Teaching of Science and Mathematics in High and Low Performing Secondary Schools

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Abstract:

The present paper examines Teaching of Science and Mathematics in High and Low Performing Secondary schools. 200 students (100 boys and 100 girls) were selected randomly from 10 high performing schools and 200 students (100 boys and 100 girls) were selected randomly from 10 low performing schools. All the science and mathematics teachers working in 10 high performing and 10 low performing schools, served as sample for the present study. Also 20 teacher educators, working in different colleges of educations and teaching science and mathematics served as a sample for the present study. The result revealed that there is a significant difference between High and Low performing secondary schools on various parameters.

Keywords: *Low Performing Secondary Schools, Mathematics, Science*

I. INTRODUCTION

Research word is a combination of two words, re and searches where re means again and search means to find. So research means to make an enquiry of old knowledge in the light of present knowledge to make it useful for the future. Research and scientific enquiry both are generally considered as synonymous. The only difference between the two words is that it is possible to employ scientific methods without research but it is not possible to conduct any research without employing scientific enquiry. Thus research is a more specialized form of scientific enquiry which is result of thinking process. Research is a systematic process for developing a theory by applying scientific methods. It is an impartial, objective, empirical and logical analyses and recording of controlled observation that will finally lead to the development of a theory, principals, laws etc. and will help us to predict about the phenomenon in future.

II. STATEMENT OF THE PROBLEM

The problem under investigation reads as under ,"Teaching of Science and Mathematics in High and Low Performing Secondary Schools."

III. OBJECTIVES OF THE STUDY

*   To identify high and low performing schools.
*   To compare, high and low performing school on various parameters

IV. HYPOTHESIS OF THE STUDY

In order to carry out the present Study, the investigator develops the following hypothesis.

*   High and Low performing schools differ significantly on various parameters

*   The opinion of science and mathematics teachers regarding various aspects of science and mathematics teaching differ in two categories of schools.

V. REVIEW OF RELATED LITERATURE

Jenkins, Edgar 2006)

"Student Opinion in England about Science and Technology"

The present paper draws upon the project to explore what the students, almost all in their penultimate year of compulsory schooling, think about science and technology. It suggests that several basic research questions need to be addressed and answered if the present widespread decline in the industrialised world in the popularity of the physical sciences as subjects of advanced study is to be halted.

Poonam Chauhan(2002)

Helping the underachievers in Science

This paper is an attempt to throw light on the aspects how we can help the underachievers. If country like India, has to keep pace with the other developed Countries of the World. If has to strengthen in scientific & technological knowledge and skills. At the same time special emphases is to be given to human resource development. It is at the school stage that the foundation for advance learning in all fields is laid. The underachievers in Science should be identified as early as possible and special treatment should be given accordingly. The role of teachers and parents is very important in this context.

D Nelson (2006)

Logic and National Curriculum School of Education.

This paper reviews the historic relation between logic and the mathematics curriculum. A list of logical elements for

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modernschool mathematics is proposed. The current National Curriculumis checked against this list and found to be deficient, especiallyin relation to the development of the ideas of proof. Argumentsfor reform are presented.

Jabeen , Samia(1995)

Effect of problem solving and traditional methods of teaching mathematics on creativity (A comparative Study)

The study was conducted with the objective to find out whether traditional approach or problem solving approach of teaching mathematics is significant with respect to the development of creativity among the learners . The design of the study was experimental and it was carried on a sample of 100 students . For measuring creativity Baquer Mehdi test of creativity was employed . The study revealed that problem solving approach is significantly better than the traditional approach with respect to the development f creativity among learners .

VI. METHODOLOGY AND PROCEDURE

Methodology

For the collection of data, the investigator, relied on self-constructed tools.

A. Checklist was framed on 8 parameters
   #Teacher
   #Methodology of teaching
   #Text and other reference material
   #Teaching aids
   #Library
   #Information of communication technology
   #Laboratory
   #Method of internal assessment
   #Attendance and time table allocation

B. Opinionnaire – I (Teacher educators)

C. Opinionnaire – II (Science teachers)

D. Opinionnaire – III (Math teachers)

The three Opinionnaire were framed on presage, process and product dimensions)

E. Interview

F. Observation (classroom observation)

G. Scientific temper scale

VII. SAMPLE

High and low performing schools were identified on the basis of the result of matriculation examination conducted by board of school examination

High performing Schools:- The schools showing the result in science and mathematics in the range of 75-100%

Low performing Schools :- The schools showing the result in science and mathematics in the range of 25-40%

For the selection of **sample**, 200 students (100 boys and 100 girls) were selected randomly from 10 high performing schools and 200 students (100 boys and 100 girls) were selected randomly from 10 low performing schools. All the science and mathematics teachers working in 10 high performing and 10 low performing schools, served as sample for the present study.

Also 20 teacher educators, working in different colleges of educations and teaching science and mathematics served as a sample for the present study.

VIII. ANALYSIS AND INTERPRETATION OF DATA

Analysis of data means studying the tabulated material in order to determine inherent facts meanings. It involves breaking down the existing complex factors into simpler parts and putting the parts together in new arrangements for purpose of interpretation.

In order to achieve the objectives, formulated for the present study, the data collected was statistically analyzed using % statistics and t test.

Table – 4: Table Showing the Demography of Science and Mathematics Teachers

Characteristics		High performing Schools (N=10)				Low performing Schools (N=10)			
		Science		Mathematics		Science		Mathematics	
		Freq.	%	Freq.	%	Freq.	%	Freq.	%
Gender	Male	10	40	6	60	9	45	3	43
	Female	15	60	4	40	11	55	4	57
Age	20-24	3	12	2	20	--	--	--	--
	25-35	15	60	5	50	2	10	1	14
	36-45	5	20	3	30	12	60	5	72
	46-55	2	8	--	--	3	15	1	14
	Abov	--	--	--	--	3	15	--	--
Education Qualification	Graduate	15	60	6	60	13	65	5	71
	Post-	8	32	4	40	6	30	2	29
	M. Phil.	2	8	--	--	1	5	--	--
	Ph. D.	--	--	--	--	--	--	--	--
	B. Ed.	12	48	5	50	11	55	3	43
Experience	1-3 Yrs.	7	28	3	30	--	--	--	--
	4-6 Yrs.	10	40	7	70	2	10	2	29
	Above 6	8	32	--	--	18	90	5	71

Table 4 reveals the following information:

High Performing Schools – Science

In the 10 high performing schools 25 teachers were identified who teach science to the students. Out of 25 teachers 40% are male and 60% are females. 12% fall in the age range of 20-24 years, 60% fall in the age range of 25-35 years, 20% fall in the age range of 36-45 years, 8% fall in the age range of 46-55 years. Regarding educational qualification 60% of the teachers are graduate, 32% are post-graduate, 8% are M. Phil. 48% of the teachers are trained with B. Ed. Degree. Regarding experience 28% of the teachers have 1-3 years teaching experience, 40% have 4-6 years teaching experience and 32% have more than 6 years teaching experience.

Low Performing Schools – Science

In the 10 low performing schools 20 teachers were identified who teach science to the students. Out of 20 teachers 45% are male teachers and 55% are females teachers. Regarding age 10% of the teachers fall in the age range of 25-35 years, 60% fall in the age range of 36-45 years, 15% fall in the age range of 46-55 years and 15% fall in the age range of more than 55 years. Regarding educational qualification 65% of the teachers are graduate, 30% are post-graduate, 5% are M. Phil. 55% of the teachers are trained with B. Ed. Degree. Regarding experience 10% of the teachers have 4-6 years teaching experience and 90% of the teachers are having more than 6 years teaching experience.

High Performing Schools – Math

In the 10 high performing schools 10 teachers were identified who teach mathematics to the students. Out of these 10 teachers 60% are male and 40% are females teachers. Regarding age 20% of the teachers fall in the age range of 20-24 years, 50% of the teachers fall in the age range of 25-35 years, 30% fall in age range of 36-45 years. Regarding educational qualification 60% of the teachers are graduate, 40% are post-graduate and 50% teachers are trained with B. Ed. Degree. Regarding experience 30% of the teachers are having 1-3 years teaching experience and 70% of the teachers are having 4-6 years teaching experience.

Low Performing Schools – Math

In the 10 low performing schools, 7 teachers were identified who teach mathematics to the students. Out of 7 teachers 43% of the teachers are male and 57% are females teachers. Regarding age 14% of the teachers fall in the age range of 25-35 years, 72% of the teachers fall in the age range of 36-45 years, 14% of the teachers fall in age range of 46-55 years. Regarding educational qualification 71% of the teachers are graduate, 29% are post-graduate and 43% of the teachers are trained with B. Ed. Degree. Regarding experience 29% of the teachers are having 4-6 years teaching experience and 71% of the teachers are having more than 6 years teaching experience.

Table-5: Table Showing the Methodology of Teaching Employed in Science in High and Low Performing Schools

Methodology/Strategy	High performing schools (N=10) Number of teachers = 25		Low performing schools (N=10) Number of teachers = 20	
	Frequency	%	Frequency	%
Lecture method	25	100	20	100
Lecture-cum-demonstration	15	60	5	25
Text based approach	25	100	20	100
Project work	10	40	--	--
Non-formal activities science exhibitions, education tours)	15	60	10	50

The above table reveals the following information

High Performing Schools – Science

The investigator observed the science lessons delivered by the science teachers in high performing schools and found that 100% of the teachers employ lecture methodology, 60% teachers employ lecture-cum-demonstration methodology, 100% teachers use science text books in imparting instructions, 40% of teachers involve their students in project work, and 60% of teachers were found to have organized visit to science exhibitions, museums, educational tours.

Low Performing Schools – Science

The investigator observed the science lessons delivered by the science teachers in low performing schools and found that 100% of teachers employ lecture methodology, 25% teachers employ lecture-cum-demonstration methodology, 100% teachers used text books in imparting instructions, and 50% teachers organized educational tours.

IX. CONCLUSION

The study confirmed the following results

1. High performing schools are better equipped in terms on number of science and mathematics teachers than low performing schools. There is a dearth of physical science and mathematics teachers in low performing schools.

2. Majority of the teachers in high performing schools fall in age range of 25-35 years while in low performing schools, it is 36-45 years.

3. Teachers working in low performing schools and teaching science and mathematics are more experienced in terms of length of service than teachers working in high performing schools.

4. In science teaching, lecture method and text based approach is used by all the teachers working in high and low performing schools. In addition to it, teachers working in high performing school also experiment with some innovative methodologies like involving students in group projects, performing demonstrations, no such activity was seen in low performing schools.

5. High performing schools have excellent science instructional facilities than low performing schools. Science teachers working in high performing schools perceived the use of such material to a high extent by students, while science teachers working in low performing school had a poor perception in this regard.

X. IMPLICATIONS

1. The result of the present investigation have very significant value in the field of science and mathematics teaching. Present study has a number of implications, which if properly appreciated, can go a long way in bringing renaissance in science and mathematics education.

2. A knowledge repository be created in the faculty of education which will serve as a node, and through cluster school networking system the latest reports like "National curriculum framework for school education 2005" available on NCERT website and online books etc. be forwarded to the concerned schools.

3. Orientation/workshop be conducted for science /mathematics teachers for their professional enrichment and sensitization on recent development in science and mathematics education.

4. Students be encouraged to participate in non formal science activities like organizing science clubs, science fairs, visit to museums for inculcation of scientific temper.

5. Reliable and valid tools be constructed for assessing scientific attitude, logical reasoning skill and basic understanding of science process and skills among the students.

6. There is a need to prepare intervention strategies for underachievers in science and mathematics.

XI. SUGGESTIONS

1. The present study may be extended to study socio-economic status, achievement motivation, self esteem of boys and girls studying in that and low performing schools.

2. A logic reasoning test may be constructed and standardized to assess the mathematics teaching in terms of building up of logic reasoning skills among the students

3. A study may be conducted on the causes of failure in science and mathematics at high school level.

4. A standardized test of science processes and skills (form A & form B) may be constructed to study the understanding of science processes of science teachers and students.

5. Problems in the implementation of new national curriculum framework 2005 in the state be critically studied.

6. An investigation may be conducted into the effectiveness of microteaching on the development of psychomotor skills in phy/chem./bio practicals.

7. Content analysis of Board Examination papers and text books be conducted .

8. A major concern is the gradual decline of practical work and experimentation in secondary schools which need to be studies .

9. Research should be conducted on ways of testing multiple abilities other than formal scholastic competence.

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