Ilkogretim Online - Elementary Education Online, 2020; Vol 19 (Issue 3): pp. 2077-2082
http://ilkogretim-online.org
doi: 10.17051/ilkonline.2020.03.735362

Impact of Heuristic and Traditional Methods of Teaching on Students' Performance

Noor Muhammad, Assistant Professor (Edu. Adjunct), University of Agricultural Faisalabad, Toba Tek Singh Campus, Noorasif490@gmail.com
Sabahat Mushtaq, Assistant Professor of English, University of Education Lahore Faisalabad Campus, sabahatmushtaq@hotmail.com
Mubashira Khalid, Assistant Professor of Education, IER University of the Punjab Lahore, Pakistan, mubashirakhalid@yahoo.com
Muhammad Saeed, Associate Professor of Education, IER University of the Punjab Lahore, Pakistan.

Abstract- The study was aimed at comparing different teaching method in the subject of Science at grade VI level. An instrument named achievement test was used based on major themes of Science. A cohort of 60 students with similar level of learning were selected randomly. It is an experimental study with pre-test and post-test group design wheretreatment group was taught by heuristic method and non-treatment group was taught through traditional method for eight weeks. Semi-standardized lessons and science kits were used for treatment groups through activity-based instruction. The results revealed thattreatment group performance was improved than non-treatment group, which showed that heuristic method leads over traditional method in teachingscience in elementary schools.

Keywords: Heuristic method, traditional method, teaching of general Science

I. INTRODUCTION

Teaching is anorganizeddemonstration of realities, philosophies, skills, and methods to students. There is no teaching when no one learners. Teaching is not just telling them what you know. It is also finding out what they do not know or more importantly what they know that's wrong and try to correcting them.Science education is a systematic knowledge deals with quantitativeaspect of learning, provide hypotheses of education in context of experiences. Ebenezer and Conner (1998) quoted that science teachers prefer to teaching of science, skill and culture links as reliable science. Science education can be prepared applicable and manageable to all learners. Kyle (1994) affirms that science instructors must develop more concerned in the procedure of teacher education. Arends (2004) states that children have great influence on students in arousing interests, talent development and giving conceptual procedural and meta cognitive knowledge. Science along with a comfortable of information is a technique of getting knowledge. Therefore, the previous researches show that the main aim of science teaching in numerousorganizations is to empowerlearners to gripmethodically the simpleevidence of physical disciplines required for additionallearning of modem discipline and skill and to comprehend its uses in this modern world. It should support them to know about experiment skills, improve the skill to ponder and to use disciplines as math's to solve the physical problems. The teachers and students both face many difficulties in instruction and science teaching at school stages.
The technological advancements of science has wide-rangeempirical applications in every field of human lifereflected as a vitaltheme in school curriculum. The main purpose of teaching of science in various institutions is to empowerlearners to gripscientificallymaterialrequired for moreeducation of current scientific knowledge to improve its presentations. It should maintenance them to get new services, improve the skill to ponder and to explain the difficulties of their time.
Science and technology can create significant impact to refining our normal of alive and to link the elementary technical and scientific knowledge essential for the generation to act upon growing professions in each area. Science is considered as important subject at all educational levels be determined by to a greatlevel on systematicdevelopments and progress of creativeaction. Zaman (1996) quoted science as anoriginaldeed to joinideas of man's usualsituation and the atmosphere for humanvaluesneedsgreatestlabors to withstand it at an optimal level of efficiency.Singh (1977) asserts that Science deliverslearners achance to

considercensoriously and exercise of review, grow science ideas, which enablesympathetic of living and physical setting, and to develop students'skills and attitudenecessary for citizenshipbehavior.
Pakistan is a developing country. Quaid-e-Azam states in Educational Conference held in Karachi in 1947 that education do not simply mean educationalteaching. Therefore, Pakistan should adopt a kind of science education which ultimately promotes professional skills in individuals for national development. Welz (2006) states that the teachers may arouse the students' interestin changing pre-conceptions ofscience teaching. In order to help the students to apprehendconcepts in complexityinformationas well as thoughtsnarrate to other thinking in the discipline (Abell 2007; Gess-Newsome, 1999; Grossman & Schoenfeld, 2005). The students learn better when they are allowed to focus on concepts and facilitate to understand the ideas (Erwin, 2002). Outdated qualitative study is a visiblearrival of highlightedsetting to the kingdom of technicalreview, but it was service of heuristic studyethics that formed the greatestbeneficialvisionsthrough the research. Heuristic study is a process that was offered by Moustakas (1990) which designates how particularknowledge is applied as aneffective research method. Discovery is at the core of heuristic study. Polanyi (1969) keeps that all studycreates with accumulatingevidences that are exciting, but are not instantlyapparent in them; a worthy issues, ratherperplexing and hopeful, is half of location.
Chohan (1989) revealed teaching methodsmake students interaction more strongto change the behaviour of learners. Ayot and Patel (1992) argue that the learning material in traditional sense is available almost readymade form and is exposed by teachers in quality and quanitity.It was` pointed out by (Grabowski & McCarthy, 1998) that the different teaching methods in traditional sense in recent times worked well in the learning process. Knowles (1990) explains that Traditional teaching methods, which include lectures, note taking and memorization are the primary mode of instruction. Haggerty's (2000) opinion is that the teacher is the center of the learning process. There was no doubt that the traditional method performed better in past. But with the passage of time, we felt the demands of new innovations in teaching of science in the world. Now, we extremely need to change the present pedagogical strategies in teaching of science with the latest technologies by internet and other communication technologies. Now, the traditional method of teaching is not effective in teaching of science in Pakistan. Heuristic method is one of the most popular methods of teaching science where a teacher plays his role in exposing or explaining the latest learning materials and facilitates the students to explore, find out, achieve or create the new learning material.This learning may also help to improve the coaching approaches of our educators and to explore the weaknesses and strengths of different teaching methods.

Hypotheses

The hypotheses of the study were as under:
Ho1: There is not an apparent distinction in achievement score of the Non-treatment and Treatment groups on pre-test in rural school.
Ho2: There is not an apparent distinction in achievement score of the Non-treatment and Treatment group pupils on post-test in rural school.
Ho3: There is not an apparent distinction in the achievement score of the non-treatment and treatment pupils in the content area of living things characteristics on post-test.
Ho4: There is not an apparent distinction in the achievement score of the treatment and the non-treatment group pupils in cell-unit of life on post-test.
Ho5: There is not an apparent distinction in the achievement score of the treatment and the non-treatment group students on the organization of life unit on post-test.
Ho6: There is not an apparent distinction in the achievement score of the treatment and the non-treatment group students in the environment area on post-test.
Ho7: There is not an apparent distinction in the achievement score of the treatment on the non-treatment group students on knowledge component of post-test.

II. METHODOLOGY

The recent research was treatment in nature.It was designed to relate the effectiveness of exploratory approaches with direct method in teaching of General Science in elementary school. It was based on the following research questions and null hypothesis.

Sample Design

The researchers randomly selected one school from district Jhang (Pakistan) having at least 60 students in 6th class (30 students for non treatment and 30 for treatment group).The sampled school situated in rural

area. The said rural school was selected on the basis of low literacy rate and the remote area of the Punjab province.It was also selected one school due to time limits and finnacial issues. The researcher followed the recent researches to select the sample. **Development of Instrument**

For the data collections, two insruments were developed by the researchers. The instrument I was consisted of 24 lesson plans which were used for only treatment group. The researchers selected the content from sixth grade (living and non-living things, life organization, Cell-Unit, and Environment along with learning outcomes). These lesson plans were employed in the treatment group while the non treatment group was taught by traditional (chalk and talk method). It was modified under the instructions of experts. Messjck (1989) supported it that validation is the investigation process that appraises validity for test score interpretation.

The instrument II was achievement test MCQs which was established by the researchers from the subjects of 6th grade General Science syllabus that obliged the aim of pre and post tests in this research. The numerousspecialplan has showedactive and effective in determininginformation and ability(Downing & Haladyna 2006; Haladyna 2004).The instrument was validated by six experts and concerned subject specialists. The instrument I and II were used both the non-treatment and treatment groups in pre and posttests. It was included 50 items and 25 short answers. These instruments were selected for the final experiment under the instruction of subject specialists and experts.

Validation of Instrument

Validity is the point to that test is computing to degree whereas consistency is the signto the reliability between two forms (Linn &Gornlund, 1995; Gay, 1996). The achievement test developed by investigators and validated by six experts who had desired expertise in the relevant field. To ensure validity and reliability of research instruments, these were piloted on a small sample other than actual sample of study. The validation of this instrument shows its reliability. It is important category of validity of evidence. Haladynaand Olson (2006) states that high consistency can keepself-assurance in creating high risks.

Data Collection Procedure

The data was collected personally by the researcher from the sampled school. The principal researcher himself taught lessons to the treatment group for eight weeks. The students were casuallyallotted in two freesettings.

III. Data Analysis and Findings

In order to find the results, the varianceproduced by the involvements (instructional methods) on pupils'attainment, t-test is a statistical process applied to associate the volume (Gay, 1996). To test the implication of instructional approaches and areachange t-test to associate mean was active. It characterizes the ratio of the normal deviation to the mean, and it is a valuable statistic for relating the mark of distinction from one data sequence.

Ho1: There is not anapparent distinctionin the achievement score of the Non-treatment and Treatment groups on pre-test in rural school.

Table 1:

Comparing of Non treatment and Treatment Groups on Pre-Test Score

Group	N	M	SD	CV (%)	t	Sig	Df
Non-treatment	30	29.87	9.168	30.59	0.411	0.683	58
Treatment	30	29.03	6.278	21.63			

Table 1 shows the standard deviation and mean of non-treatment and experiment group. The mean comparison of scores of non-treatment and treatment group (29.87 and 29.03) shows non-significant variation in the achievement score of pupils in test of science. The t-test confirmedthe difference in the pupils' achievement between groups arenon-significant at 0.05 levels. It was concluded that pre-test groups has same level of learning or performance.

Ho2: There is not an apparent distinction in the achievement score of the Non-treatment and Treatment group pupils on post-test in rural school.

Table 2:
Comparison on Mean Score of Non treatment and Treatment Groupin Post-Test

Group	N	M	SD	CV (%)	t	Sig	Df
Non-treatment	30	37.77	6.600	17.47	10.348	0.000*	58
Treatment	30	58.83	8.987	15.28			

Table 2 reveals that the standard deviation and mean of non-treatment and experiment group. The mean score comparison of non-treatment and treatment groups (37.77 and 58.83) had apparentchange in achievement score of pupils in science tests.

Table 3:
Comparing the score ofrespondents of treatment and non-treatment groupinarea of "Characteristicsof living and non-livingthings" on posttest.

Group	N	M	SD	t	Sig	df
non treatment	30	10.63	2.385	10.786	0.000*	58
Treatment	30	16.97	2.157			

Ho3: There is not an apparent distinction in the achievement score of the non-treatment and treatment pupils in the content area of living things characteristics onpost-test.
Table 3 depicted the score of treatment group (16.97) has greater mean score in non-treatment group (10.63) on characteristics of living and non-living things of posttest. The comparison was made through t-test. The t-value 10.786 is significant at 0.05 levels. So, the null hypothesis about an apparent distinction in the achievement score of the non-treatment and treatment pupils in the content area of living things characteristics on post-test was rejected. The treatment group has higher mean score thannon-treatment group about the indictor ofcharacteristics of living and non-living things inposttest.
Ho4: There is not an apparent distinction in the achievement score of the treatment and the non-treatment group students in the content area of cell-unit of life on post-test.

Table: 4
Comparing Mean Score of Students of Treatment and Non-treatment Group in indicator of "Cell-Unit of Life "on post test

Group	N	Mean	SD	CV (%)	t	Sig	df
non treatment	30	9.00	2.228	24.76	11.364	0.000*	58
Treatment	30	15.97	2.512	15.73			

Table 4 explained mean score of treatment group (15.97) that was greater from non-treatment group (9.00). So, the null hypothesis about an apparent distinction in the achievement score of the treatment and the non-treatment group pupils in the content area of cell-unit of life on post-test was rejected. It was concluded a difference in the scoreof non-treatmentand treatment group and experiment group.
Ho5 There is not an apparent distinction in the achievement score of the treatment and the non-treatment group of pupil in life organization on post-test.

Table 5:
Comparing of Mean Score of Students in Treatment and Non-treatment Groups in "Organization of Life"

Group	N	M	SD	CV (%)	t	Sig	df
non treatment	30	12.40	2.227	18.05	8.673	0.000*	58
Treatment	30	18.40	3.058	16.62			

*Co-efficient of Variation ** $\alpha = 0.01$ level
Table 5 designates mean scores of treatment group (18.40) which is greater than the mean score of non-treatment group (12.40). The performance of treatment group is better than the performance of non-

treatment group. The t-value 8.673 is significant at 0.01 levels. So, the null hypothesis about an apparent distinction in the achievement score of the treatment and the non-treatment group students on the content area of organization of life on post-test was rejected. The mean achievement score of non-treatment group significantly differ than treatment group in experiment group.

Ho6: There is not an apparent distinction in the achievement score of the treatment and the non-treatment group pupils in environment area on post-test.

Table 6:

Comparing of Mean Score of Students in Treatment and Non-treatment Group in the Area of "Environment"

Group	N	M	SD	C.V.	t	Sig	df
non treatment	30	5.77	2.445	42.37	2S.655	0.01*	58
Treatment	30	7.50	2.610	34.8			

*Co-efficient of Variation ** α = 0.05 level

Table 6 revealed that mean scores of treatment group (7.50) was greater than mean score of non-treatment group (5.77) t value was significant. It explains that t-value 2.655 is significant at 0.05 level of significance. It means that treatment group performed better in content area of environment. So the null hypothesis about an apparent distinction in the achievement score was rejected. It was evident that there is an improvement in the treatment group than non-treatment group with respect to performance.

Ho7: There is not an apparent distinction in the achievement score of the treatment on the non-treatment group students on knowledge component of post-test.

Table 7:

Comparing the Mean Score of Students in Treatment and Non-treatment Group on Knowledge Component of Test in Rural School

Group	N	Mean	SD	CV (%)	t	Sig	df
non treatment	30	15.20	4.405	28.98	3.293	0.02*	58
Treatment	30	20.13	6.922	34.39			

*Co-efficient of Variation ** α = 0.05 level

Table 7 showed the mean scores of treatment group (20.13) has greater than mean scores of non-treatment group (15.20) as t-value is significant at 0.05 levels. So, the null hypothesis about an apparent distinction in the achievements score of the treatment on the non-treatment group students on knowledge component of post-test was rejected. It wasshown that the performance of treatment group washigher than non-treatment group.

IV. Results and Discussion

This treatment study supports the findings of Ausubel (1960), Ausubel (1978), and Siddiqui (1993).Moreover, the findings of this study are also consistent with the other research studies (Siddiqui, 1993; Zaman, 1996; Shah, 2004).

The treatment group had better score than the non-treatment group on posttest. The results were consistent with the study conducted by Pandey (1986) and Steinbrink (1970). Moreover, Treatment teaching method were sported by Feller (1973), Goodman (1977), Johnson (1980), and Gupta (2004).Furthermore, it can be concluded that the treatment group performed better than that of non-treatment group on post-test of component of living things characteristics. These effects of the research studies of Ausubel (1960), Ausubel and Fitzgerald (1963), in treatment and non-treatment groups were the same that the treatment group performed better in the content area of living things characteristics.

It was concluded that the treatment group performed better than that of non-treatment group on post-test of component of organization of life.The results of this study regarding content area of environment were also consistent with the findings of Kinchin (2000), Lewis (1987) that the treatment group found to enhance effectively the conceptual understanding of the students who were in treatment group. The performance of treatment group on knowledge based level has been found equally effective rather than traditional teaching method regarding the student's achievement by Woodward (1985), Carnes (1985).

These were supported by the researchers conducted by Ausubel (1978), Ausubel& Gait (1968), Novak (2001), Lewis (1987), Rajoriya (1987), and Siddiqui (1993)who investigated learning model of treatment

teaching method with traditional teaching methods. The treatment group out-performed non-treatment group on "comprehension"ability level.The current study is aligned with the studies of Limniou (2008) andShah (2004).

V. RECOMMENDATIONS

1. This similar studies may be conducted to other science subjects to collect more comprehensive results.
2. The study may be conducted on broader level for aligned results and generalizations.

REFERENCES

1. Ayot, H. O., & Patel, M. (1992). *Instructional Methods; Educational Research and Publications LTD*; Nairobi.
2. Best, J. W., & Kahn, J. V. (2006). *Research in Education*. (10th Ed.). New York: Pearson Education Inc.
3. Dewey, J. (1934). *How We Think*. Boston: Massachusetts.
4. Erwin, S. (2002). *Revealing the potentiality for chaos in a Public School*. Oklahoma: Oklahoma Norman
5. Folino, D. A. (2001). Stories and anecdotes in the chemistry classroom. *Journal of Chemical Education*, *78*, 1615-1618
6. Gay, L. R. (1996). *Educational research competencies for analysis and application.*(5th Ed). Merrill Publishing Company
7. Given, B. K. (1996). Learning Styles: A Synthesized Model. *Journal of Accelerated learning and Teaching,21*, 11-44
8. Government of Pakistan (1947). Proceedings of the Pakistan educational conference. Karachi; Ministry of interior (Education wing).
9. Government of Pakistan (1959). National Education Commission, Karachi: Ministry of Education.
10. Government of Pakistan National Education Policy 1979, Islamabad: Ministry of Education.
11. Grabowski, B., &Mccarthy, M. (1998). *Web Enhanced Learning Environments Strategies for Classroom Teachers. Proceedings, 98*: Switzerland
12. Hand, B., &Prain, V. (1995). *Teaching and learning in science*. Sydney: Harcourt Brace Co.
13. Hodson, D. (2003). Time for action: Science education for an alternative future. *International Journal of Science Education*, *25*, 645-670.
14. Joshi, S.A.R (2005). *Teaching of science*. A.P.H. Publishing Corporation, New Delhi.
15. Kumar, A. (1995). *Teaching of physical sciences* (1st ed), Delhi: Anmol Publishers
16. Kumar, D., &Chubin, D. (2000). Science, technology and society: A sourcebook research and practice. Dordrecht of science. *The Science Education Review, 1*, 43 48
17. Linn, R. L., & Gronlund, N. E. (1995). *Measurement and Assessment in Teaching*. (7th ed).
18. New Jersy: Practice Hall, Inc.
19. McGraw, C. (1999) *Teaching Science Cooperatively in Middle/High School*. The Education Digest 64 no9 29-33.
20. Moustakas, C. (1990). *Heuristic research: design, methodology, and application*. Newbury Park, CA: Sage publication.
21. Patrick, H., & Yoon, C. (2004). *Early adolescents' motivation during science investigation*. The Journal of Educational Research. 97, 319-328 (No. 6).
22. Singh, A.K. & Nayak, A.K. (1977). *Science education*. New Delhi: Common Wealth Publications.
23. Welz, W. (2006). *Teaching Science in Europe*. Stage Dentschland, Berlin.
24. Yilmaz, R., Argun, Z., &Keskin, M. O. (2009).What is the role of visualization in Generalization Process: The case of Pre-service secondary mathematics teachers?*Humanity & social Science, 4*(2), 130-133
25. Zaman, T. (1996). *The Use of an Information Processing Model to Design and Evaluate a Physics Undergraduate Laboratory, Glasgow.* Unpublished Thesis for PhD, Centre for Science Education, Glasgow University.