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Teachers' Perception about the New Approaches of Primary Mathematics Textbooks of Bangladesh

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Abstract- Textbook is a dynamic part of any educational system. They provide the necessary guidelines for the teacher. So it is critical to know how the teacher perceives about the textbooks as it directly influences his/her practice. This research study aims to find out teachers' perception about the new approaches of mathematics textbooks which have been recently introduced in the primary school of Bangladesh. Moreover, as perception differs from teacher to teacher, this study also finds out whether and how they perceive differently from rural to urban perspective. The study followed a mixed method design. Quantitative and qualitative data is collected through questionnaire from thirty teachers (15 from rural and 15 from urban). Quantitative data is analyzed through descriptive analysis and t-test statistical analysis whereas thematic analysis is done for qualitative data. One of the findings of this study is that the majority of the teachers possess positive views about the new mathematics textbook. It is also found that teacher perception differs from rural to perspective. Rural teachers have more positive views than the urban ones. Considering the implications, the findings of this study will be of significant use for policy makers, curriculum developers, textbook experts, and the teachers who will be using the new textbooks in the classroom.

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Teachers' Perception about the New Approaches of Primary Mathematics Textbooks of Bangladesh

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Abstract- Textbook is a dynamic part of any educational system. They provide the necessary guidelines for the teacher. So it is critical to know how the teacher perceives about the textbooks as it directly influences his/her practice. This research study aims to find out teachers' perception about the new approaches of mathematics textbooks which have been recently introduced in the primary school of Bangladesh. Moreover, as perception differs from teacher to teacher, this study also finds out whether and how they perceive differently from rural to urban perspective. The study followed a mixed method design. Quantitative and qualitative data is collected through questionnaire from thirty teachers (15 from rural and 15 from urban). Quantitative data is analyzed through descriptive analysis and t-test statistical analysis whereas thematic analysis is done for qualitative data. One of the findings of this study is that the majority of the teachers possess positive views about the new mathematics textbook. It is also found that teacher perception differs from rural to perspective. Rural teachers have more positive views than the urban ones. Considering the implications, the findings of this study will be of significant use for policy makers, curriculum developers, textbook experts, and the teachers who will be using the new textbooks in the classroom.

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I. Introduction

Education is a process that undergoes continuous modification over time. In this modification process, it is needed to develop teaching style, learning process, instructional strategy, and curriculum design. Curriculum design is a continuous process where modification takes place over the time everywhere (Al-Jardani, 2011). Curriculum modification refers to that includes new content knowledge, instructional method and learning outcome through the change of materials and programs (Comfort, 1990; King-Sears, 2001). The primary curriculum of Bangladesh has been revised and modified in 2011 by national education policy 2010 (NCTB, 2011).

Teacher and textbook are two vital components to implement the curriculum. The textbook has to be considered as teacher's source of content, organization and instructional activities and ideas for lessons (Johansson, 2006; Reys et al., 2004). To achieve the aims and objectives of primary mathematics curriculum of Bangladesh, mathematics textbooks were developed in 2012. In new mathematics textbooks, most of the lessons started by asking a real-life oriented question which provides a scope to explore students' creative thinking (NCTB, 2016). Smith (1996) refers that new forms of a mathematics textbook may reduce teacher's ability and it will be challenging for the teachers. Given the backdrop, it deserves special attention to know the perception of the teachers about the new approaches of primary mathematics textbooks.

II. Purpose of the Study and Research Question

The purpose of this study is to explore the teacher's perception about the new approaches of primary mathematics textbooks. This study also aims to explore whether and how their perceptions vary from rural to urban perspective. As such, the research questions addressed in this study are-

1. How do teachers perceive the new approaches of primary mathematics textbook?
2. Whether and how do teachers' perceptions differ from rural to urban perspective?

III. Literature Review

Textbook is a dynamic part of any educational system. They provide the necessary guidelines for the teacher, for instance, connecting with contents, methodologies and the materials to be taught (Salehi & Amini, 2016). Different country has taken multifarious initiatives to reform their textbooks to make it effective. For example, in the Netherlands, development of mathematics education mostly relies on textbooks (Punhuizen et al. 1998). The mathematics reform movement started in Netherlands in early seventies. On that time mathematics education was concept based. Now it is turned into "New math movement"(ibid). In line with that, in the reformation process, Korean elementary mathematics textbooks appeared with some new approaches such as starting a lesson with question or activity, innovative way of problem-solving, different games and puzzles, multiple ways of problem-solving and classwork (Pang, 2004). Existing literature shows

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that all the approaches incorporated in the Korean textbook are critical for fruitful learning. In a study, Cheesman (2005) argued that starting a lesson with question or activity is helpful for students' effective learning. Mevarech & Kramarski (2012) explained that if a problem is solved innovatively, it will enhance students' ability to think logically and encourage students to think rationally. As a result, it will develop their reasoning skill. According to Wenglinsky (2001), class work in the classrooms significantly facilitates students learning and enhance their academic performance. Besides, it is argued that it can be possible to develop the diversity skill among the students by solving a problem in multiple ways (NCTM, 2000). Paterson (2009) stated that conducting a class with different sorts of game and puzzles is effective one as it not only makes the lesson enjoyable to the students but also helps to understand.

As well as, Japanese mathematics textbook also appeared with some approaches such as prior knowledge exploration, mathematical connection with real-life situation and collaborative way of problem-solving (Takahashi, 2006). Extant literature also shows that learning mathematics becomes more beneficial if the main focus of the teaching and learning approach is to develop insights rather than focusing on the correct solution of a problem. RMERC (1999) argued that it is necessary to connect the mathematical concept with real-life situation so that learners can build their mathematical knowledge properly. In another study, Reed (2014) explained that if students learn with collaboration, they could understand the insight of the lesson rather than blind memorization. Similarly, the literature shows that for concept development, a diagram with proper illustration is also a helpful approach (Bishop, 1989). This approach is used appropriately in Singaporean Mathematics textbooks too (Beckmann, 2004).

In Finish mathematics curriculum, inquiry approach is introduced to explore the student's ability and empowering their reasoning skill (Mendaglio, 2014). Brune (2010) stated that solving a problem by inquiry approach enhances students learning by developing thinking skills. Similarly, textbook reformation also held in Bangladesh over time and the recent reformation held in primary mathematics textbooks in 2016 (NCTB, 2016). In this reformation process, the primary mathematics textbooks appeared with some new approaches. Based on the review of the extant literature, we consider few approaches (stated in table- 1) which might be incorporated in the mathematics textbooks.

It is urgent to analyze teacher perception and their belief system they belong in a new context (Salehi & Amini, 2016). Thompson (1992) showed in his study that teachers view about mathematics is influential rather than the addition of facts, rules, procedures, and theorems. They seem that mathematics is more related to abstract principles than operational pedagogical theory (ibid). Nemser and Floden (1986) elicited that these perceptions may vary from school to school.

Table-1: Approaches in the new primary mathematics textbooks

Approach-1	Starting a lesson with key question/activity	Pang (2004)
Approach-2	Prior knowledge exploration	Takahashi (2006)
Approach-3	Mathematical connection with real life situation	Takahashi (2006).
Approach-4	Innovative way of problem solving	Pang (2004)
Approach-5	Collaborative way of problem solving	Takahashi (2006)
Approach-6	Different games & puzzles	Pang (2004)
Approach-7	Appropriate illustration and diagram	S. Beckmann (2004))
Approach-8	Multiple way of problem solving	Pang (2004)
Approach-9	Mathematical inquiry	Mendaglio (2014)
Approach-10	Classwork	Pang (2004)

IV. Methodology

This study adopted a mixed method approach. As participants, 30 primary teachers (15 from rural and 15 from urban) who take mathematics classes were chosen conveniently. A questionnaire containing both open-ended and closed-ended questions was given to each teacher. Data collected through closed ended questions were analyzed using descriptive statistics which facilitated us to find out teachers' perception about new approaches. On the other hand, thematic data analysis was conducted to explore the reasons of the importance of these approaches to the teachers. The themes were developed drawing on the data collected through open-ended questions. An approach was considered to be important for a particular reason when at least five participants indicated the reason. However, the name of the theme does not represent that respondents have always used exactly the term or phrase in their response. Rather, many of their responses were found to be related to the theme though they did not use the exact name of the theme. The

participants of this study were obliged to issues of anonymity and ensured them that their name would be kept anonymous as this process requires a sufficient level of trust based on a high level of participant disclosure.

V. Result and Findings

Our analysis shows (figure-1) that the new primary textbooks contain all the new approaches. However, teachers' knowledge about these approaches varied; few approaches were very well known and considered while few were not. Our analysis shows that 100% of participants believed that new mathematics textbooks provide adequate scopes to apply approach-10 in the mathematics classrooms while approach-9, 7 4, 3, 2 were perceived to be included in the books by 80% or more of the teachers. On the other hand in case of the approach-6 low percentage of teachers knows this approach. Again significant difference was found about the knowledge in different approaches among the teachers between rural and urban areas. For example, while 100% of the rural teachers were informed of approach- 1 and 5, only 50% of urban teachers know about approach-1 and 65% knowledge about approach-5.

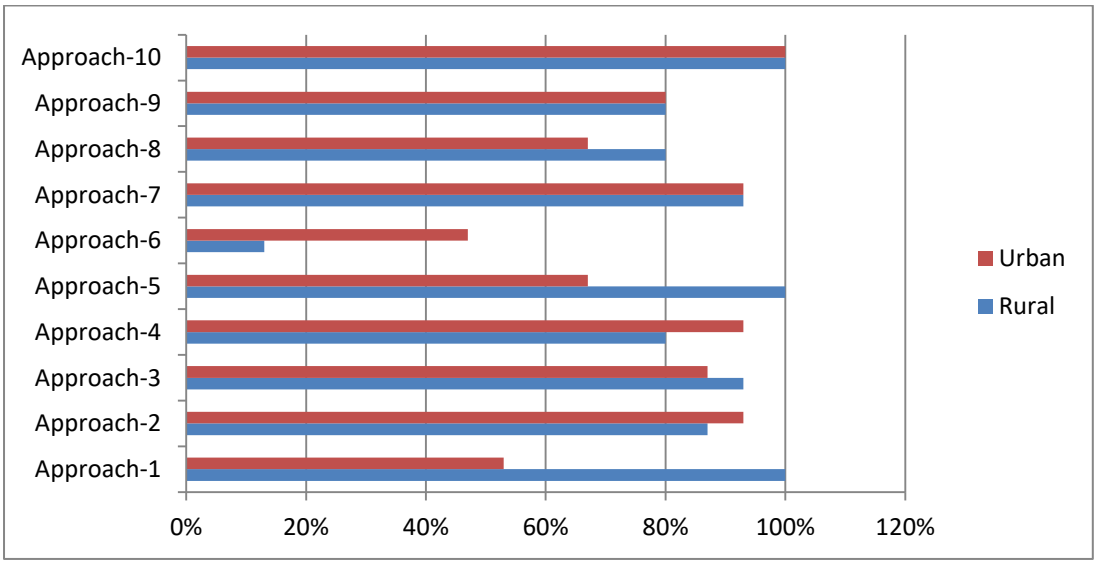

Figure-1: Teachers knowledge about the approaches in the new textbooks

A t-test statistics is adopted to see whether the rural and urban teachers' knowledge about the approaches vary and found that t=1.015 and p=0.31. As $p>.05$, there is an insignificant difference between the rural and urban teachers knowledge about the overall approaches. However, in the case of approach-5 and 1, the p-value is less than the level of significance (0.01 and 0.002 respectively). So, the difference between the knowledge about these approaches in rural and urban teachers largely varies and which is consistent with the figure-1 as well.

VI. Mentioned Task by the Participants

To explore whether the teachers could identify the new approaches in the textbooks, they were asked to mention the tasks from the new mathematics textbook where the scopes were provided to solve the problems. Our analysis (Table 2) shows that on average 70% of teachers successfully identified appropriate tasks which are possible to do with the approaches. It is found that all of the rural and urban teachers successfully mentioned the task from the new mathematics textbook in which approach- 10 and 7 could be applied. It is also observed that all the rural teachers successfully identified the tasks which provide a scope to apply approach-1 whereas in case of urban teachers a percentage of 53 could do so. Again, though figure-1 reveals that 80% of rural and urban teachers know the approach-9, our analysis in table-2 shows that most of them could not identify the task from the textbook successfully. Such incapability reflects that they are not very much confident about the approach-9. Similarly, tasks related to approach-6 were identified by a very low percentage of teachers which is consistent with our findings in the earlier section.

Table-2: Mentioned tasks by the participants in percentages

Approaches	Successful	
	Rural	Urban
Approach-1	100%	53%
Approach-2	93%	87%
Approach-3	73%	67%
Approach-4	87%	80%
Approach-5	73%	53%
Approach-6	13%	47%
Approach-7	100%	100%
Approach-8	87%	73%
Approach-9	20%	13%
Approach-10	100%	100%
Mean	73%	67%
	70%	

VII. Importance of the New Approaches

Our analysis shows (Table-3) that most of the teachers have positive views about the new approaches in the mathematics textbooks. 73% of the teachers believe those approaches highly important whereas a small percentage (17%) perceived those as partially important. Surprisingly, 10% of the teachers consider it as non-important.

In the case of rural schools, most of the teachers (80%) perceived it as highly critical whereas 13% percentage of them considered it partially important. Also, 7% of the teachers reported it as of no importance. On the contrary, in the urban areas, 67% of the teachers expressed that the approaches introduced in the new textbooks are highly important whereas 20% reported as partially important. Our analysis also shows, as is the rural area a low percentage of teachers (13%) believed it was of no importance.

Table-3: Teachers response about the Importance of new approaches

	Highly Important		Partially Important		Absolutely not	
	Rural	Urban	Rural	Urban	Rural	Urban
Approach-1	80%	67%	20%	20%	0%	13%
Approach-2	87%	80%	13%	20%	0%	0%
Approach-3	80%	67%	20%	33%	0%	0%
Approach-4	80%	60%	20%	33%	0%	7%
Approach-5	73%	53%	13%	27%	13%	20%
Approach-6	73%	67%	13%	20%	13%	13%
Approach-7	87%	87%	13%	67%	0%	7%
Approach-8	80%	60%	20%	20%	0%	20%
Approach-9	47%	47%	33%	20%	20%	33%
Approach-10	100%	100%	0%	0%	0%	0%
	80%	67%	13%	20%	7%	13%
	73%		17%		10%	

VIII. Reasons behind the Importance of the New Approaches

Our analysis of the data from open-ended questions facilitated us to develop five themes (Theme 1: Uphold interest, Theme 2: Develop creativity and thinking skill, Theme 3: Make the lesson easy and meaningfully understandable, Theme 4: Develop diversity, Theme 5: Evaluate progress) aligned with different approaches (Figure-2). When questioned about the reasons to give importance to a particular approach, we found that for the same reason different approaches were used. For example, approach-1, 2, 3, 4, 6 and 9 were considered important as these approaches

"uphold the interest" (theme-1) of the students. One of the participants stated:

I think it is very important to connect the mathematical concept to real-life situation. It makes the lesson interesting and effective.

Again, few of the approaches (1,2,4,7,8 and 9) were perceived important as teachers believed that these approaches "develop creativity and thinking skills" (theme-2) of the students. As reflected by one of the teachers-

Solving a problem in an innovative way is interesting. When I solve a problem innovatively, students feel interested in the lesson. It also increases their thinking skill.

Our analysis also shows five of the approaches "make the lesson easy and meaningfully understandable" (Theme-3). These approaches are approach-2, 3, 5, 6 and 7. For instance, one of the participants informed:

When students learn with collaboration in my class, they enjoyed the class and understood the concept clearly.

Theme-4 (develop diversity) emerged as many of the teachers perceived that approach-8 help students to be skilled in developing a diverse solution for a problem. For example, one of the participants claimed:

Solving a problem in different technique is a good way to understand the problem clearly. I think it not only develops student's creativity but also develops diversity.

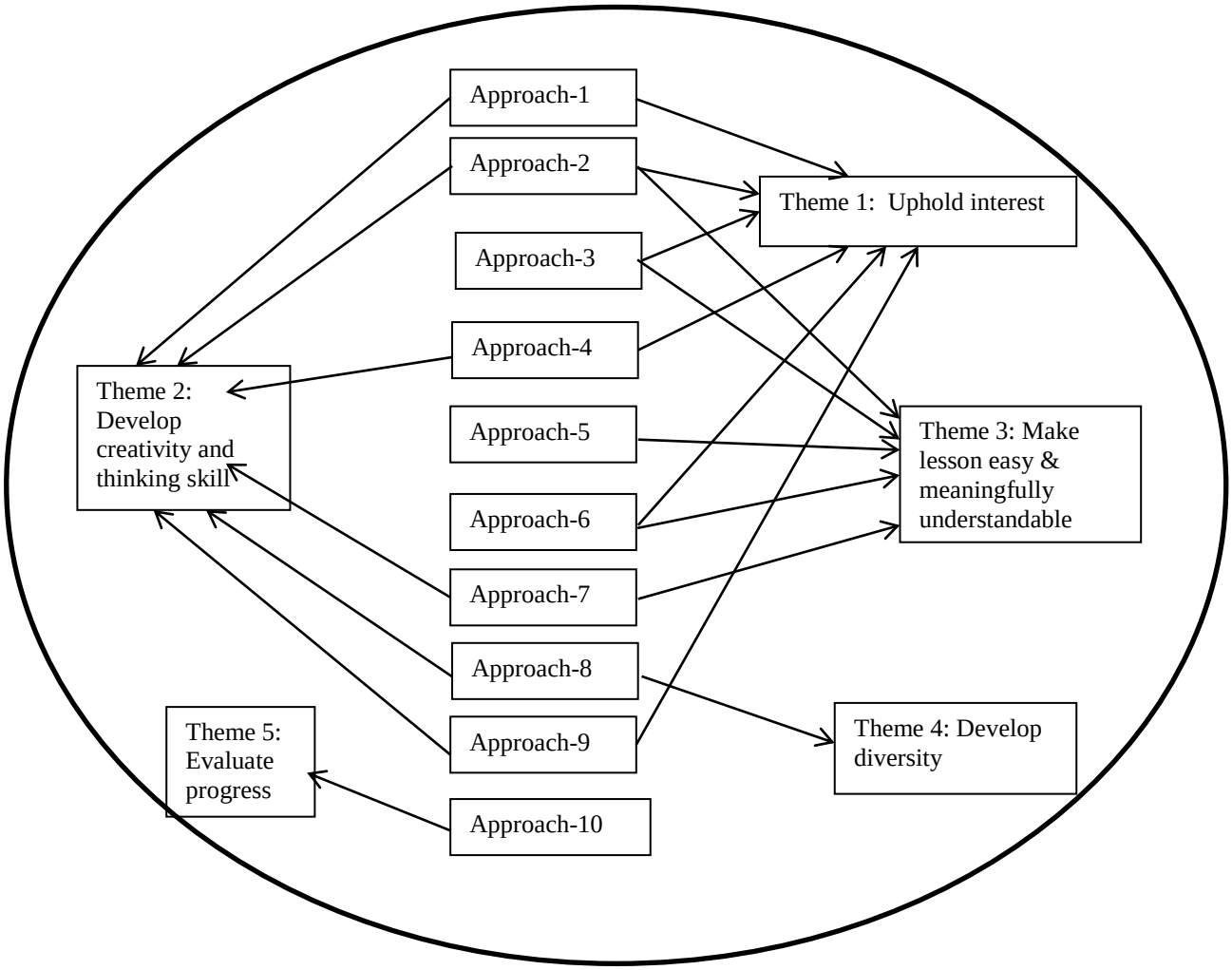

Figure 2: Identified themes

Our analysis shows that approach-10 was perceived important as teachers believe that it is an effective way to evaluate students learning progress. For instance one of the participants stated:

I think, in mathematics class, classwork is a must for assessing students' performance which is very important.

As such, Theme 1 (Uphold interest) emerged as a reason for which approaches-1, 2, 3, 4, 6, 9 were used while theme-2 (Develop creativity and thinking skill) arose as a reason for using approaches-1, 2, 4, 7, 8 and 9. Similarly, theme-3 (Make lesson easy & meaningfully understandable) emerged as a reason for which five approaches were considered important. These are approaches- 2, 3, 5, 6 and 7. It is also found that approach- 8 and approach-10 emerged in theme-4 (Develop diversity) and theme-5 (Evaluate progress) respectively.

IX. Discussion and Implications

This study found that teachers possess a positive view about the new approaches of mathematics textbooks. With a very few exceptions, most of them have proper knowledge about where the textbooks provide scope to apply the approaches. It is found that teachers show their positive view on those approaches because they think all these approaches are helpful for fruitful learning. More specifically, conforming the earlier study of Cheesman (2005), they think that starting a lesson by throwing a question or doing some activities (approach-1) is helpful to uphold interest and increase thinking skill. The study also indicates that teachers believe that exploring prior knowledge (approach-2) not only make the lesson interesting but also make the lesson clear to the students and increase thinking ability. Our finding in this regard is supported by Marzano (2004). This study also identifies that connecting mathematical concept with real-life situation (approach-3) create interest among the students and in the meantime, it helps students to learn the concept. This finding is congruent with the earlier findings of RMERC (1999). Supporting the earlier study of Mevarech & Kramarski (2012), the finding of the study shows that teachers believe that solving problems in an innovative way (approach-4) is very effective one to uphold students' interest in the lesson and develop their creativity. Another finding of this study is that for developing a meaningful concept about the lesson, collaboration (approach-5), playing by puzzles or games (approach-6) and diagram with proper illustration (approach-7) are effective approaches. This finding conforms to the earlier research of Reed (2014), Paterson (2009) and Bishop (1989) respectively. It is also found that solving a problem by playing not only make the lesson understandable but also makes the lesson interesting to the students. The study also identifies that dealing problems with diagram helps students to think critically as well as develop their creativity. Our findings are supported by NCTM (2000) which shows that to develop diversity it is an effective way to solve a problem in multiple ways (approach-8). It also helps students to develop creativity and thinking skill. Conforming to earlier studies Brune (2010), the findings of the study shows that teachers think that solving a problem by inquiry approach (approach-9) enhance students learning by developing thinking skills. However, this study also revealed that though a large percentage of teachers talked about the effectiveness of inquiry approach, in the real context, they have not properly identified the task from the textbook where this approach can be applied. Moreover, they have no clear idea about this approach as well. The findings of the study have given great importance on classwork (approach-10) for effective learning, especially for assessing students' performance which reinforces the findings by Wenglinsky (2001).

As a whole, according to the teachers' perception, to make class interesting approach-1, 2, 3, 4, 6 and 9 are very effective one. When the teachers' intention would be to increase students' creative thinking skill, approach-1, 2, 4, 7, 8 and 9 could be applied. As meaningful concept development is the prime aim of teaching, approach 2, 3, 5, 6 and 7 would be a good contribution to it. To make 21st centuries skilled citizen, it is necessary to prepare students to attend the problem in multiple ways to handle different sorts of situation. So the teacher could be used approaches-8 to prepare students for the challenging world. To justify overall students' performance, approach-10 would be the appropriate option.

The study shows that teachers perception about the new approaches in the mathematics textbooks vary from rural to urban perspective, though the variation is not very significant for every approach. Rural teachers have a more positive view in the approaches of starting a lesson key question or activity (approach-1), mathematical connection with real-life situation (approach-3), innovative way of problem solving (approach-4), collaborative way of problem solving (approach-5), multiple ways of problem solving (approach-8), appropriate illustrations and diagrams (approach-7) and mathematical inquiry (approach-9). But rural and urban teachers have similar positive perception about the approaches of prior knowledge exploration (approach-2), classwork (approach-10) and different games and puzzles (approach- 6). It is found that while 80% of rural teachers expressed that all approaches are highly important, only 67% of urban teachers possess such kind of view. On the other hand, 20% of urban teachers viewed all approaches are partially important whereas 13% hold such kind of view. As a whole, rural teachers have more positive views about the new approaches of mathematics textbooks than the urban ones. These findings are consistent with the study of Singh et al. (2010) where they stated that differences are found between rural and urban teachers' perceptions regarding the use of textbooks.

The findings of this study have both theoretical and practical implications. First, we extend the existing literature by exploring the reasons of the importance of the approaches adopted in different countries. We developed five themes (theme-1: uphold interest, theme-2: develop creativity and thinking skill, theme-3: make lesson easy and meaningfully understandable, theme-4: develop diversity and theme-5: evaluate progress) for which the approaches are adopted in textbooks. Since our finding shows, the perception about the new textbook varies from urban to rural areas; it will provide an important guideline to the policy makers that what should be incorporated in the new textbook and what should not. The finding of the study also shows that all approaches could not be identified properly by the teachers though they showed their positive views in this regards. This implies that teachers are not aptly familiar with the new textbook. So, it is needed to provide effective training to the teacher to introduce properly the new approaches of textbooks. Besides, it would be beneficial if textbooks writer provide a direction in the textbooks which approach would be appropriate for which task.

X. Conclusion

Teachers' perception about the new approaches which is adopted in the new mathematics textbook is explored in this study. This study also explores whether this perception varies between urban and rural teachers. Though a majority of the teachers possess positive views about the new textbook; they are not well informed about all the approaches (e.g. approach-9). It is also found that differences are found between rural and urban perspectives. To make sure the effective use of the new textbooks in the classroom, it is required to make the teachers concerned about the new approaches of mathematics textbooks. It is needed for the teachers to go through the new approaches of mathematics textbooks appropriately before going to the class. The study shows what approach is suitable for a specific situation and when different approaches should be used in the classroom. It also offered few theoretical and practical implications of the findings.

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