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## COMPARATIVE EFFECT OF COOPERATIVE LEARNING, DIFFERENTIATED INSTRUCTION AND TRADITIONAL INSTRUCTION ON ATTITUDE TOWARDS SCIENCE OF STUDENTS WITH LEARNING DISABILITY

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### ABSTRACT

Children with learning disability are usually present in every normal classroom. This has encouraged educators for modifications in their regular instructional techniques so as to cater the needs of these learners. Attitude towards science is an important factor for science learning. In order to enhance this attitude towards science among students with learning disability, two interventions i.e. Cooperative Learning and Differentiated Instruction were examined. This paper outlines the effect of these interventions on the attitude towards science of students with learning disability. 60 students with learning disability formed the sample for the study including 20 students each in two experimental groups and one control group. For the identification of the students with learning disability DTLTD has been used. Researcher developed Scale for Attitude towards Science has been used to measure the attitude towards science. The data collected when analyzed, revealed that the students with learning disability have gained significantly from pre-test to post-test on their attitude towards science in both the cooperative learning and differentiated instruction groups. However, in the traditional instruction control group this gain was not significant. Moreover, these mean gains in attitude towards science were almost equivalent for cooperative learning and differentiated groups but in the traditional instruction group the mean gain in attitude towards science was much lower as compared to both the experimental groups. This indicates that overall the two strategies of Cooperative Learning and Differentiated



Instruction have been proved to be effective in enhancing the attitude towards science of students with learning disability.

**KEYWORDS** : Learning Disability, Attitude towards Science, Cooperative Learning, Differentiated Instruction.

### 1. INTRODUCTION

With the onset of inclusive education, the educators are now more concerned about the progress of each and every child in the class regardless of any kind of physical or intellectual disability. The students with learning disability are usually present in every normal classroom whether diagnosed or not. But generally no special assistance or measures are provided in order to aid the needs of these learners.

The students with learning disability are not dumb or dull; in fact, they are the students with average or above average intelligence. It is just that their receiving and processing of information is different from others. The most common types of learning disabilities involves problems with reading, writing, math, reasoning, listening, speaking and visual processing. This calls for the need of some interventions that can tailor to their unique learning styles. Learning science can be even more challenging for these students. The favourable outcomes in science largely depend upon the positive attitudes towards it. Research has consistently shown attitude as the important factor of science education that can impact the student performance (Linn, 1992), participation and the interests. According to Yara (2009), attitude towards science denotes interests or feelings towards studying science. Rana (2003) and Papanastasiou & Zembylas (2004) documented a high dependency between the science achievement and the positive attitudes towards science. After reviewing the solution strategies from various practitioners, Flaherty and Hackler (2010) found two strategies of cooperative learning and differentiated instruction to strengthen the student/teacher and student/student relationships and performance in a positive learning environment.

Cooperative learning is a generic term that is used to describe an instructional arrangement for teaching academic and collaborative skills to small heterogeneous groups of students (Sharan, 1980; Rich, 1993). Cooperative learning has been supported as an effective technique of including the students with learning disability in the classroom (Johnson & Johnson, 1986). Akinbobola (2009) advocated the cooperative learning method as the most effective in facilitating students' attitude towards Physics. Also, Kose, Sahin, Ergun and Gezer (2010) supported the use of cooperative learning for better student achievement and attitude towards science. The cooperative learning strategy is based on five basic elements- positive interdependence; individual and group accountability; interpersonal and small- group skills; face to face promotive interaction and group processing. Students can be divided into three types of groups i.e. formal cooperative groups that lasts from one class period to several weeks; informal cooperative groups that may last from few minutes to whole class period or the cooperative base groups which are long term groups that can last for whole year (Johnson, Johnson & Holubec, 1998).

In a classroom, children may not be alike in terms of age, abilities, hobbies, interests, learning styles or likes and dislikes. We often tend to neglect or ignore these important differences among students and generally put their similarities on the central stage. Educators now-a-days, are looking for the modifications in the regular instruction to cater these differences. Differentiated Instruction is one such instruction. Tomlinson and Allan (2000) had defined differentiation as a teacher's reacting responsibility to a learner's need. A teacher who is differentiating instruction understands a student's needs to express humour, to work with a group, or have additional teaching on a particular skill, or have guided help with a reading passage- and the teacher responds actively and positively to that need. According to Hall (2002) differentiated instruction is recognizing that students come into the class with varying degrees of background knowledge, readiness, language, learning preferences, interests and abilities. Tomlinson (2000) has described four elements of instruction that can be differentiated based on student readiness. These are- the content, the process, the products and the learning environment. By doing modifications in any or all of these elements, the different needs of different children can be taken care. Differentiated Instruction is proactive in nature and it is more qualitative than quantitative. It is student-centred and a blend of whole-class, group and individual instruction (Tomlinson, 2001). Winsome (2007) examined the effects of Differentiated Instruction on the student achievement in science and their attitude towards it. The results found were in the favour of the Differentiated Instruction for better achievement and attitude towards science. Sondergeld and Schultz (2008)

studied Differentiated Instruction as a meaningful method for coping with the students who are gifted and those who have disabilities. When the course was taught for 3 weeks using all the four elements of differentiation i.e. content, process, product and environment, the results suggested that students perceived Differentiated Instruction as more useful than traditional instruction as it is more fun and provides more choices and better understanding.

### **OBJECTIVES:**

- 1.To study improvement in Attitude towards Science (pre-test to post-test) of students with Learning Disability taught with Cooperative Learning.
- 2.To study improvement in Attitude towards Science (pre-test to post-test) of students with Learning Disability taught with Differentiated Instruction.
- 3.To study improvement in Attitude towards Science (pre-test to post-test) of students with Learning Disability taught with Traditional Instruction.
- 4.To study mean gains on Attitude towards Science of students with Learning Disability exposed to Cooperative Learning, Differentiated Instruction and Traditional Instruction.

### **METHOD AND PROCEDURE:**

The design, sample and method of the study are as follows.

#### **Design:**

This study was based on a pre-test post-test experimental design. The two experimental groups were taught by Cooperative Learning and Differentiated Instruction and the third control group was taught using Traditional Instruction. All three groups were taught for a period of about 45 days.

#### **Sample:**

The sample of the study consisted of 60 students with learning disability studying in 5th standard in a regular classroom, with 20 students each in all the three instructional groups.

#### **Tools Used:**

##### **Following tools were used for the present study:**

- 1.For identification of students with learning disability three instruments were used. These are:
  - a)Standard Progressive Matrices Test (SPM) by Raven, Raven and Court (2000).
  - b)Diagnostic Test for Learning Disability (DTLD) by Swarup and Mehta (1993).
  - c)Teacher Referral Form constructed by the investigator.
- 2.Scale of Attitude towards Science developed by the investigator.

#### **Statistical Techniques Used:**

Descriptive statistical techniques such as mean, standard deviation, skewness and kurtosis were used to study the nature of the distribution of the sample.

t-test was used to study the significance of differences between the paired samples.

One way ANOVA was used to study the significance differences between the three groups and the multiple comparisons.

#### **Procedure:**

For the identification of the students with learning disability, first of all the Standard Progressive Matrices test (2000) was administered on the students. The students with average and above average intelligence were further examined for learning disability by using DTLD. The students with score below or equal to 30.5 are identified as the students with learning disability. Teacher referral form developed by the investigator was also taken into consideration while identification.

At the beginning of the experiment, pre-test for attitude towards science was conducted on the students in all the three groups. Then the three groups were taught using Cooperative Learning (CL), Differentiated Instruction (DI) and Traditional Instruction (TI) for a period of around 45 days. At the completion of the experiment, same attitude towards science scale was administered on the students which acted as the post test. The data obtained was then analysed using SPSS and the results were discussed in the light of the set objectives.

**RESULTS AND DISCUSSIONS:**

The details of the descriptive statistics in order to check the normality of the sample is discussed below.

**Table 5.1: Mean, Standard Deviation, Skewness, and Kurtosis of Attitude towards Science of Students with Learning Disability taught with various methods of instruction**

Group	Pre-Test				Post-Test			
	Mean	SD	Sk.	Ku.	Mean	SD	Sk.	Ku.
CL	211.60	22.720	-0.605	0.747	235.25	29.10	0.478	-0.486
DI	209.05	32.910	-0.105	-0.412	231.25	33.73	0.584	-0.385
TI	210.20	29.680	-0.865	2.404	215.95	23.286	-1.025	3.092

Table 5.1 shows that the values of mean scores for attitude towards science are almost equal at the pre-test stage for the three groups i.e. CL, DI and TI groups. The values of skewness for the pre-test in all three groups lies well within +/-1 range and is slightly platykurtic for TI group and mesokurtic for CL and DI groups. Thus the values do not deviate much from the normal distribution for all three groups at the pre-test stage for attitude towards science. At the post-test stage the values for skewness lies within +/-1 range and slightly platykurtic for TI group and mesokurtic for CL and DI groups. Thus the values do not deviate much from the normality on the post test scores for attitude towards science.

The paired samples in each group was tested for their differences from pre-test to post-test using the t-test. The details of the same are provided below.

**Table 5.2: t-test for paired samples from pre-test to post-test of Attitude towards Science for students with Learning Disability**

Groups	Level	N	Mean	Std. Dev.	Diff. in Mean	df	t	p- value
CL	Pre-test	20	211.6	22.721	23.650	19	5.117	0.000*
	Post-test	20	235.25	29.100				
DI	Pre-test	20	209.05	32.912	22.200	19	3.992	0.001*
	Post-test	20	231.25	33.734				
TI	Pre-test	20	210.20	29.680	5.750	19	1.789	0.090
	Post-test	20	215.95	23.286				

(\* stands for significant values)

As presented in Table 5.2, all the subjects in both the experimental groups i.e. CL and DI groups gained significantly from pre-test to post-test. The increase in mean of 23.65 has been observed in the CL group from pre-test to post-test. This means difference was found to be significant (t=5.117 and

p<0.01). Thus implying that there exists a significant difference in the pre-test and post-test means scores on attitude towards science of students with learning disability taught with cooperative learning based instruction.

The mean gain from pre-test to post-test in the DI group is 22.200 was also found to be significant (t=3.992 and p<0.01). This implies that there exists a significant difference in the pre-test and post-test mean scores on attitude towards science of students with learning disability taught with differentiated instruction.

However, in the control group i.e. the tradition instruction group the mean gain from pre-test to post-test was observed as 5.75 which is very low and was found to be insignificant at (t=1.78 and p>0.05). It implies that there exists no significant difference in the pre-test and post-test means scores on attitude towards science of students with learning disability taught with traditional instruction.

For the differences in the mean gain scores on attitude towards science among students with learning disability in all the three groups, one-way ANOVA had been used. Results found are presented in the tables below.

**Table 5.3: Total mean gain scores on Attitude towards Science obtained by students with Learning Disability in 3 groups**

Level	Group	N	Mean
Gain scores (post-test – pre-test)	CL	20	23.65
	DI	20	22.20
	TI	20	5.75

**Table 5.4: Summary of one-way ANOVA for gain scores of Attitude towards Science among students with Learning Disability**

		Sum of squares	df	Mean square	F	p- value
Gain scores (post test – pre test)	Between groups	3954.100	2	1977.050	4.733	0.013*
	Within groups	23807.500	57	417.675		
	Total	27761.600	59			

(\* stands for significant values)

As presented in Table 5.4, it can be seen that the f-value of the groups i.e. CL, DI and TI on the mean gain score of attitude towards science is 4.733 which is significant (p<0.05). This indicates that there exists significant mean gain difference on attitude towards science of students with learning disability taught with cooperative learning based instruction, differentiated instruction and traditional instruction. Moreover, it is quite clear from the Table 5.3 that the mean gain scores in both the experimental groups i.e. CL and DI are much higher than the mean gain scores of the control group i.e. TI group.

Now, as the difference between the three groups on the mean gain scores of attitude towards science comes out to be significant (f=4.733, p<0.05), this calls for the conduction of the post-hoc tests to study the multiple comparisons so as to check where this difference actually lies as we have three groups in consideration. Scheffe’s test for multiple comparisons has been used in this study whose

description is given below.

**Table 5.5: Post-hoc test on the Mean Gain Scores of students with Learning Disability on Attitude towards Science for multiple comparisons among the 3 groups**

Dependent Variable	Group		Mean Difference (I-J)	Std. Error	Sig.
	(I)	(J)			
Mean Gain scores	CL	DI	1.450	6.463	0.975
	CL	TI	17.900	6.463	0.027*
	DI	TI	16.450	6.463	0.047*

(\* stands for significant values)

As shown in Table 5.5, the mean gain scores on attitude towards science among students with learning disability in all the 3 groups are compared to find whether the differences between the groups are significant or not. The comparison between the two experimental groups i.e. CL and DI on the mean gain scores yield no significant difference ( $p = 0.975 > 0.05$ ). Thus, we can state that there exists no significant mean gain difference on attitude towards science among students with learning disability taught with cooperative learning based instruction and differentiated instruction. However, the comparison of the experimental group CL with the control group TI on the mean gain scores yielded a significant difference ( $p = 0.027 < 0.05$ ). It can be then inferred that there exists significant mean gain difference on attitude towards science among students with learning disability taught with cooperative learning based instruction and traditional instruction. Similarly, when the experimental group DI and the control group TI are compared for the mean gain scores, the difference was again found to be significant ( $p = 0.047 < 0.05$ ). It implies that there exists significant mean gain difference on attitude towards science among students with learning disability taught with differentiated instruction and traditional instruction.

### CONCLUSION:

This study indicated that when the attitude towards science of students with learning disability was examined under different instructional conditions, the results vary. Two interventions viz. Cooperative learning and Differentiated Instruction when studied under this context suggested their effectiveness in gaining better positive attitudes on Science. On the other hand, the traditional instruction did not yield any significant changes in the attitude towards science of students with learning disability. Hence, it can be concluded that the regular instruction when modified can result in more improved performance among students with learning disability.

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