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**ENGINEERING APTITUDE OF HIGHER SECONDARY
STUDENTS: A COMPARATIVE STUDY AMONG
STUDENTS OF STATE BOARD AND CENTRAL BOARD
OF SCHOOL EDUCATION**

*Dr. M. Thiagarajan
B. Lenin Selvanayagam*

Abstract

The study aims to find out the Engineering Aptitude of Higher Secondary Students of two different Boards of School Education with respect to some demographic variables such as gender and the combination of subjects they learn at Higher Secondary Level. A sample of 320 students from 12 different schools had been drawn through simple random sampling technique. Engineering Aptitude Scale was developed and validated by B.Lenin Selvanayagam was used to collect data and the collected data was analysed using mean standard deviation and 't' test. The study revealed that the male and the female students of Central Board of School Education have better Engineering Aptitude than their counterparts. The predictive validity of the tool also established obtaining the grades of the students joined the Engineering Education after their School Education.

Key Words: *Engineering Aptitude, Higher Secondary Students, State Board, Central Board of School Education.*

Introduction

Engineering is one of the most progressive, challenging and rewarding field that can be studied today. Many students want to be engineers. Almost everyone has the ability but few possess the drive and perseverance. According to the HRD ministry, India has 6,214 engineering and technology institutions which are enrolling 2.9 million students. Around 1.5 million engineers are released into the job market every year. But the dismal state of higher education in India ensures that they simply do not have adequate skills to be employed. Looking at the number of engineering colleges in India and the number of engineers coming out of these colleges, the questions that form in everyone's minds are, "does India need so many engineers?" Are they all employable? The negativism brought forth by such questions has crippled engineering education in India. The world needs in plenty well-equipped, talented graduates with the right attitude. There are job opportunities for those who have the potential. In addition, opportunities for self-employment are also plenty for innovative and energetic minds. Our school education system offers combinations of courses in the higher secondary level such that a student by choosing these groups can pursue engineering or medicine, even though these two streams call for entirely different aptitudes. The ideal higher secondary system would orient the student towards evaluating their aptitude and choosing to pursue one of the two streams. This would ensure that the chosen stream matches their aptitude. This is not happening now. In the absence of proper orientation in the system, parents and their wards follow an inappropriate procedure while selecting their branch of study in the college.

Significance of the Study

Higher Secondary stage is a crucial period of an individual where he has to choose his profession. Aptitude play vital role in selecting the right profession. If a student enters a professional college without any aptitude

towards that profession he may not succeed. Without the ability to do certain work, one may not develop interest in that work and as such without interest it is hard to achieve great things. Aptitude is the individual's capacity to acquire source specific knowledge, skill or set of organised response such as the ability to speak a language or to do mechanical works. Assessing engineering aptitude of XII standard students becomes necessary. It helps the teachers to discover the engineering or mechanical skills of their students and arrange activities to develop their skills. They can also motivate their students to choose the suitable profession. The students in turn become aware of their potentialities and more towards their goal. Measuring the engineering aptitude of students also helps the policy makers to develop and modify the present curriculum to cope with the student's abilities. There is a vast difference between students studying in State board and CBSE in their skills and capacities. This marked difference has an impact on their performances in their professional colleges. Engineering aptitude is the application of general intellectual capacity to engineering materials and problems. A test of engineering aptitude therefore, should be regarded as a device intended to estimate probability of success in engineering occupation.

Review of Literature

The investigator reviewed studies conducted earlier in this field of research. Cathy W. Hall et al (2015) reported that Math skills, especially calculus readiness, were strong predictors of retention in Engineering Education. Ming- Te Wang, Jackquelynne S. Eccles, Sarah Kenny(2013) tested whether individuals with high math and high verbal ability in 12th grade were more or less likely to choose STEM occupations than those with high math and moderate verbal ability. E.Tiffany Iskander, Paul A. Gore, Cynthia Fuse, (2013), Results show that there is a significant (although expected) discrepancy between the number of male and female students who expressed interest in engineering majors and careers. Walter V.

Bingham (2012) discussed the principles governing the selection and administration of tests, and the meaning of the measures they yield. de Almeida, Maria Jose B. M.; Leite, Maria Salete S. C. P.; Woolnough, Brian E.(1998), present the results of a study undertaken in Portugal to determine the influence of different factors on students' (n=499) decisions to study or refuse to study in one of the physical sciences or engineering. The factors are dependent on individual students themselves, their aptitudes, abilities, and home backgrounds. Some significantly different influences were detected between male and female students and between future scientists and non-scientists. Omizo, Michael M.(1980) examined the predictive validity of the Differential Aptitude Tests (DAT) relative to the engineering, mathematics, and science grades and cumulative grade point averages of high school seniors in engineering; and the differential validity of the eight DAT scales in comparing high and low achievers. Durio, Helen F.(1979) state that the Scholastic aptitude, mathematics achievement, and high school rank were used as college entry predictors of achievement in a foundation engineering curriculum for 1,779 freshmen enrolling in engineering at the University of Texas at Austin during the years 1974-77. Khan, Sar B.; D'Oyley, V. R.(1973) Studied the type of skills required for engineering students to succeed in their work, using high school grades and predictor batteries such as aptitude and standardized achievement tests.

Operational Definitions

Engineering Aptitude

It means the aptitude in application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, machines, processes and systems.

State Board

It is the board of secondary education under the control of Tamilnadu government. The syllabus is prescribed by the government and the text books are uniform at state board schools.

Central Board of School Education

The Central Board of Secondary Education (abbreviated as **CBSE**) is a Board of Education for public and private schools, under the Union Government of India.

Objectives of the Study

- To find out significant difference the male students of state board and CBSE schools in Engineering Aptitude
- To find out significant difference the male students of state board and CBSE schools in Engineering Aptitude
- To find out significant difference between Maths-Biology group students of state board and CBSE schools in Engineering Aptitude
- To find out significant difference between Maths-Computer Science group students of state board and CBSE schools in Engineering Aptitude

Methodology

The investigator employed descriptive method using survey as a technique to solve this present problem. Engineering Aptitude Scale was developed and validated by B. Lenin Selvanayagam (2016). The tool was administered to 100 Higher Secondary School students of Tirunelveli District for validation, split half method was used to affirm the reliability (0.843) of the tool and predictive validity was established by observing the first semester marks of the students who joined Engineering course from the

sample of this present study in July 2017. The population being the Higher Secondary School Students of Maths- Biology and Maths- Computer Science Group a sample of 320 students had been drawn through simple random sampling technique. The data was collected in 2017 May. The collected data was analysed using mean, standard deviation and 't' test.

ANALYSIS

Table-1

DIFFERENCE BETWEEN THE MALE STUDENTS OF STATE BOARD AND CBSE SCHOOLS IN ENGINEERING APTITUDE

| Variable | Category | Type of School | Count | Mean | S.D | 't' Value | Result |
|----------|----------|----------------|-------|-------|------|-----------|-------------|
| Gender | Male | State Board | 80 | 50.40 | 6.58 | 11.87 | Significant |
| | | CBSC | 70 | 62.34 | 5.74 | | |

(At 5% level of significance, the table value of 't' is 1.96)

The above table is evident that the Male Higher Secondary Students of State Board and CBSC Schools significantly differ in their Engineering Aptitude. Comparing the mean scores Students of CBSC (62.34) is having better aptitude towards Engineering than the students of State Board (50.40).

Table-2

DIFFERENCE BETWEEN THE FEMALE STUDENTS OF STATE BOARD AND CBSE SCHOOLS IN ENGINEERING APTITUDE

| Variable | Category | Type of School | Count | Mean | S.D | 't' Value | Result |
|----------|----------|----------------|-------|-------|------|-----------|-------------|
| Gender | Female | State Board | 81 | 39.76 | 6.18 | 9.62 | Significant |
| | | CBSE | 89 | 49.25 | 6.68 | | |

(At 5% level of significance, the table value of 't' is 1.96)

It is very clear from Table -2 that the Female Higher Secondary Students of State Board and CBSC Schools differ significantly in their Engineering Aptitude. Comparing the mean scores the female students of CBSC Schools (49.25) have better aptitude towards Engineering than the students of State Board (39.76).

TABLE -3

DIFFERENCE BETWEEN THE MATHS - BIOLOGY GROUP STUDENTS OF STATE BOARD AND CBSE SCHOOLS IN ENGINEERING APTITUDE

| Variable | Category | Type of School | Count | Mean | S.D | 't' Value | Result |
|----------|---------------|----------------|-------|-------|------|-----------|-------------|
| Group | Maths Biology | State Board | 71 | 40.01 | 6.27 | 11.20 | Significant |
| | | CBSE | 57 | 54.29 | 7.83 | | |

(At 5% level of significance, the table value of 't' is 1.96)

The above table infers that the students of Math- Biology group of State Board and CBSC Schools significantly differ in their engineering Aptitude. Comparing the mean scores the students of CBSC Schools (54.29) have better aptitude towards engineering than their counterparts (40.01).

TABLE -4

DIFFERENCE BETWEEN THE MATHS - COMPUTER SCIENCE GROUP STUDENTS OF STATE BOARD AND CBSE SCHOOLS IN ENGINEERING APTITUDE

| Variable | Category | Type of School | Count | Mean | S.D | 't' Value | Result |
|----------|------------------------|----------------|-------|-------|------|-----------|-------------|
| Group | Maths Computer Science | State Board | 90 | 49.02 | 7.54 | 5.14 | Significant |
| | | CBSE | 102 | 55.42 | 9.67 | | |

(At 5% level of significance, the table value of 't' is 1.96)

The table – 4 gives a picture that the Higher Secondary Students of Math-Computer Science Group of State Board and CBSC Schools differ in their Engineering Aptitude. Comparing the mean scores the students of CBSC Schools (55.42) have better aptitude towards Engineering than the students of State Board (4.02).

Table – 5

**I SEMESTER GRADES OF ENGINEERING STUDENTS
LEARNT FROM STATE BOARD AND CBSE**

| Students learnt from State Board | | Student learnt from CBSE | |
|----------------------------------|-------|--------------------------|-------|
| Number | Grade | Number | Grade |
| - | S | 14 | S |
| 2 | A | 29 | A |
| 13 | B | 45 | B |
| 22 | C | 16 | C |
| 38 | D | 4 | D |
| 11 | E | - | E |
| 5 | U | - | U |
| 91 | | 108 | |

(Grade Points S- 10, A- 9, B- 8, C-7, D-6, E- 5, U- 0)

Out of the sample 320 Higher Secondary Students who responded to the present study, 91 learnt from State Board, and 108 students learnt from CBSE schools jointed Engineering Education. The above table gives a vivid picture about the grade points earned by the students in I semester exams held in January, 2018. The students learnt through CBSC Schools secured better grades than their counterparts who learnt through state board. Thus the predictive validity of the Engineering Aptitude Scale was also proved.

Interpretation

Engineers play a pivotal role in building such sustainable competitive advantage for the country by providing solutions to the various technical and social issues. There is a strong need in country like India to build engineering pool with high calibre of Engineering attitude and aptitude. This pool will provide the requisite capability to create innovative

solutions in various technical fields. The challenge being faced by academic institutes is how to provide engineering educations which will enable them to build such pool (Himdweep Wallia, Santhya Katiyar,2015). The present study reveals that the Students of CBSC Schools have better Engineering aptitude than the students of State Board Schools. This may be due to the differences in the curriculum, Syllabus, methodology and other activities of cognitive and psychomotor abilities. The children are exposed much of application oriented practical curriculum. The syllabus is vast and which enables deeper knowledge. In CBSC schools project based learning is encouraged which leads to the development of higher order cognitive abilities, whereas the state board schools train their students for rote memorisation and there seems to have lesser opportunities for aptitude development.

Conclusion

The students should have an orientation and aptitude while selecting a branch of study at college. The study is an eye opener that the curriculum and the methodology at Higher secondary level is much more important to develop engineering aptitudes and the results of the study are evident that CBSE schools play a significant role in developing engineering aptitude. The predictive validity was established by observing the first semester marks of I BE students from the sample proved that better the engineering aptitude greater the grades. Thus it is recommended that the curriculum of the state board should be revamped on par with the curriculum of CBSE. Project based methodology will improve the understanding of the concepts by students. Engineering colleges also can modify their admission policies to include aptitude testing. This study is limited to Tirunelveli Corporation. The same study can be extended to other regions in Tamilnadu.

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ABOUT THE AUTHORS

Dr. M. Thiagarajan, Head of the Department, Dept of Business Administration, Govt. Alagappa Arts College, Karaikudi-630003.
Email:thiaga.mgmt75@gmail.com

B. Lenin Selvanayagam, Assistant Professor, Dept. of Management Studies, Karpagam College of Engineering, Coimbatore,Tamilnadu, India.
Email:lenin.mba.2014@gmail.com