

Effectiveness of Interactive Teaching Strategies Based on Learner's Learning Style on Science Achievement

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Abstract: *This research paper focuses on studying the effectiveness of Interactive teaching strategies based on learner's learning style. The learning style was used as criteria to classify the learners. A standardized test constructed by Dr. Venkataraman (SOLAT) was used for identification of the learning style of the teacher trainees. The 33 teacher trainees in the sample were identified with three learning styles out of the five learning styles. The teacher made achievement tests were applied. This study implies that the use of appropriate Interactive teaching strategies, based on learner's learning style is effective for better achievement in Science and Technology.*

Keywords: Interactive teaching strategies, learning style, Science achievement

1. Introduction

Today's age is considered as an age of Science and Technology. Tremendous changes have been carried out in the life of man. The life of human-beings has become comfortable and secured due to various developments in Science and Technology. There are various methods and techniques of teaching, which helps the students in better adaption to their learning environment. 'Interactive teaching method' is a new trend in education. In this method, the teacher modifies his or her approach in response to the needs of the learners by using various interactive strategies. The Interactive teacher should be aware of the learners and their different learning styles. Through personal interactions, the teachers work to positive development of the personality of the student in an expected manner [1].

Basically each student has a special learning mode or style. Once a Teacher understands the learning style of the students, it is easy for the teachers to select the most appropriate method of teaching Science and Technology.

1.1 Learning Styles

Many researcher, educationists, psychologist had explained the meaning of learning style according to their experiences and study. Some of their ideas about learning style were given below.

According to Kolb (1984), learning style is a product of two choice decisions-

- 1) How to approach at task i.e. grasping experiences.
- 2) Our emotional response to the experience i.e. transforming experiences. [2]
- 3) According to Atkin (2006), "The different ways of learning and making means of information is called Learning style." [3]
- 4) According to Rose (1987), "Learning style as the composite of characteristics cognitive, affective and physiological factors that serves as relatively stable indicators of how a learner perceives, interact with and respond to learning environment." [4]

- 5) According to Dunn (1983), "Learning style is an approach used by individuals to absorb, retain and process new information." [5]

These definitions reveal that- Learning styles are simply different approaches or ways of learning. Learning styles refers to student's preferences for some kinds of learning activities over others. Learning style refers to prefer mode of problem solving thing or learning used by an individual.

Dr. D. Venkataraman (1994), an Indian expert has constructed the SOLAT test which is best suitable for Indian learning environment. This test of learning and thinking styles of the students is an advance version of Torrance SOLAT test. This test was selected for identification of learning styles of students in the research study.

The interactive teaching strategies may involve range of activities to engage the learners in the teaching-learning process. Strategies useful for Science teaching are as follows:

Virtual field trips ,Quiz/ Competition, Role plays, Educational games, Plays, OHP , Group discussions, Oral presentation/ lecture, Field visit, Case studies, Multimedia presentation, Question answers, Collaborative work, Slide show, Diagrams/charts.[6] In the present study, learning style was used as the criterion to classify the learners, to provide them with different learning experiences by selecting appropriate interactive teaching strategies for enhancing achievement in Science and Technology.

2. Statement of the Problem

A study of effectiveness of Interactive Teaching Strategies based on Learner's learning style on Science achievement of student- teachers.

3. Need and Importance of the Study

3.1 Need

Diploma in Teacher Education (D.T.Ed.) is a course of 2 & half years. In this course, the teacher trainees have to study Science and Technology in second year of the course. To enhance or maximize the learning potential of the students, teachers have to identify the learning styles of the students.

3.2 Importance

The Interactive teaching method is one of the new trends in education. It can be practically used in the classroom to enhance the academic achievement of the D.T.Ed. Teacher-trainees. The more interactions in the classroom will lead to the better understanding of the subject Science and Technology. The Science teacher will impart the knowledge of Science by keeping in mind the learning styles of the students and by selecting most suitable Interactive teaching strategies for teaching.

4. Definitions of the Important Terms

4.1 Interactive Teaching Strategies

Interactive teaching method includes Interactive teaching strategies for e.g. Group Discussions, role play method, Question-answers etc. It is a process of having interactions in the class room for construction of knowledge.

4.2 Learning Styles

Every student has a unique primary learning mode or a way of learning by which he/she learns speedily and effectively. Some students learn speedily when they see things, some prefers to do activity whereas some remember the content well if they discuss in a group or read and write.

4.3 Teacher trainees

The students studying in second year of Diploma in Teacher Education course and are undergoing training to become primary School teachers.

4.4 Achievement

The achievement means the scores obtained by the D.T.Ed. Teacher trainees in the Post-test after implementation of a teaching program based on the selected units from the text book of Science and Technology.

4.5 Effectiveness

It is the academic achievement shown in the scores of post-test when Interactive teaching strategies were used for teaching the units of Science and Technology.

5. Objectives of the Study

1. To identify the learning styles of D.T.Ed. Teacher trainees using a standardized test constructed by Dr.Venkataraman (SOLAT).
2. To prepare a teaching program using Interactive teaching strategies based on the learning styles of teacher trainees.
3. To study the effectiveness of a teaching program based on learning styles of the teacher trainees, on the achievement in Science and Technology.

6. Variables

- a) **Independent Variable** of the experiment was the treatment given i.e. a teaching program prepared by the researcher using an Interactive teaching strategies based on learner's learning style on the selected units of Science & Technology.
- b) **Dependent Variable** of the experiment was the Science achievement of D.T.Ed. teacher trainees in the post-test, with reference to their learning styles.
- c) **Control Variables** are –Subject: Science & Technology, Students of D.T.Ed. College.
- d) **Intervening variables**- interest of the students, attention, grasping power.

7. Hypothesis

7.1 Research Hypothesis-H₁

There is a significant difference between mean scores of the pre-test and post-test in the Science achievement of teacher trainees when the teaching program using Interactive teaching strategies based on the learner's learning style was implemented.

7.2 Null Hypothesis (for testing purpose)-H₀₁

There is no significant difference between mean scores of pre-test and post test in the Science achievement of teacher trainees when teaching program using Interactive teaching strategies based on learner's learning style was implemented.

8. Methodology

The experiment was conducted using theoretical knowledge to find new knowledge. For the above research study, Multi-method of research was adopted. For the present study, the researcher has selected the Incidental Sampling Method based on Non-Probability method of Sampling.

8.1 Sample

The sample comprised of 33 students of second year D.T.Ed. Course, studying in Smt. Kashibai Navale Institute of education (English Medium), Tilekar Nagar, Kondhwa (Bk.), Pune. in the academic year 2010-2011.

8.2 Design

The study adopted Pre-experimental design of Single group pre-test post-test design.

O 1 X O 2

Pre-test Treatment Post-test

8.3 Procedure

The procedure of the present study was as follows:

8.3.1 Selection of tools for identification of learning style of the students:

Dr.Venkataraman (1994) is an Indian expert, who has constructed the SOLAT test. This test is an advance version of Torrance SOLAT test. The researcher has selected this SOLAT test for the identification of the learning styles of the teacher trainees as it is simple, easy to understand and best suited for Indian learning environment.

Learning Style Inventory: Dr. D.Venkataraman (1994)

In learning style inventory there are 50 items. Each item is consisting of two statements ‘a’ and ‘b’. In the tool, checking of the statement ‘a’ indicates right hemisphere, checking of statement ‘b’ indicates left hemisphere and checking of both the statements indicate integrated hemisphere. After getting responses of the students on Learning Style Inventory, the frequencies of each response on each item was counted. The brain dominance was identified. Based on the hemisphericity of brain and the frequency of responses for a particular learning style, the learner was considered as having that type of learning style. There are total 5 learning styles and 5 thinking styles suggested in the tool [7].

Table 1: Structure of SOLAT tool

| S. No | Dimensions | Items |
|-------|------------------------|----------|
| 1 | Learning style | |
| | 1.Verbal | 1 to 5 |
| | 2.Content preference | 6 to 10 |
| | 3.Class preference | 11 to 15 |
| | 4.Learning preference | 16 to 20 |
| | 5.Interest | 21 to 25 |
| 2 | Thinking style | |
| | 1.Logical/Fractional | 26 to 30 |
| | 2.Divergent/Convergent | 31 to 35 |
| | 3. Creative | 36 to 40 |
| | 4. Problem solving | 41 to 45 |
| | 5. Imagination | 46 to 50 |

8.3.2 Administration of Learning Style Inventory

The researcher administered SOLAT learning style inventory to 33 S.Y.D.T.Ed. Teacher trainees. Classification of teacher trainees of the sample into the groups based on the Learning preferences was done.

According to the learning styles of the students, they are classified into 3 groups.

Group1-10 students out of 33 students have preferred **Verbal learning style** (30.30 %)

Group2-12 students out of 33 students have preferred **Content learning style** (36.36%)

Group3-11 students out of 33 students have preferred **Interest learning style** (33.33%)

8.3.4 Interactive teaching program

The learning style was used as criteria to classify the learner, to provide them with different learning experiences. The 3 groups were taught 5 units from Science and Technology text-book using the different interactive teaching strategies. The text-book is based on the New Revised Syllabus (2004) of Maharashtra State Council for Educational Research and Training and was published by Nirali Prakashan, Pune [8].

Table 2: The details of learning style based Interactive strategies

| Sr. No. | Name of the Unit/topic | Strategies used and time allotted for each group | | |
|---------|---------------------------------------------|--------------------------------------------------|---------------------------------------------|----------------------------------------------|
| | | 2:00pm-2:40pm | 2:40pm-3:20pm | 3:20pm-4:00pm |
| | | Strategies used For Group 1. (Verbal L.S.) | Strategies used for Group 2. (Content L.S.) | Strategies used For Group 3. (Interest L.S.) |
| 1 | The teacher teaching Science and Technology | Question-Ans. | Use of teaching Aid-charts | Role play |
| 2 | Laboratory for Science And Technology | Lecture | Diagram and Explanation | Visit to the ScienceLab. |
| 3 | Syllabus and textbooks | Group discussion | Use of teaching Aids-model textbook & OHP | Role play |
| 4 | Teaching methods of Science and Technology | Explanation and discussion | Use of teaching Aids-charts | Quiz |
| 5 | Educational Aids for Science and Technology | Question-Ans. | Power-point presentation | Educational Games |

8.3.5 Administration of Post-test

The teacher made Post-test was administered. The total marks were 40 and the duration of the test was 1 and half hour.

9. Tools

The Standardized test (SOLAT) constructed by Dr. Venkataraman and the Achievement tests prepared by the researcher were used for the data collection. Mean, t-test and ANOVA were the statistical techniques used for analysis of data.

10. Analysis of Data

10.1. Qualitative Analysis

The learning style inventory (SOLAT test constructed by Dr. Venkataraman.) was administered and the data was collected.

Table 3: The percentage of Teacher trainees and the preferred learning style

| Sr. No. | Particulars | Total | Verbal L.S. | Content L.S. | Class L.S. | Learning L.S. | Interest L.S. |
|---------|---------------------------|-------|-------------|--------------|------------|---------------|---------------|
| 1. | No. of Teacher trainees | 33 | 10 | 12 | 00 | 00 | 11 |
| 2 | % of the Teacher trainees | 100% | 30.30% | 36.36% | 0.0% | 0.0% | 33.33% |

Teacher trainees’ feedback/ Opinion

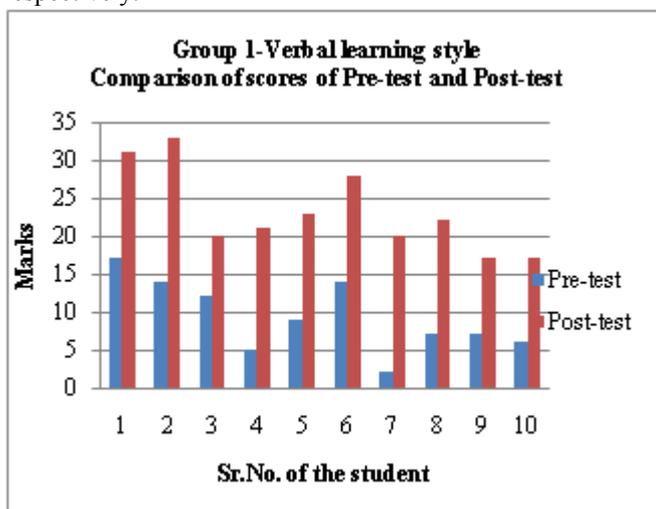
The ten teacher trainees were available for filling the opinionnaire i.e. the 3 teacher trainees from verbal group, 4 teacher trainees form content group and 3 teacher trainees from interest group. The data was then collected and analyzed. 100% of the teacher trainees had good experience of learning Science and Technology using interactive teaching strategies based on the learning styles. All of them felt that using Interactive teaching strategies improved their achievement in Science and Technology

10.2 Quantitative Analysis

The techniques adopted for data analysis were Percentage, Mean, t-test and ANOVA test [9]. Mean value was derive for group 1(verbal learning style), group 2(content learning style) and group 3(interest learning style). T-test was calculated for group 1, group 2 and group 3 separately. ANOVA test was carried out to see which interactive teaching program, based on the learner’s. Learning style, was more effective. The F-ratio was calculated.

Graphical representation and Summary table of obtained t-values for the groups.

The comparison of the scores of pre-test and post-test was shown in the Graph 1, Graph 2 and Graph 3. For Group 1 (Verbal learning style group), Group 2 (Content learning style group) and Group 3(Interest learning style group) respectively. The summary table of obtained t-value for Group 1 (Verbal learning style group), Group 2 (Content learning style group) and Group 3(Interest learning style group) is given in the Table 4, Table 5 and Table 6 respectively.



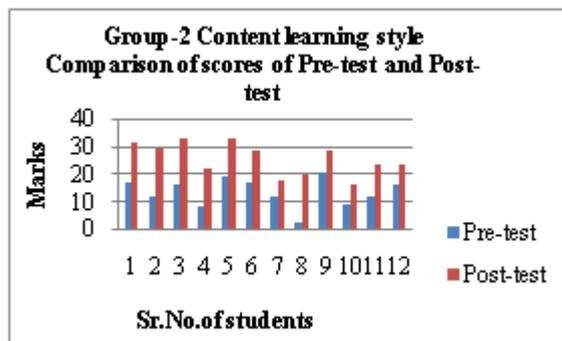
Graph 1

Table 4: A summary table of obtained t-value for group-1(Verbal learning style)

| Achievement Test | N | M | SD | SE _M | γ | SE _D | t-value (Cal.) | Table t-value (0.01) |
|------------------|----|------|-------|-----------------|----------|-----------------|----------------|----------------------|
| Pre-test | 10 | 09.3 | 10.90 | 3.449 | 1.0272 | 4.322 | 3.216 | 2.821 |
| Post-test | 10 | 23.2 | 25.09 | 7.940 | | | | |

t-value (cal.) > table t-value at (0.01) level

There is a significant difference between the mean scores of pre-test and post-test at 0.01 and 0.05 levels of significance. So the null hypothesis is rejected. The interactive teaching strategies used for group-1 (i.e. for verbal learning style group) were effective.



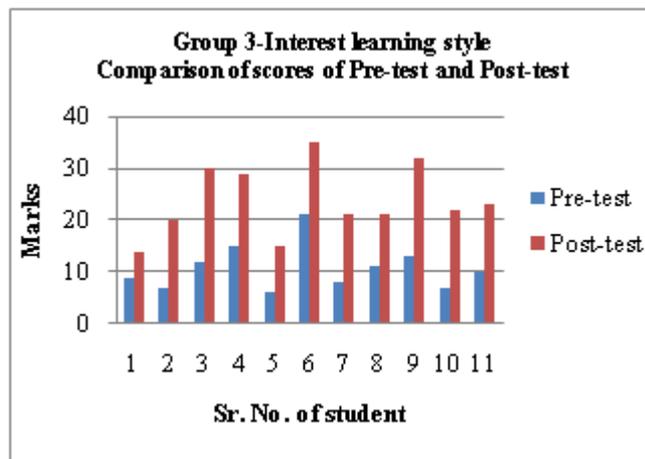
Graph 2

Table 5: A summary table of obtained t-value for group-2(Content learning style)

| Achievement Test | N | M | SD | SE _M | γ | SE _D | t-value (Cal.) | Table t-value (0.01) |
|------------------|----|--------|-------|-----------------|----------|-----------------|----------------|----------------------|
| Pre-test | 12 | 13.167 | 14.99 | 4.327 | 0.993 | 3.714 | 3.41 | 2.718 |
| Post-test | 12 | 25.83 | 27.63 | 7.976 | | | | |

t-value (cal.) > t-value (0.01)

There is significant difference between mean scores of pre-test and post-test at 0.01 and 0.05 levels of significance. So the null hypothesis is rejected. The interactive teaching strategies used for group-2 (i.e. content learning style group) were effective.



Graph 3

Table 6: A summary table of obtained t-value for group-3 (Interest learning style)

| Achievement Test | N | M | SD | SE _M | γ | SE _D | t-value (Cal.) | Table t-value (0.01) |
|------------------|----|-------|--------|-----------------|----------|-----------------|----------------|----------------------|
| Pre-test | 11 | 10.82 | 12.16 | 3.66 | | | | |
| Post-test | 11 | 23.82 | 25.896 | 7.8 | 0.979 | 4.282 | 3.036 | 2.764 |

t-value (cal.) > t-value (0.01)

There is a significant difference between mean scores of pre-test and post-test at 0.01 and 0.05 level of significance. So the null hypothesis is rejected. The interactive teaching strategies used for group-3 (i.e. Interest learning style group) were effective.

Table 7: A summary table of obtained F-ratio

| Sr. no. | Description | Symbols | Value |
|---------|-------------------------------------|----------------------------------------|-----------|
| 1 | Group Mean of post-test | | |
| | Group 1- Verbal learning style | M1 | 23.2 |
| | Group 2- Content learning style | M2 | 27.6 |
| | Group 3- Interest learning style | M3 | 24.1 |
| 2 | Correction term | C | 18700.033 |
| 3 | Total sum of squares | St ² | 1051 |
| 4 | Between groups sum of squares | Sb ² | 108.1 |
| 5 | Within group sum of squares | Sw ² | 942.9 |
| 6 | Degree of freedom | df | 29 |
| 7 | Between group sum of squares | Df of Sb ² | 02 |
| 8 | Within group sum of squares | Df of Sw ² | 27 |
| 9 | Mean square variance | Sb ² /df of Sb ² | 54.05 |
| 10 | Mean square variance | Sw ² /df of Sw ² | 34.92 |
| 11 | F-ratio (calculated) | F(cal.) | 1.5478 |
| 12 | F-table value at 0.01 level (at 26) | F(table) _{0.01} | 5.53 |
| 13 | F-table value at 0.05 level (at 26) | F(table) _{0.05} | 3.37 |

F-ratio (calculated) < F (table)_{0.01} and F (table)_{0.05}

F-ratio

Our calculated value F (cal.) = 1.5478, is not significant at both the levels of significance and hence the null hypothesis. We can say that the interactive teaching strategies based on learning styles of verbal group, content group and interest group are equally effective as far as the teaching program was concerned.

11. Fulfilling the Objectives

Objective 1- To identify the learning styles of D.T.Ed. Teacher trainees using a standardized test constructed by Dr.Venkataraman (SOLAT).

Inference-

The teacher trainees in the sample were identified with three learning styles out of five learning styles. These students were categorized in 3 different groups.

Group 1-Verbal L.S.,

Group 2-Content L.S. and

Group 3-Interest L.S.

10 students out of 33 students have preferred Verbal learning style i.e.30.30 %.

12 students out of 33 students have preferred Content learning style i.e. 36.36%.

10 students out of 33 students have preferred Interest Learning style i.e. 33.33%.

Objective 2- To prepare a teaching program using Interactive teaching strategies based on the learning styles of teacher trainees.

Inferences-For the present study, the researcher has selected the interactive teaching strategies suitable for the Science subject and according to the learning style of the students-teachers. The cluster of Interactive teaching strategies selected for 3 types of learners are given in the table 2.

Objective 3- To study the effectiveness of a teaching program based on learning styles of teacher trainees on the achievement in Science and Technology.

Inferences-The improvement is seen in the mean scores obtained in the post-test after implementation of interactive teaching program based on learner's learning style.

A summary table of obtained t-value for group-1, group-2 and group-3 (Interest learning style) is given in tables 4, 5 and 6 respectively.

12. Major Findings of the Study

The null hypothesis stated that there is no significant difference between mean scores of pre-test and post test in the Science achievement of teacher trainees when teaching program using Interactive teaching strategies based on their learning style was implemented.

Group 1- Verbal Learning Style

From table No. 4 It is seen that for Group 1 (Verbal learning style) t-value (calculated) = 3.216, which is greater than table t-value (0.01 level) 2.821, so the effectiveness of the Interactive teaching program is significant at 0.01 level. The null hypothesis is rejected.

Group 2- Content Learning Style

From table No. 5 It is seen that for Group 2 (content learning style) t-values (calculated) = 3.41, which was higher than table t-value (0.01 level) 2.718, so the effectiveness of the Interactive teaching program is significant at 0.01 level. The null hypothesis is rejected.

Group 3- Interest Learning Style

From table No.6 It is seen that for Group 3 (Interest learning style) t-value (calculated) = 3.036, which was higher than table t-value (0.01 level) 2.764, so the effectiveness of the Interactive teaching program is significant at 0.01 level. The null hypothesis is rejected. The teacher trainees have shown improvement in the achievement of Science and technology when the interactive strategies based on the learner's learning style were used for teaching.

13. Conclusions

Since the obtained t-ratio is significantly greater than the tabulated t-ratio in case of group 1, group 2 and group 3, the null hypothesis is rejected. The interactive teaching

program, based on the learner's learning style, was effective in acquiring better achievement in Science and Technology.

14. Recommendations

The use of the new trend in education i.e. interactive teaching method and Strategies enhances the academic achievement of the teacher trainees in Science and Technology. This teaching program gives more scope for having more interactions in the class-rooms and in making the learning process more interesting and joyful. It is recommended that the similar study can be carried out for teaching other subjects. A comparison between interactive teaching method for Science and other methods of teaching can also be carried out to find out the most effective method. Correlation between learning style and thinking style of the students can also be studied.

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