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Chapter – II

RELATED LITERATURE: A REVIEW

2.1 Introduction

Review of related literature is one of the significant aspects of research. It enables the researcher to know the amount of work done in the concerned area and unknown and unexplored areas. It is necessary that the researcher be aware of the knowledge generated and the ongoing process of knowledge generation for a better clarity of the problem and an insight into its methodological issues. For any researcher, review forms the basis for the problem under investigation and helps him/her to arrive at the proper perspective of the study.

In this chapter, a few studies have been reviewed under three major categories, namely, (i) Studies conducted on mathematics education at primary stage; (ii) Comparative studies conducted on mathematics education at primary stage abroad; (iii) Comparative studies conducted between Bangladesh and India.

2.2 Studies Conducted on Mathematics Education at Primary Stage

Here, studies conducted in the area of mathematics education either in India or in Bangladesh are reviewed.

A study was conducted by Roy et al. (1996) entitled, "A study measuring the achievement of competency in mathematics of the students of class II" with the following objectives. They were: (i) to measure some selected competencies from the prescribed competencies in mathematics for grade II students; (ii) to measure the level of achievement of the selected competencies between boys and girls; (iii) to measure the level of achievement of the selected competency between urban and rural students. The sample of the study consisted of 100 students of primary schools of Mymensingh district. They were categorized as boys and girls and rural or urban and were based on the stratified proportionate random sampling technique. The data were analyzed with the help of percentage. Some of the findings of the study were as follows: (i) The level of achievement of grade II students were found of average standard regarding some selected competencies of the prescribed attainable competency in mathematics. (ii) The achievement level of female students excelled than those of male students from urban areas. (iii) The achievement level of rural

female students was more than rural male students. (iv) Urban students excelled in comparison with rural students regarding achievement of competency.

A study was conducted by Amin et al. (2001) entitled, "A study measuring the achievement of competency in mathematics of the students of class V" to measure the achievement of selected competencies in mathematics of the students of class V. The required data for the study was collected from 20 primary schools of 5 Thana's of Mymensingh district. 40 teachers (two from each school) and 400 students, 10 boys and girls from each school were randomly selected. Some of the findings of the study were as follows: (i) The achievement level in mathematics of class V students was 47.59%. (ii) The performance of male students was found better than female students in the area of mathematics. (iii) Comparatively, the level of achievement in mathematics of urban students was found higher than that of rural students. (iv) Comparatively, the level of achievement in mathematics competency of Government primary school students was found higher than that of rural students.

A study was conducted by Mollic (2000) entitled, "A comparative analysis of attainable competencies in grade-IV mathematics, in grade-V pupils of Government primary school in urban and rural areas. with the following objectives: (i) to measure the attainable competencies in grade-IV mathematics, in grade-V students of urban and rural Government primary schools; (ii) to compare the attainable competencies in grade-IV mathematics, in grade-V urban and rural, male and female students; (iii) to compare the attainable competencies in grade-IV mathematics, in grade-V male students of urban and rural areas. (iv) to compare the attainable competencies in grade-IV mathematics, in grade-V female students of urban and rural areas. The data were collected from eight Government primary schools (4 from Mohammadpur, Dhaka; and 4 from Vanga, in Faridpur district); having a total of 338 students. The data were analyzed using t-test. Attainable competencies of urban and rural students, male and female students were found to have a significant difference.

A study was conducted by Haque (1998) entitled, "A comparative study of attainable competencies in mathematics of third grade students of Government primary schools and NGO run schools in Dhaka city" with the following objectives: (i) to measure and compare the attainable competencies in mathematics of students of Government primary schools and schools run by NGOs. (ii) to measure and compare the attainable competencies in mathematics between male and female students of both kinds of schools. The data were collected from 4 Government primary schools and 4

NGO run schools. The sample comprised of 299 students. The data were analyzed using mean, percentage and standard deviation. The following were the main findings: (i) The level of achievement in mathematics of Government primary school students were found satisfactory compared to NGO school students; (ii) The results of the achievement test for both types of school students were found to be satisfactory.

A study was conducted by Datta (1998) entitled, "An evaluation of attainable competencies in mathematics of third grade students at the end of the academic year" with the following objectives: (i) to measure the performance of the learners regarding their achievement of the attainable competencies in 3rd grade mathematics; (ii) to identify the difficulties of students in 3rd grade mathematics on the basis of achievement test; (iii) to compare the results of the achievement test on urban and rural students; (iv) to compare the results of male and female students. The data were collected from 6 Government primary schools of Faridpur district. The sample of the study was 224 students. The major findings were: (i) The level of achievement of students were found satisfactory. (ii) No significant differences in performance were found between urban and rural students, male and female students.

Borgohain (1999) conducted a study entitled, "A study report on improvement of teaching mathematics in primary classes" with the following objectives: (i) to assess the level of learning of teachers in teaching mathematics; (ii) to assess the children's level of learning in mathematics teaching; (iii) to assess the status of mathematics teaching in different categories of schools and FGAs; (iv) to study the behavioural changes in teachers with respect to mathematics teaching towards child-centred activity based methodology and children. 30 out of 292 schools (i.e. about 10%) were selected following stratified random sampling method from six CRC areas, covering various focus groups. A total of 56 teachers were interviewed and 10 boys and girls of class I and II from each school selected for achievement test. The data were analyzed using percentages, mean, standard deviation and t-test. The major findings were: (i) No significant difference was observed between the achievement levels of trained and un-trained teachers. (ii) The achievement levels of class I and II were 61.21% and 72.4% respectively. The achievement level of class II students showed a significant difference between boys and girls with a t-value of 2.12 at 0.05 levels. (iii) Students of both classes achieved a low level of proficiency in subtraction, indicating that the topic needed to be stressed more while teaching. (iv) The playful

teaching activity was appreciated by all sections in the FGA. TLM was sparingly used.

Goel (1996) conducted a study entitled, "A study of mathematical language needs of students of classes I and II for smooth transaction from concrete to abstract stages of comprehension of mathematics teaching" with the following objectives: (i) to identify various task levels and primary descriptors for each level; (ii) to identify various learning problems related to arithmetic difficulties; (iii) to identify the types of arithmetic errors and specific error patterns. The sample of the study comprised 300 children of classes I and II, studying in rural and urban multi-grades with poor academic achievement in mathematics. The major findings were: (i) The performance of students at representational level was better than their performance at abstract levels. (ii) Students performed better at concrete level than representation and abstract levels. (iii) The following learning problems were identified related to arithmetic difficulties: (a) memory problems, (b) reading problems, (c) language problems, (d) cordiality problems, (e) symbol confusion, (f) inability to group sets, (g) ordinarily problems, (h) lack of the concept of place values, (i) inability to subtract, and (j) lack of mastery of computational skills.

Tilakratne (1992) conducted a study entitled, "Minimum levels of learning (MLLs) mathematics of first standard students: An assessment" with the following objectives: (i) to assess the competencies of MLLs for selected units; (ii) to study the impact of gender on attainment of MLLs of first standard students; (iii) to identify most difficult and easiest competencies in selected units. The study was conducted by survey method. Researcher had selected five schools in Baroda city and 125 students randomly. A test based on the 28 competencies identified from the standard one mathematics textbook and initially this test consisted of 15 questions having 50 items. Final test contained 15 questions of 64 items on the same learning outcomes. The major findings were: (i) First standard students had not understood the notion of zero. (ii) Order of number was not understood by them. (iii) Numbers from 1 to 9 were not understood properly. (iv) The use of the symbols '>' and '<' were also not understood in its proper sense. (v) Students could not add horizontally, although they could do the same activity vertically. (vi) The students could not compare two numbers. (vii) There was no difference in the performance of boys and girls.

Bhatia (1992) studied Identification and remedy of difficulties in learning fractions with programmed instructional material. with the following major

objectives: (i) to develop programmed instructional material on fractions for students of class V; (ii) to use programmed instructional material as a remedial tool; (iii) to test the effectiveness of programmed instructional material in classroom teaching for students of class five. A sample of 50 students was selected from two M.C.D. primary schools of Kard Bagh, New Delhi (twenty-five students from each school). The collected data were treated by using mean, SD, and t-test. The major findings were: (i) Teaching and learning through programmed instruction could definitely help both students and teachers. (ii) Students receiving the programmed instructional material did better in post-test as compared to the other group. (iii) The programmed instructional material worked effectively as a remedial tool.

Dubey (2000) conducted the study, "Micro-analysis of the four fundamental operations in mathematics" with the following objectives: (i) to help students to understand the concept of the four fundamental operations; (ii) to help students to solve the problems on their own; (iii) to help students to solve the problems quickly; (iv) to develop a liking for mathematics in students. The investigator divided each operation into sub-components. These sub-components were arranged in hierarchical order. One sub-component was explained in the class followed by five questions for the class work and the answers were checked. Then five questions were given for homework and checked the next day. A test based on the same type of questions was conducted to test the accuracy, perfection and speed of the students on a particular sub-component. The findings were: (i) 90 of the students were able to solve the problems correctly on their own. (ii) The remaining 10 could not get perfection in all the four, but could do simple addition and subtraction. The reason was they could not learn multiplication tables up to five. (iii) As the concept of the four fundamental operations became clear to the students of class II it was observed that the students became more interested in the subject. (iv) They enjoyed the mathematics period because they could do the exercises very fast. There was an improvement in their speed.

Pradhan (1996) conducted the study, "Minimum levels of learning in mathematics for class III children in Orissa" with the following objectives: (i) to study the existing status of MLLs in mathematics for class III children in the state of Orissa; (ii) to study the existing status of MLLs in mathematics for class III children with reference to urban and rural children; (iii) to study the existing status of MLLs in mathematics for class III children with reference to tribal and non-tribal children. 836

class III children studying in 36 primary schools of Orissa constitute the sample for the study. The major findings were: (i) Only 15.3 percent class III children of Orissa attained MLLs in mathematics as against the minimum desired level of 80 percent. The percent of children under different categories, viz., urban tribal, urban non-tribal, rural tribal and rural non-tribal were 9.68, 24.41, nil and 10.74, respectively. (ii) The difference between class III children studying in urban schools of Orissa and class III children studying in rural schools of Orissa with regard to attainment of MLL in mathematics is significant. The percentages of children in urban and rural schools who attained MLL were 21.52 and 7.18, respectively. (iii) The difference between class III tribal children of Orissa and class III non-tribal children of Orissa with regard to attainment of MLL in mathematics is significant. The percentages of tribal and non-tribal children who attained MLLs were 4.23 and 19.10, respectively.

2.3 Comparative Studies Conducted on Mathematics Education at Primary Stage Abroad

Frempong (2000) studied, Socio-economic gradients in mathematics achievement: Findings for Canada from the Third International Mathematics and Science Study. Understanding the processes that allow all students to successfully learn mathematics has been an important objective for most education systems including those in Canada. Educational system however, has not achieved this goal as many students with low socio-economic status, females, and minority students fail to achieve an adequate knowledge of mathematics. Much of the discussion regarding this lack of achievement concerns classroom resources and practices, school policies within educational systems, and the specific domain of mathematics achievement. This study conceptualized a successful mathematics classroom in terms of its level of mathematics achievement and how equitably achievement was distributed. The study employed multilevel models and the Canadian data from the Third International Mathematics and Science Study to address three main research issues: (i) the extent to which differences in mathematics achievement is attributable to gender, family background, classrooms, and the province where a student attends school; (ii) whether the variation in achievement is specific to a mathematics domain; and (iii) whether the variation among six provinces (New foundland, New Brunswick, Ontario, Alberta, British Columbia, and Quebec) in the levels of their mathematics achievement is

associated with various aspects of school policy and practices. The analysis indicated a slight male advantage in mathematics achievement, and a large, significant gap in achievement associated with the socio-economic status (SES) of the students' families. Students from low SES backgrounds were disadvantaged as they tended to have relatively low achievement in mathematics within classrooms, especially in proportionality, measurement, and fractions. The most successful classrooms were those in which students from disadvantaged backgrounds excel in mathematics.

Wilson et. al. (2001) studied Shape and structure in primary mathematics Lessons: a comparative study in the North – east of England and St. Petersburg, Russia – some implications for the daily mathematics lesson. The research focused upon an analysis of the shape and structure of mathematics lessons in the two countries and identified common features and characteristic routines. These suggested a contrast between the public interaction typical of Russian Lessons and the private nature of much interaction in the middle phase of English Lessons. While Russian Lessons were composed of a greater number of shorter sections, English lessons had a characteristic long section during which pupils work independently and have a greater responsibility for controlling the pace of the learning. It was suggested that a comparative analysis of the two models can usefully stimulate thinking about forms of social constructivism in practice.

Yang and Cobb (1995) studied A cross-cultural investigation into the development of place-value concepts of children in Taiwan and the United States. This study built on previous investigations that had compared the mathematics achievement of Asian and American students by analyzing the arithmetical learning contexts of children in Taiwan and in the United States. Interviews were conducted with parents and teachers to identify cultural beliefs about learning arithmetic, ten lessons were video-recorded in one classroom in each country to identify classroom social interaction patterns and interviews were conducted with children to identify the level of sophistication of their arithmetical concepts. Consistent with previous research, the arithmetical understandings of the Chinese children were found to be generally more advanced than those of their American counterparts.

Jacobsen (1996) studied International co-operation in mathematics education. This study examined the change from education for developing high-level man-power to universal primary education; what had been the implications for mathematics education; and what international co-operation in mathematics education had been

achieved. Decolonization changed the lives of most of the world's inhabitants, allowing them to demand education. The comparatively small percentage of students studying school mathematics, changed to the majority of school-aged children being in school. The mathematics programmes were no longer adequate and needed to be improved. The work in mathematics education of UNESCO, ICMI and its affiliates, and other mathematics education groups and institutions is examined. Their role in international co-operation is examined, giving an example of the interactions of this co-operation in one country in Africa. Finally an opinion is given of the likely future of world wide co-operation in mathematics education.

The thirteenth ICMI study was a comparative study on mathematics education in different cultural traditions conducted in 2001. A study attempting a comparison between mathematics educations in different traditions will be helpful to understand this phenomenon in detail and to exploit it for the sake of mathematics education. From this, paths will be discovered leading to adequate and effective applications of differences, as well as, correspondence in national and international environments. Due to the size of an ICMI study, in manpower and in time, this enterprise must be limited to only a selection of cultural traditions. Those based in East Asia and the West seem particularly promising for a comparison, since similar interests in differences and correspondences have existed for a long time and experiences in equivalent research have been gathered. A rich variety of aspects of mathematics education is to be considered in this comparative study, ranging from the host of social, economic and other contexts, curricula, teachers, students, goals, contents, methodology, media etc. to the nature of mathematics and the future of mathematics as well as mathematics education. Traditions of teaching and learning that are deeply embedded in history and culture will have to be compared, with a consideration of the rich experience growing out of them as well as their resistance to change. At the same time, this comparative study must consider technology as well as ethics; changing attitudes between generations are influencing the teacher-student relationship, as are the new information and communication technologies.

Jean (1998) studied A cross-national comparison of fourth-grade mathematics instruction in the United States and China. The background preparatory experiences, personal efficacy, and perceptions of influence on students learning of 79 fourth-grade teachers in China and 29 teachers in the United States was compared through a survey administered to teachers in Beijing, China and Spokane, Washington. The analysis of

preparatory experiences revealed that U.S. teachers have more post-secondary training. A comparison of Chinese and U.S. teachers' self-perceptions of countries' competence in mathematics instruction indicated that teachers from both countries believe that student success is strongly related to teacher competence, compared to other teachers in their school, U.S. teachers rated their competence in mathematic instruction greater than Chinese teachers ($P<.01$), while Chinese teachers reported that their effort in mathematics instruction had a greater effect on student success in mathematics ($P<.01$). Chinese teachers believed their hard work had a positive effect on students' learning and resultant success in math, and that a lack of hard work on their part had a detrimental effect on student learning. While U.S. teachers also reported a positive relationship between the teacher's hard work and students' achievement, the relationship was less strong. U.S. teachers desired more collaboration with peers and increased planning and preparation time for mathematics lessons. U.S. teachers were more willing than Chinese teachers to try new instructional methods ($P<.01$), with Chinese teachers preferring more familiar methods ($P<.01$). U.S. teachers' instructional methods were observed similar to the reported Asian lesson format, with U.S. teachers asking higher level questions to the whole class, and encouraging students to self correct errors by rethinking their responses.

Hsieh (1995) studied A comparison of the thinking processes of mathematically advanced and average students, age 10 to 11 engaged in mathematics problem solving. The study was to explore the differences between the thinking processes applied by mathematically-advanced students as compared to average students of fourth or fifth grade while solving the same problem. Three sections of problems were used to collect the data. Each section of problems was constructed to observe the thought processes of the problem solver in a different context in order to draw conclusions regularities about overall problem-solving approaches. In comparing the performance of the two groups, the most dramatic difference between the problem-solving approaches of the two groups was seen with the problems focusing on logic and application areas.

Tyner (1996) studied to examine the effects of developmental instruction on the whole number computational abilities and mathematical attitudes of kindergarten children. The research designed both the attitudinal scale and cognitive abilities test which were given both before and after the instructional treatment. The sample for the

study consisted of 62 kindergarten students enrolled in four half-day classes in one elementary school. Four hypotheses were formulated and tested at the 0.05 level of significance. There was no significant difference between the whole number computational abilities and mathematical attitudes of Kindergarten children receiving developmental instruction of kindergarten children receiving traditional instruction.

Hodges (2001), studied Computer-aided instruction compared to a traditional method of teaching fractions in elementary mathematics. The purpose of this study was to compare student achievement in mathematics on the concept of fractions. The students in the two groups were from an urban area. The researcher gathered data and analyzed student achievement by administering the California Achievement Test to the two groups as a pre and post assessment. The major findings of this study were as follows: (i) The results of the study revealed that no significant difference was found in achievement between the two groups or between the group means. (ii) When directly comparing computer-aided-instruction to traditional instruction for teaching fractions, no significant difference was found between the two teaching methods or between the group means. (iii) In comparison of male/female results within each teaching method on the concept of fractions, no significant differences were found in the pre and post test.

Lee (1999), studied Why they fall behind in math: A study of underlying cognitive factors of second-grade high-math achievers and low-math achievers in Taiwan. The study examined Chinese second-grade high-math achievers (HMAs) and Low-math achievers (LMAs) who are at risk of developing mathematical learning disabilities (MLD). Both groups had average or above-average intelligence, normal sensory functioning and no emotional disorders. This study aimed to identify why LMAs are poor in math. The result show that, when compared to HMAs, LMAs showed a wide range of weakness in the areas of short-term memory, working memory and long-term memory. LMAs were slower to solve number facts than HMAs. In addition, they tended to use less mature and less efficient strategies to solve these problems (e.g. they used "counting all" or "counting on"), and their place value concepts were also less mature and complete.

2.4 Comparative Studies Conducted Between Bangladesh and India

A comparative study of socio-political attitudes of activists in India and Bangladesh was done by Ara (1983). All respondents were male students drawn from undergraduate and post-graduate classes. Muslim students were selected as respondents in Bangladesh and Hindu students in India in order to keep religious variable controlled. The conservatism – Radicalism scale, Koul's Adaptation of Authoritarianism scale (A-scale), Hasan's Adaptation of Dogmatism scale (D-scale), Liverant Rotter's Internal – External control scale (I-E scale), Rokeach's value Inventory and Income and Education Questionnaire were used by the investigator for collection of data. The researcher identified the similarities and differences between students from India and Bangladesh on socio-political attitudes like nationalism, democracy, minority attitudes, religiosity, violence, and social change in the conservatism-radicalism.

Shahjahan (1982) compared the need-patterns of University students of India and Bangladesh and to find out if distinct masculinity and femininity patterns of need's were traceable. The study concluded that both male and female Bangladeshi students are more orderly and systematic than their Indian counterparts. Need for change was stronger on the Indian side. The Bengali-speaking Indian female seemed to be less systematic and orderly even in comparison with their Hindi-speaking counterparts.

2.5 Implications of the Review to the Present Study

Studies conducted by Roy et. al. (1996), Amin et. al. (2001), Mollic (2000), Haque (1998), Datta (1998), Borgohain (1999), Tilakratne (1992), Pradhan (1996) provided the information about improvement of teaching mathematics and judged the achievement level of teachers (trained and untrained, in-service and pre-service etc.). Goel (1996) shows that children with arithmetic disabilities make little or no progress and the main reasons for this include poor teaching, ill-prepared teachers, improper materials, and inadequate sequence. Bhatia (1992), Dubey (2000), Tyner (1996) and Hodges (2001), developed instructional technique which can help the students to learn better and also help the teacher to know how the students learn better. Hsieh (1995) revealed distinct patterns in advance and average students' problem-solving approaches. Lee (1999) identified Chinese second-grade high math achievers and low-math achiever had average

or above average intelligence, normal sensory functioning and no emotional disorders. Frempong (2000) identified that socio-economic gradient in mathematics achievement are correlated. Wilson et. al. (2001) identified common features and characteristic routines of mathematics lessons in the North-east of England and St. Peters burg, Russia. Yang and Cobb (1995) conducted a cross-cultural study and found that the arithmetical understandings of the Chinese children were found more advanced than those of their American counterparts. Jacobsen (1996) emphasized on world wide co-operation in mathematics education. ICMI (2001) attempting a comparison between mathematics education in different traditions which will be discovered leading to adequate and effective application of differences, as well as correspondences, in national and international environments. Jean (1998) provided a foundation for further cross-national comparisons between China and U.S. mathematics instruction. Ara (1983) and Shahjahan (1982) conducted cross-cultural study between Bangladesh and India on social science education.

From the review of above studies following implications for research can be drawn.

(1) There is a lack of research evidence on comparative education between Bangladesh and India, and specifically, no study is found in the field of mathematics education at primary level.

(2) There is a need for comparative study on mathematics education to judge where one nation stands in relation to others

(3) There is ample opportunity for both nations to borrow/lend policies on education, methods and techniques of education from one another in order to improve quality of mathematics curriculum.

Considering the above implied aspects, the present study is an attempt to compare the mathematics curriculum at primary level in Bangladesh and West Bengal of India.