ACHIEVEMENT IN PHYSICS, WITH SPECIAL REFERENCE TO SECONDARY SCHOOL STUDENTS

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Abstract

Achievement has become an index of the future of child in the present system of education throughout the world. A great many students may appear not to give themselves credit commensurate with their known or rated abilities. Many time it has been observed that students of average abilities excel. Such baffling facts, that in spite of similar educational facilities, environment, aspiration and even intelligence, academic-achievement of the students tempts on to attempt systematic analysis of this phenomenon differ from one another. Academic achievement is the core of educational growth. It has a great importance in the life of a child. Success in academic subjects act as stimulant and any damage done to the child at home or in neighbourhood may be partially repaired by success in the school.

In the paper an effort is carried out regarding academic achievement and various factors related to achievement in Physics with special reference to secondary school students.

In school, great stress is late on academic achievement. It is in fact a very important factor, in a life of a student in this competitive world. Academic achievement refers to the achievement of the students in different school subjects. It is generally tested through examinations conducted by the school itself or by some external agency especially constituted for conducting public examinations. The marks secured by the students are regarded to as the index of their academic achievement.

In recent past, it has been realised that number of failures is increasing, especially if public examination results of various boards are reviewed. The large incidence of failure in Secondary School examination has been a great concern not only to parents but also to the educators as the marks obtained by the students in different examination has assumed greater importance for their future career.

Keywords : Achievement, Socio-economic status, study-habits, aptitude, laboratory facilities and achievement-motivation.

INTRODUCTION

Academic achievement is the core of educational growth. It has a great importance in child‟s life. Success in academic subjects act as stimulant and any damage done to the child in home or neighbourhood may be partially repaired by success in school. High achievement in school creates self-esteem and self-confidence in the child. These lead to better adjustment in society. Attainment of success in school subjects helps children to set high goals for themselves.

Swami Vivekananda says, “Man is potentially divine. The goal is to manifest this potentiality with in, by controlling nature – external and internal, through education.”

The trend of increasing importance of academic achievement, has given the logical ground to researchers to shift their focus to wider sets of factors consisting of school/college environment, home quality and students‟ personal characteristics in their search for a model to explain the success phenomena at college.

Academic achievement has become an index of child‟s future in this highly competitive world. A great many students may appear not to give themselves credit commensurate with their known or rated abilities. Many times, students of average abilities excel. Such baffling facts, that in spite of similar educational facilities, environment, aspiration and even intelligence, academic achievement of the students tempts one to attempt systematic analysis of this phenomenon differ from one another.

Educationists, teachers, guardians and public men at large are worried about present system of education. They want some change in the prevailing process of teaching learning in schools and in assessment of pupil progress. Whereas relating the content of education to practical problems of life, environment, interest and aptitude of the students is a very important aspect, on the same time evaluation and measurement of achievement to know how far the goals have been met, is also of paramount importance.

Achievement differs from subject to subject. There are cases when for the same student level of achievement to high in one subject and low in the other. This may be due to factors influencing this achievement, which vary in their importance as contributing factors.

After independence, more emphasis has been laid on study of sciences at secondary level. Infact, for entering two important professions viz. Medical and Engineering, Chemistry, Mathematics, Physics, Zoology and Botany are subjects used for competitive entrance examinations. Incidentally, Physics happens to be common subject for medical as well as engineering courses. May be this is the reason, why Physics as a subject has attained singular importance for these students. Achievement in Physics like other subject has certain contributing factors. Therefore, it seems worthwhile to take up a detailed study of achievement in Physics alongwith various factors influencing the achievement in general and Physics as particular.

The present study was, therefore, designed to fulfil these needs. It aimed at identifying different variables including demographic ones having relationship with academic achievement. Also through appropriate statistical techniques an attempt was made to work out the relative importance of the different variables as contributing factors for achievement in Physics.

Assessment of achievement in Physics using some objective tool was the first problem faced by the researcher. Though some standardized achievement tests are available in Physics, they hardly are of any utility as courses in Physics are continuously changing and new contents are being added. Thus, construction of a new objective test and its standardisation was needed that covered the total course and was really useful for the students.

STATEMENT OF THE PROBLEM

The present study entitled – "***A study of factors related to achievement in Physics, with special reference to secondary school students in the city of Lucknow***", is designed to assess the relationship between achievement in Physics of Intermediate students with factors like sex, age, caste, family type, birth-order, intelligence, socio-economic status, scientific aptitude, achievement-motivation, attitude towards the subject Physics, study-habits and assessment of relative importance of these factors as contributors for achievement in Physics.

OBJECTIVES OF THE STUDY

General Objectives :

The present investigation aims at studying the level of achievement in Physics among secondary school students. It also aims to collect information about their sex, age, caste, birth-order, family type, socio-economic status, intelligence, scientific aptitude, achievementmotivation, attitude towards the subject Physics and study-habits using appropriate tests.

Specific Objectives :

Specific objectives of the study were as follows :

1. To construct an achievement test in Physics to assess achievement in Physics.
2. To study the relationship of achievement in Physics with some demographic factors like sex, age, caste, birth-order and family type.
3. To study the association of achievement in Physics with some social-psychological factors including : socio-economic status, intelligence, scientific aptitude, achievement-motivation, attitude towards the subject Physics and study-habits.
4. To assess the relative contribution of social-psychological factors to explain the variance of achievement in Physics.
5. To assess the existing facilities of the institutions (like laboratory and library) and to relate these factors with the achievement in Physics.

DELIMITATIONS OF THE STUDY

In spite of all care and best efforts of the investigator in the planning and execution of the study, it is rather impossible to investigate the problem in the most desirable manner

covering all its aspects. The investigator, therefore, has to delimit the research project and to be aware of this fact while generalizing the findings. These delimitations generally cover selection of the problem and variables, formulation of hypotheses, selection of sample and tools, collection of data, analysis of data and interpretation of results. Keeping in mind these factors, certain compromises at different stages of the investigation have been made and all results are to be seen in the light of these delimitations. The delimitations of the study are as follows :

- The sample used in the study is limited, as it is restricted to a population of Class XII of Intermediate colleges of Lucknow City only having 315 students drawn from nine institutions recognised by U.P. Board.
- The tool for the assessment of the achievement in Physics is developed by the investigator. Though attempt has been made for proper item selection, try out, estimation of reliability and validity of the tool, detailed norms still remain to be prepared.
- The socio-economic status scale has income as one of the components, assessment of which is difficult, if not impossible, as people do not disclose easily their correct income and children are hardly aware of exact income of their father/guardian.
- For assessment of intelligence Raven‟s Progressive Matrices Test, which is nonverbal test is used. Thus, the verbal part of intelligence has been left untapped. Even for Raven‟s non-availability of latest Indian norms has forced the researcher to use only raw scores for calculations.
- Attitude towards the subject Physics has been assessed using a scale developed by the researcher for which only reliability could be calculated.
- Collection of data in two sittings may be one more delimitation as a number of students are present only is one of the two sessions. Though a third visit is made to cover such students, some dropouts still remain beyond reach of the investigator and have been dropped from the study.

- It is desirable that the researcher reaches first hand or original sources for the study, but as access to some material was not possible, material taken from available secondary sources, has been used.

REVIEW OF THE RELATED LITERATURE

The detailed survey of the work done covers relationship of various variables, viz., age, sex, birth-order, family type, caste, socio-economic status, intelligence, scientific aptitude, achievement-motivation, attitude towards the subject and study-habits with the academic achievement. And it has been found that the variable like, family type, intelligence, study-habits and attitude towards the subject have a definite positive relationship with the academic achievement while sex, caste, birth-order, socio-economic status, scientific aptitude and achievement-motivation have provided conflicting results with the academic achievement through various studies carried out time to time by different research scholars. The different studies cover achievement areas other than the subject of Physics. Therefore, it seemed worthwhile to include these variables in the present study.

HYPOTHESES

Keeping in view the literature available on the relationship of various variables with academic achievement following hypotheses were postulated.

These hypotheses are divided into following two sections :-

(1) Achievement in Physics among adolescents using categorized data of demographic factors : sex, caste, family size and birth-order.

(2) Achievement in Physics as a dependent variable with independent variables : Age, socio-economic status, intelligence, scientific aptitude, achievement – motivation, attitude towards the subject Physics, and study-habits.

Section - I

Achievement in Physics and Demographic Variables (Sex, Caste, Birth-Order and Family-Type) :

1.1 There is no difference in the achievement in Physics of boys and girls.

1.2 There is no difference in the achievement in Physics among different caste categories (caste category – 1, caste category – 2 and caste category – 3).

1.3 There is no relationship between birth-order and achievement in Physics among different sample groups.

1.4 There is no relationship between the family-type and achievement in Physics.

Section - II

Association between Achievement in Physics and Various Independent Variables :

2.1 There is no association between age and achievement in Physics.

2.2 There is no association between socio-economic status and achievement in Physics.

2.3 There is no association between intelligence and achievement in Physics.

2.4 There is no association between scientific aptitude and achievement in Physics.

2.5 There is no association between achievement-motivation and achievement in Physics.

2.6 There is no association between attitude towards the subject Physics and achievement in Physics.

2.7 There is no association between study-habits and achievement in Physics.

Methodology of Investigation :

Method of research work is determined by the nature of the problem i.e. theory of the topics, objectives of the study, resources of investigator etc. This consideration led the investigator to use the ex-post-facto design, as the topic did not suit.

Sampling :

The population for the present study was defined as the male and female students of senior secondary level, situated in Lucknow city. The sample consisted of 315 boys and girl students of 9 secondary schools recognised by U.P. Board situated in the city. This sample was selected by using two stage stratified random sampling. First, the schools were taken. The schools were divided into three categories, on the basis of sex of students (boys and girls institutions), on the basis of management, viz., managed by Government, managed by private management but aided by Government and Municipal Corporation school and on the basis of the results, administration and facilities available in the school and they were categorized into „A", „B" and „C" categories of good, average and poor. Out of these three categories one „A" type, two „B" type and one „C" type schools were selected. To make the sample representative one co-educational privately governed school was also selected. Thus, in all 315 respondents drawn from nine institutions (schools) from the final sample for the study.

Tools :

In this study, the researcher has used following tools –

1. **Achievement in Physics –** a test developed by the investigator
2. **Socio-Economic Status (SES)–**a scale developed by B.Kuppuswamy (1962) (Urban)
3. **Intelligence – Standard Progressive Matrices (SPM) –** a Test developed by J.C. Raven (1983)
4. **Scientific Aptitude –** a scale prepared by Dr. A.K.P. Sinha and Dr. L.N.K. Sinha (1987)

5. **Achievement-Motivation –** a test developed by Dr. D. Gopal Rao (1974)
6. **Attitude towards the subject Physics –** a scale developed by the investigator
7. **Study-Habits –** a scale developed by Palsane and Sharma (1989)
8. To assess the existing institutional facilities (like laboratory and library), a proforma was prepared by the investigator.

Collection of Data :

The tests were administered on nine classes of Mathematics stream, one class from each school. In the first sitting general information was collected and Raven‟s Progressive Matrices test, Scientific Aptitude Test were administered. In the second sitting, the respondents completed Achievement-Motivation, Attitude Scale, Study-Habits and Achievement in Physics. Each student present on the day of data collection is included in the study. Respondents gave their answers on their respective answer-sheets after reading items from the test booklet. Thus, all the responses were recorded on the response sheet.

Analysis :

Various statistical techniques were applied in the analysis of data; Hypotheses covering demographic variables (sex, caste, birth-order and family type) were tested using tvalue. For association between dependent variable of achievement in Physics and other independent variables (age, socio-economic status, intelligence, scientific aptitude, achievement-motivation, attitude towards the subject Physics and study-habits), the data was fed to a computer system for analysis by feeding the same to a computer programme for computation of co-efficient of correlation „r‟. The hypotheses are tested in terms of significance of „r‟ values. The correlation matrix was further analysed using step-wise multiple regression analysis and R^2 changes were used to explain the variance of the dependent variable. For t-values as well as „r‟ values two tailed tests were used and level of significance were fixed at p=.05 and p=.01. And for existing institutional facilities rank order correlations were computed.

RESULTS OF THE STUDY

Comparative study of the various sections (Section-I, Section-II, Section-III and Section-IV) of Chapter-IV reveals the following results :

- There is no significant difference between first-born and middle-born for combined, boys as well as for girls sample, the respective t-values are 0.0955, 0.0599 and 0.0013. There is no significant difference between first-born and last-born for combined, boys and girls sample, t-values are 0.6216, 0.4850 and 0.4387 respectively. There is no significant difference between middle-born and last-born for combined, boys and girls sample and their respective t-values are 0.7035, 0.4328 and 0.4383.

- The mean value of achievement in Physics is higher among single family students compare to joint family students in case of combined and boys sample, while for girls sample mean value of achievement in Physics is higher among joint family students rather than single family students. It is found that there is no difference in achievement in Physics between joint family and single family for combined and girls sample at .05 level of significance. Though there is a significant difference in achievement in Physics between joint family and single family for boys sample at .05 level of significance.

- There is no association between age and achievement in Physics for combined, boys and girls sample at .05 level of significance. The „r" values are 0.0144, 0.0147 and 0.066 for combined, boys and girls sample.

- The association between socio-economic status with achievement in Physics is not significant at .05 level of significance for combined and girls sample, while it is significant at .05 level of significance for boys sample. The „r" values for combined, boys and girls sample are 0.0512, 0.1982 and 0.0235 respectively.

- The association of intelligence with achievement in Physics is significant .01 level of significance for combined, boys as well as for girls sample. The „r" values are 0.3772, 0.3694 and 0.4133 for combined, boys and girls sample respectively.

There is an association of scientific aptitude with achievement in Physics at .01 level of significance for combined, boys and girls sample and their respective „r" values are 0.2210, 0.2576 and 0.1739 respectively.

- There is no association of achievement-motivation with achievement in Physics at .05 level of significance for combined, boys and girls sample and „r" values are 0.0364, 0.0654 and 0.0319 respectively.

- There is an association of attitude towards the subject Physics with achievement in Physics at .01 level of significance for combined, boys and girls sample respectively. The „r" values are 0.2947, 0.2903 and 0.3340 respectively for combined, boys and girls sample.

- The association of study-habits with achievement in Physics is significant for combined and boys sample at .05 level and .01 level of significance respectively.

  Though, it is no significant at .05 level of significance for girls sample. The „r" values are 0.1152, 0.2127 and 0.0616 for combined, boys and girls sample respectively.

- In case of combined sample the independent variable intelligence has emerged as the most important (powerful) contributing factor to the variance of achievement in Physics (with 14.05%) followed by attitude towards the subject Physics (4.97%), scientific aptitude (2.18%), socio-economic status (0.28%), study-habits (0.07%), achievement-motivation (0.04%) and age (0.02%). Therefore, all the independent variables explain 21.61% of the variance of the dependent variable of achievement in Physics.

- For boys sample, the independent variable intelligence has again emerged as the most important contributing factor to the variance of achievement in Physics with (11.81%) followed by attitude towards the subject Physics (4.45%), socio-economic status (4.08%), scientific aptitude (2.08%), study-habits (0.82%), achievement-motivation (0.29%) and age (0.02%) respectively. Hence, all the independent variables combinedly explain 23.55% of the variance of the dependent variable of achievement in Physics.

- In case of girls sample the independent variable, intelligence has emerged as the most powerful factor to the variance of achievement in Physics with (16.77%) followed by attitude towards the subject Physics (7.87%), scientific aptitude (1.25%), age (0.44%), achievement-motivation (0.16%), socio-economic status (0.07%) and study habits (0.02%) respectively. Thus, all the independent variables explain only 26.58% of the variance of achievement in Physics.

- The existing institutional facilities also play an important role in achievement in Physics. Though, the rank order correlations are found to be positive but not significant for facilities and achievement in Physics, facilities and board result of Physics and facilities and board result as aggregate. And their respective correlations are 0.12, 0.11 and 0.15 respectively.

CONCLUSIONS

In the light of aims of the study, it is possible at this stage to draw certain conclusions. These are given here briefly (it is possible at this stage to draw certain conclusions) :

- Sex plays an important role in achievement in Physics. Boys are found to score significantly higher than girls.

- Mean value of achievement in Physics is higher (maximum) in caste category-1 followed by caste category-2 and caste category-3.

- The relationship between caste category-1 and caste category-2 and category-1 and category-3 is significant, while it is not significant in case of caste category-2 and caste category-3.

- Birth-order does not play any role in achievement in Physics.

- Family type (family size or joint family and single family) does not play an important role in case of combined sample as well as for girls sample though it is significant in case of boys sample.

- Age gives a positive correlation with achievement in Physics in case of combined sample as well as in case of boys sample while in case of girls sample age is negatively correlated with achievement in Physics. And age is not significantly correlated with achievement in Physics.

- Socio-Economic Status is inversely associated with achievement in Physics in case of girls. In case of combined sample Socio-Economic Status (SES) is positively associated with achievement in Physics. Though, in these two cases it is not significantly correlated. But in case of boys sample Socio-Economic Status is significantly and positively associated with achievement in Physics.

  Intelligence gives a positive and significant correlation with achievement in Physics in case of combined, boys and girls sample. Higher the level of intelligence higher is the level of achievement in Physics.

- Scientific aptitude is positively and significantly associated with achievement in Physics in case of combined, boys and girls sample.

- Achievement-motivation gives a positive association with achievement in Physics in case of combined, boys and girls sample, though it is not significant in each case.

- Attitude towards the subject Physics is positively and significantly associated with achievement in Physics in case of combined, boys as well as for girls sample.

- Higher the level of attitude towards the subject Physics, higher is the level of achievement in Physics.

- Study habits are positively associated with achievement in Physics in case of combined sample, boys sample and girls sample, though it is not significant in case of girls sample.

SUGGESTIONS

This study brought various factors into limelight, which can prove useful for parents, teachers, students as well as researches in the field to understand the phenomena more clearly.

Suggestions for Parents :

- Parents should encourage the students to make the application of Physics learning and day to day matters at home.
- Students can progress according to their inherent characteristics. So parents should refrain from very high or very low expectations.
- The subject requires punctuality and regularity in the studies. So proper time and space should be made available to them for learning of the subject in the form of good study-habits.
- Parents should keep in touch with the school and be aware of the individual progress of their wards. A good cooperation between school and home needs to be developed.

Suggestions For School Policy Makers And Other Authorities :

- Teacher should use various CDs, other audio-visual aids, projector and various filmstrips (mainly in case of 3-D figures) to the students.
- Results of this study reveals that most of the institutions lack teaching facilities like laboratory, library and other equipments. Being a practical subject, Physics can hardly be taught without these facilities. So some kind of norms need to be satisfied before any institution is granted permission for teaching of this subject.
- Place of Physics in time schedule of the school should be fixed in such a way that it is covered in early hours of the day when students and teachers are relatively fresh. This is true especially in case of theory classes.
- Teacher-pupil ratio is also an important factor. High teacher-pupil ratio is associated with lower level of achievement. So no post of teachers should be left unfilled for the subject.
- In the area of extra curricular activities students should be encouraged to have their hobby clubs and allowed Physics exhibitions or various functions where students can get a chance to display their talents.

 Teacher should use various CDs, other audio-visual aids, projector and various filmstrips (mainly in case of 3-D figures) to the students.

Suggestions for Teachers and Students :

 For proper evaluation of students learning in Physics some careful planning on the part of teachers is required. They can construct such tools for evaluation which have fairly good reliability and validity. Sometimes, use of diagnostic test and remedial teaching programme need to be undertaken by them.

 Physics is a practical subject, teacher besides discussing theories should be able to demonstrate using well-planned experiments or at least with the help of drawings on black board, this needs a continuous practice.

 Physics is a subject where changes in content taking place at a tremendous rate. So a Physics teacher tries to keep himself a breast with the latest knowledge in the area of the subject. Students achievement is conditioned by not only their intelligence, socio-economic status, study-habits but also by motivation for the work. Teachers should pay due attention to individual differences and adjust their teaching accordingly.

Suggestions for Further Research :

Those who are concerned with the research in the area of achievement dealing with adolescents in school setting can also be offered some suggestions, in the planning of their studies in the light of parent work. Some of these are mentioned here :

 Detailed analysis of the correlation matrix is able to explain about 22% in case of combined sample, about 24% in case of boys sample and about 27% in case of girls sample of variance of the dependent variable by all seven independent variables taken together. May be in the selection of variables, some important factors have been ones left out. Therefore, in further, these factors should be identified and studied in detailed.

- The present study is confined only for U.P. Board Intermediate Colleges. To make the study more wide, I.S.C. Board and C.B.S.E. Board schools should be included for getting wider generalization in this field.
- Present investigation is confined to about 315 students of one city only. It needs to be replicated in various cities of the country to arrive at generalizations having wider implications. It will be better if students with rural background are included in the sample alongwith urban sample and a comparison is made between these types of samples.
- In the present study, all the information has been collected through various tests (written test), questionnaire. Through other possible ways like interview, individualistic study mechanism, information may also be attempted.
- In future researches, investigators may select low achievers in Physics with average performance in other subjects and find out the factors associated with low achievement.

EDUCATIONAL IMPLICATIONS OF PRESENT STUDY

In any programme of formal education, achievement of the students is of at most important. Almost every good system of education prepares programmes of instruction in such a way that it is possible for every individual student to attain optimum level of achievement. Perhaps, this is the reason why researchers have been making efforts to device appropriate tools for the measurement and evaluation of students‟ progress in various subjects of curricula.

Physics being one of the important subjects at senior secondary level needs special attention. It is a compulsory subject in the entrance examination for Engineering as well as Medical profession. Studies like the present one have doubled utility, on one side a standardized tool using objective type question has been provided and on the other side role of various academic and non academic factors in this achievement has been assessed. The findings of the present study can go a long way in making a reform in the programmes of teaching Physics.

It is clear that factors like intelligence, socio-economic status, scientific aptitude, achievement-motivation, and attitude towards the subject Physics and study habits are related with the level of achievement. This fact is to be kept in mind by the policy makers and teachers, parents and guardians and individual students. Laboratory plays an important role in teaching of any subject but this is more so in the case of subject like Physics. The study reveals that many educational institutions do not possess ideal laboratory condition same is the case for teacher-pupil ratio.

No doubt, the board examination result in general presents a bright picture but compared to results of standardized objective type test gives rather gloomy picture. Though in the present study, Physics teachers have not been interviewed at length but their available reactions indicate that they have to work under many constraints. The direction provided by the study can further be supplemented if detailed interviews are conducted of Physics teachers and students of Physics in general and students having low scores in Physics in particular. The researcher can hardly claim the all aspects connected with teaching and assessment of Physics have been covered in the present venture but it is an amble beginning which opens the path to more valuable work in this area.

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