and ±0.50 to=±1.0 (large)
Source: Data generated through VICS and E-CSA-WA Tests and Processed through PASW 18.0

Now, we may consider the median of Verbal-Imagery Ratio of 7th class students then we can see that 07 out of 09 in total students of this class preferred bimodal styles of thinking during pretest session; whereas, only 02 students preferred verbal style of thinking. But, in posttest session 02 students of this

class shifted to another styles of thinking *i.e.* verbal and imagery each. In total, 03 out of 09 students preferred verbal style and 01 student preferred imagery styles of thinking in posttest session. Hence, we may see there is an impact of multi-media test on the achievement of 7^{th} class students, which conceived weak correlation between median of Verbal-Imagery Ratio of pretest and posttest sessions *i.e.* r=.219, n=9, $p>.05$ (Table 3).

As far as median of Verbal-Imagery ratio of pretest and posttest sessions of class 8^{th} students of Satluj Public School, Sirsa, it may be observed that 09 students (90 per cent) did not preferred any style of thinking or they were bimodal whereas, 01 student preferred verbal style of thinking during the pretest session but he/she also shifted to imagery style of thinking during posttest session. In case of posttest session of this test, 07 students (70 per cent) out of 10 in total preferred bimodal styles of thinking. These changes of shifting of styles of thinking among the student resulted strong and negative correlation coefficient between these ratio during pretest and posttest sessions *i.e.* r=-.613, n=9, $p>.05$.

Statistically, it is found that there is no significant correlation between VI ratios in pretest and posttest sessions performed by 5^{th} to 8^{th} grade students of elementary school by accepting the hypothesis that there is no significant correlation between VI ratios in pretest and posttest sessions in terms of grades.

As far as age groups and genders of students of Satluj Public School, Sirsa is concerned, it is stated that in the age group 09 years there is 01 student of each gender. The female student did not prefer any styles of thinking in pretest and posttest session. On the other hand, the male student preferred imagery style in pretest session and shifted to bimodal in posttest session. Consequently, the correlation between VI ratio in pretest and posttest session was found large and significant at .01 significance level *i.e.* r=1.000, n=2, $p<.01$.

In case of 10 years age group of students, there were 04 male and 03 female students. 02 male and 01 female students preferred verbal and imagery dimensions of cognitive styles whereas, 04 students of this age group have not style preference in pretest session. But, in posttest session 06 students did not prefer any style of cognitive. 01 female student preferred verbal style of thinking in this session. Among the students of this age group, the correlation between VI ratio in pretest and posttest session was found large and significant at .05 significance level *i.e.* r=.786, n=7, $p<.05$.

When, we have a glance on the age group of 11 years' students, it is found that out of 05 male and 03 female students did not preferred any cognitive styles of thinking in pretest session. But, in posttest session 01 student of each gender preferred verbal and 01 female preferred imagery style of thinking for understanding the stimuli of multi-media test and gave responses accordingly. Among the students of

this age group, the correlation between VI ratio in pretest and posttest session was found medium and insignificant at .05 significance level *i.e.* r=.427, n=8, *p*>.05.

In pretest and posttest sessions, 06 male and 02 female students of 12 years' age group did not prefer any cognitive styles except 01 female student who preferred imagery style during posttest session. Among the students of this age group, the correlation between VI ratio in pretest and posttest session was found large and insignificant at .05 significance level *i.e.* r=-.633, n=8, *p*>.05.

When, we look on the age group of 13 years' students, it is found that out of 04 male and 06 female only 01 male and 02 female students preferred verbal dimension of cognitive styles during pretest session. But, in posttest session, 01 female student preferred imagery styles of thinking; whereas, 01 male and 02 female students preferred verbal dimension of cognitive styles. Due to this shifting, the correlation between VI ratio in pretest and posttest session was found small and insignificant at .05 significance level *i.e.* r=-.074, n=10, *p*>.05 among the students of this age group.

At the end, there is only one female student in the age of 14 years who did not preferred any specific style of cognitive during pretest and posttest sessions.

Further, it is found that out of 20 male and 16 female students of this school only 01 male and 03 female preferred verbal styles of thinking and 03 male students preferred imagery style of thinking in pretest session. Rest of them, 16 male and 13 female students did not prefer any specific dimension of cognitive style or they are bimodal. In posttest session, it is found that only 02 male and 04 female preferred verbal style of thinking and 03 female students preferred imagery style of thinking. Rest of them, 18 male and 09 female students did not prefer any specific dimension of cognitive style or they are bimodal.

Hence, we can see that 01 female shifted from verbal to imagery; 01 male and 02 female shifted from bimodal to verbal and 02 female shifted from bimodal to imagery and 03 male shifted from imagery to bimodal. Due to this shifting, there were small and positive correlations which were not found significant in case of male *i.e.* r=.221, n=20, *p*>.05 and for female *i.e.* r=.292, n=16, *p*>.05 in terms of VI ratio during pretest and posttest sessions. Therefore, we can accept the hypothesis that there is no correlation among male and female students towards verbal-imagery dimensions of cognitive styles during pretest and posttest sessions in terms of gender.

In conclusion, only 04 (11.11 per cent) and 03 (8.33 per cent) students of Satluj Public School, Sirsa preferred verbal and imagery styles, respectively to understand the stimuli material and to give responses on the stimuli in pretest session. Rest of the students *i. e.* 29 (80.56 per cent) participants did

not prefer any style for understanding these stimuli in this session, means they are bimodal or they used both styles of thinking simultaneously.

In posttest session, only 06 (16.67) and 03 (8.33 per cent) students out of 36 students of Satluj Public School, Sirsa preferred verbal and imagery styles, respectively for understanding the stimuli material and to give responses to the concerned stimuli in posttest session. Whereas, 27 (75 per cent) students of this elementary school did not prefer any specific style of thinking in this session, means they are bimodal or they use verbal and imagery styles of thinking simultaneously.

Hence, we can see that there is small correlation (r=.152, n=36, p>.05) between the Median of Verbal-Imagery ratios in pretest and posttest sessions which indicates that there is small impact of multi-media intervention on the learning outcomes of the students of Satluj Public School, Sirsa.

Statistically, it is found that there is no significant correlation between median of Verbal-Imagery ratio in pretest and posttest sessions performed by all students of Satluj Public School, Sirsa accepting the hypothesis that there is no significant correlation between median of Verbal-Imagery ratio in pretest and posttest sessions**.** The results are also supported by Clark (1983, 1985a) claiming that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition.

Conclusions and Recommendations

In crux, 09 (25 per cent) students changed their styles of thinking in terms of verbal to imagery or vice-versa, verbal to bimodal or vice-versa, imagery to bimodal and vice-versa during pretest and posttest sessions of the multi-media intervention. But, 27 (75 per cent) students of elementary school did not change the dimensions of cognitive styles during pretest and posttest sessions. But, based on age, gender and grade we can see different degrees of correlations among the students of elementary students. Therefore, it may be suggested that the study material be prepared by considering the age, gender and grade so that elementary school students can understand and process the information easily during multi-media learning by using verbal-imagery dimension of cognitive style.

References:

1. Charoula Angeli, Nicos, Valanides and Paul, Kirschner (2009). Field dependence–independence and instructional-design effects on learners' performance with a computer-modeling tool, *Computers in Human Behavior*, 25, 1355–1366.

2. Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, 43(4), 445-459.
3. Clark, R.E. (1985a). Confounding in educational computing research. *Journal of Educational Computing Research*, 1(2), 445-460.
4. McBride, Dawn M. (2010). *The Process of Research in Psychology* (7th ed), New Delhi: SAGE Publications India Pvt. Ltd., p. 232.
5. Pallant, J. (2005). *SPSS SURVIVAL MANUAL A step by step guide to data analysis using SPSS for Windows (Version 12).* NSW, Australia: Allen & Unwin. Retrieved August 15, 2012, from http://www.academia.dk/BiologiskAntropologi/Epidemiologi/PDF/SPSS_Survival_Manual_Ver12.pdf, 125-126.
6. Peterson, R. E. (2005). *Verbal Imaginary Cognitive Styles Test & Extended Cognitive Style Analysis -Wholistic Analytic Administration Guide.* University of Edinburgh, Psychology. New Zealand: University of Edinburgh. Retrieved April 7, 2012, from http://webdropoff.auckland.ac.in.nz/cgi-bin/pickup/bb8edeb53aca283d50b0d6afaf3af6/222972, 12.
7. Riding, R. J., & Cowley, J. (1986). Extraverion and sex differences in reading performance in eight-year-old children. *British Journal of Educational Psychology*, 56, 88-94.
8. Riding, R., & Douglas, G. (1993). The effect of cognitive style and mode of presentation on learning performance. *British Journal of Educational Psychology*, 63, 297-307.
9. Richard J. Riding, Frank Pearson (1994). The Relationship between Cognitive Style and Intelligence. *Educational Psychology - EDUC PSYCHOL-UK* , 14(4), 413-425.
10. Richard J. Riding, Michael Grimley, Hassan Dahraei and Gloria Banner (2003), Cognitive style, working memory and learningbehaviour and attainment in school subjects. *British Journal of Educational Psychology*, 73, 149-169.
11. Riding, R., & Rayner, S. (2007). *Cognitive Styles and Learning Strategies Understanding Style Difference in Learning and Behaviour* (9th ed.). New York: Routledge, 45.
12. Vincent, Nasso (2006), Learning with Media and Technology. *Educational Design of Learning Environments*, Fall, E19.2158.

Note: The Verbal Imagery Cognitive Styles (VICS) test is a computerized test that measures verbal versus imagery preferences for the way information is represented (Copyright 2003 University of

Edinburgh). The Extended Cognitive Styles Analysis Wholistic-Analytic (CSA-WA) test is a computerized test that measures preferences for structuring information in a wholistic versus an analytic way. (The CSA is copyrighted by Richard Riding 1991. The extension to the CSA-WA is copyrighted by the University of Edinburgh 2004.). Retrieved from http://www.psych.auckland.ac.nz/uoa/vics-test-and-extended-csa-wa on August 15, 2012. Used with the permission of Dr. Surinder Singh Kundu, Assistant Professor & Incharge, Department of Commerce, Chaudhary Devi Lal University, Sirsa-125055 who have done the agreement with the quarter concerned with the witness of Mrs. Saroj Bala, Research Scholar, Department of Education, Chaudhary Devi Lal University, Sirsa-125055.