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# EFFECTS OF MULTIPLE INTELLIGENCE-BASED TEACHING ON ENHANCING SCIENCE LITERACY CONCEPTS

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## Abstract

Multiple Intelligence is an important indicator of students' success. Multiple intelligences play significant role in one's academic success. This study was based on the effects of multiple intelligence-based teaching on the students' performance. Participants were selected from Middle and Secondary boys' schools. The sample consisted of 60 male students. This was an experimental study which employed quasi experimental design. The experimental group was taught through multiple intelligence-based teaching. Data was analyzed through t-test to compare the means of two groups. It was found that method of multiple intelligence-based teaching when compared, was found better. The study proposed that unusual treatment may be implemented to raise the performance of low achievers in science subjects and teachers may be trained accordingly.

**Keywords**: *Multiple Intelligences, Low Achievers, Middle Level, Science Students*

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**Introduction**

Science considers any systematic field of study or knowledge gained from it (Cassimally, 2011). It is knowledge attained through study or practice. In spite of the importance of science subject, desirable results are not coming. There are many factors which are responsible for this situation. One of the most important factors is not to accommodate the intelligence of all the students. Intelligence is regarded as an individual's capability to be able to develop problem solving skills or be able to develop some product which is valuable in social settings. Howard Gardner was the person who looked beyond the intelligence theory as a person's intelligence quotient on limited aspects. He claimed and proved that a person's intelligence is composed of eight intelligences by introducing the concept of multiple intelligences (Gardner, 1983). Interestingly his theory got popularity and it's explored in different settings and different scenarios with many variables. In 1999, Gardner was the person by whom definition of intelligence was redefined who said that "intelligence is a behavioral and emotional mental ability to work out the data that can be utilized in a social setup to explain a problem or generate products that are of important in a society". His definition enlightened that being intelligent does not mean having a single talent, but to have at least eight other types of intelligence which are not only important but cannot be ignored.

The trend of multiple intelligences now becomes more focused in the subject of science to fill up the blank spaces regarding fulfilling the requirements of new era in terms of the students' achievement (Anne, 2010). These intellects comprise of different intelligences one may have more, and one may have less varieties of intelligences from each other during performing the experimental work or activities. Based on their multiple intelligence, students manifest their abilities (Juanita, 2010). Different studies indicated in the literature that whenever students are taught through multiple intelligences, they show improvements in their results. Bertrand (2015) said that "Multiple Intelligence theory to be the single most valuable concept I learned when I become certified to teach to High School Physics".

Positive effect of Multiple Intelligence based instruction methods in the classes and enhancing their multiple intelligences all the way using a

great deal of variety and natural manner of learning (Suleiman, Hassan, & Yi, 2011). Educational growth is seen by introduction of multiple intelligence-based teaching not only for average students but also for those students who were tagged as slow learners, uninterested in their studies or ineffective (Stanford, 2003 as cited by Saechao (n.d.). Since students come up with a variety of learning styles, learning demands, learning abilities, skills, mental capacities etc., this diversity can be handled through multiple intelligence-based teaching so that maximum students' needs can be met. Students' learning competencies can also be boosted by using MI methods in classrooms (Haley, 2004). Winarti, Yuanita and Nur (2019) conducted a study on 124 junior high school students to improve their science learning through multiple intelligence teaching. They found significant improvements in students' academic performance and concluded that this is an effective teaching method to improve the performance of students. In addition, to accommodate and integrate the intelligence in the instructional process may make it possible for students to learn in different ways.

Multiple intelligence is an important aspect in educational success of students. So, this paper will shed light on the important aspects of academic improvement for students to help them to increase their academic performance. This important area will also enlighten curriculum developers to focus on inclusion of teaching methods and content in the text based on multiple intelligences so that students' learning styles may be catered at maximum level. Teachers will also benefit from the findings of this study to incorporate elements of multiple intelligence in their teaching so that students may be taught through this innovative method.

**Statement of the Problem**

Despite the focus given on science education by the Government (Education Policy, 2009) no fruitful results are found. The core reason may be insufficient way of teaching learning and not accommodating the students' potentials according to their needs and wishes. The theory of multiple intelligences-based teaching not only provides a flexible teaching approach but students' progress in studies can also be accelerated. So, the researcher intended to study the "Effects on the Performance of Low

Achievers by using Multiple Intelligences Based Teaching in Science Literacy at Middle Level".

**Objectives**

1. To find the effects of multiple intelligence-based teaching on enhancing science literacy concepts.
2. To match-up the results of low achievers through multiple intelligence-based teaching in science literacy at middle level.

**Hypothesis**

$H0^1$: Multiple intelligence-based teaching has no significant effect on academic achievement of low achievers.

**Research Methodology**

This study used experiment and it was descriptive in nature.

**Population**

Following is description of population:

| | |
|---|---|
| Middle and secondary schools | 90 |
| Students | 5000 |
| Grade | $7^{th}$ |
| Gender | Male students |
| District | Nowshera |

There were 90 schools which had 5000 students in different sections of $7^{th}$ class. Gender of students was male.

**Sample**

The researcher randomly selected two sections of $7^{th}$ graders. This procedure was done through a table of random numbers. There were 60 students (30 students in each section respectively).

**Research Tools**

The researcher administered three tools. "Howard Gardner multiple intelligence-based test", performance Test, and prepared lesson plan. The validity of tools was checked which indicated satisfactory remarks from 05 educational experts. Their input was embedded, and the final prototype was used in the actual data collection phase.

**Procedure of the study**

Pre-test post-test quasi experimental design was used. For this purpose, the researchers made two groups one was experimental, and the other was control group. One group was taught through multiple intelligences-based teaching and other group was taught through conventional method. Results of pre-and post-tests were compared.

**Data Analysis**

Data was personally collected, and results of experiment were analyzed descriptively in terms of Mean and SD and t-test, was used to analyze group differences.

There was total number of 60 students who were selected randomly in the research, and out of which 30 were placed in experimental group and 30 in control group. But before starting the intervention the multiple intelligence-based test was taken from all the students based on which the students were categorized as high achievers, average achievers, and low achievers. The researcher only focused on low achievers which reduced to minimum number of students. Furthermore, in low achievers, some intelligences were found, and some were recessive in them. So, the number of students for the recessive intelligences were zero (0) as shown below in the control group, which means there were no such students for the respective intelligence in the control group. The population of this study was 12696 girls' students enrolled in 38 high schools in Tehsil Nowshera. Female students/gender selection justification is that as the girls are on the more deprived side in education (World Bank Group, 2022 & Baron, et al. 2022) and having educational experiences, strategic choices, and constraints the researcher focused on studying the girls for this study. In this regard, the population of the study was 12696 girls' students enrolled in 38 high schools in Tehsil Nowshera.

From the above population, 118 pupils from four secondary schools for girls were chosen as a sample.

**Data Analysis (Pre -Test Score Analysis)**

The outcomes of pre-test are mentioned in the following table by using t-Value, Mean, and SD.

**Table 1**

*Pre-Test Scores (Group Comparison)*

| Group | N | M | Std | $t_{cal}$ | $t_{tab}$ | df | p | α. |
|---|---|---|---|---|---|---|---|---|
| Experimental | 30 | 21.47 | 5.87 | 2.045 | 2.045 | 29 | .001 | 0.05 |
| Control | 30 | 21.43 | 5.74 | | | | | |

This table tells the group comparison of experimental and control group. It indicated that there is no significant difference between experimental and control groups. The mean scores of both groups are also the same. This is also statistically significant.

**Table 2**

*Linguistic/Verbal intelligence (Group Comparison of Low Achievers)*

| | Group | N | Mean | |
|---|---|---|---|---|
| | | | Pretest | Post Test |
| Linguistic/Verbal | Experimental | 5 | 13.4 | 28.2 |
| | Control | 1 | 13 | 25 |

Table 2 indicates that represents pretest and posttest scores of control group and experimental group. Mean score of experimental groups in pre and posttest is 13.4 and 28.2 respectively which is higher than the mean scores on pre and posttest of control group which is 13 and 25 respectively. It indicates that multiple intelligence-based teaching has improved students' performance who exhibited linguistic/verbal intelligence.

**Table 3**

*Logical/Mathematical intelligence (Group Comparison of Low Achievers)*

| | Group | N | Mean | |
|---|---|---|---|---|
| | | | Pretest | Post Test |
| Logical / Mathematical | Experimental | 5 | 13.4 | 28 |
| | Control | 1 | 13 | 25 |

Table 3 demonstrates pretest and posttest scores of control group and experimental group on mathematical/logical intelligence. Mean score of experimental groups in pre and posttest is 13.4 and 28 respectively which is higher than the mean scores on pre and posttest of control group which is 13 and 25 respectively. It indicates that multiple intelligence-based

teaching has improved students' performance who exhibited mathematical/logical intelligence.

**Table 4**

*Musical Intelligence (Group Comparison of Low Achievers)*

| | Group | N | Mean | |
|---|---|---|---|---|
| | | | Pretest | Post Test |
| Musical | Experimental | 2 | 12.5 | 27 |
| | Control | 0 | 0 | 0 |

This table presents pretest and posttest scores of control group and experimental group on musical intelligence. Mean score of experimental groups in pre and posttest is 12.5 and 27 respectively which is higher than the mean scores on pre and posttest of control group which is zero. It indicates that multiple intelligence-based teaching has improved students' performance who had musical intelligence.

**Table 5**

*Visual / Spatial intelligence (Group Comparison of Low Achievers)*

| | Group | N | Mean | |
|---|---|---|---|---|
| | | | Pretest | Post Test |
| Visual/Spatial | Experimental | 4 | 13.4 | 29 |
| | Control | 0 | 0 | 0 |

Table 5 demonstrates pretest and posttest scores of control group and experimental group on visual/spatial intelligence. Mean score of experimental groups in pre and posttest is 13.4 and 29 respectively which is higher than the mean scores on pre and posttest of control group which is zero. It indicates that multiple intelligence-based teaching has improved students' performance who had visual/spatial intelligence.

**Table 6**

*Bodily/Kinesthetic Intelligence (Group Comparison of Low Achievers)*

| | Group | N | Mean | |
|---|---|---|---|---|
| | | | Pretest | Post Test |
| Bodily/ | Experimental | 5 | 13.4 | 28.4 |
| Kinesthetic | Control | 1 | 13 | 25 |

Table 6 shows pretest and posttest scores of control group and experimental group on bodily/kinesthetic intelligence. Mean score of experimental groups in pre and posttest is 13.4 and 28.4 respectively which is higher than the mean scores on pre and posttest of control group which is 13 and 25 respectively. It indicates that multiple intelligence-based teaching has improved students' performance who exhibited bodily/kinesthetic intelligence.

**Table 7**

*Intrapersonal intelligence (Group Comparison of Low Achievers)*

| | Group | N | Mean | |
|---|---|---|---|---|
| | | | Pretest | Post Test |
| Intrapersonal | Experimental | 4 | 13.25 | 30 |
| | Control Group | 0 | 0 | 0 |

Table 7 shows pretest and posttest scores of control group and experimental group on intrapersonal intelligence. Mean score of experimental groups in pre and posttest is 13.25 and 30 respectively which is higher than the mean scores on pre and posttest of control group which is zero. It indicates that multiple intelligence-based teaching has improved students' performance who demonstrated intrapersonal intelligence.

**Table 8**

*Interpersonal Intelligence (Group Comparison of Low Achievers)*

| | Group | N | Mean | |
|---|---|---|---|---|
| | | | Pretest | Post Test |
| Interpersonal | Experimental | 5 | 13.4 | 27.2 |
| | Control | 0 | 0 | 0 |

This table demonstrates pretest and posttest scores of control group and experimental group on interpersonal intelligence. Mean score of experimental groups in pre and posttest is 13.4 and 27.2 respectively which is higher than the mean scores on pre and posttest of control group which is zero. It indicates that multiple intelligence-based teaching has improved students' performance who had interpersonal intelligence.

**Findings and Discussions**

This study indicated significant differences in pre and posttest of experimental and control group which indicated that students who receive

multiple intelligence-based teaching had better performance that those who did not received it and were exposed to traditional teaching. Same topics taught by multiple intelligence-based teaching versus traditional teaching lead towards the following findings:

1. Findings of table 1 show group comparison on the pre-test scores. The experimental group's scores in terms of Mean and Standard Deviation are almost same as of the control group, indicating that no difference exists. However, to confirm that the difference is significant for Mean, the t-statistics and p-value (.001) in the following table provide evidence for it. So, the calculated value is in the rejection rejoin and null hypothesis is rejected.
2. A significant mean difference was found (Table 2) between control and experimental group indicating the effectiveness of multiple-based intelligence teaching method on low achievers' performance who had linguistic intelligence.
3. It was found that (Table 3) multiple intelligence-based teaching had better effect on academic achievement of low achievers with logical/mathematical intelligence.
4. Profound improvements through multiple intelligence-based teaching were found (Table 4) in low achievers having musical intelligence.
5. Significant improvement in low achievers' academic performance is found through multiple intelligence-based teaching who exhibited musical intelligence (Table 5).
6. Multiple intelligence-based teaching resulted in visible academic performance of low achievers who had visual intelligence.
7. Profound improvements in low achievers' performance were found through multiple intelligence-based teaching who had bodily/kinesthetic intelligence (Table 6).
8. High effect of multiple intelligence-based teaching on academic performance of low achievers was found who had intrapersonal intelligence (Table 7).
9. The significant effect of multiple intelligence-based teaching on academic performance of low achievers was found who had interpersonal intelligence (Table 8).

The results of this study are supported by different research. In this regard, Winarti, Yuanita and Nur (2019) conducted a study on 124 junior high school students to improve their science learning through multiple intelligence teaching. They found significant improvements in students' academic performance and concluded that this is an effective teaching method to improve the performance of students. Suleiman, Hassan, and Yi (2011) also found positive effects of MIT on students' academic performance. Owalabi and Okebukola (2009) also reported the significance of multiple intelligence strategy which was also supported by Othman (2013).

**Conclusions and Recommendations**

This study ends with the conclusion that multiple intelligence-based tests enhanced educational performance level of the students which had high effect on their academic achievement. So, multiple intelligence-based teaching is recommended not only for high achievers but also for low achievers.

Students improved academic achievement by multiple intelligence-based teaching in eight intelligences. So, this is effective with students who had any type of multiple intelligences irrespective of the fact that what is their academic performance level.

Multiple intelligence-based teaching is better than lecture method or conventional teaching in which low achievers are tagged to low performers. This teaching method enhances their academic performance no matter how they learn i.e. bodily/kinesthetic, visual, interpersonal, or intrapersonal. This study recommends that all types of intelligence can equally be taught through MIT approach and this approach may be used in secondary and middle level schools for students' improvements in their academic performance.

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