IOSR Journal of Research & Method in Education (IOSR-JRME)
e-ISSN: 2320–7388,p-ISSN: 2320–737X Volume 4, Issue 6 Ver. III (Nov - Dec. 2014), PP 06-10
www.iosrjournals.org

Attitude towards Mathematics of the Students Studying in Diploma Engineering Institute (Polytechnic) of Sikkim

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Abstract: *Study of mathematics in the 1st year of a three-years Diploma Engineering(Polytechnic) Course is very important as it becomes the foundation for all engineering subjects.In our society it is generally believed that mathematics is a subject for boys. In this paper, the attitude of 1st year students towards mathematics is studied. It is also studied whether there is significant difference in attitude towards mathematics between Male and Female students, or Male and Female students coming from Rural and Urban areas or Male and Female students coming from Private and Government schools.*

I. Introduction

"The progress and improvement of mathematics is linked to the prosperity of the state" --Napoléon Bonaparte

Mathematics is a fundamental part of human thought and logic, and integral to attempts at understanding the world and ourselves. Mathematics provides an effective way of building mental discipline and encourages logical reasoning and mental rigor. In addition, mathematical knowledge plays a crucial role in understanding the contents of other school subjects such as science, social studies, and even music and art.

Although there is no standard definition of the term attitude, in general it refers to a learned predisposition or tendency on the part of an individual to respond positively or negatively to some object, situation, concept or another person. Several studies have shown that positive attitudes are conducive to good performance.

Conventional wisdom and some research suggest that students with negative attitudes toward mathematics have performance problems simply because of anxiety. Attitudinal research in the field of mathematics has dealt almost exclusively with anxiety or enjoyment of subject matter, excluding other factors. One of the first instruments developed was the Dutton Scale (Dutton, 1954; Dutton & Blum, 1968), which measured "feelings" toward arithmetic. Later Aiken (1974) constructed scales designed to measure enjoyment of mathematics and the value of mathematics. The Fennema-Sherman Mathematics Attitude Scales (1976) were developed in 1976, and it has become one of the most popular instruments used in research over the last three decades. The Fennema-Sherman Mathematics Attitude Scales consist of a group of nine instruments: (1) Attitude Toward Success in Mathematics Scale, (2) Mathematics as a Male Domain Scale, (3) and (4) Mother/Father Scale, (5) Teacher Scale, (6) Confidence in Learning Mathematics Scale, (7) Mathematics Anxiety Scale, (8) EffectanceMotivation Scale in Mathematics, and (9) Mathematics Usefulness Scale.

Fennema's theory is based on research with the Fennema-Sherman Mathematics Attitudes Scales, which has clearly been the most popular instrument in research about attitudes toward math (Fennema& Sherman, 1976). It purports to have nine scales, but subsequent research has questioned the validity, reliability (Suinn and Edwards, 1982), and integrity of its scores (O'Neal, Ernest, McLean, & Templeton, 1988). Melancon, Thompson, and Becnel (1994) isolated eight factors rather than nine, and they were unable to find a perfect fit with the model proposed by Fennema and Sherman. Mulhern and Rae (1998) identified only six factors, and suggested that the scales might not gauge what they were intended to measure.

Other researchers suggest that students may find math to be simply unappealing or socially unacceptable, although they may actually have high aptitude. In any case, it is crucial that any investigation of attitudes be assessed with an instrument that has good technical characteristics if research conclusions are to be meaningful. The relationship of affect to course selection, performance, achievement, and cognitive processes must be based solidly on a valid, reliable measure of attitudes. Attitude scales must withstand factor analysis, tap important dimensions of attitudes, and require a minimum amount of time for administration. Finding a need for a shorter instrument with a straightforward factor structure, the Attitudes Toward Mathematics Inventory (ATMI) was developed.

II. Objectives Of The Study

The following objectives have been formulated related to the study:

1. To study the gender-wise difference in students' attitude towards mathematics.
2. To study the gender-wise difference in attitude towards mathematics among students coming from Urban and Rural areas.
3. To study the gender-wise difference in attitude towards mathematics among students coming from Private and Government Schools.

HYPOTHESIS

The following hypotheses were framed for the study:

H1: There is a significant difference in attitude towards mathematics between Male and Female students.

H2: There is a significant difference in attitude towards mathematics among Male and Female studentscoming from urban areas.

H3: There is a significant difference in attitude towards mathematics among Male and Female studentscoming from rural areas.

H4: There is a significant difference in attitude towards mathematics among Male and Female students coming from Private Schools.

H5: There is a significant difference in attitude towards mathematics among Male and Female students coming from Government Schools.

Delimitation Of The Study

1. The study is limited to 1st Year students of one Polytechnic (CCCT) in Sikkim.
2. Economic status of the students is delimited in this study.
3. The educational qualifications of the parents of the students are excluded fromthis study.
4. The educational qualifications and training in teaching methods of thestudents' school mathematics teachers are excluded from this study.
5. The mathematics teachers are not included in this study.

III. Methodology

Tools

In an effort to study students' attitudes towards math, Elizabeth Fennema and Julia A. Sherman constructed the following attitude scale in the early 1970's called the Attitude Towards Mathematics Inventory (ATMI) scale. The scale consists of four subscales: a confidence scale, a usefulness scale, a scale that measures mathematics as a male domain and a teacher perception scale. This scale could give a teacher and an individual student useful information about that particular student's attitude(s) towards mathematics.

The ATMI consisting of 47 questions was administered to the students by the investigators themselves.

Key to Fennema-Sherman scale for mathematics:

C = Personal confidence about the subject matter
U = Usefulness of the subject's content
M = Subject is perceived as a male domain
T = Perception of teacher's attitudes

Attitudes:

+= Question reflects positive attitude
- = Question reflects negative attitude

Question Numbers	Category of Question	Attitude
4,8, 19, 23, 32, 43	C	-
1,12, 25, 33, 37, 41	C	+
9, 11, 18, 24, 36	M	-
6, 15, 28, 31, 38, 46	M	+
7, 16, 22, 26, 30, 40	T	-
2, 14, 20, 35, 45, 47	T	+
5, 13, 21, 29, 39, 42	U	-
3, 10, 17, 27, 34, 44	U	+

Scoring Directions:

Each positive item receives the score based on points

A = 5 B = 4 C = 3 D = 2 E = 1

The scoring for each negative item should be reversed

A = 1 B = 2 C = 3 D = 4 E = 5

Samples

In the present study, to assess theattitude towards mathematics among students,the sample consisted of 101 number of students, of which there were 37 Females and 64 Males, studying in 1st Year DiplomaEngineering Courses in one of the Polytechnics in Sikkim viz. CCCT.

Area of the study

The present study was conducted among the students studying in 1st Year at **Centrefor Computers and Communication Technology (CCCT)** located at South District of Sikkim. The Institute conducts AICTE approved Three-years diploma engineeringcourses and is ISO 9001:2008 certified. The Institute is managed as autonomousinstitute under the Directorate of Technical Education, Human Resource DevelopmentDepartment, Government of Sikkim.

Review of Literature

What is Attitude? According to Kobella (1989)[13], the term attitude encompasses a wide range of affective behaviors (e.g. prefer, accept, appreciate, and commit) and is due to loosely and without basis by some writers. It is also applied in number of contexts and with a variety of meanings.

Vaidya (1989)[14] explained attitude as "a condition of readiness for a certain type of activity". Attitudes held by the individuals may be simple or complex, stable or unstable, temporary or permanent and superficial or fundamental. Judgments based upon insufficient facts are likely to yield wrong results and thereby develop biased attitudes.

Anastasi (1969)[12] defined attitude as, "a tendency to react favourably orunfavourably toward a designated class of stimuli". It is evident that when so defined, attitudes cannot be directly observed, but must be inferred from overt behavior, both verbal and non-verbal.

Rosenberg and Hovland (I960) [9]express that, "attitudes are typically defined as, predispositions to respond in a particular way towards a specified class of objects".

Being predispositions they are not directly observable or measurable. Instead they are inferred from the way we react to a particular stimulus.

MsGuire (1976)[10] who has reviewed numerous definitions of attitudes concluded that these definitions differ in almost every conceivable important way. Some psychologists define attitudes as inner states, but a few refer to attitudes as consisting of groups of responses. Some define attitudes as a disposition to respond, others considers the response as representing the attitude. Some regard an attitude as having a unity, but others regard it as having a set of distinct components. Some distinguish between attitude and knowledge while others regard both as unified cognitive components.

Fishbein and Ajzen (1980)[11] featured work based on hypothesized relationship among beliefs, attitudes, behavior intentions, and behavior.

F. Khatoon[5] has studied the relationship of mathematical aptitude among boys and girls and finds no significant difference in the aptitude for mathematics among boys and girls.

A. Rosaly [1] has found that the attitude of high school students towards the learning of mathematics and their achievements in mathematics are highly correlated and that urban boys and girls have a more positive attitude towards mathematics than rural boys and girls.

D. Stipek and H. Granlinski [3]indicates in the article that girls have lower expectations for themselves in math than boys, and that girls believe they do not have mathematical ability.

J. Gill [6] indicates that middle school and high school girls have positive attitudes toward school but negative attitudes toward mathematics.

E. Fennema and J. Sherman [4]found that students of teachers who were well organized, achievement oriented and enthusiastic tended to have more positive attitude towards mathematics.

D. Swetman [2]shows that girls' positive attitudes towards mathematics decline as they grow older. Initially girls have more positive attitudes towards math than boys do, but as they continue in school, girls' attitudes become more negative.

N. R. Patel [7] conducted a study on Mathematical ability of pupils of classes IX and X in the context of some cognitive and affective variables. They found that there were no significant sex differences with regard to mathematical ability of pupil of classes IX and X.

S. Saha [8] conducted a study on gender, attitude to mathematics, cognitive style and achievement in mathematics. It was found that all the three contributes to statistically significant difference in achievement in mathematics.

IV. Analysis And Interpretation

Data were collected on the scale from 101 respondents. The data collected is further divided in five different categories e. g. male vs female, male vs female from rural/ urban locality of school and male vs female for government/private school background at the time of appearing class X examination. This data wereanalyzed by applying statistical measures accordingly. Theresults were interpreted by comparing the means and by using the t-test at$P < 0.05$, level of significance.

Table -I

ENGINEERING STUDENTS OF IST YEAR			
VARIABLE	MALE	FEMALE	T -VALUE
Personal confidence about the subject matter	43.0625	39.3514	0.134
Subject is perceived as a male domain	35.5	40.0811	0.115
Perception of teacher's attitudes	43.0625	44.3784	0.490
Usefulness of the subject's content	49.0656	49.4865	0.965
OVER ALL	170.7	173.3	0.622

Table – II

RURAL STUDENTS PURSUING DIPLOMA			
VARIABLE	MALE	FEMALE	T -VALUE
Personal confidence about the subject matter	44.1667	41.2832	0.330
Subject is perceived as a male domain	44.7167	43.2544	0.243
Perception of teacher's attitudes	38.6667	39.4615	0.770
Usefulness of the subject's content	46.3333	48.3846	0.397
OVER ALL	170.55	169.794	0.832

Table – III

URBANSTUDENTS PURSUING DIPLOMA			
VARIABLE	MALE	FEMALE	T -VALUE
Personal confidence about the subject matter	45.2879	45.3585	0.954
Subject is perceived as a male domain	42.8831	43.9775	0.527
Perception of teacher's attitudes	39.0909	40.8214	0.427
Usefulness of the subject's content	46.3636	50.5357	0.192
OVER ALL	170.535	177.086	0.220

Table – IV

GOVT SCHOOL STUDENTS PURSUING DIPLOMA			
VARIABLE	MALE	FEMALE	T- VALUE
Personal confidence about the subject matter	42.8046	41.3246	0.632
Subject is perceived as a male domain	43.4333	43.7339	0.875
Perception of teacher's attitudes	39.2667	40.5789	0.630
Usefulness of the subject's content	49.3	49.1579	0.948
OVER ALL	171.838	171.901	0.958

Table – V

PVT. SCHOOL STUDENTS PURSUING DIPLOMA			
VARIABLE	MALE	FEMALE	T -VALUE
Personal confidence about the subject matter	44.893	45.0556	1.000
Subject is perceived as a male domain	43.494	43.5719	0.920
Perception of teacher's attitudes	38.9412	40.7222	0.376
Usefulness of the subject's content	46.3529	49.3889	0.321
OVER ALL	170.505	175.516	0.420

The t-value (0.134) for confidence about mathematics is not significantat $P < 0.05$. Therefore, null hypothesis that there is no significant differencein confidence of male and female students towards mathematics of the students pursuing diploma engineering is accepted at 0.05 level of significance. The t-values (0.115) Subject is perceived as a male domain is not accepted as the level of significance is 0.05. The hypothesis for Perception teachers' attitude and usefulness is also not accepted. The t-value(0.662) for total attitude mean scores indicates that there is no significantdifference between the total mean scores of male and female studentstowards mathematics, therefore, the null hypothesis that "there is nosignificant effect of gender on students' attitude towards mathematics diploma engineering students of Sikkim" is accepted at 0.05 level of significance.

The data further analyzed in context of hypothesis H2,H3,H4,H5 and found from table no hypothesis is significant as no single context comes under the significant value of 0.05.

V. Conclusion

The results of this study lead us to an important conclusion. The male andfemale students of 10th grade of the polytechnic in Sikkim have sametype of attitude towards mathematics. It means that gender differential has noimpact on the attitude of students towards mathematics in Sikkim.

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