Linking In-School Mathematics and Out-of-School Mathematics: A Case Study

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Abstract
The objective of the study was use to ascertain out-of-school mathematics of students related to daily activates. The sample consists of 6 students (3 girls + 3 Boys) having age group 10-12 from 6 grade of Hindi medium middle school run by Bihar. The sample was purposefully selected. One hour daily discussion were held with 6 students within five days. The result of the study indicate that student’s cognitive activities involve in mathematical calculation which comes from everyday situation in the family, societies and environment. The result of data analysis shows the students use mental ability to solve their problem by using out of school mathematics but that was not organize (e.g. place value and division algorithm). It should be only possible if teachers will be bring example accordingly to their context.

Keyword: Cognitive activities, Out-of-School Mathematics

Introduction
Mathematics is part and parcel of our daily life and it is the core subject of the school curriculum. Traditionally, mathematics is considered as hard subject or a killer subject and a large number of students fail or drop out before completing elementary level in India because teaching-learning process cannot cope with linkage of school mathematics and out-of-school mathematics. The report learning without burden, 1993 had pointed out that children were not dropping out but being pushed out by using tradition teaching method. Because majority children can’t comprender mathematics. They have always question about mathematics, why should I learn mathematics? National Curriculum Framework – 2005 guided the development of curricula, textbooks and using new pedagogical practices in the classroom on the basis of how children construct knowledge accordingly social and cultural practices. RTE Act 2009 mandates that the learning should be based on activities, discovery and exploration in a child centred and child friendly manner by making the child free of fear, trauma and anxiety. National Curriculum Framework – 2005 also emphasise that goal of mathematics should be shift from narrow to higher, from mathematical content to procedural knowledge to processes and environments which promote ability for mathematics.

Out-of-school mathematics concerns to children formalize their mathematical knowledge gained in out-of-school environment. Many researchers accepted that children need bridging in-school mathematics to everyday out-of-school mathematics experience to develop mathematical thinking. Children come to school with everyday mathematical experiences. Teacher can connect in-school mathematics to out-of-school mathematics to enhance mathematical knowledge of student. Mathematics learning "is not limited to acquisition of the formal algorithmic procedures passed down by mathematicians to individuals via school. Mathematics learning occurs as well during participation in cultural practices as children and adults attempt to accomplish pragmatic goals" (Saxe, 1988, pp. 14-15). "Mathematics teaching can be more effective and will yield more equal opportunities, provided it starts
from and feeds on the cultural knowledge or cognitive background” of the children (Pinxten, 1989, p. 28). “Knowing and using students’ out-of-school mathematics practice is important in school situations because it provides contexts in which students can make connections” (Masingila, 2002, pp. 30-39). But it is often found in Indian classroom. In order to develop children’s mathematical thinking to connect in-school mathematics to out-of-school mathematics, need to know how children perceives mathematics from out of school in everyday life.

Need of the Study

NCF 2005 says developing children's abilities for mathematisation is the main goal of mathematics education. The narrow aim of school mathematics is to develop 'useful' capabilities, particularly those relating to numeracy—numbers, number operations, measurements, decimals and percentages but the broader aim is to develop the child's resources to think and reason mathematically, to pursue assumptions to their logical conclusion and to handle abstraction. Out-of-school mathematics is very important to connect in-school mathematics for the cognitive development of mathematical thinking. Researches of the mathematics practice has done in distinct cultures (e.g., Gerdes, 1986; Posner, 1982; Saxe, 1981) and everyday situations within cultures (e.g., Carraher, 1986; de la Rocha, 1985; Masingila, 1994, 2002; Millroy, 1992). Mathematics practice in distinct cultures is said ethno mathematics. According to Pompeu, (1994, p. 3), ethno-mathematics refers to any form of cultural knowledge or social activity characteristic of a social and/or cultural group that can be recognized by other groups such as “western” anthropologists, but not necessarily by the group of origin, as mathematical knowledge or mathematical activity. “Closely tied to the ethnomathematics research is research about mathematics practice in everyday situations within culture” ((Masingila, 2002, pp. 30-39).

Informal learning environments such as zoos, museums, and parks provide contexts for investigating the influence of school learning on out-of-school experience. (Pugh & Bergin, 2005, pp. 15-23). Beach (1995), Saxe (1988, 1990) provides evidence that in-school learning can affect out-of-school mathematics activities. In Chennai, India, Naresh (2009) examine one bus conductor’s mental mathematical activities with a focus on bringing out the relationship between formal school taught mathematics and workplace mathematics. The finding shows that bus conductors’ work and work-related activities could serve as a source for designing such problems to integrate students’ learning experiences in and out of school. Bose and Subramaniam (2011) study explore and characterize the nature and extent of everyday mathematics knowledge and involvement in economic activities amongst middle-grade students from school located in low economic status in area of Mumbai. The finding shows that the students sound knowledge of currency handling in every day mathematics including doing arithmetic operations on the currency involving multi-digit numbers.

The above discussion indicate that there is a need to link in-school mathematics and out-of-school mathematics to explore children’s mathematical thinking. Very few research has been conducted on linking to in-school mathematics and out-of-school mathematics in Indian context. In order to connect in-school mathematics to out-of-school mathematics, the investigator has proposed to identify out-of-school mathematics activities of the student.
Methodology

A case study was used to ascertain out-of-school mathematics of students related to daily activities. The sample consists of 6 students (3 girls + 3 Boys) having age group 10-12 from 6 grade of Hindi medium middle school run by Bihar government, located at Baidyanathpur village, Chiraiya Block, East Champaran district. The sample was purposefully selected. One hour daily discussion were held with 6 students within five days. This village is a remote area of the East Champarn district of Bihar. The economics income of household was depends on farming, animal husbandry and labour. Children also helps their parents in these activities. However, some parents prefer their children to finish study first, that children don’t engage with these activity. School was started at 10 o’clock in the morning and closed at 4 o’clock at the evening. Investigator observed the classroom and after that informal discussions were made with students about daily activities to get their mathematical knowledge and understanding, and to get initial understanding differences among the students of out-of-school mathematics. After taking consent of teachers and student, the discussions were recorded.

Data analysis and Interpretation

Audio record, worksheet, and field note were the source of data. Data were analysed qualitatively with the help of these data sources. The first day, interaction was made with students and fearless environment was created by investigator. The following interactions were:

Investigator: आपने पैसा देखा है? (Have you seen currency).

Student: हाँ सर (yes sir)

Investigator: कौन सा वाला नोट आपने देखा है? (which currency you have seen?)

Student: सर 5, 10, 20,50,100,500,1000, नयावाला 2000, (sir, 5, 10, 20,50,100,500,1000, new 2000).

Investigator: आपने कहाँ देखा है? ( where you have seen new 2000 note?)

Student1: सर दूधवाला पापा को सुबह 2000 को नोट देते हुए मैंने देखा (sir, I have seen that Milkman was giving 2000 note to my father in the morning.)

Investigator: आपने सिक्के देखे हैं (Have you seen coin?)

Student: हाँ सर 1, 2, 5, 10 मैंने. (yes sir, 1, 2,5,10.)

Investigator: क्या आपने 1 और 2 के नोट देखे हैं? (Have you seen 1and 2 rupees note)

Student: नहीं, केवल एक ने कहा हाँ (no, only one said yes).

Above discussion shows that students have knowledge about currency where they have seen out-of-school in daily life.

2nd day interaction with students were about numbers. Investigator was dictated some numbers to write in their notebook. One of the most findings across the students was knowledge about number. The findings shows that out
of six student only 2 students wrote correctly and 4 students of them had difficulty in writing. They made error in place value when the numbers were bigger than 100, e.g. 50037 for 537 (five hundred thirty seven), 200020025 for two thousand two hundred twenty five. However the numbers were written correctly e.g. 100,500,2000,25 but they made mistake in writing place value. It indicates that probably, this type of their knowledge comes from knowledge about currency.

3rd, 4th, 5th day interaction with students were about arithmetic operation. In many time they use out-of-school knowledge to solve their problem e.g. student (3) belong to a farmer family. His father was involve in farming and animal husbandry for milk production. Investigator was asked a problem to the student (3): your father have 10 khatha land. For one khatha land required 5 kg wheat seed for cultivation. How much wheat seed required for 10 khatha land for cultivation? Student (3) were started thinking and adding 5 at 5 times and it’s become 25 and again add 25. After that he said 50. Another example, Investigator asked question to student (3): for one packet maggi noodles, how much money required? He said 12 rupees. For 5 packet, how much money required asked by investigator to him. He said 60 and argued that price of 5 packet is 50 at the rate of 10 rupees and price of 5 packet is 10 at the rate of 2 rupees. (१० के हिसाब से ५ पैकेट का ५० और २ के हिसाब से ५ पैकेट का १०). Here he was used strategies which was used in his family daily life situation. 2 students were no difficulty in division algorithm but 4 students were found that they have difficulty in division algorithm.

Discussion and Conclusion

Most researchers agreed that the language, culture, environment in the society influences the cognitive learning of the children. Masingila, (2002) argued that out-of-school mathematics practice is important in school situations because it provides contexts in which students can make connections. Mathematics education is mostly associated with the institutional context (Pinxten, 1994).

Above data analysis and interpretation indicate that how children use mathematical calculation in their daily life. It indicate that student’s cognitive activities involve in mathematical calculation which comes from everyday situation in the family, societies and environment. Students had difficulties in place value and division algorithm. The result of data analysis shows the students use mental ability to solve their problem by using out of school mathematics but that was not organize (e.g. place value and division algorithm). It should be only possible if teachers will be bring example accordingly to their context. One of the way to bring components of everyday mathematics into classrooms is to use mathematical problem which closely related with children’s everyday activities (Freudenthal, 1991; NCTM, 1989). So Bringing together out-of-school mathematical knowledge and in-school mathematics possibly can play a vital role for developing skills and interests in learning mathematics.

Educational Implication

The present study suggest that many educational implication for teachers, curriculum planers, and policy makers. The study found that students have cognitive activities to solve their problem. The findings from this study suggest that children use mental computation and strategies to solve problems which is learned from their cultural and society. So that teachers should use to link out-of-school mathematical knowledge and in-school mathematics.
References


