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A Comparative Study of Academic Achievement in Physics among the Secondary Students of different States in Eastern Regional Part of India in Relation to their Science Teaching

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Abstract:

The present study aims to identify the impact of science teaching on the academic achievement scores in Physics among the secondary school students of different states in Eastern Regional Part of India. This observation endeavors in finding the significant difference of mean achievement scores in Physics between the secondary students of Eastern Regional Part(taking three states West Bengal, Odisha & Tripura jointly) of India and West Bengal, between Eastern Regional Part of India and Odisha, and also between Eastern Regional Part of India and Tripura. The author conducts the descriptive survey research design keeping in mind the objectives of the study. A quantitative methodology is used. A sample of 300 secondary students of class-IX promoted to class-X is randomly selected from six purposively selected secondary schools of each of the three states of Eastern Regional Part of India. A regional group of 300 students is formed taking 100 secondary students from each of the three states. A self constructed and standardized achievement test questionnaire of Physics is used as the tool for data collection. The collected data are analyzed using graphical representation, descriptive statistics and t – test for the justification of research questions and hypotheses of the study. Result reveals significant variation of impact of teaching science on the achievement scores in Physics at the secondary level of three states of study in Eastern Regional Part of India.

Keywords: **Teaching Science, Achievement, Physics, Secondary Students**

Introduction:

Physics is the branch of science that encompassing the fundamental concepts and scientific study of matter, motion, force, energy and various laws governing the universe. According to Albert Einstein Physics is the modern understanding of the fundamental Physics, his theories of general relativity and light describe the scientific nature of reality. Achuonye, 2014, focused on Physics which plays a vital role in developing ways of thinking, increase freedom among the students to choose a wider range of career, challenges, possibilities and various potentials. Science education and Physics study help the students to achieve the wholesome potentials in their study and work. So, it needs the suitable pedagogical application at all their level of education. For technological development of the country the knowledge and understanding of Physics is very much necessary.

Effective teaching is measured in classroom situation by the expected academic achievement (outcomes) of the students. There are several factors which influence science teaching including student characteristics, learning resources, learning environment, students' motivation towards learning, teaching strategies & methods, teachers' experience and qualifications. The variety of science teaching that has positive and significant influence towards the academic achievement of the students includes project-based and inquiry-based learning, hands-on-experiments, CAI, ABL method, collaborative learning and using various technological tools & resources. Teaching is very much challenging activity for the teachers and they try to their best for effective learning and learning outcomes (achievement) of the students. Besides the modern methods of teaching science there has been an impact of conventional (traditional) methods of teaching which includes lecture method, discussion and demonstration method , innovative method are very much practicable for science teaching. The practical –based and project – based teaching

methods hold the positive and significant impact on science teaching and learning process. Teaching methods are the primary elements of curriculum. Students centered teaching methods are provided by national curriculum.

Academic achievement is associated with the students' progress, development and their success in acquiring educational skills, knowledge, understanding and learning goals & objectives. It is measured by grades, scores of different tests and by different evaluation processes.

Various research studies showed a positive and significant impact of teaching science on the academic achievement in Physics at the secondary school level. So, it cannot be neglected that the quality and suitable methods of science teaching is an influential factor besides the other factors which play an important role towards the academic achievement of the students.

Review of Related Literatures:

A case study of **Shafqat Hussain (2011)** on "The Effect of Teaching Physics through project method on academic achievement of secondary students in the subject of Physics", published in Journal of Education and Practice showed that teaching Physics at the secondary level through project method was more effective as compared to traditional lecture method of teaching.

Ukozor, F.I., (2011), Department of Science Education, University of Nigeria, studied on the effect of constructivist teaching strategies on senior secondary students' achievement and self-efficacy in Physics. The result revealed that students taught with constructivist strategy performed better and secured higher mean scores compared to the students taught by traditional lecture method. The effect of constructivist teaching strategy was significantly better on students' self-efficacy scores but it was different between male and female students.

Khan, M., Dr. Muhammad, N., Islamabad, Pakistan, (2012) aimed to investigate the impact of activity-based teaching on the students' achievement in Physics at secondary level. The result of the study showed that the activity-based teaching method is more effective for the higher order skill development in the students.

Suleman, S., Dr. Hussain, I., et al.,(2017), Institute of Education & Research, Pakistan, aimed to establish the effects of computer – assisted instruction (CAI) on the academic achievement of secondary school students in the subject of Physics. The major findings of the study showed that the computer assisted instruction has a positive significant effect on students' academic achievement and retention in Physics.

Mbia, B.A., Nsungo, U.N., (2019), Nigeria, studied experimentally to determine the effect of innovative method of teaching on the academic performance in Physics of senior secondary school students in Akamkpa Local Government Area of Cross River State. The result of this study focused that the students taught with the peer tutoring, problem-based learning, cooperative method of learning and discovery learning methods achieve more significantly than those students taught with traditional method of teaching.

Statement of the Problems:

This study is conducted to establish the impact of science teaching on the achievement scores in Physics of the secondary students of three different states of Eastern Regional Part of India. It is also considered to find the difference in academic achievement scores in Physics (i) between the regional scores and the scores of West Bengal, (ii) between the regional scores and the scores of Odisha, and between the regional scores and the scores of Tripura. The review of literatures related to this study found no such studies has been conducted earlier. So, the authors have initiated to investigate the problem: **A Comparative Study of Academic Achievement in Physics among the Secondary Students of different States in Eastern Regional Part of India in Relation to their Science Teaching.**

Delimitation of the Study:

This study is delimited to consider the three states West Bengal, Odisha and Tripura from the Esatern Regional Part of India. One district from each of the three states is purposively selected for the study. The randomly selected secondary schools of each district of the selected states are affiliated by the State Board of Secondary Education.

Research Questions:

RQ_1: Do the achievement scores in Physics between the secondary students of Eastern Regional Part of India and West Bengal differ significantly?

RQ_2: Do the achievement scores in Physics between the secondary students of Eastern Regional Part of India and Odisha differ significantly?

RQ_3: Do the achievement scores in Physics between the secondary students of Eastern Regional Part of India and Tripura differ significantly?

Objectives of the Study:

1. To identify the impact of teaching science on the academic achievement scores in Physics of the secondary students of Eastern Regional part of India.
2. To find the significant difference in achievement scores in Physics of the secondary students between the Eastern Regional Part of India and West Bengal.
3. To find the significant difference in achievement scores in Physics of the secondary students between the Eastern Regional Part of India and Odisha.
4. To find the significant difference in achievement scores in Physics of the secondary students between the Eastern Regional Part of India and Tripura.

Hypotheses:

HO_1: There is no significant difference of means of achievement scores in Physics between the secondary students of Eastern Regional Part of India and the state of West Bengal.

HO_2: There is no significant difference of means of achievement scores in Physics between the secondary students of Eastern Regional Part of India and the state of Odisha.

HO_3: There is no significant difference of means of achievement scores in Physics between the secondary students of Eastern Regional Part of India and the state of Tripura.

Methodology:

This study is conducted by descriptive survey method. The secondary students of class-IX promoted to class-X of Howrah district in West Bengal, Balasore district in Odisha, and West Tripura district in Tripura state are considered as the population of this study. A sample of 300 secondary students is randomly selected from each of the three districts of study from six purposively chosen schools of each of the three districts. A group of 300 students of Eastern Regional Part of India is formed by randomly taken together 100 students from each of the three states West Bengal, Odisha, and Tripura. Self constructed and standardized Physics achievement Test of questionnaire is used as the tool of this study. The methodology of teaching science at the secondary level is considered as the independent variable while the achievement test questionnaire in Physics is considered as the dependent variable of the study. The achievement test questionnaire is applied to the sample participants with the prior permission of school authorities. The collected data are analyzed by using descriptive statistics, Bar graphs, Paired-Ogive and t-test.

Data Presentation and Analysis:

Descriptive Statistics of achievement scores in Physics (state wise)
Table: 1

States	Sample size(N)	Mean(M)	Median	Standard Deviation (S.D)	Skewness (Sk)	Kurtosis (Ku)
West Bengal	300	9.02	8.16	3.50	0.22	0.257
Odisha	300	8.04	8.00	3.46	0.12	0.291
Tripura	300	8.32	7.04	2.94	1.31	0.251
Regional	300	9.32	9.17	3.34	0.13	0.247

Graphical representation of comparison of means of academic achievement in Physics of three states with the mean of regional scores in Physics

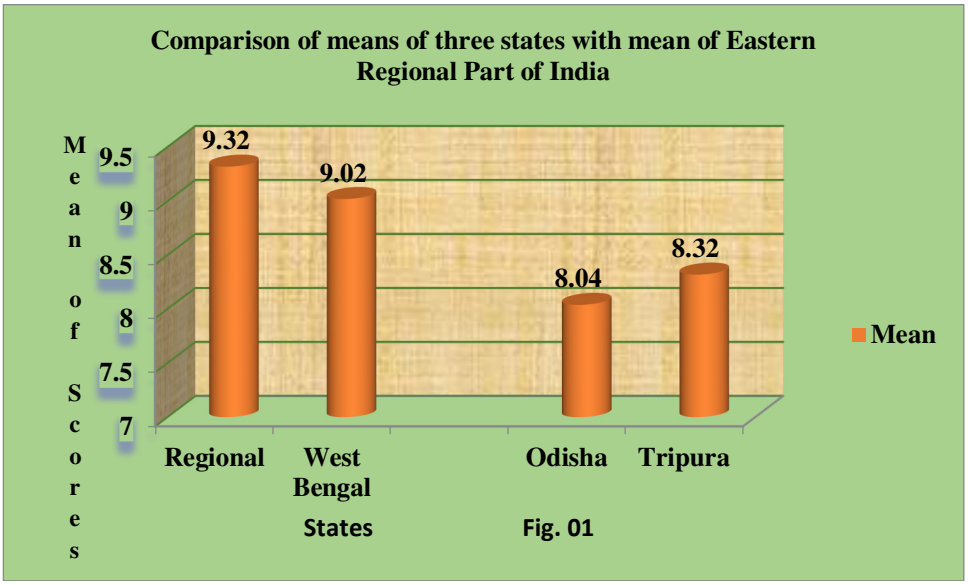

Fig. 01

Figuare : 01 shows that the mean of achievement scores in Physics of West Bengal is very much nearer to the mean scores in Physics of the secondary students of the Eastern Regional Part(three states taken jointly) of India. The means of scores in Physics of Odisha and Tripura are almost similar to each other but their mean value differ significantly with mean scores in Physics of the Eastern Regional Part (three states taken jointly) of India.

Graphical Representation (Paired-Ogive)

Table: 2

Scores	Regional		West Bengal		Odisha		Tripura	
	f	Cum. %f	f	Cum. %f	f	Cum. %f	f	Cum. %f
0 – 2	00	4.2	6	5.8	5	9.2	01	4.01
3 – 5	38	18.2	40	21.9	73	28.6	34	23.8
6 – 8	88	43.2	99	46.2	96	54.6	143	52.8
9 – 11	99	70.4	80	72.1	65	79.1	84	81.2
12 – 14	58	89.7	54	88.9	60	93.1	29	94.8
15 – 17	16	98.0	17	97.2	01	99.9	09	99.0
18 - 20	01	99.9	04	99.6	00	100	00	100

Comparison of Ogive on the scores in Physics Test of regional, West Bengal, Odisha & Tripura

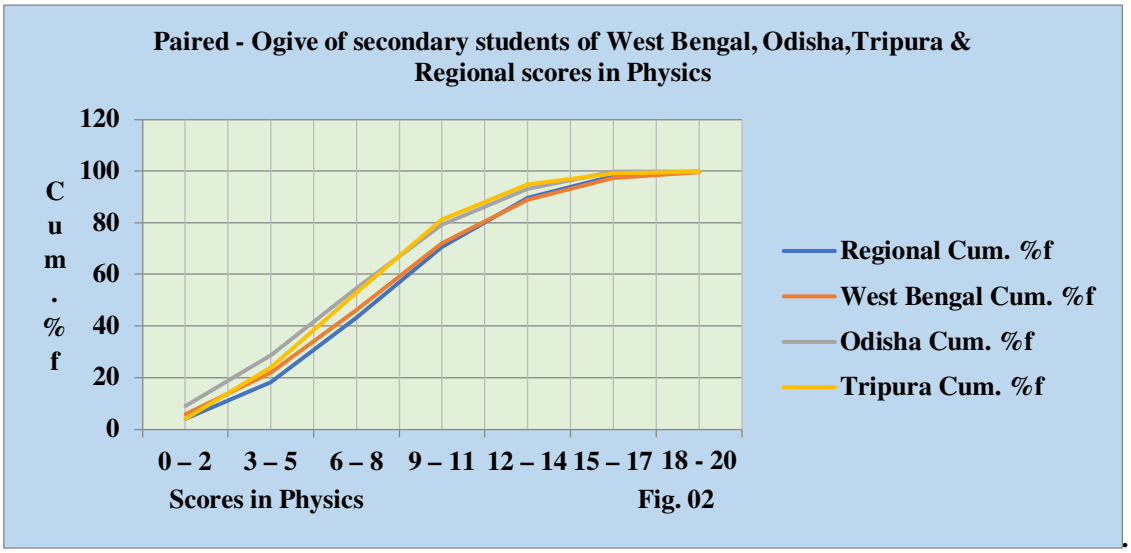

Fig. 02

Figure: 02 of paired Ogives of the secondary students' academic achievement scores in Physics show no significant difference in scores of Physics between West Bengal and Eastern Regional Part (three states taken jointly) of India. The Ogives of Odisha and Tripura show almost similar but these two Ogives differ significantly from the Ogive of Easter Regional Part(three states taken jointly) of India.

Statistical analysis by t – test:

Significance of difference of means between the Eastern Region Part of India and West Bengal groups of secondary students on the scores in Physics Test:

Table: 3

(t – test for Hypothesis No: 1)

Group	N	df	M	Mean Difference	SD	SE_D	t	Significance at 0.05 level	P	S / NS
A	300		9.32		3.34				o.2850	P >

B	300	598	9.02	0.30	3.50	0.28	1.07	1.96		0.05 NS

Group – A: Regional Part, N: Sample size, M: Mean, SD: Standard Deviation. SD_E: Standard Error, t – calculated t – value, df: Degree of Freedom

Group – B: West Bengal, P: Probability, S: Significant, NS: Not Significant

Result of Table: 3 shows that there is no significant difference between the secondary students of Eastern Regional part of India and the state of West Bengal in Physics test scores. So, the Hypothesis **HO_1** is retained.

Significance of difference of means between the Eastern Regional Part of India and Odisha groups of secondary students on the scores in Physics Test:

Table: 4

(t - test for Hypothesis No: 2)

Group	N	df	M	Mean Difference	SD	SE_D	t	Significance at 0.05 level	P	S / NS
A	300	598	9.32	1.28	3.34	0.28	4.57	1.96	< 0.00001	P <0.05 S
C	300		8.04		3.46					

Group C: Odisha

Result of Table: 4 shows that there is significant difference between the secondary students of Eastern Regional part of India and the state of Odisha in Physics test scores. So, the Hypothesis **HO_2** is rejected and hence the Physics test scores of Odisha differ significantly with Physics scores of Eastern Regional Part of India.

Significance of difference of means between the Eastern Regional Part of India and Tripura groups of secondary students on the scores in Physics Test:

Table: 5

(t - test for Hypothesis No: 3)

Group	N	df	M	Mean Difference	SD	SE_D	t	Significance at 0.05 level	P	S / NS
A	300	598	9.32	1.00	3.34	0.26	3.85	1.96	0.000131	P <0.05 S
D	300		8.32		2.94					

Group D: Tripura

Result of Table: 5 shows that there is significant difference between the secondary students of Eastern Regional part of India and the state of Tripura in Physics test scores. So, the Hypothesis **HO_3** is rejected and hence the Physics test scores of Tripura differ significantly with Physics scores of Eastern Regional Part of India

Interpretation of result of t – test(s):

From the result of Table: 3, 4 and 5 it is interpreted that the academic achievement scores in Physics of the secondary students of West Bengal does not differ significantly with the Physics test scores of the Eastern Regional Part (three states taken jointly) of India. On the other hand, the academic achievement scores in Physics of the secondary students of Odisha and Tripura differ significantly with the Physics test scores of Eastern Regional Part (three states taken jointly) of India.

Major Findings:

- A significant impact of teaching science focuses on the achievement scores in Physics at the secondary level of three states of study in Eastern Regional Part of India.
- The mean achievement scores in Physics do not differ significantly between the secondary students of Eastern Regional Part of India and West Bengal.
- The mean achievement scores in Physics differ significantly between the secondary students of Eastern Regional Part of India and Odisha.
- The mean achievement scores in Physics differ significantly between the secondary students of Eastern Regional Part of India and Tripura.

Summary and Conclusion:

Each of the three districts of each states of Eastern Regional Part of India follows more or less similar type of methodology for science teaching at the secondary level. All of the state uses mainly the traditional method of teaching science. In West Bengal there is no provision for practical study but project preparation is strictly followed. In Odisha there is no provision for both the practical study as well as project preparation at the secondary level during the time of investigation. In Tripura practical Study is followed but there is no provision for project preparation by the secondary students.

The Bar graphs and the paired- Ogive exhibit that achievement mean scores in Physics do not differ significantly between Eastern Regional Part of India and West Bengal. The achievement means scores between Odisha and Tripura are almost similar but, the achievement means scores between Eastern Regional Part of India and Odisha as well as the achievement means scores in Physics between the Eastern Regional Part of India and Tripura differ significantly. The result of t – test also show the similar type of observations.

So, it may be concluded that the teaching science has positive and significant impact towards the academic achievement in Physics among the secondary students of different states in Easter Regional Part of India.

Recommendation:

It is recommended following the findings of the present study that all the concerned authorities and specially the teachers should implement the suitable methods of teaching science at the secondary school level for achieving their desired level of learning outcomes.

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