



Students' Attitude Towards Research Based Teaching Method (RBTM) In Physics At 10th Grade Level

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ABSTRACT

The study was conducted to assess the impact of research base teaching on the attitudes of secondary school students towards Physics while teaching Physics to grade 10th. Boyer Commission in 1998 recommended that making research-based learning the standard, it refers to the point strongly made by John Dewey a century ago that learning is based on discovery guided by mentoring rather than on the transmission of information. Commission further recommended that to turn the prevailing culture of receivers into culture of inquirers, a culture in which students share an adventure of discovery. A Sample of (120) students from Government Higher Secondary School Pind Hashim Khan and Government Girls High School No. 2 Haripur were selected. Data was collected by administering pre-test and post-test. The collected data were analyzed through descriptive statistics i.e. mean scores, standard deviation, standard error of mean. The difference between variables were calculated by applying independent sample t-test. Result showed significant difference between pre-test and post-test of secondary school students while teaching Physics to grade 10th through research base teaching method.

KEYWORDS: Research base teaching, attitude towards Physics, pre-test and post-test experimental design.

INTRODUCTION

Science has changed societies in many ways by bringing different approaches in numerous fields of life. Economy is key ingredient of a society, and science is contributing enormously for the socioeconomic advancement of societies. Therefore, it is important to inculcate scientific point of view in the general population, so that youngsters embrace science education and decide to pursue scientific careers. It can be possible by using innovative teaching methodologies at school level. The effective teaching can nurture the abilities of students and produce positive attitude.

Physics is considered the most complicated subjects not only by the students but also by the teachers, when we look at the complications of teaching learning process. The studies have revealed that students are taking less interest and attention in choosing science. Massive research has been conducted in order to find out ways to achieve excellence in science education and to increase number of admissions in science classes. Students' attitude is one of the main influencing factors for science learning. Student's participation in science courses and science related profession can be enhanced by their positive attitude towards science (George, 2006). Most of the students show less importance towards science lectures that is why they do not choose science subjects especially physics. Students face difficulties for understanding concepts of physics (Alebiosu, & Michael, 2011). Therefore, carefully planned and conducted inquiry base teaching instructions can yield positive effect on the students learning environment and improve the science scores (Wolf and Fraser, 2008). During laboratory experiments, students explore a huge range of materials and discuss the scientific concepts more deeply as compared to their peers from non-enquiry classes (Ofsted, 2008). He further state that the process of planning, conducting, recording and evaluating student's investigations is a way to explore student's enthusiastic learning by the support of their teachers. Scientific attitudes are either a combination of a number of mental habits or predispositions to attend new or problematic situations (Gauld, & Hukins, 2002). The scientific aptitude express behavior of the learner for science learning. Ineffective science teaching and putting less interest towards practical activities make science learning not only less interesting but also less long lasting (Nzewi, 2008). Expanding scientific attitude among students, practical experiences must be provided (Amaral, Garrison, & Klentschy, 2002).

Research shows positive impact of effective teaching on student achievements (Aina et al, 2015). In terms of physics, students might comprehend the subject as difficult and instructions might be considered as challenging. Cimer (2007) identified effective teachers as the ones who successfully achieve the learning objectives of students as set by themselves before the class. Hipkins et al. (2002) state that teaching science and physics is effective when students' existing ideas, values, and beliefs, which they bring to a lesson, are elicited, addressed and linked to their classroom experiences at the beginning of a teaching program. Educational documents have discussed such roles of science teachers that will strengthen the teaching effectiveness of the teachers. Though the documents have highlighted science teachings and learning differently at all educational levels.

Scientific attitude is the need of today's society for peaceful and meaningful living of every person in a multicultural world (Singh, et al., 2016). Scientific attitude as mind habit guide predisposition to act and think in particular way when facing scenario of problem solving (Trempp, 2013). Kozlov and Nay (1976) labeled the attitude components as the cognitive, intent and action. The component of cognitive reflects student's understanding of the manner in which attitudes appear themselves in scientist professional behavior. The

component of intent reflects the student's tendency to show agreement or disagreement of behaviors which determine an attitude. Action component reflects extent to which the students show in the science classroom.

According to Zhao Weidong et al., (2009) an innovative teaching method, research-based teaching requires teachers to teach in a way, which is different from conventional teaching. It integrates scientific research into teaching, and further cultivates students' innovation and problem-solving abilities. In essence, teaching contents and modes are designed in research-based teaching by means of scientific research to help students absorb knowledge in an exploratory way. Research-based teaching can also well coordinate teachers' leading role and students' centrality in teaching (Lipeng Ma, 1999). Indeed, research-based teaching has many characteristics that distinguish it from conventional teaching methods. Students are required to be more initiative to attend class in research-based teaching. Students are to be absorbed in research topics. In doing so, students can master the in-depth knowledge and improve their abilities. Research-based teaching is also an exploratory learning, which inspires students to solve problems with their knowledge and skills. Such a problem solving method fosters students' emanative, dialectic and groping thinking, which are vital to train their innovative abilities.

Research-based teaching is one of the crystallized forms thereof: together with research-engaged teaching, research intensive learning, inquiry-based learning, and students as researchers' pedagogy (Aditomo et al., 2013 & Kinkead, 2003). Educational sciences provide various scientific motivations for research-based teaching.

Research base teaching has been widely recognized and accepted by more colleges. It is teaching through meaningful and real hands-on experiences in research. Students have a role as researchers and ask complex questions, search for answers by doing research, and report about their research journey. This innovative teaching approach is based on the philosophy of constructivism that includes four aspects: learning that build student understanding, learning by developing prior knowledge, learning is a process of social interaction and meaningful learning is achieved through real experience. Research-based teaching blends authentic learning, problem-solving, cooperative learning, and contextual inquiry discovery approach that is guided by the philosophy of constructivism. In implementation, students are trained to be able to solve the problem with research which is based on the fact that they have encountered. Research base teaching (RBT) provides an opportunity for students to find information, develop hypotheses, collect data, analyze data, and make conclusions based on compiled data. Students trained to apply the scientific method, draw up a report and present it in public.

Recent decades have seen large expenditures of time and money on research and development related to the improvement of introductory, college-level science, technology, engineering, and mathematics (STEM) courses. Significant empirical research has shown

that student learning can be substantially improved when instructors move from traditional, transmission-style instruction to more student-centered, interactive instruction (Handelsman, 2004).

A good amount of work has been done on research based teaching in the different countries of the world (Firdaus and Darmadi, 2017; Broek, 2012, Huet 2007, Weidong, Haifeng and Anuha, 2009, Dekker & Wolff, 2016). It has also been revealed that studies relating to the various pedagogies / instructional strategies like inquiry based (Hussain, Azeem & Shakoor, 2011), problem solving (Malik 2010), computer-assisted instructions (Suleman et al, 2007), ICT (Khurshid, Shah & Reid, 2016), low cost material (Khitab et al, 2015) helps in improving students' academic achievement.

RESEARCH QUESTION

1. What is the difference in attitude towards Physics among secondary school students while teaching Physics to grade 10th through research based teaching method (RBTM)?

RESEARCH HYPOTHESES

- H₀₁: There was no significant difference in attitude towards Physics among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).
- H₀₂: There was no significant difference in attitude towards Physics (interest) among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).
- H₀₃: There was no significant difference in attitude towards Physics (amusement) among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).
- H₀₄: There was no significant difference in attitude towards Physics (motivation) among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).
- H₀₅: There was no significant difference in attitude towards Physics (fearlessness) among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).

RESEARCH METHODOLOGY

Pre-test and post-test equivalent group experimental research design was used to find the difference in attitude towards Physics between male and female secondary school students while teaching Physics to 10th grade students. The students studying in 10th class in session ...2020-21 were the population of the study. The enrolment was 10495 in all the secondary

schools of district Haripur. Two schools i.e. Government Higher Secondary School Pind Hashim Khan and Government Girls High School No. 2 Haripur were randomly selected as sample for the experiment. Pre-test was conducted before start of the experiment. The students were taught selected topics from 10th class Physics book through research base teaching method. After completion of the experiment, post-test was conducted. The data was analyzed by applying descriptive statistics i.e. mean, standard deviation, and standard error of mean. Difference between variables was calculated through independent sample t-test.

RESULTS

H₀₁: There was no significant difference in attitude towards Physics among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).

Table: 1. significant difference in attitude towards Physics among secondary school students

Factor	Test	N	Mean	SD	SE Mean	t-value	p-value
Attitude	Pre-test	50	120.30	11.922	1.539	-3.884	0.000
	Post-test	50	128.77	11.957	1.544		

The table shows that mean value 120.30 standard deviation 11.922 of Pre-test while mean value 128.77 standard deviation 11.957 of Post-test of secondary school students. The t-value -3.518 with p-value .001 shows significant difference between Pre-test and Post-test of secondary school students while teaching Physics to 10th grade through Research Based Teaching Method (RBTM). The null hypothesis H₀₁: "There is no significant difference in attitude towards physics among secondary school students while teaching Physics to Grade 10th through Research Based Teaching Method (RBTM)" was rejected.

H₀₂: There was no significant difference in attitude towards Physics (interest) among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).

Table: 2. significant difference in attitude towards Physics (interest) among secondary school students

Factor	Test	N	Mean	SD	SE Mean	t-value	p-value
Interest	Pre-test	50	18.65	3.058	.395	-3.518	0.001

Post-test	50	20.52	2.746	.355
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The table shows that mean value 18.65 standard deviation 3.058 of Pre-test while mean value 20.22 standard deviation 2.746 of Post-test of secondary school students. The t-value -2.577 with p-value .011 shows the significant difference between Pre-test and Post-test of secondary school students while teaching Physics to 10th grade through Research Based Teaching Method (RBTM). The null hypothesis H₀₂: “There is no significant difference in attitude (Interest) towards physics among secondary school students while teaching Physics to Grade 10th through Research Based Teaching Method (RBTM)” was rejected.

H₀₃: There was no significant difference in attitude towards Physics (amusement) among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).

Table: 3. significant difference in attitude towards Physics (amusement) among secondary school students

Factor	Test	N	Mean	SD	SE Mean	t-value	p-value
Amusement	Pre-test	50	32.13	4.515	.583	-2.577	0.011
	Post-test	50	34.12	3.893	.503		

Table above shows that mean value 32.13 standard deviation 4.515 of Pre-test while mean value 34.12 standard deviation 3.893 of Post-test of secondary school students. The t-value -2.577 with p-value .011 shows the significant difference between Pre-test and Post-test of secondary school students while teaching Physics to 10th grade through Research Based Teaching Method (RBTM). The null hypothesis H₀₃: “There is no significant difference in attitude (Amusement) towards physics among secondary school students while teaching Physics to Grade 10th through Research Based Teaching Method (RBTM)” was rejected.

H₀₄: There was no significant difference in attitude towards Physics (motivation) among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).

Table: 4. Significant difference in attitude towards Physics (motivation) among secondary school students

Factor	Test	N	Mean	SD	SE Mean	t-value	p-value
Motivation	Pre-test	60	37.58	3.911	.505	-2.955	0.004
	Post-test	60	39.67	3.812	.492		

The table shows that mean value 37.58 standard deviation 3.911 of Pre-test while mean value 39.67 standard deviation 3.812 of Post-test of secondary school students. The t-value -2.955 with p-value .004 shows the significant difference between Pre-test and Post-test of secondary school students while teaching Physics to 10th grade through Research Based Teaching Method (RBTM). The null hypothesis H₀₄: "There is no significant difference in attitude (Motivation) towards physics among secondary school students while teaching Physics to Grade 10th through Research Based Teaching Method (RBTM)" was rejected.

H₀₅: There was no significant difference in attitude towards Physics (fearlessness) among secondary school students while teaching Physics to Grade 10th through research based teaching method (RBTM).

Table: 5. significant difference in attitude towards Physics (fearlessness) among secondary school students

Factor	Test	N	Mean	SD	SE Mean	t-value	p-value
Fearlessness	Pre-test	60	31.93	3.640	.470	-3.782	0.000
	Post-test	60	34.47	3.698	.477		

The table shows that mean value 31.93 standard deviation 3.640 of Pre-test while mean value 34.47 standard deviation 3.698 of Post-test of secondary school students. The t-value -3.782 with p-value .000 shows the significant difference between Pre-test and Post-test of secondary school students while teaching Physics to 10th grade through Research Based Teaching Method (RBTM). The null hypothesis H₀₅: "There is no significant difference in attitude (Fearlessness) towards physics among secondary school students while teaching Physics to Grade 10th through Research Based Teaching Method (RBTM)" was rejected.

FINDINGS AND DISCUSSIONS

The first hypothesis reveals significant difference between Pre-test and Post-test of secondary school students in attitude towards Physics while teaching Physics to 10th grade

through research based teaching method. Research-based teaching shapes the students' attitudes towards Physics as well as in all science subjects.

The second hypothesis show significant difference between Pre-test and Post-test of secondary school students interest towards Physics while teaching Physics to 10th grade through research based teaching method. Research-based teaching shapes the students' interest in Physics.

The third hypothesis reveals significant difference between Pre-test and Post-test of secondary school students in motivation towards Physics while teaching Physics to 10th grade through research based teaching method. Research-based teaching improves the motivation of students towards Physics as well as in science subjects.

The fourth hypothesis reflect significant difference between Pre-test and Post-test of secondary school students in attitudes towards Physics (amusement) while teaching Physics to 10th grade through research based teaching method. Research-based teaching shapes the students' interest in Physics.

The fifth hypothesis show significant difference between Pre-test and Post-test of secondary school students in attitude towards Physics (fearlessness) while teaching Physics to 10th grade through research based teaching method. Research-based teaching enhance the students' attitudes towards Physics as well as in all science subjects.

The research-based teaching develops the interest as well as motivation in students' attitudes towards Physics; particularly critical-mindedness, suspended judgment, respect for evidence, honesty, objectivity and questioning attitude as well as tolerance of uncertainty. These scientific attitudes vary according to every steps of learning activities. Preparation of scientific posters and research seminars contributes in shaping the scientific attitude comprising critical-mindedness, suspended judgment, respect for evidence, honesty, objectivity and questioning attitude, as well as tolerance of uncertainty. The result showed that students can achieve very good learning outcomes. The learning process also could be environmentally setting to accommodate the growing of positive attitudes of the students. The scientific attitudes that can be grown and developed in this research are responsibility, curiosity, critical thinking, honesty and cooperative. Besides it can grow and develop the scientific attitudes of the students, the using of this approach can help students to have good achievements in three aspects, cognitive, affective and psychomotor as well.

CONCLUSIONS

1. Post-test scores were better than pre-test scores in attitude towards Physics and its sub factors i.e. interest, motivation, amusement and fearlessness among secondary school students. These results lead to the conclusion that research based teaching method (RBTM) is a source of inculcating research oriented, creative, critical,

reasoning and practical capabilities in learners and producing positive impact on their attitudes.

2. Research-based teaching improves the interest of students towards Physics.
3. Motivation enhances the attitudes of students towards Physics through research-based teaching method.
4. Amusement helps in developing attitudes towards Physics among secondary school students.
5. Research-based teaching produces fearlessness in secondary school students for improving attitudes towards Physics.

RECOMMENDATIONS

1. This research may be further replicated on other science disciplines and in social sciences studies as well as at different grades level. Moreover, this endeavor has been made in the public sector institutes which may also be extended to private sector educational institutions of the country.
2. Use of ICT improves the interest of students towards Physics, hence it may be reflected in daily lesson plans.
3. Poster making helps motivating students' attitudes towards Physics, it may also exercise in routine teaching-learning activities.
4. Laboratory work, use of library and discussion in groups may be recommended for developing attitudes towards Physics (amusement).
5. Seminar presentation may be recommended in class activities for enhancing confidence and improving attitudes towards Physics.

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