

Why do few children at rural secondary madrasas in Bangladesh choose to study an optional course in Higher Mathematics?

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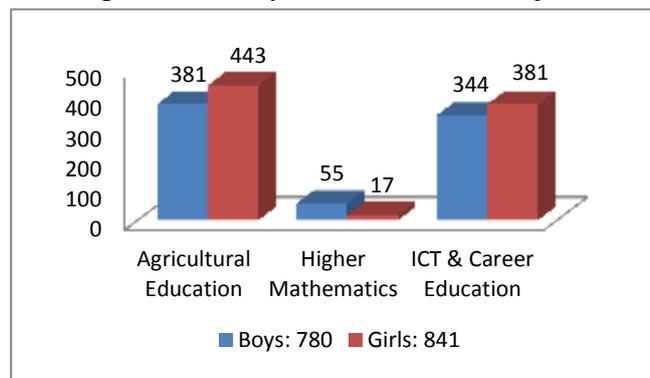
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In Bangladesh, children of the science stream education at secondary level may choose to study ‘Higher Mathematics’ as an optional course among the other subjects such as Agricultural Education, ICT and Career Education and Biology. This paper reports a preliminary analysis of six focus group discussions (FGDs) with some children of grades 9 and 10 across three rural secondary madrasas (Islamic schools) in Bangladesh. The analysis suggests that shortage of good higher math teachers and a private tuition centered math education have negative effects on children’s participation in an optional course in Higher Mathematics.

Keywords: Bangladesh; higher mathematics; influence; madrasas; private tuition.

Introduction

Mathematics is a compulsory subject in the secondary school and madrasa curriculum in Bangladesh as in other countries but there is also an option to study an additional subject that gives the opportunity to add above 40% of the acquired marks on that subject to their total marks in Secondary School Certificate (SSC) Examination. This extra mark can help improve their expected overall grade in SSC examination at the end of grade 10. In madrasas in Bangladesh, students of science stream have the option to study one additional subject such as Agricultural Education, Biology, Higher Mathematics (HM), and ICT and Career Education and a few other subjects. There is concern that relatively few students choose to study Higher Mathematics, thus restricting future career opportunities and reducing the pool of mathematically qualified citizens in Bangladesh. This study focuses on student participation in Higher



Mathematics in rural madrasas (Islamic Secondary Schools), seeking to investigate the influences on participation and non-participation, in particular considering any gender differences. In Bangladesh, the gender differences in mathematics with a bias against girls persist in all types of schools. But the worst gap is observed in rural madrasas (Nath, 2008). For that reason this study focuses on rural madrasas. Enrolment data from eighteen rural secondary madrasas in Bangladesh show the poor participation in Higher Mathematics and the popularity of Agricultural Education, and ICT and Career Education (Figure-1).

The Study

This is a PhD research project mainly based in 3 rural secondary madrasas in Bangladesh where a qualitative case study approach was used. Three madrasas are situated within the

same district of the northern part of Bangladesh. Madrasa A and B are situated in two very rural areas but madrasa C is situated in a semi urban area. However, due to good road and transportation links to the rural villages, people’s movement has become easier than it was few years before. But there are still many observed differences between people’s lives in the urban and the rural areas. Another 15 madrasas within the same district are also involved in this study from where enrolment data was collected and a survey of students’ attitudes to mathematics was conducted using a Bangla translated version of Fennema-Sherman Mathematics Attitudes Scale (FSMAS) (Fennema & Sherman, 1976). Table-1 and Table-2 show the summary of the data collection approaches used, and the number of interviews and other data collections carried out.

Table 1: Data collection carried out in the three case study madrasas

Case study madrasa	Head Teacher interview	Focus Group Discussions with grade 9 & 10 pupils	Math teacher interview	Math lesson observation	Home visit & parent interview
A	1	2 (Boys 9, Girls 6)	2	4	5
B	1	2 (Boys 9, Girls 9)	1	2	5
C	1	2 (Boys 3, Girls 13)	2	1	5

(Note: There is no female math teacher in the three case study madrasas.)

Table 2: Other data collection carried out in the 18 madrasas

Madrasa	Female math teacher’s lesson observation	Female math teacher interview	Survey of attitudes to mathematics	Enrolment data
A-C			√	√
D	1	1	√	√
E	1	1	√	√
F-R			√	√

(Note: Madrasa A, B & C are the case study madrasas. Only in madrasa D & E there are female math teachers. Total 500 children took part in the survey of attitudes to mathematics)

Due to the page limitation, this paper only focuses on the findings from the analysis of focus group discussion data, collected through six focus group discussions with a total of 49 (21 boys and 28 girls) pupils of grades 9 and 10. Forthcoming papers will present the findings from the analyses of other types of data.

Conceptual Framework

The conceptual framework is adapted from Ker’s (2016) integrated model for variables affecting mathematics achievement, based on the suggestions from educational effectiveness literature. According to the economic definition of educational effectiveness, the production process of schools is the transformation of inputs to outputs. The performance of schools or madrasas can be viewed as the outputs, measured by students’ participation and performance in mathematics and other subjects. The inputs include school resources, students’ characteristics and instructional hours. The process includes school factors, teacher factors and student factors as shown in Figure-2. The focus of educational psychology is placed upon factors such as student motivation, the variables measuring the learning process in classrooms and teacher preparation. The sociological aspect in education includes students’ gender, socio-economic status, students’ background, parental education, school experiences and school/classroom climate. On the other hand, educational economists prioritise their attention to availability of school and classroom resources, and instructional materials. These parameters may have significant effects on students’ learning, their enrolment in a challenging course and performance, as suggested by many studies (Bloom & Owens, 2011; Creemers & Kyriakides, 2006; Kraft & Dougherty, 2013; Strand, 2010). Ker’s model is thought to be appropriate also for studying participation considering the fact that the same variables/ factors can affect students’ intentions to study mathematics at an advanced level

and that could be influenced by school practices. In a recent review of literature, Smith (2015) found that prior attainment in mathematics, enjoyment, perceived competence, interest in mathematics and awareness of the utility of mathematics have an effect on students' plans to study mathematics at A-level. Student background factors of gender, ethnicity and socioeconomic status interact with these and are also significant in affecting participation (Boaler, Altendorff, & Kent, 2011; Strand, 2011; Tripney et al., 2010). Considering all these, a few more variables (marked with asterisks) are included in the model which are thought to be relevant to mathematics participation and achievement both.

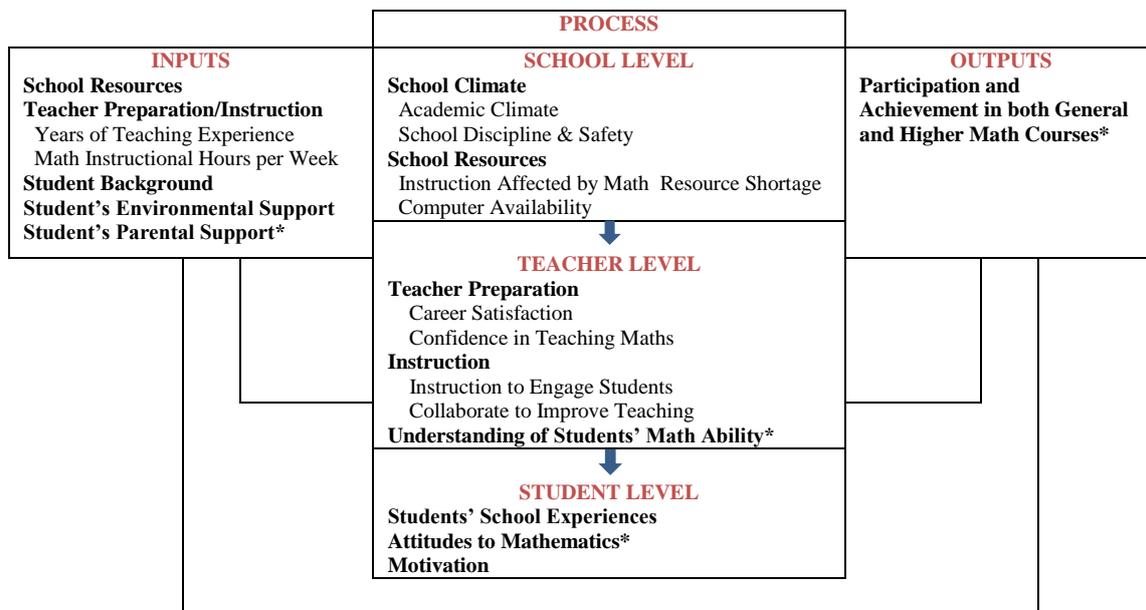


Figure 2: The integrated model for mathematics achievement and participation

Data Analysis and Findings

NVivo 10 software was used to analyse the FGD data. Audio tapes were transcribed and translated into English along with the field notes. The coding process was mainly data driven. The analysis initially aimed to identify big themes/ issues related to the research questions. Efforts were made to find the similarity and differences between boys' and girls' views within and across the three case study madrasas. Two major themes were identified as influential in children's decisions to choose the optional course in Higher Mathematics. These are discussed in the following sections.

Availability of Higher Mathematics Teaching in Madrasas

In each of the three madrasas, general mathematics (GM) teachers are in place. In madrasa A there is a specific HM teacher but not in madrasa B and C. In these two madrasas the same maths teachers are supposed to teach both GM and HM. That should not be a problem if teachers perform their HM teaching properly but it is reported by the students of those two madrasas that HM lessons are rarely given. Even in madrasa A, HM teacher is not that serious about the regularity of giving HM lessons. The reason for this lack of regularity is uncertain. Boys of grade 9 said, "Sometimes he has personal problems or he is on leave or there is a public holiday, sometimes he simply forgets to take HM lessons. We do report but when Principal calls him, by this time the lesson time is over." Further to the query about the reason, students mentioned that the number of students in the HM optional course is negligible and that is a major cause for why the HM teacher does not take it seriously. A

comparative picture of the number of HM students of grades 9 and 10 at the time of data collection of the three madrasas is shown in Table-3. The total ratio of boys and girls in HM is 23:4. Girls of grade 9 in madrasa C commented as below.

No lessons take place in HM. We are fully dependent on private tuition. Teachers don't listen to our problems. Rather they tell us "who told you to study higher maths?" As we are only two (one boy & one girl), teacher doesn't feel encouraged to teach. If it is a big group then he would feel interested to teach (we guess).

It has been observed during the field study that madrasa C used to close every day at around 1 pm. Children reported that the first one or two lessons take place regularly, this is possibly to register children's attendance of the day just to keep an official record in case the madrasa needs to face any government inquiry. Few children or teachers actually stay until 1 pm. It is assumed from the informal discussions with some teaching staff that no serious monitoring system is in place because the Principal is mostly absent as he lives in Dhaka capital city and attends his office only once or twice in a month. The Vice Principal is a local person but it seems that he agrees with other teachers' demands and he himself usually leaves the madrasa at 1 pm. Moreover, during any public examinations, madrasa lessons are suspended for a few weeks. Therefore, children are greatly concerned about their ongoing education and become dependent on private tuition.

Madrasa	Grade 9		Grade 10	
	Boys	Girls	Boys	Girls
A	7	0	3	1
B	1	1	10	1
C	1	1	1	0

Table 3: Number of children enrolled in HM

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In madrasa B the problem is different. The only girl studying HM in grade 9 shared her experience as follows.

The math teacher we have is actually a teacher of general maths, not for HM. Also he is very ill. HM teaching is imposed on him. He is supposed to take HM lessons twice in a week. Although I study HM but I don't get private tuition outside of madrasa. The topics that I don't understand, I try to discuss those with my teacher twice in a week and practice at home.

One boy of grade 10 raised an important issue in a polite manner.

General maths teaching is good in our madrasa but HM was not taught for many years and recently started again, so our teacher has some lacks in teaching the subject HM. That is why; we cover our study of HM through private tuition. As our teacher studied mathematics many years before, so if at least once in a year or once in few months he can have training then we could do better in maths.

The comments above were confirmed by the maths teacher himself, who raised in his interview the issues of his own weakness in mathematics subject knowledge and the need for relevant training as he studied degree level mathematics about 27 years before. He also mentioned that he is just trying to pass time as he has been suffering from illness for the last 5 years and intends to retire in seven years. For that reason, the 10 children of grade ten, who decided to study HM at that time, were told by the madrasa management that they need to manage their HM study on their own without having proper support from the madrasa. However, the maths teacher confirmed that he is good in teaching general maths which is compulsory for everyone and he has been teaching this subject for many years. A grade 9 girl of the same madrasa who is not studying HM said, "If we had a HM teacher, we could study HM. We could get private tuition from him with lower cost as our parents don't allow us to go far away to get private tuition." From this comment it is understandable that shortage of a good HM teacher is one of the main reasons for children not to study HM. Also, children feel that private tuition is a must for them to study HM. More detail about private tuition will be discussed in the next section.

Private Tuition Culture

It has already been observed that private tuition is an important issue for children's learning of mathematics in Bangladesh due to the restricted teaching-learning facilities in rural madrasas and also possibly in general secondary schools. Children usually take private tuition either from their madrasa teacher or from a tuition centre nearby. Some of them go to the teachers of the nearest general secondary school. If none of those is possible, then they seek help from their siblings or local neighbours.

In madrasa A, the general maths teacher teaches general maths along with Biology, Physics and Chemistry. He is not confident in teaching HM although he seems good in GM. The general practice is for students to pay for private tuition from their own teachers. Students look for private tuition support not only in maths or HM but in other subjects too. Thus the teachers are motivated to do as much private tuition as possible in different subjects which is why the teachers like to be involved in teaching various subjects in the madrasa. However, it is interesting to know that the HM teacher in madrasa A is not interested in private tuition as reported by the FGDs. Therefore, children look for available private tuition facilities nearby. Some boys and few girls go to the tuition centres at the nearest sub district town. But unlike boys, some girls are concerned about their safety on the way to and from the tuition centre as they need to travel alone by bus for about an hour or so and it becomes dark on their way back. Some parents cannot afford the cost of the private tuition, that is why some girls urge to open an after school tuition centre within the madrasa so that they can get private tuition support with a lower cost. The introduction of a creative question system in 2009 called '*Srijonshil Proshno Poddhoti*' was identified as an important motivation for children to take private tuition. Girls of this madrasa expressed their feeling of anxiety about this new system of exam/question pattern. To improve their understanding of the new question system, they feel it is necessary to have private tuition support as they find their classroom teaching inadequate to cover those issues.

In madrasa B, children try to use the same modes of private tuition support available in their locality. Some children take private tuition in general maths from their only math teacher. Only one boy and one girl study HM in grade 9 but the girl mentioned that she tries to solve her HM problems herself in consultation with a text book and her math teacher. From the data it is not clear about the only boy's mode of private tuition in HM although he mentioned, "I have an elder sister. She did her HSC (Higher Secondary Certificate) course from a general college. She is now studying a BSc course. She can help me with maths." However, it has already been mentioned in the previous section that 9 boys and 1 girl of grade 10 who were studying HM, had to depend fully on private tuition as the madrasa authority told, "You need to manage your HM study on your own without having proper support from the madrasa."

In madrasa C, few children get private tuition from their math teacher. Many others go to a tuition centre as it is a sub-district town and many tuition centres and private tuition facilities are available. It is interesting to note that one math teacher of this madrasa for the higher secondary and college section has his own private tuition centre, situated just in front of the madrasa gate. As mentioned in previous section, this madrasa normally closes at 1 pm so this teacher wanted to use his much available time for private tuition as it gives him an extra bit of income. Although this madrasa is based in a semi-urban area, many of the children come from rural villages. Some of the boys do part-time work to earn money or to help in their parent's domestic works as their parents cannot afford the full cost of their private tuition. Similar situations are also reported in other madrasas. However, girls usually support their mother's work not directly to earn money but to give their mothers a short relief from their work.

Conclusion

According to the analysis of data and personal experience from the field study it is clear that the issues of availability of good math teachers, who are able to teach higher mathematics, need to be addressed by the Bangladesh government and madrasa authorities. At the same time, mathematics subject enhancement programs could be organised for existing math teachers. It seems that private tuition is a widespread education culture in Bangladesh due to the lack of existing classroom practices in madrasas and in general schools. Therefore, teachers need some sort of motivation and supervision support from the madrasa authorities to help improve their maths teaching performance. Children of both genders have similar experiences and views on their study of mathematics and higher mathematics courses. Referring back to the integrated model above a conclusion can be drawn by saying that the overall input for maths education is low, the processing mechanisms are not functioning properly and that is why children's participation and achievement in general maths and higher maths are low.

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