Gender difference in mathematics achievement among the graduates of BRAC schools

Samir R Nath

Senior Staff Statistician

May 1998

BRAC

Research and Evaluation Division

75 Mohakhali, Dhaka 1212, Bangladesh

Contents

List of tables

Abstract

This study aims to explore the gender difference in mathematics achievement of the graduates of BRAC schools. Data generated in the numeracy section of the study on assessment of basic competencies of the graduates of BRAC schools of 1997 were analysed for this purpose. Two types of BRAC schools, viz., NFPE and BEOC, were considered in this study. Both bi-variate and multivariate approach were used to analyse the data. The findings of this study clearly showed that achievement in mathematics is significantly lower among girls than boys in BRAC schools ($p<0.001$). The gender variation was observed in both types of schools, however, the graduates of BEOC are more likely to do better in the test than the graduates of NFPE. Some suggestions were also made to improve the situation towards gender equity in mathematics learning in BRAC schools.

Introduction

BRAC, the largest non-governmental development organisation in Bangladesh, has been operating multisectoral development programmes targeting poverty alleviation and empowerment of the poor since 1972 (BRAC, 1997). Like many other developing countries, women especially the rural women are the most vulnerable section of Bangladesh population. Thus, the rural women of Bangladesh are the targeted beneficiaries of all the development programmes of BRAC. For instance, 93% of the village organisations (VOs) of BRAC's rural development programme (RDP) (largest programme of BRAC) are women's organisation. BRAC also took several other steps to ensure equal opportunity of man and women among its staff and within programmes (BRAC, 1997). Creating a women's advisory committee (WAC), launching a training programme titled gender analysis and awareness course (GAAC) and a programme named gender quality action learning (GQAL) are different steps towards gender equity. A gender resource centre was also established to disseminate gender related information. Ultimate goal of all these initiatives are to enhance the quality of BRAC programmes in relation to gender that addresses village women and girls.

In primary education sector of Bangladesh, BRAC operates two models of education programmes for two groups of children. The non-formal primary education (NFPE) and the basic education for older children (BEOC) are respectively targeted to the children aged 8-10 and 11-14 years. Over emphasis is also given to female education in these two school programmes. Over 70% of the students of BRAC schools are girls and 97% of the teachers are female (BRAC, 1997). The programme was developed in response to the needs of girls. The curriculum is designed in such a way that it should not provide only basic education to the students, but also to provide them with some basic skills that help in performing their roles and responsibilities in their families - immediate or in the future. The level of basic education attained by the graduates of BRAC schools are monitored regularly (Nath et al., 1998, 1996, 1994 & 1992). Studies conducted after nine/ten months of their graduation showed that around 70% of the graduates could pass the minimum criteria of basic education (Nath et al., 1998 & 1996). Nearly 85% of the

graduates enrolled in formal schools for further education. No gender variation was observed in the levels of basic education and enrolment rates. Another study confirmed that BRAC schools are more likely to provide basic education than the learners of formal schools (Nath, 1997). All these findings suggest that BRAC schools provide a satisfactory level of education. However, it was observed in other studies that gender difference was there in numeracy (Nath et al., 1998, 1996). The boys were found more likely to have numeracy skills than their peer girls. It should be mentioned that only mental arithmetic section of the numeracy part, as obliged by the definition of basic education, was used in assessing numeracy skills of the children. However, a total of 13 question items were put in the assessment instrument. A need was felt to analyse all these items together to get better understanding about gender variation in BRAC schools.

Gender difference in mathematics and science is not new (Robinson et al., 1996; Hedges and Nowell, 1995; Leder, 1990; Hyde et al., 1990; Bailey, 1988). Like other social, cultural, economic and educational achievement, girls lag behind boys in mathematics participation and achievement, is a worldwide phenomenon. One recent study on Bangladesh explored that boys of 11-12 years performed better than their peer girls in arithmetic knowledge (Nath et al., 1997). Mathematics should be taught equally to all students not only because it is one of the fundamentals of 'knowledge' and science, but also it is vital to employment. Thus, mathematics knowledge can make people empowered in employment market and so in the society. As BRAC aims to promote better life for women, the education programme should ensure equal learning opportunities for both boys and girls in all the areas of education. This study aims to look at the gender difference in arithmetic achievement of the BRAC school graduates.

Methodology

Study population and sampling

The focus of this study was the students of BRAC schools (both NFPE and BEOC) who had completed a three-year curriculum in early 1997. A total of 11,467 schools (NFPE 9,231 and BEOC 2,236) completed the curriculum in 1997 where 378,411 students were graduated. Considering each of the question item as dichotomous variable (correct or incorrect) a sample of size 420 was calculated to be needed to have a single estimate with 95% confidence limit and 7% precision level. Attempt was taken to have separate estimates for both the school types. The 30 cluster sampling procedure was used to select the graduates. A two stage sampling technique was used. At the first stage, 30 teams were selected separately for each type of school, applying probability proportional to sizes with systematic sampling technique. At the second stage, two schools were selected from each team, one at random and one adjacent to the first one. Lists of children who graduated from these schools were compiled from which two separate samples of 7 boys and 7 girls were taken at random. If any problem arose (due to absence of selected children in the house, etc.) the interviewers took another school closest to the one they just finished, and repeated the process to complete the remaining interviews. A similar procedure was followed for NFPE and BEOC schools. Thus, finally the data of 841 children were used in this analysis.

The instrument

There were six parts in the test instrument containing 13 question items. There was one question on counting numbers, three on reading numbers, three on writing numbers, one on addition, one on subtraction. and four on mental arithmetic. A detail of the test items is in Appendix.

The quality of the data was assessed by a post-enumeration check. About 10% of the original sample were selected for re-interview on some of the selected items. Matching

operation of interviewed and re-interviewed data showed that most of the items matched in more than 90% of the cases (Nath et al., 1998).

Data analysis

Analysis of data started by producing percentage of graduates correctly answered each of the question items. This analysis was done separately for each of the school type and sex. The means and the standard deviations of number of correct items were calculated separately for the boys and the girls of different socio-economic characteristics. As the distribution of 'number of correct items by an individual' was not 'normal', it was thought that the multiple regression analysis might not be an appropriate approach for multivariate analysis. Again it was seen that about two-thirds of the respondents correctly answered all the question items and the distribution seems to follow a logistic curve. Thus, it was decided to re-analyse the data considering the outcome variable as dichotomous (correctly answered all the items and others). Percentage of graduates correctly answered all the items were produced separately for each of the study group and sex. A logistic regression model was fitted with the following explanatory variables: school type, sex, age, current enrolment of children, mothers education, fathers education, yearly food security status of household and religion. However, a multiple regression model was also estimated considering 'number of correct items' as dependent variable and with the same explanatory variables. A stepwise approach was followed to estimate the regression models and the models were fitted by a forward selection of significant variables and a backward elimination of insignificant variables. Appropriate statistical tests (t-test, chi-square) were done as per needed to know the significance of the differences among the estimates.

Results

Socio-economic characteristics of the respondents

The socio-economic characteristics of the children are presented in Table 1. On average, the mean age of the respondents was 12.4 years. The mean age was higher among the

graduates of BEOC followed by NFPE. After graduating from BRAC schools, 85.3% of the children enrolled in formal schools for further education. Percentage of graduates enrolled in formal schools was higher among the graduates of NFPE than BEOC. Nearly three quarters of the mothers and 57.1% of the fathers of the respondents never attended any educational institute. Proportionately more illiterate parents were found among the graduates of BEOC. On average, yearly food security status of more than half of the households from which the graduates came from was reported as deficit. Persons from households with less than 50 decimals of land and at least one person selling labour for more than 100 days a year were considered eligible for BRAC's development programmes. Only 36.4% of the graduates were found to come from such eligible households. Nearly 16% of the respondents came from non-Muslim households.

Table 1. Socio-economic characteristics of the sample graduates

Socio-economic characteristics	NFPE		BEOC		All (weighted)
	Boy	Girl	Boy	Girl	
Mean age (in years)	12.1	12.1	13.8	13.9	12.4
Current enrolment rate	87.2	87.1	78.5	74.9	85.3
Mothers never attended school (%)	75.4	71.0	80.4	79.6	75.2
Fathers never attended school (%)	56.9	53.8	61.2	63.0	57.1
Yearly food security status as deficit (%)	53.1	51.5	59.8	57.8	53.9
BRAC membership eligible households* (%)	36.5	36.4	35.9	37.0	36.4
Non-Muslim (%)	16.1	14.8	15.3	17.5	15.8

* Eligible = Households with less than 50 decimals of land and at least one person sell labour more than 100 days in a year; Non-eligible = others.

Arithmetic knowledge of the graduates

The percentage distribution of children correctly answered each of the arithmetic question items are presented in Table 2. Except subtraction, on average, more than 90% of the interviewed children correctly answered all the question items. When the data were broken down by sex it was observed that the performance levels of the NFPE girls were less than 90% in some of the other items. On average the performance of the children of BEOC was significantly better than that of the children of NFPE in two items ($p<0.02$). These are writing the numbers 67 and 208. Among the graduates of NFPE.

gender difference was observed in five items: writing the numbers 5 and 208 and doing three mental arithmetic viz., addition, subtraction and division ($p<0.05$). Otherwise, among the graduates of BEOC, gender difference was seen in six items ($p<0.05$). These are reading numbers 49 and 500, writing numbers 67 and 208 and doing two mental arithmetic viz., subtraction and multiplication. In all these cases gender difference favoured boys.

Table 2. Percentage of children correctly answered different items in arithmetic assessment by school type and sex

Item	NFPE			BEOC		
	Boy	Girl	Both	Boy	Girl	Both
Count number	95.3	92.9	94.1	96.7	95.7	96.2
Reading number						
3	99.5	99.5	99.5	100.0	100.0	100.0
49	95.3	92.9	94.1	98.1	90.0	94.0***
500	98.1	96.7	97.4	100.0	94.8	97.4***
Writing number						
5	100.0	98.1	99.0*	99.5	99.1	99.3
67	92.9	88.1	90.5	97.6	91.9	94.8**
208	93.8	86.7	90.3*	99.5	93.8	96.7**
Addition	96.2	96.2	96.2	95.7	94.3	95.0
Subtraction	79.6	74.8	77.2	85.6	79.1	82.4
Mental arithmetic						
Addition	97.6	91.0	94.3**	96.2	95.3	95.7
Subtraction	97.6	89.5	93.6***	98.1	93.8	96.0*
Multiplication	95.7	92.9	94.3	96.2	91.0	93.6*
Division	96.2	91.4	93.8*	98.1	94.8	96.4

Notes ***p<0.001 **p<0.01 *p<0.05

Difference between the schools was found in writing 67 ($p<0.02$) and 208 ($p<0.001$)

The means and the standard deviations of number of correct items by different socio-economic characteristics are presented in Table 3. On average, boys correctly answered 12.5 items and the girls answered 12 items. The standard deviation of number of correct

Table 3. Mean and standard deviation of number of correct items by different socio-economic characteristics

Socio-economic characteristics	Boy		Girl		Both		Level of significance
	Mean	S.d.	Mean	S.d.	Mean	S.d.	
All	12.5	1.0	12.0	1.7	12.3	1.4	p<0.001
School type							
NFPE	12.4	1.2	11.9	1.7	12.1	1.5	p<0.001
BEOC	12.6	0.8	12.1	1.7	12.4	1.3	p<0.001
Level of significance	p<0.02		ns		p<0.02		
Age (in year)							
≤10	12.0	1.3	11.9	1.3	11.9	1.3	ns
11-12	12.4	1.2	12.1	1.6	12.2	1.4	ns
13-14	12.6	0.8	12.2	1.5	12.9	1.2	p<0.001
15-18	12.7	0.7	11.7	2.2	12.2	1.7	p<0.001
Level of significance	*p<0.05*		*ns*		*ns*		
Current enrolment status							
Enrolled	12.5	1.0	12.2	1.5	12.4	1.3	p<0.01
Not-enrolled	12.5	0.8	11.2	2.2	11.8	1.8	p<0.001
Level of significance	ns		p<0.001		p<0.001		
Mothers education							
Never schooled	12.5	1.0	12.0	1.6	12.3	1.3	p<0.001
Have some schooling	12.5	0.9	12.0	2.0	12.2	1.6	p<0.05
Level of significance	ns		ns		ns		
Fathers education (in year)							
Nil	12.4	1.1	11.9	1.8	12.2	1.5	p<0.001
1-5	12.5	0.9	11.9	1.9	12.2	1.5	p<0.01
6+	12.6	0.9	12.6	0.8	12.6	0.9	ns
Level of significance	ns		p<0.01		p<0.01		
Yearly food security status							
Always deficit	12.3	1.5	11.8	1.8	12.0	1.7	ns
Occasionally deficit	12.5	0.8	12.0	1.7	12.3	1.4	p<0.001
Balance	12.4	1.1	12.3	1.5	12.3	1.3	ns
Surplus	12.8	0.6	11.8	1.9	12.3	1.4	p<0.001
Level of significance	p<0.05		ns		ns		
Religion							
Muslim	12.5	1.0	12.0	1.8	12.2	1.5	p<0.001
Non-Muslim	12.7	0.8	12.2	1.4	12.5	1.2	p<0.02
Level of significance	p<0.02		ns		p<0.05		

answers was higher for girls than boys. Thus, a significant difference was appeared against girls ($p<0.001$). Equal level of statistically significant gender difference was observed among the graduates of both the types of schools ($p<0.001$). The mean difference between boys and girls was lower among the currently enrolled children than non-enrolled children and among the younger children than the elder once. Greater gender difference was also seen among the children of never schooled parents compared to the children of the parents with some years of schooling. The level of gender difference was varied according to religious belief of the respondents. The difference was higher among the Muslims than non-Muslims. On average, the non-Muslim children showed significantly better performance than the Muslims ($p<0.05$).

Table 4 presents the percentages of children by number of items correctly answered, school type and sex. The range of the number of correct items is 3 to 13 for all the children. However, it was only 9 to 13 for the boys of BEOC schools. It was observed that a very few proportion of the children (3.1%) correctly answered eight or less number of items and nearly 65% of the children could correct all the 13 items. On average, 82.8% of the children correctly answered 12 or 13 items.

Table 4. Percentage distribution of children by number of items correctly answered, school type and sex

Number of items	NFPE		BEOC		All
	Boy	Girl	Boy	Girl	
≤ 8	1.9	5.3	--	5.2	3.1
9	0.9	3.8	1.0	2.4	2.0
10	4.3	4.8	1.9	3.8	3.7
11	7.6	13.3	6.7	6.2	8.4
12	19.0	18.6	15.8	18.5	18.0
13	66.4	54.3	74.6	64.0	64.8
Range	*5-13*	*4-13*	*9-13*	*3-13*	*3-13*

Table 5. Percentage of children correctly answered all question items by different socio-economic characteristics

Socio-economic characteristics	Boy	Girl	Both	Level of significance
All	70.5	59.1	64.8	p<0.001
School type				
NFPE	66.4	54.3	60.3	p<0.01
BEOC	74.6	64.0	69.3	p<0.02
Level of significance	*ns*	*p<0.05*	*p<0.01*	
Age (in year)				
≤ 10	53.8	45.8	50.0	ns
11-12	67.3	60.7	64.1	ns
13-14	73.7	62.5	67.9	p<0.05
15-18	75.0	53.7	63.9	p<0.01
Level of significance	*ns*	*ns*	*ns*	
Current enrolment status				
Enrolled	71.0	64.8	67.9	ns
Not-enrolled	68.1	35.0	50.7	p<0.001
Level of significance	*ns*	*p<0.001*	*p<0.001*	
Mothers education				
Never schooled	70.9	58.0	64.6	p<0.001
Have some schooling	68.8	62.5	65.5	ns
Level of significance	*ns*	*ns*	*ns*	
Fathers education (in year)				
Nil	67.7	55.7	61.7	p<0.01
1-5	70.3	57.6	63.7	ns
6+	79.0	73.0	76.1	ns
Level of significance	*ns*	*p<0.05*	*p<0.01*	
Yearly food security status				
Always deficit	70.7	52.9	61.1	p<0.05
Occasionally deficit	68.2	55.6	62.2	p<0.02
Balance	65.8	68.6	67.3	ns
Surplus	85.7	53.7	70.9	p<0.001
Level of significance	p<0.05	ns	ns	
Religion				
Muslim	67.8	58.1	62.9	p<0.01
Non-Muslim	84.8	64.7	74.6	p<0.01
Level of significance	p<0.01	ns	p<0.01	

The percentages of children correctly answered all the 13 items by socio-economic characteristics are presented in Table 5. This table shows that in correctly answering all the items, boys performed better than their peer girls ($p<0.001$). This observation is equally true for the graduates of both types of schools. However, the performance was better among the graduates of BEOC than those of NFPE ($p<0.01$). No statistically significant variation was observed in the performance according to increase in age of the children, but gender difference occurred among elders not among the younger. The performance of the currently enrolled children was more likely to be better than that of the non-enrolled children. However, the gender variation was observed only among the non-schooled children. No variation was observed according to the variation in mothers education. Otherwise, the performance was found increasing according to the increase of fathers education ($p<0.01$). The gender difference occurred only among the children of never schooled parents. The children of non-Muslim parents showed significantly better performance than the children of Muslim parents. However, equal level of gander variation was observed in both the religious groups.

Regression analysis

It was already mentioned that two regression models were constructed for further explanation of gender variation in arithmetic achievement of BRAC school graduates, one is multiple and the other is logistic. The results of both the regression models are presented in Tables 6 and 7.

Table 6. Multiple regression analysis of arithmetic knowledge considering number of correct items as dependent variable

Socio-economic factors	Beta	t-value	Level of significant
Sex	0.17	5.11	$p<0.001$
Current grade of the child	0.21	6.36	$p<0.001$
Father's education	0.08	2.46	$p<0.05$
Religion	0.07	2.00	$p<0.05$
Constant	10.58		$p<0.001$

Notes Adjusted R square = 0.08, F-statistic = 19.88 ($p<0.001$)

Multiple regression: Among the eight variables considered for the analysis, only four appeared in the multiple regression model (Table 6). These variables are sex, current grade of the children, years of schooling of father, and religion. The regression model explains that the performance of the boys are more likely to be greater than the girls after controlling for current grade of children, fathers education, and religion ($p<0.001$).

Logistic regression: Five of the eight variables appeared in logistic regression model (Table 7). The variables are school type, sex, current enrolment status, fathers education, and religion. According to this model, after controlling for school type, current enrolment, fathers education and religion, the boys are 1.66 times more likely to be competent than the girls in correctly answering all the 13 items ($p<0.001$).

Table 7. Logistic regression analysis of arithmetic knowledge considering correctly answered all items as dependent variable

Socio-economic factors	Odds ratio	Wald statistic	Level of significance
School type		11.20	p<0.001
NFPE	1.00		
BEOC	1.67		
Sex		11.52	p<0.001
Girl	1.00		
Boy	1.66		
Current enrolment status		15.79	P<0.001
Not-enrolled	1.00		
Enrolled	2.13		
Fathers education (in year)		7.46	p<0.05
Nil	1.00		
1-5	1.13		ns
6+	1.80		p<0.01
Religion		5.84	p<0.01
Muslim	1.00		
Non-Muslim	1.70		

Notes -2 Log Likelihood = 1035.37. Model $\chi^2 = 52.71$ with 6 d.f. ($p<0.001$)
Overall prediction in the classification table is 67.34%

Current schooling of the children was found to be most important predictor in both the regression models. However, sex of the children appeared as second important variable according to predictive power.

Discussion

The aim of this article was to explore the gender difference in mathematics achievement of the graduates of BRAC schools. To do this, data of two groups of children viz., NFPE and BEOC, who were graduated in early 1997, were assessed. Gender imbalance in participation and achievement is not new in mathematics education. The degree of imbalance varies according to age of the students (Beller and Gafni, 1996; Mulles et al., 1993). Studies in developed countries confirmed that there is no or less gender difference among the children of younger ages. Again, the difference gradually increases as the age of the students increased. However, gender imbalance was common in all ages in these countries some decades ago. This is a significant improvement in the educational system of these countries. This was possible due to major activities (both research and programme) in schools against gender inequality. Even Hawaiian studies on the students of grades 4, 6 and 8 have suggested that sex difference in mathematics achievement have favoured girls (Brandon et al., 1987).

In Bangladesh the educational sector is still growing. Only the primary education, which is only for five years, is compulsory for the children of aged 6 to 10. The overall quality of primary education in Bangladesh is not satisfactory. However, some special programmes are doing better compared to others. BRAC's non-formal primary education programme is one of those. One recent study suggested that the learners of BRAC schools were more equipped in basic education than the students of formal schools (Nath, 1997). In the area of mathematics education, so far only one study is available on Bangladesh which was based on a representative sample taken from all over the country (Nath et al., 1997). Using the similar instrument (similar to present study) this study explored the gender difference in arithmetic achievement among the children aged 11-12

years. As the present study used the instrument, which is similar to that of the national study, it is possible to compare the findings of both the studies.

The findings of this study show that of the 13 question items, gender difference was present in five items among the graduates of NFPE and in six items among the graduates of BEOC. On average, the mean number of items correctly answered by the boys was significantly higher than that of the girls. Again, proportion of the girls correctly answered all the items were significantly lesser than that of the boys. Similar findings were seen when the data were analysed separately for NFPE and BEOC. All these findings confirm a significant gender imbalance in mathematics achievement among the graduates of BRAC schools. However, nonetheless to say that overall performance of the BRAC graduates was much higher than the performance of the children shown in the national survey (Nath et al., 1997). The gender gap was seen wider among those children who were not currently in school, elder in age, and whose parents were illiterate. Having much difference in elder age, compared to younger age, is consistent with existing literature (Beller and Gafni, 1996). However, one study in the Dominican Republic did not find any effect of age in the mathematics achievement of the children, where children of different ages sit in a same classroom (Ma, 1997). This observation is similar to that of the present study.

The regression analyses confirmed that four variables such as sex of the children, their current schooling status, father's education, and religion were statistically significant predictors of arithmetic achievement of the graduates of BRAC schools. Like many other studies on primary education in Bangladesh this study showed that current schooling of the children was the most important predictor of mathematics achievement of the children (Mohsin et al., 1996; Nath, 1997). This finding is also similar to that of national study (Nath et al., 1997). However, sex of the children came out as second important predictor of mathematics achievement of the children. If we compare the gender gap in numeracy found in this study and the study which considered only four items (Nath et al., 1998), it can be said that the gap became wider when all 13 items were considered.

This study and the previous one (Nath et al., 1997) clearly explored that gender difference in mathematics education exists in primary schools in Bangladesh. Different steps have been taken to increase the enrolment rates in primary schools in recent years. Some steps, especially by the NGOs, have been taken to improve the quality of education at primary level. However, it is very limited compared to national demand. BRAC is planning to open more ten thousand schools by this year. It is the time to take steps to eradicate gender inequalities from a special subject like mathematics. We should not forget that mathematics is not only a basic science, also creates greater work opportunities. Present level of inequality might be much greater in the future life of the graduates, which may negatively affect in well being in female life. BRAC, as a whole, wants to eliminate gender imbalance from the lives of its beneficiaries. So, BRAC should carefully look at the non-formal education programme in this regard. To reduce gender inequality in mathematics learning in BRAC schools for the time being and to eliminate it in future following steps might be considered.

1. The findings of this study should be discussed among the Programme Organisers (POs), Programme Assistants (PAs), and the resource teachers.

2. The teachers should be informed about gender imbalance in mathematics in their schools. Steps should be taken to include these matters in teacher training and monthly refresher meetings. It might lead NFPE teachers towards greater attention to girls in mathematics classes.

3. It should be checked whether gender difference happens due to parents and/or teachers' attitudes to girls doing mathematics, classroom behaviour or the mathematics curriculum.

4. An initiative might be taken to do research on mathematics education in BRAC schools regularly. Curriculum dependent tests on different types of mathematical problems and evaluation of above mentioned matters (in # 3) should be included in this process.

References

Beller M, Gafni N (1996): The 1991 international assessment of educational progress in mathematics and science: the gender difference perspective. *The Journal of Educational Psychology*, **88** (2): 365-77.

BRAC (1997): *BRAC 1996.* Dhaka: Bangladesh Rural Advancement Committee.

Brandon PR, Newton BJ, Hammond OW (1987): Children's mathematics achievement in Hawaii: sex differences favouring girls. *American Educational Research Journal*, **24** (3): 437-61.

Ma X (1997): A multiple regression analysis of mathematics achievement in the Dominican Republic. *International Journal of Educational Development*, **17** (3): 313-21.

Mohsin M, Nath SR, Chowdhury AMR (1996): Influence of socio-economic factors on basic competencies of children in Bangladesh. *Journal of Biosocial Science*, **28** (1), 15-24.

Mulles IVS, Dossey JA, Qwen EH, Phillips GW (1993): *NAPE 1992: mathematics report card for the nations and the states.* Princeton, NJ: Educational Testing Service.

Nath SR, Imam SR, Chowdhury AMR (1998): *Levels of basic competencies of the BRAC school graduates of 1995 and 1997.* Dhaka: Bangladesh Rural Advancement Committee.

Nath SR (1997): *The impact of BRAC's education programme on raising basic education levels for the children of rural Bangladesh.* An unpublished dissertation submitted to the University of Oxford, UK.

Nath SR, Mohsin M, Chowdhury AMR (1997): Gender difference in the arithmetical knowledge of children in Bangladesh. *Research in Education*, **58**: 35-45.

Nath, S.R. and Chowdhury, A.M.R. (1996): *Basic competencies of the graduates of BRAC schools of 1995.* Dhaka: Bangladesh Rural Advancement Committee.

Nath, S.R., Khan, M.K.A. and Chowdhury, A.M.R. (1994): *Progress in basic competencies of NFPE and PEOC graduates over time.* Dhaka: Bangladesh Rural Advancement Committee.

Nath, S.R., Mohsin, M. and Chowdhury, A.M.R. (1992): *Assessment of basic education of NFPE and PEOC graduates.* Dhaka: Bangladesh Rural Advancement Committee

Appendix: The test instrument

The following questions were asked to the children to solve

1. Interviewer: Ask the child to count 40-50.
   Can count = 1, Can count partially = 2, Can't count = 3

2. Interviewer: Show the following "numbers" card and ask the child to read the numbers loud.
   3: Can read = 1, Can't read = 2
   49: Can read = 1, Can't read = 2
   500: Can read = 1, Can't read = 2

3. Interviewer: Dictate the following numbers and ask the child to write.
   5: Can read = 1, Can't read = 2
   67: Can read = 1, Can't read = 2
   208: Can read = 1, Can't read = 2

4. Interviewer: Ask the child to do the following addition.

   5
   + 53
   + 20 Correct = 1, Can't do = 2

5. Interviewer: Ask the child to do the following subtraction.

   70
   - 43 Correct = 1, Can't do = 2

6. Interviewer: This part is mental arithmetic. Read the followings one by one and ask the child to answer orally.

   a) In the market you have bought fish for Tk. 15, potatoes for Tk. 5, and green chelis for Tk. 2. How much money have you spent?
   Correct = 1, Incorrect = 2, Can't say = 3

   b) You had Tk. 30. You bought a notebook and pencils for Tk. 15. How much money do you have left?
   Correct = 1, Incorrect = 2, Can't say = 3

   c) You bought 4 pens costing Tk. 3 each. How much did you spend on 4 pens?
   Correct = 1, Incorrect = 2, Can't say = 3

   d) Divide Tk. 40 among 4 persons equally. How much each will get?
   Correct = 1, Incorrect = 2, Can't say = 3