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CONCEPT OF ARITHMETIC IN SECONDARY LEVEL STUDENTS OF NALBARI DISTRICT OF ASSAM

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Abstract: Arithmetic is the oldest and most elementary branch of mathematics. This paper first gives a glimpse of the history of arithmetic. Then, on the basis of field study in Nalbari district, high school students' conception in mathematics and in arithmetic are discussed. The sample in this study comprises 329 pupils of secondary schools under SEBA of which 152 (46.2%) are male and the rest 177 (53.8%) are female. For most of the students reading in the schools run by government management, mathematics is the least favorite subject after English. Independent *t* tests show that female students display less confidence in arithmetic as well as in mathematics than their male counterpart.

Keywords: Arithmetic, Conception, Nalbari district, SEBA.

1. INTRODUCTION

Arithmetic is to mathematics as spelling is to writing; it is the basis of all other mathematics. It is essentially adding, subtracting, multiplying, and dividing. Arithmetic also refers to the upper level concept of number theory, which is the study of the property of integers. In Aristotle's classification of the sciences, discrete quantities were studied by arithmetic, continuous quantities by geometry [1]. It is used by almost everyone, for tasks ranging from simple day-to-day counting to advanced science and business calculations.

The first instance of arithmetic is found in the Ishango bone from central Africa. It is nearly 22,000 years old and shows evidence that pre-historic man knew the basics of addition and subtraction. The Egyptians and the Romans used all the elementary arithmetic operations as early as 2000 BC. They used a decimal base number system but did not include positional notation. The Babylonian mathematics had a sophisticated hexadecimal (base 12) positional numeral system. Similarly the Mayan mathematics had a vigesimal (base 20) positional numeral system. The continuous historical development of modern geometry and arithmetic started in ancient Greece. But, the Greek numeral system lacked positional notation and did not consider zero as a number. The Indian system with its eventual Arabic numerals prevailed because it incorporates the concept of zero and place value.

The Hindu-Arabic number system was introduced in Europe in around 500 AD by Arab mathematicians. In the 16^{th} century, they became commonly used in Europe. The Italian mathematician Fibonacci (c.1170-1250) was primarily responsible for spreading

their use throughout Europe after the publication of his book Liber Abaci in 1202. Fibonacci wrote: "The nine Indian figures are: 9 8 7 6 5 4 3 2 1; with these nine figures, and with the sign 0 ... any number may be written.") [2].

This paper is to study High School Students' Conception in arithmetic and mathematics in Nalbari District of Assam (India). According to census report 2011, population of the district is 769,919 of which 395,804 are male and 374,730 are female. Average literacy rate of Nalbari district is 79.89 (85.58 for male and 73.85 for female). The district is known to the whole of Assam for its excellent academic performance in High School Leaving Certificate (HSLC) examinations.

Board of Secondary Education, Assam (SEBA) is responsible for the secondary education in Assam. Mainly commercial arithmetic has been incorporated in the High School syllabus. The topics are Discount (Retail Discount and Trade Discount), Compound Interest, Proportional parts and Partnership business, Share, Stock and Brokerage for class IX and Banking System and Income Tax for class X. These chapters introduce students to some practical calculating problems of the present society.

2. PURPOSE 0F THE STUDY

The study is to investigate the relationship, if any between a set of independent variables i.e., gender, school type (managed by Govt. and the Private authorities) on the conception in arithmetic and mathematics of the students of Nalbari district.

3. HYPOTHESIS

The following hypotheses are formulated as well as tested against empirical data:

H1: There is no significant difference in the conception level in arithmetic and in mathematics among students of Nalbari district studying in different types of schools having different types of management.

H2: There is no significant difference in the conception level among male and female students in arithmetic and in mathematics studying in the high schools of Nalbari district of Assam.

4. METHODOLOGY

This study used survey design which involves the collection of data from representative sample of three different blocks of Nalbari district. The inhabitants mostly comprise typical Assamese middle class and lower middle class people.

The current work is a descriptive study investigating conception in arithmetic and mathematics of students studying in high schools of Nalbari district under SEBA. The analysis is based on an empirical study with students as the main informants. The questionnaire was administered to ninth grade students who have just promoted to grade ten. To study conception

on arithmetic, a five-item instrument using various sub-chapters of arithmetic is used. The questions to the students and teachers were constructed by the researcher based on the prescribed class nine curricula to cover the basic of mathematics which consisted of 33 items associated with ninth grade syllabus (11 for the students, 22 for the teachers). The students were asked to rate the statements on a five point Likert scale ranging from strongly agree (5) to strongly disagree (1). The questions were on conception level on arithmetic and various other chapters of mathematics. High score on the scale indicates a high level of conception in mathematics. There was a trial testing to improve the content reliability. A Cronbach alpha analysis of the reliability of the questionnaire was found to be 0.742268. After the initial validation of questionnaire, it was administered to the participants. Private schools have high reputations in society. Pupils in these schools belong to well to do families with high socio-economic status. Tuition fees in the government schools are very meager and generally, students from relatively low socio-economic strata of the society flog these schools.

5. DATA ANALYSIS

The research questions are answered using means, standard deviations and charts. Student's *t*-test is utilized for testing the significance of difference between mean conception scores. The hypotheses were tested at 5% level of significance.

6. RESULTS

Table 1
The Number, Mean, Standard Deviation, and t Value of Scores on Conception Level of Different Topics in Commercial Arithmetic

Topic	*School*	*Group*	*N*	*M*	*SD*	*df*	*t value*	*Remark*
Discount	Govt.	Male	80	3.84	1.08434	178	1.65	NS
		Female	100	4.08	0.90654			
	Private	Male	72	3.61	1.00078	147	0.152	NS
		Female	77	3.64	1.01189			
Compound Interest	Govt.	Male	80	3.64	0.99675	178	0.443	NS
		Female	100	3.70	0.89330			
	Private	Male	72	3.71	1.08040	147	3.04	S
		Female	77	3.18	1.03527			
Proportional parts & partnership business	Govt.	Male	80	3.46	1.04268	178	2.67	S
		Female	100	3.19	1.06073			
	Private	Male	72	3.70	1.05669	147	1.50	NS
		Female	77	3.43	1.10535			
Share, Stock & Brokerage	Govt.	Male	80	3.35	1.02005	178	1.20	NS
		Female	100	3.17	0.98533			
	Private	Male	72	3.35	1.07677	147	1.77	NS
		Female	77	3.03	1.13525			
Average	Govt.	Male	80	18.44	3.11730	178	0.74	NS
		Female	100	18.11	2.77759			
	Private	Male	72	18.65	3.02202	147	2.18	S
		Female	77	17.53	3.24274			

M = Mean *N* = Number of pupils, *S* = Significant, *NS* = Not Significant.

Table 1 shows that in the private schools, there is significant difference between arithmetic conception scores of males and females in case of the chapter Compound Interest ($df = 147$, $t = 3.04$). In case of government school, the table shows significant differences in the chapter Proportional Parts & Partnership Business ($df = 178$, $t = 2.67$). Taking arithmetic as a whole, there is significant difference among male and female students studying in private schools. In both the cases boys are ahead of the girl students.

Hypothesis 1:

Table 2
Analysis of Conception Scores in Arithmetic of Two Groups of Students Formed on the Basis of School Ttype

Type of school	*Number*	*Mean*	*SD*	*df*	*t Value*	*Remark*
Government	180	18.26	2.9295	327	.538	Not Significant
Private	149	18.07	3.1773			

(At 5% level of significance the table value of *t* is 1.96).

Table 3
Analysis of Conception Scores in Mathematics of Two Groups of Students Formed on the Basis of School Type

Type of school	*Number*	*Mean*	*SD*	*df*	*t Value*	*Remark*
Government	180	61.81	5.52474	327	1.75	NS
Private	149	62.87	5.35454			

(At 5% level of significance the table value of *t* is 1.96).

Table 2 and Table 3 show that the obtained *t* values are within the limit set for 0.05 level of significance. *Hence the null hypothesis that there is no significant difference in conception level of arithmetic (and mathematics) among students of Nalbari distrct studying in private and government secondary schools is accepted.*

Hypothesis 2:

Table 4
Analysis of Conception Scores in Arithmetic of Two Groups of Students Formed on the Basis of Gender

Gender	*Number*	*Mean*	*SD*	*df*	*t-Value*	*Remark*
Male	152	18.54	3.0642	327	2.03	Significant
Female	177	17.86	2.9938			

(At 5% level of significance the table value of *t* is 1.96).

Table 5
Analysis of Conception Scores in Mathematics of Two Groups of Students Formed on the Basis of Gender

Gender	*Number*	*Mean*	*SD*	*df*	*t-Value*	*Remark*
Male	152	63.12	5.33877	327	2.68	Significant
Female	177	61.51	5.48770			

(At 5% level of significance the table value of *t* is 1.96).

Table 4 and Table 5 show the t values are above the limit set for 5% level of significance. *Hence the null hypothesis that there is no significant difference in conception level between male and female secondary school students is rejected*. From mean values, it is concluded that male students are conceptually stronger than their female counterparts.

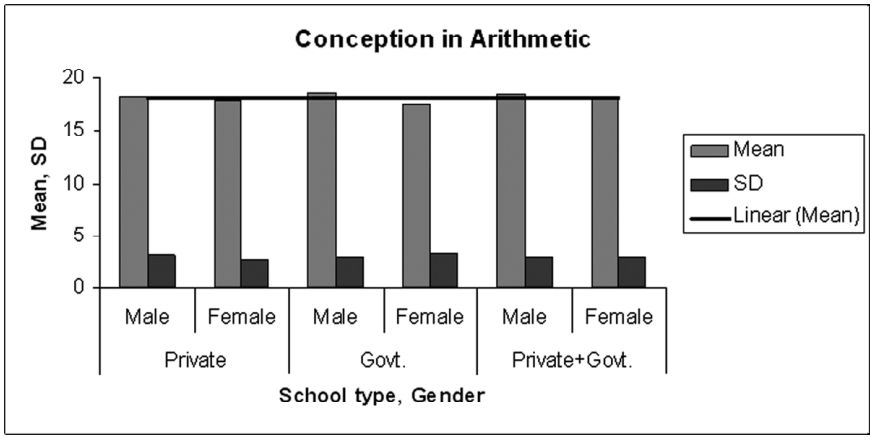

Figure 1: Conception Level in Arithmetic

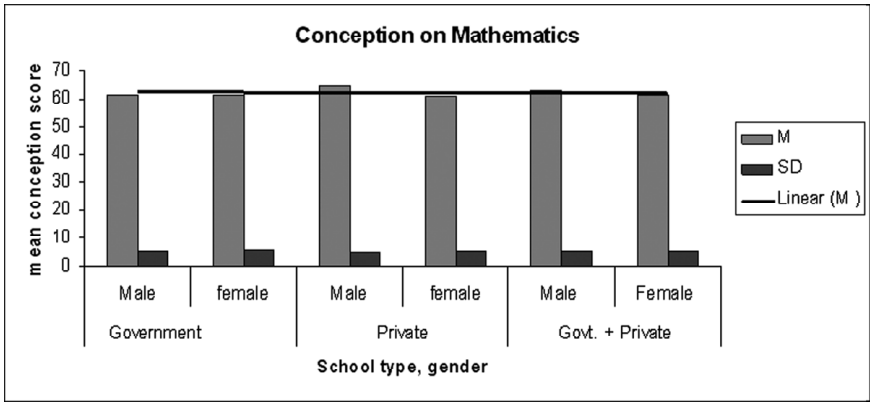

Figure 2: Conception in Mathematics

7. DISCUSSION

One of the major conclusions derived from the study is that students of private schools are conceptually stronger than students of government schools (though not significantly). The disparity among different types of school can be due to the difference of socio-economic status of students. It is a known fact that students from high economic strata have enriched home environment and better physical and mental health. Researchers like Coleman also concluded in the 'Equality of Educational Opportunity' report of U.S.Schools, that the home background has a much more powerful influence than the school on student achievement [3].

Another finding is that there is significant difference in conception level among male and female students in arithmetic as well as in mathematics. Male students are in a better position than the female students. The result is that female students avoid mathematics and math related subjects in their future studies. In science stream, only 2.03% female candidates appeared in the Assam Higher Secondary Final Examination of 2011. The result is consistent with previous studies on mathematics and mathematics related subjects. For example, Graham found that Chemistry, Physics, Mathematics and further Mathematics are male-dominated zones [4]. It is a matter of global concern. The UNESCO admits: unfortunately, gender inequality in education has remained a perennial problem of global scope [5, 6, 7].

Table 3 shows that there is significant difference in conception level between boys and girls of private secondary schools of Nalbari district, the disparity is less in case of government schools. The fact is that people of this area is losing faith in government schools. If the poor parent finds that their boy is a brilliant one, then they try their best to give him better education. But in case of girl child, they hesitate to do so if they cannot afford it or if the school is not in a comfortable distance from home. Implicit in it is that most of these private schools are located far from the rural areas.

So, Private schools are getting students from privileged section of the society as well as some brilliant male students from the weaker section of the society. The brilliant female students from weaker section of the society remain in the low cost government schools. The brilliant male students from the weaker section of the society may be the factor which is responsible for the disparity among male and female students of private schools as far as conception in arithmetic (and mathematics) is concerned. The results are consistent with previous studies. For example, explaining the increased popularity of private education, the PROBE Team stated that in this case the breakdown of govt. schools is often more decisive than parental ability to pay [8]. Findings of Murulidharan and Kremer supported this view [9]. Of course, all agree that females in principle will produce exactly the

same scientific knowledge as males provided that sufficient rigor is undertaken in scientific enquiry [10, 11].

One latent variable may be the mathematics anxiety among students. In most of the previous studies, mathematics anxiety is found to have a negative relationship with mathematics performance and achievement. Researchers also found that female students suffer more from math anxiety than their male counterparts [12, 13].

8. CONCLUSION

Government and private school students need to compete, collaborate and gain from one another in mathematics teaching and learning. Frequent interaction and mathematics meet among these different background students and teachers can be a good help to augment the cause of mathematics. All concerned should maintain an active role and encourage students to incorporate mathematics into their daily routine.

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