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Effect of Multiple Intelligences' Teaching on Academic Achievement of High Achievers in Science at Elementary Level

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Abstract

Every human being has different types of intelligences. Through the usage of multiple intelligences theory, individuals may be encouraged to use their preferred intelligences in their own learning area, and instructional activities may be appealed to different forms of intelligences. Teachers are using multiple intelligences of students to increase their learning. The main aim of the study was to find the effect of multiple intelligences' based teaching on academic achievement of high achievers in science at elementary level. The objectives of the study were to find out the MIBT's effect on academic achievement of high achievers of science students at elementary level. Population of the study was 88 Girls Middle & Secondary Schools of District Nowshera, 60 female students were sample of the study. Study was proceeded using quasi experimental design; involved two groups and it was pre-post-tested. One group was called experimental group received an unusual treatment of MIBT and other was control group received usual treatment. It was found that method of MIBT was comparatively better than traditional method. It was recommended that MIBT may be implemented in science at elementary level and teachers may be trained through pre-post service trainings accordingly. It may fulfill the requirements of science students.

***Keywords**:* Multiple Intelligences, Academic Achievement, Elementary Level, Science Students, High Achievers

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Introduction

Science is playing a vital role to bring about socio economic development and empowerment all over the world. According to Hinkson (2014), science gives us security, facilities and self-awareness; it not only provided us understanding of things, but also helped us to inquire about the occurrence of different scientific phenomenoa. According to Gardner (1983), the ability which leads to solve a problem by creating a valued product in one or more social setups is called intelligence. For this purpose, Gardner (1983), introduced a theory of Multiple Intelligences. Gardner redefined the definition of intelligence in 1999 as "intelligence is a behavioural 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".

Gardner suggested that intelligence is not a single general talent. Every person has minimum different eight intelligences that derive at different levels in each individual. According to Edward (2009), the idea of the multiple intelligences (MIs) is emanated from the discipline of psychology. In accordance to the research of Kornhaber (2001), the theory of MIs provides validity for the daily experiences of educators. Theory expresses that the individual learners get and learn the information and think about it in a verity of ways. Most of the researches proved that whenever multiple intelligences are focused in teaching learning process it has always given desirable results. As asserted by Bertrand (2015), "Multiple Intelligence theory to be the single most valuable concept, I learned when I become certified to teach to High School Physics". On the basis of multiple intelligences, students manifest their abilities (Parker, 2009). The approaches based on MIs have increased educational background, also for those learners who were recognized as ineffective and uninterested. In accordance with the study of Stanford (2003), individual learners come up with distinct learning ways and abilities, so that multiple intelligence class room permits teachers to introduce teaching approaches based on innovations that consist a wide range of methods, information and strategies. Through the implication of multiple intelligence theory in the class room, teacher can unhide the complete learning competencies of individual learner (Haley, 2004).

Review of Literature

Armstrong (1994, as cited by Bilgin 2006), stressed multiple intelligences based teaching as a new approach that may help out the students to enhance their grades and provide active learning. Using the

strategy, learners can learn previous historical topics and literature with the indulgence of MIs mixing the role-play techniques by the learners including drama, storming the brain, using surveys, computer work, cooperation with peers and many more other ways that can stimulate seven different intelligences. The researches further suggested that, different cultural settings enhance intelligences while performing their competencies round the globe, MIs approach provides the things easier to be experienced by the individuals. The division of various capabilities of human in seven different intelligences, provides seven ways to learn and think by the students that lead them to achieve better results. It enhances the chance of success in school life to gain and deliver.

In a practical work for creation of theories based on logic, learners used the strategy based upon MIs in a natural way for learning. When the sequence of reasons are needed, the logical intelligence is utilized. In cases where something to be justified, the verbal intelligence was used. In peer works to cooperate each other, the interpersonal intelligence was intervened. Similarly, visual intelligence is used for figures and diagrams based on knowledge and concepts. For self-regulating learning, intrapersonal techniques are utilized for self-learning. The musical intelligence was used for singing a song about the concepts used by the learners in the unit. (Fogarty, Stoehr, 1995 as cited by Bilgin 2006).

Reese (2002, as cited by Mohammadi, Abidin& Ahmad, 2012),correctly suggested that for active learning there may not be a good or bad way or any right or wrong style of learning to be used but the thing which matters most is anything that works for the effectiveness of individual learners. If a learner is successful to find a way for accommodating his/her intelligences using a certain learning style, that will be considers best fitted for him/her and the educators should be agree with them as the learners has agreement for that. Most of the times, various students did not found the opportunity to accommodate their intelligences, the research studies have been carried out to have space for the same. In such situations, the teaching strategies based on MIs should assist the learning and accommodate the intelligences of the individual learners.

Ghazi, Shahzada, Gilani, Shabbir, & Rashid (2010 as cited by Qoura, 2015), aimed to investigate the relationship between students' self-perceived multiple intelligences and their academic achievement. Correlation between self-perceived verbal/linguistic, logical/mathematical, interpersonal, intrapersonal, naturalistic intelligence and students' academic achievements was found to be significant. The integration of multiple intelligence theory by the

teachers leads to the implication of it in teaching learning process as per student's wellbeing, competencies and skills. It indicates that the excellent approach for the utilization of theory of multiple intelligence is to become aware about adaptation of the subject for different intelligences (Akkuzu and Akcay, 2011).

Bas & Behyan (2010), Conducted a research, and the aim of the research was to find out the effects of multiple intelligences supported project-based learning methods and traditional instructional methods on students' attitude and their academic achievement in English. The results of the research revealed a significant difference between the attitude scores of the experiment group and the control group. In the positive development of the students' attitudes, it was also observed that the multiple intelligences approach activities were more effective. Finally the study of the research reflected that the respondents who are taught by multiple intelligences supported project-based learning methods are more successful and have a higher motivation level than the respondents who are instructed by the traditional instructional methods. At the end both methods also showed a significant difference. There was a significant difference between the achievement levels of the students who have been taught by MI supported project-based learning method and the students who have been educated by the traditional instruction methods.

Many researchers, keeping in view the importance of MIBT in science, agree that MIBT should be more focused in science. For this purpose Goodnough (2010), conducted a study, which reports on the experiences of science teacher in a high school. As he investigated multiple intelligences (MI) theory within the context of an action research group. The theory was used as a framework to take decisions about how he would structure learning experiences in a science unit on space and astronomy for grade nine students. The research gives insight into the nature of MI theory. By using MI theory science can be made easier for students and supported them in achieving high levels of scientific literacy.

Cherry (2017), concluded that Gardner used one of many causes to use MI-theory that everything can be consider in more than one way. Mindy & Kornhaber suggest as cited by Cherry (2017), that the multiple intelligence theory provides opportunity to students to think, learn and imagine the things in many ways. The theory of MI also offers educators to organize the curriculum assessment and pedagogical practices and to build up new approaches that might be fulfill the needs of learners in their class rooms.

Statement of the Problem

According to the education policy (2009), Government of Pakistan is giving too much attention on science education; however, the results are not up to the mark. The root cause may be inadequate teaching learning process and un-utilization of students' potentials according to their desires. Teaching through multiple intelligence based theory not only provides a flexible approach to good teaching, it may also improve academic achievement of the students. Therefore this study intended to explore the "Effect of multiple intelligence based teaching on academic achievement of high achievers in science at elementary level".

Objectives of the Study

Following were the objectives of the study:

1. To compare the learning outcomes of high achievers through multiple intelligence based teaching in science at elementary level.
2. To find the effect of multiple intelligences based teaching on academic achievement of high achievers.

Hypotheses

$H_0 1$ There is no significant effect on academic achievement of high achievers by using multiple intelligence based teaching in science at elementary level.

Significance of the Study

This study would be very useful for the development of science curriculum, because the proper development of curriculum always helps the teachers as well as the students to teach and learn different topics by using new teaching strategies through scientific ways. This study will help to make better future decisions regarding science students at elementary level, to judge their attitudes towards a specific curriculum based on activities and to raise their achievements in science. It will also be valuable for teachers and administrators to cover the loop holes and limitations in curriculum and teaching methods for science subject and that how a specific type of curriculum based on activities may change the attitude of students for the subject of science and raise their achievements at elementary level.

Population

The population of the study consisted of 4500 female students of 6th class, studying in 88 Girls Middle & Secondary Schools in District Nowshera (KPESE, 2018).

Sample of the Study

From the target population two sections of grade six from Govt. Girls High School Nowshera Cantt. were randomly selected as a sample. Each section was consisted of 30 students' thus total number of respondents was 60.

Procedure of the Experimental Design

The study was experimental. Pre-posttests quasi experimental design was used (Price, Jhangiani, & I-Chant (2015). Two groups were made i.e. experimental and control to collect data from respondents.

Group	Pre Test	Treatment	Post Test	Difference	Comparison
Experimental	Y_1	X_1 (MIBT)	O_1	Y_1 Difference O_1	Comparison of the final results of experimental and control group.
Control	Y_2	X_2(Usual)	O_2	Y_2 Difference O_2	

Lesson plans designed for experimental group proceeded the study to teach through MIBT and all MIs were adjusted in it. In this method initially respondents were taught according to their common characteristics. Different types of activities were made which were accommodating all their intelligences. Those activities were written on the black board by the teacher. According to their interests they chose activity. Activities were performed by the students. Finally, they shared it with their classmates.

Instruments for the Study

Three instruments were used in this study i.e.

1. Howard Gardner Multiple Intelligence (HGMI) Test. This test was used to identify the multiple intelligences of the students. There were 28 items overall. For each intelligence, four items were there tool.

2. Lesson Plans: On the basis of multiple intelligences researcher prepared lesson plans for 20 selected topics from 6th Grade science textbook and tried to accommodate all the intelligences of the students.
3. Achievement Tests: With the consultation of experts, researcher developed two achievement tests. One was used as pre-test and the other as a post-test. Each Achievement test was consisted of MCQs. The test was included 40 multiple-choice items to measure the students' academic achievement. Each question had one correct answer and three 'distracters'. Achievement test was prepared in the light of students' multiple intelligences.

Statistical Analysis

The results were shown in numerical form. t- Value, Mean and SD were used to analyze the data taken from four different schools by using achievement test.

Results

The results of the study are as follows:

Pre -Test Score Analysis

Table1:
Group Comparison on the pre-tests scores

Group Name	N	Mean	Std. Dev.	t_{cal}	t_{tab}	df	*P*	α.
Experimental Group	30	21.47	5.87	2.045	2.045	29	0.001	0.05
Control Group	30	21.43	5.74					

N = Number of Students, t_{cal}= Calculated value of t, t_{tab} = Table value of t, df = Degree of freedom,
p = Significance value, α = Significance Level

Table 1 shows pre-test results. The groups were equally arranged and balanced for the study.

Post Test Score Analysis

Table 2:
Comparison based on verbal / linguistic Intelligence for high achievers

Name of Intelligence	Group Name	N	Mean	
			Pre test	Post Test
Linguistic / Verbal	Experimental Group	2	28.5	33.5
	Control Group	3	20	29

In Table 2, pretest score (M=28.5) and post test score (M=33.5) of experimental group, and pretest score (M=29) and post test score (M=20) of control group clearly indicated that MIBT has high effect on academic achievements of high achievers for linguistic intelligence.

Table 3:
Comparison based on logical/mathematical intelligence for high achievers

Name of Intelligence	Group Name	N	Mean	
			Pre test	Post Test
Logical / Mathematical	Experimental Group	2	28.5	33.5
	Control Group	2	21.5	28.5

Table 3 shows the mean pretest score and mean post test score of experimental group are 28.5, and 33.5. Moreover, Mean pretest score and mean post test score of control group are 28.5, and 21.5.In the light of analysis, it is undoubtedly expressed that MIBT has high effect on academic achievements of High achievers for logical/ mathematical intelligence.

Table 4:
Comparison based on musical intelligence for high achievers

Name of Intelligence	Group Name	N	Mean	
			Pre test	Post Test
Musical	Experimental Group	1	28	34
	Control Group	1	13	30

Table 4 suggests that respondents who possess musical intelligence, their pretest score (M=28) and post test score (M=34) were greater than pretest score (M=30) and post test score (M=13) of control group. Result of analysis showed that MIBT has clear effect on academic of high achievers.

Table 5:
Comparison based on Visual/Spatial intelligence for high achievers

Name of Intelligence	Group Name	N	Mean	
			Pre test	Post Test
Visual / Spatial	Experimental Group	2	28.5	33.5
	Control Group	3	20	29

Table 5 reflects mean pretest score and mean post test score of experimental group i.e. 28.5 and 33.5 respectively. Furthermore, mean pretest score and mean post test score of control group are 29 and 20. Study revealed that MIBT has noticeably effect on academic achievements of high achievers who had Visual Intelligence.

Table 6:
Comparison based on bodily / kinesthetic intelligence for high achievers

Name of Intelligence	Group Name	N	Mean	
			Pre test	Post Test
Bodily/ Kinesthetic	Experimental Group	2	28.5	33.5
	Control Group	3	17	29

Table 6 indicates score of bodily/ kinesthetic intelligence of respondents on pretest score (M=28.5) and post test score (M=33.5) of experimental group. On the other hand, pretest score (M=29) and post test score (M=17) of control group. The result of the analytical data provided evidence that MIBT has visible effect on academic achievements of high achievers.

Table 7:
Comparison based on intrapersonal intelligence for high achievers

Name of Intelligence	Group Name	N	Mean	
			Pre test	Post Test
Intrapersonal	Experimental Group	2	28.5	33.5
	Control Group	2	20.5	28.5

Table 7 expresses that the mean scores of pre and posttest for experimental group are 28.5 and 33.5 respectively. Additionally, mean scores of pre and posttest for control group are 28.5 and 20.5. Statistical analysis demonstrated in Table-8 that MIBT has high effect on academic achievement of high achievers who have intrapersonal intelligence.

Table 8:
Comparison based on Interpersonal intelligence for high achievers

Name of Intelligence	Group Name	N	Mean	
			Pre test	Post Test
Interpersonal	Experimental Group	2	28.5	33.5
	Control Group	2	19.5	29.5

Table 8 represents pretest score (M=28.5) and post test score (M=33.5) of experimental group. Likewise pretest score (M=29.5) and post test score (M=19.5) of control group. Moreover, data illustrated that mean (pre-posttest) of experimental group is greater than mean (pre-posttest) of control group groups. Result of data analysis described that there is clear effect of MIBT on academic achievements of high achievers who have Interpersonal Intelligence.

Discussion

The purpose of this study was to know the effect of multiple intelligence based teaching on academic achievement of science students at elementary level. The findings of the study revealed that the effect of multiple intelligence based teaching on academic achievement of science students at elementary level is too effective. Consistent with the research findings of Emendu, Nnamdi (2013), MIBT if applied properly can explore and judge different intelligences of the students. Conclusion of the study indicates that experimental group performed better than control group, which shows that there is a significant role of MIBT on academic achievement in science which has a great deal of consistency with the studies of Bertrand (2015), that revealed method based on MIs can raise intellect of the students in science subject, Haley (2004), which expressed MI based approach enhances learning potentials and Campbell & Campbell (1999), asserts using activities based on multiple intelligences the students learning outcomes are enhanced. This study reflected that responses of the teaching through multiple intelligences are

very helpful for the improvement of academic achievement of science students, this finding is highly associated with the research of Yalmanci and Gurbuzoglu (2009), which investigated that education through multiple intelligences strengthened academic growth of the students dramatically, able to talk and discuss freely themselves to use un-exposed intelligences using hands on practice.The study also revealed that for the explosion of MIBT in a good manner and successfully, it is necessary that we should give stress on that type of teaching where all lessons should be planned according to multiple intelligences. This finding has the close correspondence to the study of Garcia (2004) that regular incorporation of multiple intelligences in teaching learning process and its intervention for the contribution of all teaching learning activities including course content as well raises the level of opportunities both for teacher and learners to enhance motivation and improve assessment scores. In this manner we can achieve remarkable academic achievement in science at elementary level.

Conclusion

On the basis of findings following conclusions were drawn:

MIBT enhanced scholastic attainment level of the students due to which high effect on their academic achievement noticed. Experimental group demonstrated very good performance as compare to control group, which proved that strategy of MIBT found more effective than conventional teaching. Through MIBT, too much improvement was observed in academic achievement of high achievers.

Recommendations

The following recommendations were made:

Study proved that, Multiple Intelligence Based Teaching is better than traditional methods for science students of grade six. In addition, for the better learning achievements it is recommended that this method may be implemented at elementary level. For this purpose, in-service teachers may be suggested refresher courses and trainings related to multiple intelligences, so that there will be positive effects on the performance of the students.

As the study showed that there is strong relationship between MIBT and Multiple Intelligences of the students. It is therefore recommended that some programs and activities should be organized in schools on Multiple Intelligences of science students at the beginning of the

academic year. It may be helpful for the exploration of MI and academic achievement of the students.

Keeping in view the results of the current study high achievers in schools may be provided different opportunities like: reward, praising, encouragement, games, quiz programs, projects, puzzles, exposure in community, group work, role play& reinforcement that will lead to polish the Multiple Intelligences of the students.

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