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Imparting social science curriculum through visual/spatial intelligence to foster active learning among the elementary school classroom

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Abstract
Multiple Intelligences is a novel concept in the Indian early education system. Multiple Intelligences (Gardner, 1983) based teaching-learning helps to understand each child's personality and interest individually in order to impart the best education. The present study is focused on application of Gardner's spatial intelligences in imparting a selected curriculum. Visual/Spatial Intelligence is an ability to visualize the world accurately, modify their surroundings based upon their perceptions, and recreate the aspects of their visual experiences. People with high visual-spatial intelligence are good at remembering images, faces, and fine details. The aim of the present research article is to find out the influence of Visual/Spatial Intelligence based intervention program in the social science curriculum to foster active learning among the elementary children. A self-structured Multiple Intelligences Inventory with 0.729 Cronbach's alpha and 0.638 split-half correlation and and Active Learning Scale with 0.827 Cronbach's alpha and 0.921 split-half correlation were administered to the respondents. The sample consists of both boys and girls of sixth standard, where, 50 children for experimental group from Ramashree Udaya Education Society and 50 children for control group from Seshadripuram school was selected for the study. The students were initially assessed and grouped based on their intelligences using Multiple Intelligences scale. Visual/Spatial Intelligence was found to be dominant among the sixth grade classroom. Hence, the Teaching-Learning Materials (TLM) were developed in accordance with Visual/Spatial Intelligence for social science curriculum. The Teaching-Learning Materials (TLM) were introduced to the 50 respondents of experimental group. The results revealed highly significant differences between the pre-test and post-test scores of the experimental group children indicating the Visual/Spatial Intelligence intervention had an influence on active learning among the children of experimental group. Identifying the dominant intelligence in the children and helping them to recognize their own potentials and imparting teaching as well encouraging them to learn accordingly is very important.

Keywords: visual/spatial intelligence, dominant, active learning, multiple intelligence

Introduction
Multiple Intelligences theory a brainchild of Dr. Howard Gardner came to light in the year 1983 through his famous book "Frames of Mind". The theory consists of eight different types of intelligences, namely, linguistic, logical, musical, bodily/kinesthetic, visual/spatial, interpersonal, intrapersonal and naturalistic intelligence. Among these intelligences spatial ability is imperious. Gardner says creating lessons that recognize spatial intelligence may be the key to helping some of your students be successful in all areas (Melissa, 2017). Spatial ability, defined by a capacity for mentally generating, rotating, and transforming visual images, is one of the three specific cognitive abilities most important for developing expertise in learning and work settings. Spatial intelligence is crucial for many tasks, yet it's often neglected at school. Duke University's Jonathan Wai, Lubinski and Benbow showed that neglecting spatial abilities could have widespread consequences. There is even evidence that early spatial ability predicts a young child's reading skills (Franceschini *et al*. 2012) [2].
Spatial ability is an important variable that guides students' academic achievements (Battista, Wheatley, & Talsma, 1982 [1]; Lubinski, 2010 [3, 4]; Maeda & Yoon, 2013 [5]; Yurt, 2014) [7]. Spatial ability can be most effectively utilized for the social studies subject.
Spatial ability is needed in the social studies class especially while using a map, drawing a

sketch and picturing facts and phenomena in mind three dimensionally (Ministry of National Education [MNE], 2005]. MNE states that by using their spatial ability, students can, i) Picture in their minds the shape of an object in space or a figure on paper, ii) see a figure three-dimensionally and iii) picture an area, a sketch, a street or a building in their minds to understand the subject well. Teachers of social science should cross the boundary of conventional teaching and incorporate innovation in their teaching so that student may feel connected in their learning situation. Social science teachers should make originality in their teaching to boost this type of aptitude among the students. By doing so, teachers can make their lessons more interactive and facilitate the students to develop visual/spatial intelligence (Madhumita, 2016). Teaching picture smart learners requires imaginative and illustrative lesson planning and when imparted in this method has other benefits as follows:

- Allowing the learners to be recognized and rewarded for their strengths;
- Provides opportunities for learners to adapt their studies to their interests and learning preferences;
- Reduces the chances of boredom by offering a variety of activities; and
- Provides a teaching/learning methodology that works.

In view of the above discussion, the present study has made an attempt to impart social science curriculum with spatial intelligence activities and to find out its effect on active learning among elementary school children.

Methodology

Aim: To find out the influence of Visual/Spatial Intelligence intervention for imparting curriculum on active learning among the elementary children.

Objectives

- To profile the Visual/Spatial Intelligence and active learning of elementary school children.
- To develop Teaching-Learning Materials (TLM) on social science curriculum using Visual/Spatial Intelligence educational activities.
- To administer the developed Teaching-Learning Materials (TLM) to the experimental group.
- To find out the differential influence of intervention program on pre-test and post-test scores of active learning.
- To find out the differential influence on active learning between control group and experimental group children.

Hypotheses

1. There was no significant difference between the pre and post-test mean scores of the following aspects of active learning among experimental group respondents.

- Do
- Review
- Learn
- Apply

2. There was no significant difference between the mean scores of experimental and control group respondents on the aspects of active learning considered for the study.

Scope

The present research provides a framework to identify the learning outcome of children based on Visual/Spatial Intelligence intervention. The students become intelligent by exposing them to variety of ways of learning; it individualizes according to their interests and needs; children get exposed to variety of teaching strategies that make learning more efficient, successful, and enjoyable. Teachers are also enabled to use such strategies for effective classroom learning.

Sampling Technique: Random sampling method was carried out to maintain the homogeneity of the samples.

Research Design

Phase I: Identification/Development of appropriate tools

An extensive survey was carried out to identify the most appropriate tools for assessing the Multiple Intelligences and Active Learning among elementary school children. The investigator has done a thorough review of literature and a market survey of availability of Multiple Intelligences scale and Active Learning scale. As researcher was not able to get the suitable scales for the present study, it was decided to develop the tools. Thus, the tools were developed and standardized.

Thus, the tools were developed and standardized with Multiple Intelligences Inventory with 0.729 Cronbach's alpha and 0.638 split-half correlation and and Active Learning scale with 0.827 Cronbach's alpha and 0.921 split-half correlation.

Phase II: Identification of schools

A survey of schools of both private and government schools in Bangalore city was carried out to identify schools which are ready to participate in the research program. The schools which showed keen interest were considered for the study. Hence, two schools were selected and approached through the management to seek the permission for the further research study. One of the schools, Ramanashree Udaya Education Society was selected for the experimental study and Seshadripuram School was taken as the control group study.

Phase III: Selection of sample

Elementary school children identified in the previous phase was selected for the research study. The 50 children of sixth grade from Ramashree Udaya Education Society, situated in the close proximity was selected for intervention program and 50 children of sixth grade from Seshadripuram School, which is located away from the experimental group school was identified as a control group to avoid spillover effect. The children of sixth grade were selected for the intervention program.

Phase IV: Pre-test Assessment

Initially a pre-test was conducted on the selected group for the study to understand the type of Multiple Intelligence and Active learning of sixth grade children. The representative samples identified in phase III were assessed to find out the dominant intelligence.

Phase V: Teaching-Learning Materials (TLM) Development

The Teaching-Learning Materials (TLM) were designed and developed for Social Science subject considering the dominant intelligence, i. e. Visual/Spatial Intelligence of the elementary school children. The academic subject was identified based on the discussion with the teachers and experts.

Phase VI: Implementation of the Intervention Program
The developed Teaching-Learning Materials (TLM) were introduced to the experimental group in a phased manner for a period of one semester. The sessions were held every day for the one class period duration permitted by the school authorities. Every aspect of the social science curriculum was covered using the Visual/Spatial Intelligence educational activities to foster the active learning among the respondents.

Phase VII: Post Assessment
A Post assessment of the respondents was carried out to find out, if there is any effect of intervention program on the participants active learning scores taught through Visual/Spatial Intelligence curriculum using the Active Learning scale.

Phase VIII: Analysis and interpretation of data
Analysis of the data was done using Mean, Standard Deviation, chi-square and Student't' test. Interpretation of data and conclusions are presented in the results and discussion.

Results and Discussion

Table 1: Classification of Respondents by Socio-Demographic Variables N=100

Characteristics	Category	Respondents						χ^2 Test
		Control		Experimental		Combined		
		N	%	N	%	N	%	
Age group (years)	10-11	22	44.0	23	46.0	45	45.0	0.04 NS
	12-13	28	56.0	27	54.0	55	55.0	
Total		50	100.0	50	100.0	100	100.0	
Gender	Boys	30	60.0	25	50.0	55	55.0	1.01 NS
	Girls	20	40.0	25	50.0	45	45.0	
Total		50	100.0	50	100.0	100	100.0	
Ordinal position	First born	26	52.0	22	44.0	48	48.0	1.18 NS
	Second born	20	40.0	21	42.0	41	41.0	
	Later born	4	8.0	7	14.0	11	11.0	
Total		50	100.0	50	100.0	100	100.0	
Number of siblings	No	3	6.0	6	12.0	9	9.0	12.76*
	One	21	42.0	35	70.0	56	56.0	
	Two	17	34.0	6	12.0	23	23.0	
	More than Three	9	18.0	3	6.0	12	12.0	
Total		50	100.0	50	100.0	100	100.0	

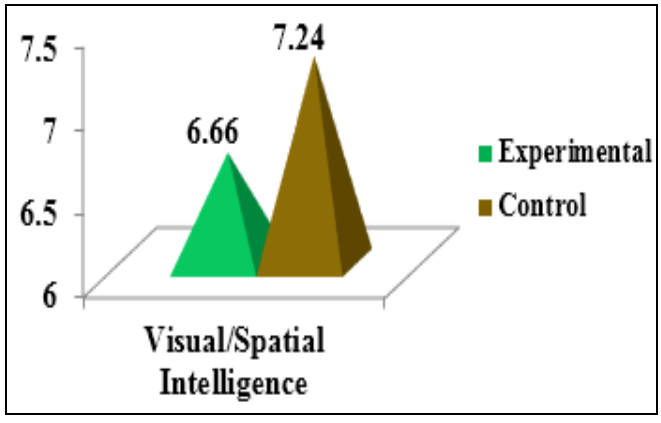
* Significant at 5% level, NS: Non-significant

The table 1 depicts the experimental and control group respondents' age. Majority of both experimental group (54%) and control group respondents (56%) were belong to the age group of 12-13 years. Hence, there was no significant difference found between the experimental and control group respondents with respect to age distribution.
Majority (60%) of control group respondents were boys, whereas, among experimental group, there was an equal distribution of the respondents between both the genders. However, there was no statistical significant difference found between the groups.
When the ordinal position was considered, majority of both experimental (44%) and control group (52%) were first born. The next highest percentage of both experimental (42%) and control group respondents (40%) were second born. A small percentage of the respondents' of both control and experimental group fall under later born category (8% and 14% respectively). Hence, 1.18 score was the statistical difference found between the groups which is statistically non-significant.
The elucidated information on number of siblings clearly indicates that majority of experimental group (70%) respondents and considerable percentage of the control group respondents (42%) had only one sibling. Considerable percentage 34% of the respondents were in control group while equal percentage (12% each) of experimental group respondents were belong to both second and no siblings' categories. A small percentage of control group respondents (6%) had no siblings. The analysis indicates differences between experimental and control group respondents with respect to number of siblings' variable. Hence, the statistical analysis indicates 12.76 significant differences at 5% level.

Table 2: Assessment of Visual/Spatial Intelligence among the respondents N=100

Aspect of Intelligence	Experimental Group		Control Group		't' Test
	Mean	SD	Mean	SD	
Visual/Spatial Intelligence	6.66	1.51	7.24	1.67	1.82 NS

NS: Non-significant

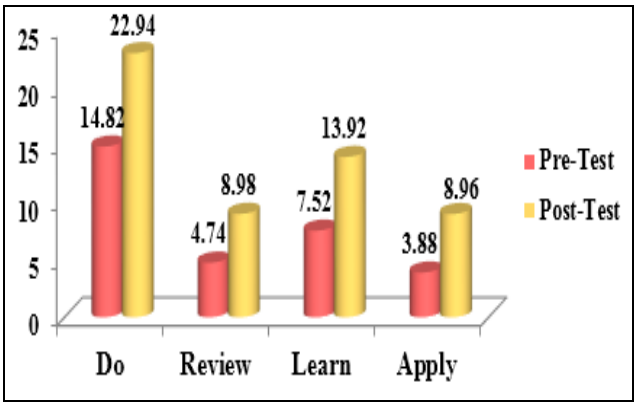


The table 2 represents the mean scores of spatial intelligence among control group and experimental group respondents. The mean spatial intelligence score for the experimental group was 6.66 while for the control group respondents 7.24. However, when the above data was subjected to statistical analysis, non-significant difference was observed between the groups.

Table 3: Pre and post assessment of Active learning among Experimental group N=50

Aspect	Response	Scores		Paired 't' Test
		Mean	SD	
Do	Pre	14.82	2.06	23.31*
	Post	22.94	2.35	
Review	Pre	4.74	1.77	14.37*
	Post	8.98	1.30	
Learn	Pre	7.52	2.19	17.59*
	Post	13.92	1.58	
Apply	Pre	3.88	1.67	17.28*
	Post	8.96	1.38	

* Significant at 5% level



A social science curriculum based spatial intelligence intervention was given to the respondents predominant with spatial intelligence to nurture the active learning. Spatial intelligence based intervention teaching-learning materials designed and developed with activities like videos, drawing, picture pick and speak, collage, picture matching were given to teach social science curriculum to enhance active learning among the experimental group respondents.

The table 3 depicts the pre and post assessment of active learning among the experimental group respondents. When the above data was subjected to statistical analysis, it indicated a significant difference between the pre and post-test active learning mean scores for all the aspects of active learning, as follows: Do (Pre-test 14.82 to Post-test 22.94); Review (Pre-test 4.74 to Post-test 8.98); Learn (Pre-test 7.52 to Post-test 13.92); and Apply (Pre-test 3.88 to Post-test 8.96) with post-test scores showing higher than the pre-test scores. Hence when the above data was subjected to find the statistical significant differences between pre and post-test mean scores for all the aspects of active learning, a strongly significant difference was observed at 5% level indicating intervention was very effective in nurturing active learning skills among the respondents.

Hence, the hypothesis (1) stating that there was no significant difference between the pre and post-test scores of experimental group respondents on all the aspects of active learning considered for the study was rejected.

Table 4: Pre and post Assessment of Active learning among Control group N=50

Aspect	Response	Scores		Paired 't' Test
		Mean	SD	
Do	Pre	11.16	2.02	4.31*
	Post	10.62	2.12	
Review	Pre	4.18	1.27	1.76 NS
	Post	4.24	1.25	
Learn	Pre	6.36	1.66	1.42 NS
	Post	6.4	1.16	
Apply	Pre	4.5	1.37	0.77 NS
	Post	4.56	1.32	

* Significant at 5% level, NS: Non- Significant

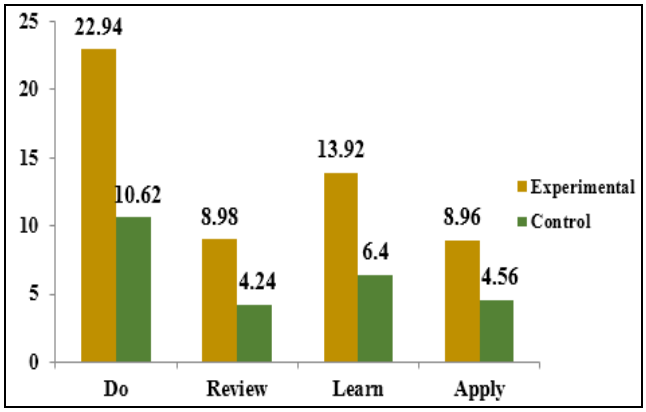
Control group respondents did not receive any intervention to impart social science curriculum. These respondents were taught the social science curriculum with regular teaching methods in the school.

The table 4 represents the pre and post-test scores of active learning among the control group respondents. When the above data was subjected to statistical analysis, no significant differences was observed between the pre and post-test active learning mean scores for all the aspects of active learning except for one, which are presented as follows: Do (Pre-test 11.16 to Post-test 10.62); Review (Pre-test 4.18 to Post-test 4.24); Learn (Pre-test 6.36 to Post-test 6.4); and Apply (Pre-test 4.5 to Post-test 4.56). The data indicates that there was not much difference found between the pre and post-test scores among the respondents. Thus when the above data was subjected to find the statistical significant differences between pre and post-test mean scores for all the aspects of active learning shows no significant differences.

Table 5: Comparison of Active Learning among Experimental and Control group respondents N=100

Aspect	Experimental		Control		Paired 't' Test
	Mean	SD	Mean	SD	
Do	22.94	2.35	10.62	2.12	28.22*
Review	8.98	1.30	4.24	1.25	17.70*
Learn	13.92	1.58	6.4	1.61	22.89*
Apply	8.96	1.38	4.56	1.32	15.32*
Total	54.8	5.02	26.2	6.63	27.81*

* Significant at 5% level



The table 5 exemplifies the scores of active learning among the experimental and control group respondents. The respondents of the experimental group were introduced to the intervention program while the control group respondents were not. When the above data was subjected to statistical analysis, there found to be significant differences between the experimental and control group respondents on all the aspects of active learning mean scores. The mean scores of experimental and control group are presented as follows: Do (exp 22.94 and cont 10.62); Review (exp 8.98 and cont 4.24); Learn (exp 13.92 and cont 6.4); and Apply (exp 8.96 to cont 4.56). The data indicates that there were significant differences found between the experimental and control group respondents' mean scores. Thus, when the above data subjected to find the statistical significant differences between experimental and control group respondents' mean scores for all the aspects of active learning, shows significant differences at 5% level.

Hence, the hypothesis (3) stating that there was no significant difference of the mean scores of active learning between the experimental group and control children on all the aspects of active learning considered for the study was rejected.

Conclusion

The present study shows the Visual/Spatial Intelligence intervention for social science curriculum found to have an impact on the active learning among the elementary school children. Children tend to be more inventive during this stage of life, hence the Visual/Spatial intelligence educational activities have opened new doors to explore their learning atmosphere to be creative.

The results of the study show highly significant differences between pre and post-test scores of the experimental group respondents as well as between experimental and control group indicating the Visual/Spatial intelligence intervention influences the active learning.

Identifying the dominant intelligence in the children and helping them to recognize their own potentials and imparting teaching as well encouraging them to learn accordingly is very important.

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