Journal of Nonlinear Analysis and Optimization Vol. 15, Issue. 1, No.5 : 2024 ISSN : **1906-9685**



UNDERSTANDING DETERMINANTS OF ACADEMIC ACHIEVEMENT AT SECONDARY SCHOOL LEVEL WITH THE HELP OF EDUCATION PRODUCTION FUNCTION

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Abstract

Education Production Function measures the relationship that exists between student and/or school inputs and the school output. These various inputs that affect the student's learning can be anything from the individual's family, their peers, their neighbourhoods and even their school in itself. The study used the education production function to better understand factors that influence academic achievement at the secondary school level. The aim of the research was to investigate the impact of several factors, including family size, school infrastructure, parental participation, socioeconomic position, and self-esteem, on the academic performance of secondary school students, using the framework of education production function. 643 secondary school students from different Greater Mumbai schools made up the sample. The researcher has employed reliable and valid scales to gather data. The current study's findings showed that socioeconomic position, family size, parental participation, and self-esteem are major predictors of secondary school students' academic achievement. School infrastructure does not significantly predict secondary school pupils' academic achievement.

Keywords: Education Production Function, Academic Achievement, Socio Economic Status, Size of Family, school infrastructure, Parental Involvement, Self-Esteem, Secondary School Students

I. THE CONCEPT OF AN EDUCATION PRODUCTION FUNCTION

A production function is defined as the maximum level of output that is possible to achieve from various combinations of inputs. It provides a sort of summary of the technical associations that exist between the inputs and the outputs. It tells us what is practically possible to achieve, and behaves as a standard against which one can evaluate their practice based on productivity achieved. Once the production function is figured out, any administrator or policy analyst can use it to calculate the level of production under any given circumstances. They can then use this knowledge to make predictions of efficiency and improvement.

The application of this economic concept to the field of education is essentially what an educational production function is. It measures the relationship that exists between student and/or school inputs and the school output. These various inputs that affect the student's learning can be anything from the individual's family, their peers, their neighbourhoods and even their school in itself. The outputs which are then measured are things like the success in the labour market, an individual's school attendance, graduation rates, and the most commonly measured, academic achievement.

The first and the original study that sparked the interest that now exists today in the concept of the education production function, was conducted by James S. Coleman, a sociologist. In this paper called The Coleman Report (1966), he indicated that the marginal effect that various school inputs have on student achievement was miniscule when compared to the impact of the student's family and friends.

Later on, economists brought themselves to the picture, and applied the structure of a production function in the analysis of student learning outcomes.

The Coleman Report's conclusion that variations in school resources did not account for the majority of the gap in student accomplishment generated a great deal of discussion. The relevance of schools and instructors for student success appeared to be considerably less essential than the impact of kids' socioeconomic level (SES), as shown by a number of family background variables such as parental education, occupation, and income. The debate over these findings sparked a significant amount of study in both developed as well as in developing nations. Heyneman (1979), wrote one of the first of these studies for developing countries, wherein he examined a large sample survey of Ugandan students and discovered that the SES of the student was not as relevant in Uganda as it was seen in the United States.

However, The Coleman Report was critiqued for a number of methodological reasons, leading to more research on the subject of variations in teacher effectiveness, student-teacher ratios, and other school-related issues. Hanushek (1986), in his most recent review of production function studies in the United States, found that while the average expenditure has increased over time, test results have stayed the same, which he explains is an issue of the very limited influence educational inputs have on outputs. He came to the same conclusion in his following study that was conducted in developing countries (1995). He believed that albeit increasing inputs, which was the conventional method to improving student outcomes, was not an effective policy option, since he found there was no actual and consistent link between the aggregate inputs and the test results of students.

II. RELEVANCE OF SOCIO-ECONOMIC STATUS, SIZE OF FAMILY, SCHOOL INFRASTRUCTURE, PARENTAL INVOLVEMENT AND SELF-ESTEEM WITH RESPECT TO ACADEMIC ACHIEVEMENT

One of the most extensively researched variables in the social sciences is the socioeconomic status (SES) of an individual or their entire family in general. It is often tested in conjunction with education, employment status, and income. In recent decades, a wide range of sociocultural contexts have seen the widespread observation of a relationship between academic achievement in school-age children and family SES. According to the Coleman Report (1966), "the inequalities imposed on children by their home, neighbourhood, and peer environment are carried along to become the inequalities with which they confront adult life at the end of school," family SES accounted for a large portion of the variations that can be seen and observed in an individual's academic success.

The family of an individual is their primary socializing agent right from their birth, which also helps mould the individual into society. This is possibly why family is easily one of the biggest contributors to how successful (or unsuccessful) an individual may turn out to be in every activity they pursue, education included. The relationship between a child's family background and their academic achievement is one that is slowly but surely becoming widely researched. All of this research is critical to evaluating the educational equality (or the lack thereof) that exists in society today between each student and their unique circumstances. The conventional family structure, which consists of parents/guardians, grandparents and their offspring, is giving way to new types of family structures that provide an alternate dependency system. Because children rely on their families for emotional and material support, evolving family arrangements may have an impact on academic success in the child's school performance.

An essential base for efficient learning and instruction in the classroom is the school's infrastructure. Infrastructure in secondary schools is designed to support student attendance, boost employee morale, and enhance academic performance. The infrastructure of the institution consists of classrooms, labs, hallways, open fields, game rooms, dorms, and restrooms. Every day, formal teaching and learning take place in classrooms. Students have the opportunity to do their own independent research and studies at the libraries. It is on the field that various co-curricular activities take place. Students and faculty must be housed at the school whilst also having access to sanitation amenities such as toilets, waste disposal services, and clean water. As a result, school infrastructure is a critical component in guaranteeing successful education.

Parental involvement in a child's early schooling has been proven to be consistently linked to a child's academic success. Academic attainment is higher in children whose parents are more interested in their education than in children whose parents are less committed. Researchers contend that parent-child interactions, particularly those that are engaging and responsive, have a significant influence on a child's intellectual development. These programmes could be created to enhance academic performance by the analysis of certain child-rearing behaviours, such as parental participation and the ways in which these practices affect academic success. Although parent participation has been identified as having to do with higher academic achievement, the precise processes by which parent participation influences academic performance in a kid are not yet fully known.

One of the important factors influencing a student's academic success is self-esteem. It is an assessment of a person's thoughts and attitudes about their own abilities and ideals. It has been stated that having a strong sense of self-worth can contribute to having a high level of academic accomplishment. Selfesteem can be defined as a person's worldwide evaluations of competence regarding their own value. When children compare their self-evaluation to their actual performance on a range of activities, this construct of self-esteem develops. Furthermore, this contrast between the perceived self and the ideal self is critical, especially throughout adolescence, since teenagers face a variety of developmental tasks and obstacles that are unique to their age. Because of the various changes that occur in the roles and responsibilities of teenagers, self-esteem tends to be fragile during adolescence. Early adolescent selfesteem tends to drop and then improve in the middle and later phases of adolescence. The growth of self-esteem is therefore one of the most crucial phases of adolescence's developmental stages.

Many of the inputs of the education production function examined in this research appear to be related to one another in some manner in addition to showing a substantial association with academic achievement. The home atmosphere and setting, in addition to the credentials and involvement of the parents, can also have a significant impact on a family's SES. The level of teacher participation in a classroom may or may not depend on the kind of school. Gender and self-esteem of a student also may go hand-in-hand, and affect student achievement. Even teacher involvement can be a strong predictor of the school climate.

Such correlations make studying education production function a lot more interesting, since it is almost impossible to separate these variables apart and solely study their effects on a student's performance. Instead, it's critical to concentrate on how these factors as a whole affect academic accomplishment.

III. LITERATURE REVIEW

Hanushek, E. A. (1979) claimed that the educational production relationships and the past analyses of a student's achievement have been plagued with the lack of conceptual clarity as well as a number of possible severe analytical problems. Hence, there is a considerable amount of confusion, not only about what has been learned, but also about how these studies should be conducted and what can be learnt from them. This review considers each of these specific issues. It also relates knowledge from these studies to any research about the areas other than just school operations and performance in academics. White, K. R. (1982) used meta-analysis techniques on almost around 200 studies that were based on the socioeconomic status of students and their academic achievement. The results of this meta-analysis indicated that as the SES is typically defined and used, it is seen to be only weakly associated with the academic accomplishment. The typically obtained correlations between the SES and academic achievement jump to 0.73. Any family characteristics that are sometimes incorrectly referred to as SES as well, are significantly correlated with academic achievement, when individuals are the unit of analysis. Different factors such as the grade level, type of academic achievement measure, type of socioeconomic status measure, and also the year in which the data were collected were all significantly correlated with the degree of the correlation between academic achievement and SES. Hanushek, E. A. (1989) acknowledged the inseparability of Economics and Education; it is significant to note that in the consideration of schools and their capacities an economist should give due consideration to infrastructure and resources with respect to expenditure per student in the context of schools allocating money. He noted that administration and facilities show no systematic relation with academic performance. However, data with respect to school expenditure and achievement displays strong positive affiliation. Ángel-Castillo et al, (2008) observed that children from nuclear families appear to have some educational benefits, hence a higher level of academic achievement, but children from other forms of family arrangements are likely to have lower educational levels. This research also examines how external events can alter the internal family structure. Booth, M. Z., & Gerard, J. M. (2011) looked into the connection between self-esteem and scholastic success. They conducted research on this relationship on young teenagers in England and the United States. 86 North American and 86 British teenagers provided quantitative and qualitative data to investigate the relationships between academic success and self-esteem from the start of the academic year to its conclusion. Even though there were variances between the two countries by the end of the year, maths seemed to have a constant correlation with self-esteem in both. Qualitative analyses revealed that British students' self-perceptions were supported and that they more closely reflected their academic experiences than did American students'. Chen, W. W., & Ho, H. Z. (2012) investigated the role that student academic beliefs-that is, attitudes about effort, academic self-concept, and perceived control-play in mediating the relationship between Taiwanese students' perceived parental participation and academic accomplishment. About 468 first-year students from Taiwanese colleges and/or universities made up the study's sample. The study's findings suggested that the relationship between academic achievement and perceived parental participation was moderated by students' academic beliefs.

All of these studies are very vital when taking into consideration education production function, however, there are no studies that consider all of these variables all together, to see their effect on academic achievement. This was the gap identified by the researcher and the study was selected accordingly.

IV. OPERATIONAL DEFINITIONS

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- 1) Academic Achievement: Academic Achievement is operationalised as the marks that secondary school students have attained in 10th Standard. (Secondary School Certificate Maharashtra Board)
- 2) Socio-economic Status: Socio-economic status is operationalised as the financial and societal standing of secondary school students according to their occupation, income, and level of education.
- 3) Size of family: Size of family reflects the number of people living together in the family.
- 4) School Infrastructure: School infrastructure includes tangible resources that contribute to students' academic growth and progress such as classrooms, laboratories, library, playground, sanitation etc.
- 5) **Parental Involvement:** Parental involvement is defined with respect to the active interest taken by the parents in every facet of children's academic development which can be specified in terms of time spent for studies, supervision of homework, taking regular updates from child etc.
- 6) Self-esteem: It is an extent to which secondary school students values, appreciate and love themselves. It is nothing but student's sense of self-worth.

V. OBJECTIVES OF THE STUDY:

- 1) To examine the methodological approach and the framework of education production function in the context of academic achievements.
- 2) To apply the framework of education production function to study the influence of socio-economic status, size of the family, school infrastructure, parental involvement and self-esteem on the academic achievements of secondary school students.

VI. NULL HYPOTHESIS

There is no significant prediction of the academic achievement of secondary school students by their socioeconomic status, size of the family, school infrastructure, parental involvement and self-esteem.

VII. DESIGN OF THE STUDY

Design of the study comprises of methodology of the study, sampling techniques and tools used in present research.

Methodology of the study

In the current study, the descriptive research approach covered by the quantitative paradigm was applied. Regression analysis is used to examine how well secondary school students' academic achievement is predicted by factors such as their socioeconomic level, family size, school infrastructure, parental participation, and self-esteem.

Sampling techniques

A three-stage sampling strategy was employed for the current investigation, with stratified random sampling and simple random sampling being used at different phases. The stratified random sample technique was used to choose the schools for the initial sampling phase. The strata were established according to the schools' geographic locations within Mumbai. Mumbai city and Mumbai suburban comprised the two stratum that made up the entire city. Schools from Mumbai City and Mumbai Suburban were chosen using the simple random sample technique for the second stage of sampling. Students at the matriculation level were chosen using a simple random sample technique during the third step of sampling. 643 Mumbai secondary school students make up the study's sample.

Tools used in present research

- 1) For assessing Academic Achievement of secondary school students their marks in 10th standard were considered.
- 2) Kuppuswami **Socio-Economic Status Scale** (modified for 2019) was used for assessing Socioeconomic status of secondary school students. Maximum and minimum possible score on this scale is 29 and 3 respectively. The tool was designed in such a way that higher is the score better is the socio-economic status.
- 3) For the purpose of present research School Infrastructure Scale was prepared by the researcher keeping in mind all the tangible aspects of school which may have bearing on the academic achievement of a student. This was accomplished by doing a strong literature review. Researcher could not find any scale which was relevant in current time period so it was decided to prepare a fresh School Infrastructure scale suitable for the current study. School Infrastructure Scale was developed as a 5-point Likert scale. Initially there were 31 statements. Out of these 21 statements were positive and 10 statements were negative. Researcher deliberately included negative statements for minimizing response pattern bias. Once the scale was ready it was verified for Content validity to check its suitability and relevance to the intent of the current study. Content validity was done by calculating Lawshe's content validity ratio. The final version of School Infrastructure Scale had 27 statements. Out of these 19 statements were positive and 8 statements were negative. After completing the validity procedure, the final version of the tools was examined to evaluate its reliability. Cronbach's alpha was found to be 0.82. Minimum and maximum possible scores of school infrastructure scale are 27 and 135 respectively. The scale is designed in a manner that higher is the score better is the school infrastructure and the other way around.
- 4) For the purpose of present research Parental Involvement in Child's Education Scale was prepare by the researcher keeping in mind all the factors depicting active interest of parents in every facet of children's academic development which can be specified in terms of time given for studies, extra coaching etc. This was accomplished by doing a strong literature review. Researcher could not find any scale which was relevant in current time period so it was decided to prepare a fresh parental involvement in child's education scale suitable for the current study. Parental involvement in child's education scale was developed as a 5-point Likert scale. Initially there were 20 statements. All statements were positive. Once the scale was ready it was verified for Content validity to check its suitability and relevance to the intent of the current study. Content validity was done by calculating Lawshe's content validity ratio. The final version of parental involvement in child's education scale its reliability. Pilot study was conducted in order to establish reliability index for the parental involvement in child's education scale. Cronbach's alpha

was found to be 0.98. The responses are separately collected for the mother and the father of the student and then for each statement average score is considered as final. Minimum and maximum possible scores of Parental Involvement in Child's Education scale are 19 and 95 respectively. The scale is designed in a manner that higher is the score extra is the parental involvement in child's education and the other way around.

- 5) **Rosenberg Self-Esteem inventory** (1965) was used in the present study for measuring self-esteem of secondary school students. Reliability index of tool was 0.85. Tool consisted of 10 statements (5 positive and 5 negative). Each statement was rated on 4-point scale. i.e. strongly agree, agree, disagree and strongly disagree. Maximum and minimum possible score on this tool is 40 and 10.
- 6) Demographic information like **age, gender, number of people in the family** etc. was also collected.

Variable	Sample Size	Mean	Median	Mode	Standard Deviation	Skewness	Kurtosis
Academic Achievement	643	64.78	65.00	65.44	12.58	-0.05	-0.58
Socio-Economic Status	643	15.16	14.00	11.68	5.96	0.58	0.32
Size of Family	643	5.27	5	4	2.42	3.33	20.84
Perceived School Infrastructure	643	95.77	95.00	93.46	13.48	0.17	0.93
Perceived Parental Involvement	643	76.38	76.50	76.74	13.78	-0.03	1.46
Self-Esteem	643	28.32	28.00	27.36	3.98	0.24	0.92

VIII. DESCRIPTIVE DATA ANALYSIS

Source: Primary data collected by the researcher

Table 1. Descriptive Statistics of Academic Achievement, Socio-Economic Status, Size of Family, Perceived School Infrastructure, Perceived Parental Involvement and Self-Esteem of Secondary School Students

IX. FINDINGS, CONCLUSION AND DISCUSSION

There is no significant prediction of the academic achievement of secondary school students by their socioeconomic status, size of family, school infrastructure, parental involvement and self-esteem. The statistical technique used to test this hypothesis is **Regression analysis**.

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Multiple R	0.27
R Square	0.07
Standard Error	12.17

Source: Primary data collected by the researcher Table 2 Multiple R, R square and Standard Error

MULTIPLE R is 0.27 which shows moderate positive linear relationship between dependent and independent variables. R SQUARE signifies the coefficient of determination, which shows the goodness of fit. In this example, the value of R square is 0.07. In other words, only 7% of the dependent variable (y-value) is explained by the independent variables (x-values). STANDARD ERROR is the average distance that the observed values fall from the regression line. In this example, the observed values fall on an average of 12.17 units from the regression line.

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	DF	Sum of Squares (SS)	Mean Squares (MS)	F	P Value
Regression	5	7358.49	1471.70	9.94	3.57E-09
Residual	637	94273.93	147.10		
Total	642	101632.4			

Source: Primary data collected by the researcher Table 3 ANOVA Table of Regression

ANOVA reveals whether the regression model as a whole is statistically significant or not. In this case the p-value is less than 0.05, which indicates that all the independent variables (combined) have a statistically significant association with the dependent variable.

	Coefficients	Standard Error	t Stat	P-value
Intercept	43.97	4.61	9.53	3.17851E-20
Socio-economic Status	0.22	0.08	2.68	0.01
Size of Family	-0.68	0.20	-3.42	0.0007
School Infrastructure	0.07	0.04	1.73	0.08
Parental Involvement	0.08	0.04	1.98	0.04
Self Esteem	0.31	0.13	2.43	0.02

Source: Primary data collected by the researcher

Table 4 Regression Coefficients

Coefficient gives the least square estimates. The coefficients for each explanatory variable reveal average expected change in the response variable, assuming the other explanatory variable as constant. For example, the student's academic performance or score here is expected to increase by 0.31 percent for every unit increase in the Self Esteem.

For the given regression table, the equation would be approximately:

Y = 43.97 + 0.22X1 - 0.68X2 + 0.08X4 + 0.31X5

It can be written as

Academic Achievement = 43.97 + 0.22SES - 0.68SF + 0.08PI + 0.31SE

Where, SES = Socio-economic status, SF = Size of family, PI= Parental Involvement, SE = Self esteem **P-VALUES**

The individual p-values tell us whether the coefficients of each explanatory variable are statistically significant or not. In this example, coefficients of intercept, socio-economic status, size of family, parental involvement and self-esteem are significant because all the corresponding P- values are less than 0.05. Coefficient of school infrastructure is not significant because its P value is greater than 0.05. Thus, the null hypothesis is rejected partially. There is a significant prediction of academic achievement of secondary school students by their socioeconomic status, size of family, parental involvement and self-esteem. There is no significant prediction of academic achievement of secondary school students by their socioeconomic status, size of family, parental involvement and self-esteem. There is no significant prediction of academic achievement of secondary school infrastructure. Therefore, except school infrastructure all other independent variables influence academic achievement of secondary school students, their socioeconomic status, size of family, parental involvement and self-esteem matters a lot. As a result, coefficient of school infrastructure is not considered in the above equation of education production function.

Socio economic status is a very important predictor of academic achievement. There is a direct relationship between socio economic status of the family and students' academic achievement. Higher socioeconomic status ensures better resources and opportunities for the students and hence results in

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better academic performance. Size of family is a very important predictor of academic achievement. There is a negative relationship between Size of family and students' academic achievement. High size of family leads to erosion of parental resources and this creates hindrances in the achievement of academic excellence. This phenomenon is also explained by Becker (1997) in his quantity-quality trade-off. Academic attainment is significantly influenced by parental participation. Parental involvement, or engagement, can relate to many different things, but it usually refers to the ways in which parents along with other family members help and support their child's education. As a result, there is a clear connection between academic success and parental participation. One of the most significant indicators of academic success is self-esteem. Individuals who possess high self-esteem perceive themselves as competent and proactive, capable of advocating for change through hard work and setting demanding objectives that result in gaining new knowledge. Thus, there is a clear connection between students' academic success and their sense of self-worth.

X. SIGNIFICANCE OF THE STUDY

- 1. The findings of the study would enable the teachers, counsellors, teacher-educators, and policy makers to get an insight into the methodological framework of education production function.
- 2. The findings of the study would enable the teachers, counsellors, teacher-educators and policy makers to understand the relationship between academic achievement and Socioeconomic status, size of family, school infrastructure, parental involvement and self-esteem.
- 3. The knowledge of the association between academic achievements and other related variables will help government to formulate various policies to enhance the academic performance of the students.
- 4. The findings of the study would enable the principals and management to understand relationship between the academic achievement and school related factors and take appropriate steps towards enhancing performance of the students.
- 5. The findings of the study would enable parents to understand relationship between academic achievements and home related factors, and take appropriate steps towards enhancing performance of the students.

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