Mathematics Education in Secondary School in Afghanistan
Teachers' View and Practices on Teaching Problem Solving

Nargis Halimi
ABSTRACT

Although Mathematics is seen as one of the most important knowledge and school subject, it is believed that math teaching in school is very much of abstract nature and does not promote critical and analytical thinking skills.

I was supposed to do a research about problem solving approaches in afghan schools, in Kabul city. So three points were very important to know: teachers’ points of view about mathematic knowledge and problem solving approaches, teachers practice while they teach problems in their classes, and mathematics examples and their solutions in text books. I made three tools: questionnaire, structured observation and table for analyzing the books and I use them relatively for each aforementioned purpose. Views of 100 teachers (from 16 schools in Kabul, half female and half male teachers) through questionnaire; observing math teaching of five teachers teaching in classrooms (out of the 100 ); and identifying problem solving approaches in math text book of grade 7 were the main data.

It was found that most of the teachers think that mathematic is a way that promotes students’ problem solving ability and their critical thinking beyond mathematics. While observing teachers’ classes it was seen that they teach mathematics as an abstract. On the other hand, they used problem solving approaches in a very weak level. Moreover the newly revised books contain examples that were solved directly by implementing the formula and most of the examples were mathematic examples not in other subject.

Generally one can say that the teachers know about the value of mathematics to some extent, but they do not implement in their teaching. It means that they teach and follow what they see in the book and they do not use other material beside text book.

Finally, the main reason behind the problems that could be seen in teaching and learning mathematics is in teaching methods and in the examples on the books. In spite of differences between teaching practices and views on math, it is promising that teachers’ express about importance of mathematics as well as of problem solving approaches to math teaching. These findings require further studies revealing the roots of the real problems of math teaching and learning.
ACKNOWLEDGEMENT

In our world, whatever positive and negative changes that we look are not the result of one person work. Nothing could be done without helping each other. I want to say that my work on this research supported by others who are the respected persons.

First of all, I want to say that without the help of almighty Allah and support of my family I cannot go even one step further from my current situation in every field of my life. Then I want to thank from everyone who have taken parts for providing such master program which was really very helpful and unique in our society especially, Swedish teachers who came here and taught very important issues for us.

Many thank from my supervisor Dr. Amir Mansory. He was not one who just gave advice but he had very good and kindly behavior with me and he was always ready for help that I will never forget his support.

During this period (Master program) we had a good comparative relation with each other and I learned many things from my classmate that had a very effective impact on our learning.
Table of Contents
Abstract .......................................................................................................................... i
Acknowledgement ........................................................................................................ ii
List of tables ................................................................................................................... iv
List of figures ................................................................................................................... v
List of abbreviations ...................................................................................................... vi
Introduction .................................................................................................................... 1
  Problem area ................................................................................................................ 1
  Aim ................................................................................................................................. 2
  Outline .......................................................................................................................... 2
Literature Review .......................................................................................................... 3
  Learning ....................................................................................................................... 3
    Behaviourism .......................................................................................................... 3
    Constructivism ...................................................................................................... 3
  Bloom’s Taxonomy .................................................................................................... 4
  Math Learning and Teaching .................................................................................... 5
  Math teaching and learning in Afghanistan .............................................................. 6
  Mathematics word problems .................................................................................... 6
  Problem solving approaches .................................................................................... 7
  Polya’s strategy in solving problems ....................................................................... 8
Methods ......................................................................................................................... 9
  Questionnaire ........................................................................................................... 9
  Class observation ...................................................................................................... 9
  Textbook analysis .................................................................................................... 10
  Limitation .................................................................................................................. 10
Findings ......................................................................................................................... 11
  Views of teachers on teaching and learning of problem solving approaches .......... 12
  How mathematics teachers practice problem solving approaches ....................... 16
  Textbook and problem solving strategies ............................................................... 17
Discussion ..................................................................................................................... 19
  Views of teachers on teaching and learning of problem solving approaches ........ 19
  Teachers’ views and practices ................................................................................. 20
  Problem solving approaches in textbooks .............................................................. 21
Conclusion ..................................................................................................................... 22
Reference List ............................................................................................................... 23
Annexes ......................................................................................................................... 25
LIST OF TABLES

Table 1. General information about the responders..............................................................11
Table 2: Teachers points of view about mathematics knowledge........................................12
Table 3: The usage of different exercises beside textbooks................................................14
Table 4: Comparing of two students one who follows problem solving approaches steps while the other wants to find the solution................................................................................................................14
Table 5: They ways of teaching textbooks word problems.....................................................15
Table 6: Analysis of grad 7 text book according to George Polya’s problem solving approaches…17
LIST OF FIGURES

Figure 1: Bloom's Taxonomy.................................................................5
Figure 2: Teachers points of view about the pureness and abstractness of math learning..........12
Figure 3: Teachers views about the claim that math has no connection with life affairs...........13
Figure 4: The frequency usage of different exercises beside textbooks.................................13
Figure 5: The teaching of math for life...............................................................................15
Figure 6: what percent math is used in other subject by teachers.........................................16
LIST OF ABBREVIATIONS

NCTM, National Council of Teachers of Mathematics
TTC, Teacher Training College
INTRODUCTION

Mathematics is a cultural product which has developed through several activities such as: counting, locating, measuring, designing, playing and explaining which people are engaged and through these activities people develop mathematical knowledge (Bishop, 1988). Indeed, mathematics has a close relationship with culture and the study of the relationship between them is called ethnomathematics. Ethnomathematics scholars divide mathematics into two different branches, which are called school (formal or academic) mathematics and everyday (informal or street) mathematics (Namukasa, 2004). School mathematics includes the numbers, figures and symbols of math which children learn and use in schools while street mathematics includes the activities which almost use in streets and markets for buying, selling and etc. Furthermore, in school mathematic children use pen and pencil to calculate something while in street mathematic children do not use pen and pencil, they just stress on their mind to calculate something (Carraher et al. 1985). Problem solving is used in both school mathematics and everyday mathematics.

Problem solving has a very broad meaning and usage. Especially in mathematics we can use problem solving strategies very much in order to improve our thinking and reasoning skills (Coy, 2001). Furthermore, the aim of solving a problem is to learn how to solve it not how to reach into a correct answer (Coy, 2001). Problem solving is also used by teachers to assess their students. A kind of problem solving that is used in mathematics gives chance and capability for students to practice and learn about the implementation of mathematics in other fields of knowledge (Charles, 2001). To improve math teaching and learning teachers as well as students should use problem solving strategies, which should be taught during math teaching and learning in schools. In spite of the importance of the problem solving approaches to math, teaching in in Afghan schools portray a very traditional approaches which promote very rote learning of the subject (Mansory 2010, Karlsson 2005).

The study is about mathematics teaching and problem solving approaches in lower secondary schools, with a focus on teaching of problem solving tasks (word problems) in grades 7-9 of the schools.

Problem area

In this area students in school should be taught so that they become better thinkers and problem solver. Learning and teaching mathematics is different from other subjects. Math leaning is not about factual information and more about analytical thinking. Learning mathematics needs thinking and analyzing, so mathematics can make learners enable to develop mentioned skills (Charles, 2001)

Solving mathematics word problems is a problem that many students face while doing them. One of the reasons is that students cannot translate the words’ of a problem to symbols. Symbols are the words that made the language of mathematics. These words themselves have many meanings and many usages. For example, when we add one thing to another or we want to combine two things using “+” is required (Coy, 2001). Here the teacher should explain and teach them how to translate and figure out a word problem.

Memorizing the formulas is not enough to solve a problem but applying a strategy can help students to solve every problem. Indeed, practicing a strategy improves students’ confidence to become a better problem solver (Coy, 2001).

In Afghanistan school students learn math from the textbooks, which teachers also follow them when teaching. Textbooks, even the recently revised copies are also written in a way that does follow any specific teaching and learning theories. It is also claimed that they are not easy even for teachers to understand. Moreover, school teachers are not highly
qualified as well. In the best case school teachers have good command of subject knowledge, but hardly any pedagogical skills how to teach subjects- in other words, they lack pedagogical content knowledge. Traditionally, in schools, learning mathematics emphasized on memorizing math formulas as any other factual knowledge.

In Afghanistan math is taught and learnt as a pure theoretical subject. Memorizing formulas are the goal of teaching and learning math and it is seen as none applicable subject. Teaching and learning of most subjects, but especially in math, concentrate on low level of learning hierarchy i.e. memorizing and recalling facts and formulas. Very little of higher order thinking skills are taught and learnt in schools. Problem solving approaches to math are hardly practiced in schools. It is said that most students forget all math after they finish school.

Generally it is claimed that school students score very low in independent math learning achievement test and lag far behind the international average level (Mansory 2010, Mansory 2012).

On the other hand, as we know math knowledge is seen as a very valuable and prestigious knowledge both in schools as well as out of school in the society. In fact, math scores are given high value in exams and university admission test; and those who study faculty of math has a very good chance to work because they can work in different places for example, teaching, and working in banks, doing business and etc.

The last years’ efforts have been made to improve textbooks for schools, including math textbooks, as well as teaching in schools. Textbooks have been revised and in-service teacher training programs have been provided to school teachers in the country. Very little is known how math teaching and learning has changed during the last years? Whether teachers’ understanding and practices of math has changed at all? How do school teachers view and how do they practice in schools about problem solving approaches and learning level (hierarchies) when teaching math? How do math textbooks reflect the problem solving approaches? No specific studies have been conducted so far in the country in this regards. This study will try to put some light on some aspects of the mentioned issues. The study aims also to look to textbooks and to analyze problem solving approaches in them.

Aim

The main aim of this research is to explore problem solving approaches in math teaching in secondary education. The study also aims to study to some math textbooks and to analyze problem solving approaches in them.

To understand the situation, and to achieve the objective of the study, the following research questions were set to be responding in this study.

1. How do teachers view and perceive the problem solving approach in math teaching and learning?
2. How is problem solving in math taught by secondary teachers?
3. What kinds of problem solving tasks are included in math textbooks?

Outline

This study contains some main chapters. A Literature review that explains about the mathematics teaching and learning and other related issues then, the chapter on methods come and it explains about the procedure of data collection. The finding chapter contains table, figures and text explanations of the data. Finally, two remaining chapters are discuses and conclude the finding in light of literature review.
LITERATURE REVIEW

In the coming pages a very brief account of related concepts as well as the context and teaching and learning in schools will be provided.

Learning

Throughout all the years which humans live, they had a strong appeal toward learning and tried to find out how learning happens. Philosophers like Plato and Aristotle who lived Before Christ thought about the process of learning and shared their ideas, although as time passed more of new ideas were said (Schunk, 2011). According to Schunk (2011) “Learning is an enduring change in behaviour or in the capacity to behave in a given fashion, which results from practice or other forms of experience” (p.3). Learning theories are important to teach effectively and to recognize learning process from different aspects. The main theories of learning are Behaviourism, Cognitivism, and Constructivism (Yilmaz, 2011).

Considering aforementioned points, I discuss two theories of learning because as we know, the main feature of school teaching in Afghanistan is about behaviourism theory while in today’s world the use of constructivism theory seems very important in teaching for learning.

Behaviourism

Behaviourism is a traditional learning theory has been practiced for a long time throughout the history. This theory has failed to contend for the involvement of mental or constructive way of learning (Yilmaz, 2011). The behaviourist basically focuses on stimulus and responses (ibid). Stimulus in teaching process could be marked or praising words, however student can also be punished by low marks. In this theory reward and punishment are used to reinforce learning (Schunk, 2011). According to this theory a teacher transmits the knowledge to his/her students and the students should follow and accept their teacher well-organized speech (Wang, 2006). From behaviourist points of view students are seen as objects or receiver of knowledge from the teacher not as a subject of their own learning. It means that they cannot actively participate in knowledge construction (Boghossian, 2006).

According to behaviourism there is over emphasis on practice which forms the foundation of knowledge. In addition to that, in this learning theory the teacher will be a center of knowledge and his duty is to transfer the knowledge in an organized manner in which student have no reflection of what they have understood (ibid).

Constructivism

Constructivism is another theory which is the opposite of behaviourism. It rejects the idea that scientific truths always must exist and accept (Schunk, 2011). In this theory students are given a subjective image. It means it is students who must be active members in the construction of new knowledge through social interactions. Unlike behaviourism, constructivism follows a learner-centered approach where students construct knowledge involving in dialogues, discussions and critical thinking. One cannot say that something that is true for oneself to be true for everybody; everyone’s constructed knowledge is true for oneself. Obviously, traditional learning approaches like behaviourism ignore social interactions of students or knowledge construction rather they are given an objective image where they are just carriers of knowledge. They cannot have an explanation or reflection of their own but learn what is taught by the teacher (Boghossian, 2006). On the whole, I can say that learning is not something to be forced but to be constructed. I can precisely say that learning in a constructive way promotes both students’ and teachers’ critical thinking and problem solving skills.
When we want to teach our aim is helping students to learn better so everyone likes to use the best theory of learning. Teachers’ knowledge about different theoretical explanations to learning helps them to act with awareness when teaching. Learning theories as discussed above talk about what and how do we learn, while Another aspect of the issues is that what does it mean to learn. There are different explanation of these issues, which help teachers and educators to improve their understanding of the issue. In the below section, Bloom’s taxonomy as it is widely used in assessments of students’ knowledge capacity. Bloom’s taxonomy also explains the levels of higher order thinking.

**Bloom’s Taxonomy**

Benjamin S. Bloom who lived between (1913 – 1999) introduced an educational tool named after him as Bloom’s Taxonomy. The taxonomy is mostly used while making test questions and for giving assignments (Krathwohl, 2002). This taxonomy contains six levels which are: remembering, understanding, applying, analyzing, evaluating, and creating (Krathwohl, 2002). When a student is able to recall his/her previous knowledge, it means that he/she is at remembering level. For example, if a student is asked to write a formula it means that he/she should recall his/her knowledge in this situation i.e. take the derivative of the following rational function using quotient rule. The second level goes to those students who are able to use their understanding in suitable places. For example, while reading a problem, and seeing graphic messages if one can use his/her knowledge to come up with them by applying the knowledge that he/she has already gained, it means that he/she is on understanding level. In this level they can just directly implement the formula in the given situation i.e. Find the slope of the tangent line to the following function at a given point. But if there is a need of using knowledge to solve a word problem in math, it means that first one should understand the problem and recall the knowledge and then apply it. This is the next level, applying. At this level no one say which formula is essential to use but one should decide to apply it i.e. Find the derivative of the following implicitly defined function.

Next step in this taxonomy is named analyzing level. It really refers to higher levels because this level besides remembering, understanding and applying one should be able to study the given material and break it into its content parts. Then he/she should recognize links between each part and finally in every small parts use his/her understanding and apply it i.e. Let f(x) be a fourth-degree polynomial. How many roots can f(x) have?

Evaluating level means that one who stands in this level have the capacity to judge whether the process which is used already is correct or not. The other or the highest level of this taxonomy is creating. It goes to someone who introduces a new concept by experiments and give his previous knowledge new structure (Krathwohl, 2002). i.e. related rate word problem where student decides which formulae are to be used and which of the given numbers are constants or instantaneous values.

Every teacher can use this taxonomy not only while making question for test to assess his/her students but also in his/her teaching generally. Since the subject of my paper is related to mathematics, for them the use of bloom taxonomy is very essential because the more a math teacher asks questions the better results will get from the students.
Applying mathematics in other fields, is very important and needed because without doing mathematics no one accepts that we know mathematics (NCTM, 2000). As claimed in NCTM (2000) that learning mathematics is not just depend on memorizing the formula and exercising but students are supposed to discuss mathematical idea when they read and write this subject. Also giving short response and always doing mathematics with the numbers like playing a game does not lead students to higher levels of improvement. As Cobelen (2006) mentioned, when students use the basic mathematics to solve problems it encourage them to learn more about basic mathematics. In this situation the task of the teacher is to find exercises which are at the level of students’ knowledge. Teaching in this way helps students to have self trust that they can learn, understand and apply their understanding. On the other hand, they become eager to learn more because they value of mathematics becomes appear for them (ibid). Allen (1999) widely supported ideas that students’ awareness of those strategies that are used for solving problems and their skills of practicing is very important. He added, students should be reflective while learning mathematics due to the fact when they face difficulty, easily could mention their thought (Allen, 1999). When the students reflect their thought then, it is the teachers’ job to help them through teaching more skills which they need to become better problem solvers (Alter, 2011).

Although teaching mathematics is not a simple task but a teacher who wants to teach math effectively should have two goals as, he/she must help students to learn skills of solving problems and they should learn the skills of thinking critically (NCTM, 2000). The problem solving skills will define later under the title of “Polya strategies in solving problems”. According to Acharya (2005) "The critical thinking is purposeful and reflective judgment about what to believe or what to do in response to observations, experiences, verbal or written arguments” (p. 1). As such problem solving improves to think beyond mathematics and while facing problem in real life we can think critically and find the reason to struggle with (Jessica, 2001).
Math teaching and learning in Afghanistan

In Afghanistan the basic level of education is from the first grade up to the end of the ninth grade which is compulsory education in the country. On the other hand, higher education level started from the tenth grade up to the end of the twelfth grade. All education levels are provided free for all children in the country. (Ministry of Education, 2008).

From the first grade up to twelfth grade, students learn different topics of mathematics. From the first grade up to the fourth grade students learn Arithmetic basics of numeracy e.g. the ways to calculate whole numbers multiply numbers, divide numbers and subtraction minus numbers. From the fifth grade up to ninth grade they learn mathematics and some topics of algebra which includes sets, fractions, equations, statistic and probability etc. And from the tenth grade up to twelfth grade they learn algebra which includes integrals, limits, derivatives and etc (Ministry of Education, 2008).

In Afghanistan the teaching of mathematics has many problems. The main problem is the lack of professional teachers. A skilled and qualified teacher would teach in a constructivist way even in big classes and within a 45 minutes teaching session. It is obvious that most of the teachers do not know how to apply mathematics in other fields rather than mathematic subjects so they always want to teach math as an abstract subject. I remember from my school a lesson that we were able to solve the question related to the lecture but when dealing with some mathematics problems in everyday life, we faced difficulties. As Mowahed (2009) argued, two factors are very important to take into account while better learning of mathematics. First, the people who have the responsibility to revise textbooks should organise the mathematical concepts in a logical order in textbooks. Then, during teaching the teachers should think about the sequence of concepts in textbooks and teach them according to students learning capacity. In order to increase students thinking ability about mathematics concepts (Mowahed, 2009).

A general view is that, most of the people think that math is a very abstract knowledge requiring some specific talent so everyone can not learn. They hardly accept that this knowledge can be applied in real life situation beyond school. Teaching and learning of most subjects, but especially in math, concentrate on low level of learning hierarchy i.e. memorizing and recalling facts and formulas. Very little of higher order thinking skills is taught and learnt in schools. Problem solving approaches to math are hardly practiced in schools. Considering these and other aspects of math teaching and learning in schools, it will be interested but also needed to find about the issues and about teachers’ views and practices in this regard.

On the other hand, Afghanistan educational system and educational structure have destroyed during thirty years of war. Therefore Afghanistan curriculum and the process of mathematics education was not standard. In recent years, the Ministry of Education makes curriculum which is standard based but still teachers does not have access to the curriculum (Samady, 2013).

Mathematics word problems

In this paragraph the difference between exercise and problem, in mathematics, will be discussed. Both exercises and problems are tasks. They are similar in appearance since they end by question mark but are differing in nature. When a question is given to students and they are expected to answer and find the answer by remembering a formula. This kind of questions just helps in exercising the lessons which were learnt before. It needs some easy and narrow steps to find the proper and exact answer which called its solution (Badger et al, 2000).
For example, if a student is asked to find the surface of a given squire which has a 2cm length in each side. Solving this problem requires recalling the formula of \( S = a^2 \) and inserting the value of “\( a \)” in the formula. According to Bloom’s taxonomy by solving such question students remain in the first level of learning hierarchy. In order to improve students’ problem solving skills we can ask them this type of question: find the surface of a ground which surrounded by walls and all of the walls have the same length and each length equals to 2m. This example needs more thinking to find the relation between what is given and what is wanted. Also through analysis we can change this narrative into mathematics symbols and solve the problem. Although the result of both problems is equal to 4 but students who done first example just recalled their previous knowledge while the others who solve the second question spent more time by recalling, analyzing and applying their knowledge.

The same as above questions let’s see another once. For example, if a student is asked to answer \( \int_{\pi}^{\pi} \sin(2x) \, dx \). For understanding and applying, the indefinite integral is important. Although for answering this question, first the student should know that \( \int \sin(2x) \, dx = \frac{1}{2} \cos x + C \), then must find the value of \( \cos x \) at two points, \( \pi \) and \(-\pi\). Finally the answer is \( \cos \pi - \cos(-\pi) = 0 - 0 = 0 \). For solving such kind of questions by applying previous knowledge the answer is found and the question is solved. In mathematics the name of the exercise is used for them (Badger et al, 2000). If we want to find the area of the surface which is between the graphs of \( y = \sin 2x \) and \( x \) axis in a given interval ,then it can be called a math problem, because it needs both knowledge and applying in the situation that we must analyze and then apply our own knowledge. This one called problem because just by recalling the formula and applying of previous knowledge it does not solve. It needs analysing too (ibid). Also Allan and Bernardo (2005) defined that “solving mathematical word problems is an integral part of mathematics education in most parts of the world because these problems allow students to apply their mathematics knowledge and skills to real-world situations”. (p. 117).

Problem solving approaches

For solving word problems, it is necessary to have knowledge about arithmetic due to the fact that arithmetic, which is studied by students in elementary school, develops students’ problem solving skills in their further studies (Leh, 2012).

To solve a problem first one should know what is given and what is asked for. For example, if students are asked to find the number of pens, if one has two pens and three other pens he receives from school. In this example he should combine and find the total number of pens (Powell, 2011). When the narrative of the explaining of a problem changes, the way of solving also changes. As Powell (2011) described this example: if we have three pens then when we give one of them to a friend, how many pens will remain? In order to solve this problem we should find the changes in numbers of the pens. So when the narrative of a question changes it means another type of problem presents. So for solving a problem it is very important to know its type and apply the suitable method (ibid).

One of the methods which we know under the title of the George Polya strategy is used to solve mathematic problem. It is useful for any kind of problems because it is the way to pick up the important element of a problem and deeply understand the problem.
Polya’s strategy in solving problems

George Polya’s strategy was introduced in his book, in 1945, in a very brief and understandable way. Since it was a very valuable book, it became very famous and it is translated in many languages. In his book the strategies of problem solving was explained (Huang et al, 2012). He wrote that for learning mathematics, practicing and solving the problems is important but not because of finding the end point of solution. Problem solving is a process that we learn to critically think and giving suitable reasons through it (ibid). So the strategy of problem solving approaches that has mentioned in his book has four steps which are going to explain below.

In first step the one who wants to solve a problem should understand what information is given and what is not given. Also one should find the relation between both known and unknown then, he/she should think if knows any formula to solve such question or not (ibid). When this step is completed then, one should think which concept is suitable for solving the problem and in this step problem solver must get help from his/her previous knowledge to devise a good plan (ibid). The third step is easy because in this step problem solver should apply the plan and use mathematics operations while fourth and final step require looking into final answer and test whether the devising plan worked correctly or not. If not, one should think of another way that means the process of solving again starts from the second step (ibid).
METHODS

The research was designed as a quantitative method in which for collection of data I used multiple research strategy and methods. I used three types of data collection tools which were questionnaire, class observation and analysis of textbooks. Each tool belongs to one research question and in findings chapter the report of collecting data will be illustrated according to the research questions.

Questionnaire

The questionnaire used to gather information about the teachers point of view about the problem solving approaches. I selected questionnaire as research tool. The questionnaire helps us to collect a large number of data from big number of respondents it is not necessary to see every despondences so in a short time we can collect the data (Denscombe, 2010). The questionnaire consists of 25 questions in which at the first part there were some questions about the teachers’ background information. Through this part I gather information about the teachers’ age, sex, experience, education level and any other related issue that will illustrate in findings chapter with details. The second part of he questionnaire was focused on the perception of teachers on how they use problem solving methods in teaching mathematics. Since the purpose of making questionnaire was to have mathematics teachers’ points of view, I distributed to 100 mathematics teachers in 16 schools in Kabul city. The questionnaire became ready in 14 of September.

The questionnaire was piloted in one school with three teachers. The feedback I received from teachers and respondents were useful and I adapted the questionnaire using the feedback. I decrease the number of questions from 30 to 26. In some question considering the teachers advice I replaced some words to make it clear. After piloting the questionnaire, the research was practically conducted from 15 September and data collection completed on 21 September 2013.

The data collected through questionnaire from eight girls’ school which I was involved and one of my colleagues helped me in collection data from boys’ schools. I distributed 134 questionnaires in 16 schools in Kabul city to the teachers who taught mathematics for secondary students. After giving sufficient time, I went back to collect the questionnaire, but I received only 100 questionnaires which I had distributed to teachers. There were some reasons which I think made not returning the questionnaire on time: some of them did not return it back, others said that they need more time because they are busy, the rest return it without filling the paper. During collecting data I have decided to collect equally responses from both male and female teachers so I distributed to eight boys and eight girls schools but after collecting the number of female teachers become more than male teachers. The reason was that in Kabul city the number of male math teachers is less than female. Even in boys schools some math teachers are female. During class observation I did not face any serious problem so on text book analysis. Although I piloted the questionnaire, during inserting in summary table some cells remain without data. Also the 18th and 21th had not any interesting result so I did not report in findings chapter.

Class observation

During September 14 and 21, through observation form I start to take notes on teachers’ practice directly because in my second research the practice of teachers in teaching mathematics especially in problem solving approaches. For this purpose I select five (three female and two male) teachers from five Kabul city schools. This observation was structured
observation so I had a form and based on this form I observed the classes. According to Bryman (2008), structured observation is a social research method which is used to observe actions and take note by having a form that has already prepared. Indeed, I noted some problems out of the form that I prepared before that were really important to take into account and I illustrated them in findings chapter.

**Textbook analysis**

Book analysis was done in September 22 to 25, at first I have decided to analyze three textbooks from seven, eight and ninth classes. During reviewing each of them the textbook of eight-class looked interesting for me because it contains different titles so I chose that. I analyzed the examples in the book (totally 143) according to the George Polya strategy for problem solving approaches in math. I saw examples of the whole book and categorize them in four steps. The first category covers all the examples that solve just considering one step. Some of the examples were solved just by conducting of two steps of his strategy that made the second category. In third category those examples which include three steps of the strategy used. And in the fourth category the examples that are solved by considering all four steps includes. I just simply counted the frequencies of examples in each category.

When I collected questionnaire, filled observation forms and analyzed the book, I made summary tables for each tool. Since the data collected through questionnaire was big in number so I used coding for most of the questions. Simple descriptive statistics mainly frequencies and relative frequencies have been calculated. The experience of TEMP1 students helps us to know about these problems and arrange this procedure in good ways.

**Limitation**

As I mentioned before I supposed to collect 100 teachers’ points of view but considering above mentioned problems I made 132 copies and it helped me to have 100 almost filled questionnaire forms.

Another limitation which can be mentioned was that my ambition was to analysis all three textbooks (of grade 7, 8 and 9) but found it very hard due to time limitation and did only of grade 7. So the situation might be different in the other two books. However, as the authors are the same for all these books, I assume there is not much different in structure approaches to the content of the books, hence grade textbook can be seen as an example for them all.
FINDINGS

This section will present the findings which are linked to research questions. At first, the data which have been collected through questionnaire is going to be presented. Also I consider the order of questions which mostly correspond to my research question one. I use tables and charts to make the finding clear and analyzable. Instead, I have explained some questions in text only. To present the data of structured observation from math classes I did not use tables or graphs as the number of classes were limited, instead I used text to present the findings. The last part of the findings includes the issues and findings concerning the textbook analysis and that is presented through tables.

Table1: General information about the responders

<table>
<thead>
<tr>
<th>Teacher Age (years)</th>
<th>Teachers' Sex</th>
<th>Teachers Education Level</th>
<th>Teacher Experience (year)</th>
<th>Teachers participating in Training courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Percent</td>
<td>Category</td>
<td>Percent</td>
<td>Category</td>
</tr>
<tr>
<td>20-30</td>
<td>44</td>
<td>Male</td>
<td>35</td>
<td>School Graduated</td>
</tr>
<tr>
<td>31-40</td>
<td>26</td>
<td>Female</td>
<td>65</td>
<td>TTC Graduated</td>
</tr>
<tr>
<td>41-50</td>
<td>21</td>
<td>BA</td>
<td>57</td>
<td>BA</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>Total</td>
<td>100</td>
<td>Total</td>
</tr>
</tbody>
</table>

The findings depict that majority of respondents were female however the percentage of male respondents were almost half compared to female respondents. Almost all of the teachers aged below 50 years old. TTC graduated teachers and BA degree educators show high numbers than School graduated teachers. More than half of the teachers participated in both Insets (inset is a methodical work shop which run by the ministry of education to Afghan school teachers).
Views of teachers on teaching and learning of problem solving approaches

In the following tables graphs I the relative frequencies of responses from teachers for different questions in the questionnaire are reported.

Table 2: Teachers points of view about mathematics knowledge

<table>
<thead>
<tr>
<th>Options</th>
<th>To what extent do you agree or disagree with that:</th>
<th>Parentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solving word problems develop students’ skills to think better and be able to give a suitable reason while dealing with their real life problems?</td>
<td>Strongly agree 67</td>
</tr>
<tr>
<td></td>
<td>Students’ previous experience helps them while solving the problems?</td>
<td>Strongly agree 63</td>
</tr>
<tr>
<td></td>
<td>Teacher experience about the subject helps students to solve problems?</td>
<td>Strongly agree 60</td>
</tr>
<tr>
<td></td>
<td>Math is practical knowledge?</td>
<td>Strongly agree 38</td>
</tr>
<tr>
<td></td>
<td>Learning mathematics develops rational thinking skill?</td>
<td>Strongly agree 69</td>
</tr>
<tr>
<td></td>
<td>To what extent do you agree that mathematics is used in every other subjects in school?</td>
<td>Strongly agree 64</td>
</tr>
</tbody>
</table>

Vast majority of the teachers agree that through solving problems in math, students become able to solve problems beyond math subject. Also the majority of respondents mentioned that teachers’ experience as well as students experience is important and help students to solve math problems in this subject. Very few of them show they do not accept that math is practical knowledge. The majority of respondents supported the idea that through learning mathematics our rational thinking ability would develop. There was no claim that mathematic has no usage in other school subjects.

Figure 2: Teachers points of view about the pureness and abstractness of math learning

According to the figure the percentage of teachers who believe that math is a pure abstract knowledge and those who oppose to this claim are almost equal. But considering their stress on their opinion shows that nearly half of them are supportive to this idea while one third of all teachers are appositives whit this claimant.
Figure 3: Teachers views about the claim that math has no connection with life affairs.

This figure depicts that almost all the teachers believe there is no connection between life related affairs and mathematics while a small percentage shows that there is a relation between real life and mathematics issues. Instead some teachers even do not know what mathematics is for.

Figure 1: The frequency usage of different exercises beside textbooks

As mentioned in the figure nearly all of the teachers use extra exercises beside math text books exercise. The percentage of the teachers who always use exercises outside of the books indicates only one fifth of all the teachers while twice of them mentioned that they sometimes use exercises or when they need to such exercise. Educators who never use or they use the exercises rarely indicates, only 5%.
Table 3: The usage of different exercises beside textbooks

<table>
<thead>
<tr>
<th>What kind of other exercises do you ask your students?</th>
<th>Percentage of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>From other subjects</td>
<td>17</td>
</tr>
<tr>
<td>Life related affairs</td>
<td>60</td>
</tr>
<tr>
<td>From the object in the classroom</td>
<td>23</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

The table shows that most of the male educators practice the exercises with their learners as role play while female educators mostly practice their teaching activities through real object. Instated female teachers rarely link their lessons to other subjects.

Table 4: Comparing of two students one who follows problem solving approaches steps while the other wants to find the solution.

<table>
<thead>
<tr>
<th>Suppose two students are given the same problem. One of them follows the problem solving approaches steps but his/her answer is not correct. The other does not follow step by step but reach to the correct solution.</th>
<th>Percentage of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inset I</td>
</tr>
<tr>
<td>The first one understands more</td>
<td>75</td>
</tr>
<tr>
<td>The second understands more</td>
<td>0</td>
</tr>
<tr>
<td>Both of them understand how to solve problem</td>
<td>25</td>
</tr>
<tr>
<td>None of them understand how to solve the problem</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

The table indicates that most of the teachers who were involved in both workshops or in one of them had almost the same indicated about the choices. Nearly all of them claimed that students who follow a strategy step by step will be in the right direction instead the learner who does not follow a structured way of learning.

Question 20, which were asked from the educators about their mathematics teaching methods. Almost two third of the educators expressed their satisfaction of their teaching methods. As they marked the option that their teaching methods mostly increase the learners ability to learn mathematics One third of the teachers indicated that they are not satisfied with their teaching as efficient to increase the learners’ mathematics learning achievements.

When the teachers were asked about the effectiveness of applying math in real life, the major of them gave positive answer while few of them responded negatively. Among those who positively agree almost one third of them did not give any example but most of them pointed to different examples. A small number of the teachers exemplified and indicated that applying math with real situation helps students to know the connectivity of math to real life affaires. Only 13% of them argued that every topic can apply in real life. For example, the class chairs arrangement by row and column is an example of matrix. There was another small category of the teachers who have written that statistic is one of the math subjects uses in
every other situation. The next category which shows the lowest percent wrote that whenever we teach math practically the students become interested in the subject. Other group of them (only 13%) mentioned teaching geometry without applying it does not make sense.

There was a question about the teaching of math. Almost all of the teachers have responded that they teach math for both reasons: to transfer math knowledge for new generation and to teach them how the use math in their daily life.

When they indicated that they teach math for both up mentioned reason, they were asked how much and when do you teach to achieve such goal. The educators had replied as shown in the following graph.

**The teaching of math for dealing with real life problems**

![Graph showing teaching of math for dealing with real life problems](image)

**Figure 5: The teaching of math for life**

In the question almost half of the teachers indicated that they always teach math to relate the subject to the real life, while a small percent indicated as they never practice it.

When differences between teachers were searched, it was found that there are differences between teachers with different educational background. The responses per teachers’ categories are shown in table 5 below.

### Table 5: the ways of teaching text books word problems

<table>
<thead>
<tr>
<th>How mostly do you teach word problems of the textbooks to your students?</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>School Graduated</td>
</tr>
<tr>
<td>I solve some for them and ask them to solve the remaining.</td>
<td>0</td>
</tr>
<tr>
<td>I read some for them, analyze the text to find what is given and what is asked for.</td>
<td>33</td>
</tr>
<tr>
<td>I read and ask students to analyze and find what are given and what is asked for.</td>
<td>33</td>
</tr>
<tr>
<td>I teach them to analyze and find what is given and what is asked for.</td>
<td>33</td>
</tr>
<tr>
<td>I don’t use any specific strategy.</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

As seen in the above table, all of the school graduated teachers teach word problems by following George Polya strategies in some extents (options in rows 2, 3 and 4 in the above table). While one fifth of the teachers who graduated from TTCs and or University, solve problems without the use of any specific method.
When teachers asked how often they integrate math knowledge with another subject, their responses varied from always to never as shown in the below pie chart below.

![Pie Chart: The usage of math in other school subject](image)

**Figure 2: what percent math is used in other subject by teachers.**

It becomes clear from the figure that more than half of the teachers always and or often apply math in other school subject. Almost one third of them bring examples from other subject that has written in textbook while teaching math. The same percentage of the teachers never brings any example from another subject. Finally, we reach to this point that the teachers’ points of view about mathematics knowledge and its value were something that shows their interest in this knowledge. This point is really important and leads them to come up with difficulties in their field.

**How mathematics teachers practice problem solving approaches**

The result of the teaching observation was analyzed and the following can be repeated form it.

The students who were interested to take part in the class activities i.e. those who raise their hands to respond to teachers questions, were below than 50%. In all classes students worked individually just one of the teachers gave a question and divided the class into groups but the number of students in every group was not equal. The teachers gave three minutes for them to work on the example but they do not discuss because some groups had five members and the time was not enough for them.

While solving the problems the focus was on the solution of the problem and there were just a teacher who decided whether the answer is correct or not. In all the classes only text book was used and the teachers did not bring an example of out of class context and they did not put the example in everyday life practices.

The teachers were eager to teach students how to implement the formula in the other math example by changing the variables. Also they mostly emphasized on memorizing the formula and rarely do they practice understanding of formula with students.

There were some good points that I noted. All the teachers except one of them had spoke in very kind manner. There were silences during lectures in every class and the students were really polite.

Beside these good points I observed some problems in the classes. One of the teachers used just two third of the board because the one third of board was filled with the title of the subject, date, students number and other written text which were not important to write all of them. Other point that I saw and it looked not important was the looking through student’s homework inside the class.

Most of the teachers valued the work of students that they do math examples step by step even if they could not reach to the correct solution. All the teachers explained the
examples very nicely and in a way that the students know. They were very patient while solving the exercises. For example, in one class, a student reached to the incorrect result the teachers requests her to do it again. It shows that problems solved is more important than reaching to the right answer. By the way it was very good finding even though they just practice exercises which are inside the books, I saw that the teachers are not coping the solution ways directly from the book. To summarize this section I would like to say that the teachers’ work was based on the textbooks. They do no use some extra material to make the lesson clearer and more understandable.

**Textbook and problem solving strategies**

When I analyzed the book developed in 2012 and currently used by mathematic teachers in all schools. There were very interesting things in the book; for example, every chapter is started with a brief definition of the title and mostly they example of its usage shown through a picture. This book has been written very smoothly and contains lots of examples and exercises. Science I was supposed to analyze this book considering George Polya’s problem solving approaches, I just saw in its examples which were solved by authors because it was my aim to look where the steps of solving the problems followed or not.

I made four categories that I have already explained in method chapter. The below table presents my finding after analyzing.

**Table 6: Analysis of grad 7 text book according to George Polya problem solving approaches steps**

<table>
<thead>
<tr>
<th>Chapter of textbook grade 7</th>
<th>First step only</th>
<th>First and second steps only</th>
<th>Frist three steps</th>
<th>All four steps</th>
<th>None of them</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sets</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Natural Numbers</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>27</td>
<td>37</td>
</tr>
<tr>
<td>Integer Numbers</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Rational Numbers</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>0</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Triangles and diagonals</td>
<td>2</td>
<td>0</td>
<td>13</td>
<td>0</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Parallel and Stable lines</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Statistic</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Probability</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total (Frequency)</strong></td>
<td><strong>5</strong></td>
<td><strong>8</strong></td>
<td><strong>45</strong></td>
<td><strong>5</strong></td>
<td><strong>80</strong></td>
<td><strong>143</strong></td>
</tr>
<tr>
<td><strong>Relative frequency (%)</strong></td>
<td><strong>3%</strong></td>
<td><strong>6%</strong></td>
<td><strong>31%</strong></td>
<td><strong>3%</strong></td>
<td><strong>56%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

As seen in the table above, grade seven textbook for Afghan schools contain different chapters. In the examples provided in the analyzed textbook of grade 7 (totally 143 examples), more than half i.e. 57 % do not following step of the problem solving strategy of Georg Polya. Although 31% follow the first three steps of the said strategy, still the cases show that it is very little of the problem solving approaches promoted in this textbook.

According to Bloom’s taxonomy the book’ examples were not in higher level. Most of them improve students recalling and understanding ability. There were some examples which need implementing but the examples which improve students analyzing ability were hardly seen.
Finally, it become clear that the revised books are not standard based books due to the fact that it does not contain examples which promote students higher thinking skills.
DISCUSSION

Through this section I will discuss the findings of data collection mainly from questionnaire, structured observation and textbook analysis which focus on three main themes of the research respectively teacher’s perception and practice. The findings will be elaborated in the light of literature review.

Views of teachers on teaching and learning of problem solving approaches

The information that I received from the teachers’ background was interesting. Most of the math teachers were female and they were teaching in boys’ schools, which is not common in the country. The age among teachers varied from school to school, however the majority of teachers (44%) of total respondents were young and below 50 years. The average age among teachers was 25 years. It was found that the majority of teachers had higher levels of education (97 % TTC or university graduates). While only 3% of teachers had an education level of high school graduate i.e. grade 12. It seems as a positive aspects of and a good change compared to past years, because all the teachers come with a high level of education while some ten years ago, the situation was on the contrary.

Teachers’ perception concerning the importance of math knowledge. As seen in table 2, majority of them believed that math is a practical subject and trough learning mathematics students will acquire problem solving skills which enable them to use these skills out of school contexts and their real life. Additionally problem solving skills will enable students to think critically and think better when they meet difficulty in their life. This view of teachers confirms with what Jessica (2001) wrote i.e. that through learning mathematics we will become able to practice with solving the problems which we meet in life. This finding seems promising as at least teachers are aware of the importance of the math teaching.

The findings through questionnaire contradicts what I have observed during the structured observation, as most of the teachers did not use a real life example while solving mathematical problems and questions. Most of the teacher only copied what was written in the textbook and did not connect textbook contents to real life examples in order to broaden the knowledge of students. The textbook depicts some pictures of real life situation as mathematical problems but a teacher only used those points which were only in the textbooks. I reviewed the books and there were pictures at the first page of every chapter that shows the usage of mathematics. Although teachers use textbooks when they teach, but in the classroom I observed, hardly anyone acted as they expressed. This contradiction of teachers’ views and practices may be is because teachers are not clear. It could also be that they heard about the importance of these issues during their trainings, but do not know how to implement and practice these in teaching to students. Another likely reason could be that teachers have not time for preparation and planning appropriately. Teachers’ low motivation for their jobs could be yet another explanation to this controversy.

When looked to their responses to another similar question whether math is a pure abstract subject, almost half of the teachers were agreed with this claim that mathematics is a pure abstract subject. It is a problematic issue because if a mathematics teacher thinks like this he/she will not accept that it is a practical knowledge and also the vast majority of them pointed out that there is no connection between real life and mathematics issues. While observing the classes they practice in this way, both observation and the second question confirms the meaning that teachers are not clear in their views and or do not understand what the first claim mean in practice.

As seen in figure 3, two third of teachers answered that they use exercise out of textbooks when the students ask and sometimes that is needed but I did not observe this in
their practice while it is very important as Cobelens (2006) argued, students self confidence will be improved if teachers prepare exercises the same as students level.

problems solved is more important than reaching to the right answer. By the way it was very good finding even though they just practice exercises which are inside the books, I saw that the teachers are not copping the solution ways directly from the book.

Aforementioned paragraphs indicates that they method which today teachers use are not very effective because students always engaged in learning mathematics as an abstract subject but they themselves are satisfied with the teaching method that they currently use. This may indicate even more problems of teaching and learning math in schools. Teachers’ firm believe in the effectiveness of their teaching method they use the weak pedagogical content of text books reinforced by more abstract teaching i.e. less problem solving approaches make the math teaching and learning more complicated. In other terms, teachers and textbooks are both focusing on the lower level of the learning hierarchy (Bloom’s taxonomy) i.e. recalling math formulas and very little on understanding math may influence teachers’ believes that they do not know about their weakness. This is an issue which requires changes, if the quality of education in schools to be addressed is the same it probably damage learning. The vast majority of teachers showed their greenness that there is a big different when we teach mathematics knowledge and while applying it (as reported in the text before figure 4), and they support their idea by giving some examples that all of the title has usage. The books had also some examples and supported their idea but they never use any example from their mind in their teaching. They may believe that applying math is not included in school mathematics. While the aim of teaching arithmetic is to develop students’ ability to practice and apply their knowledge in other fields (Jayne, 2012). This process must be done at the school level. Otherwise the learning level of students will not go beyond the second level of Bloom Taxonomy.

The purpose of teaching mathematics was asked and almost majority of them positively answered that teaching math is not only to transfer mathematics knowledge but also is to inform the students applying math in their life while they themselves do not accept that math is not an abstract subject as was explained in above paragraphs. Since this was not seen when observing their teaching in classrooms, in their practical teaching, it is hardly to accept what they expressed.

About the process of problem solving nearly all of them indicated by filling the options of a related question that first they analyze the question and then to solve them and through class observation I noticed almost the same what teachers responded through questionnaire. Students are not given enough time to discuss and analyse the question among their groups. The student can learn much better if mathematic issues could be discussed in group work. Surprisingly, teachers with the education level of grade (compared to teachers with TTC and University studies) were among all who expressed that they more or less follow problem solving strategies to a higher degree than others did say. This might be that those with a low qualification stick to instruct more than those with higher subject knowledge.

**Teachers’ views and practices**

Although different methodological training workshops are provided to school teachers, but still teachers follow the old method, their emphasize was mostly on implementing the plan rather than student learning. Schunk believes that involving student in class practice will give a sense they are not only the listeners but they actively can contribute the teaching and learning process (Schunk, 2011). So everyone should take part in the class while as I observed the classes in all classes the students who raised their hands to take part were below than 50%
present in every class. Mostly teachers views and practices were contradictory i.e. they seem to be more aware of the problem solving approach but hardly was observed in their teaching.

As it mentioned in the findings, teachers almost teach all the things themselves and they just give the exercises to students for practice and they hardly talk about of learning, for example of problem solving steps. This way of teaching may effect on students learning but their ability of problem solving approaches will not improve.

Seeing students homework inside the class is wast of time. The teachers have to assess their students work but in a way that they can learn better. If they see in the class the teacher can not highlight their mistakes because of time limitation. Also he/she should assess his/her students work according to learning taxonomy to find and evaluate students’ work.

**Problem solving approaches in textbooks**

After observing books, I looked and analyzed only the examples given in the textbook for each chapter. I realized that there was hardly any example found that follows George Polya’s four step problem solving strategy. In every chapter few questions were solved in this strategy while it is not a specific strategy and for a special category. Lots of questions were solved just for practicing the formula with changing the variables. Even the questions that are solved considering three steps of his strategy were not very clearly explained.

As reported in table 5, a big difference could be seen in their views and written examples in text book. As they mentioned that almost they analyze the examples but there are not such solved questions in the book. Also their practice was similar to the content of the books.

In general, the most exercises in the book is for recalling memorized the formula and understanding but rarely we can find questions to improve students learning at higher levels of Bloom Taxonomy.

Finally, considering teachers’ views, their practice and the textbook that they use are not based on problem solving approaches because there is not a general strategy used by teachers and so on in text books it does not mention clearly. According to Bloom Taxonomy the two learning hierarchy, memorizing or recalling the formulas and understanding is used mostly, but implementing the formula to other subjects and real life affairs which is a very important issue is hardly used.

Teachers’ low professional qualification might be, reinforced by the low quality of textbooks among the causes that teachers teach the way they do. Additionally, teachers’ firm believes in the effectiveness of their teaching method make them contradicting their views and practices.
CONCLUSION

The overall aim of this study is to explore problem solving approaches in math teaching and learning in secondary education. This paper investigates about teachers view on mathematics knowledge, their practice in teaching mathematics and it also looks to some math textbooks to analyze problem solving approaches. The findings of this study answered the research questions, problem area and aim of this study.

Teachers expressed views and practices are different. They seem to be aware of some issues in relation to effective math teaching when their views were analyzed. On the other hand, the teaching practice does not reflect what they said. This could be that the respondent’s teachers are not clear on what they mean. It also could be that they not skilled enough to translate the views into their practices.

It was shown that teachers use extra exercises out of text books while in their practice it does not happen and the books were hardly contained such examples. The teachers need to find out the practical section from other resources. It indicates that educators link the text books with other complementary teaching and learning materials. It is clear that even the teacher needs to search for extra exercises that they rarely use them.

It was also found that, during solving a problem, the teachers spend most of their time on the third step of problem solving strategy that was introduced by George Polya. While the all steps are very important and must use and the teachers should learn implementation of this strategy and they should know about its efficiency due to the fact that teaching is not a single task but it is a mixture of content knowledge and pedagogical knowledge which a teacher requires to enquire before starting to teach. The teachers must gain such knowledge and they must be equipped with both subject content knowledge and pedagogical content knowledge first. After that they can adapt the outside exercise in their teaching classroom.

As reported from the findings, the examples in the textbooks are not pedagogically written and hardly any examples found as Polyas’ problem solving approaches. Also the written examples mostly promote the first level of learning hierarchy. It is the first level which Bloom taxonomy indicates it. The first level is recalling. To a little extent the second level to understand math issues is the level which depicted by a few numbers of respondent.

Even though this research conducted in Kabul city, it could be generalized due to the fact that here most of the teachers have possibility joining seminars in all over the country. In addition the text books are shared by the ministry of education to all schools equally.

Finally I want to express that it was really interesting work for me as a university teacher. I learned not only how to design and conduct a research, but also deepen my understanding of teaching an leaning as general but especially in regard to math.
REFERENCE LIST


ANNEXES

1. Teachers’ Questionnaire

Teachers Number...........
Age: ..................... years
Male ☐  Female ☐
Education:  (Please select one option based on your highest level of education)
Grade 12 ☐  Teacher Training Institute ☐  University ☐
Teaching Experience.................. years
Teaching Class:  Boys ☐  Girls ☐
Teaching Level/Grade:  Grade-7 ☐  Grade-8 ☐  Grade-9 ☐
Grade-7-9 ☐  Grade-7-12 ☐  Other ☐
Did you participate in in/service teacher training programs? ☐Inset I  ☐Inset II
Other special math training .......... ..................

<table>
<thead>
<tr>
<th>Questions</th>
<th>sstron</th>
<th>Aag</th>
<th>I do</th>
<th>Ddis</th>
<th>strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ngly</td>
<td>agree</td>
<td>not</td>
<td>aagre</td>
<td>disagree</td>
</tr>
<tr>
<td>11</td>
<td>To what extent do you agree or disagree that math learning is a pure mental process?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>To what extent do you agree or disagree that math learning is a pure abstract subject?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>To what extent do you agree or disagree that math learning is a school subject only not for life related affairs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>To what extent do you agree that solving word problems develops students’ skills to think better and be able to give suitable reason while dealing with their real life problems?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>To what extent do you agree that students’ previous experience help them while solving the problems?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>To what extent do you agree that teachers experience about the subject helps students to solve problems?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Do you agree or disagree that math is a practice knowledge?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>To what extent do you agree that learning mathematics develops rational thinking skill?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>To what extent do you agree that mathematics is used in every other subjects of school?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>To what extent do you agree that mathematics is the base of science subjects.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11. Is there any other material that you use beside text book during teaching mathematics?  
Yes  
No  
If yes, please specify here:…………  ……..

12. How often do you give other kind of exercises beside textbooks with your students or not?  
a. Always  
b. Sometimes  
c. When asked  
d. Seldom  
e. Never

13. What kind of other exercises do you ask your students?  
a. From other subjects  
b. Life related affairs  
c. From the object in the classroom  
d. other (please specify here):……………………

14. How do you think about the textbooks (you can select more than one option):  
a) They are written according to the student level  
b) They are written higher than students level  
c) They are written very simple but not clear  
d) Contain applicable knowledge  
e) Only pure math abstract knowledge  
f) Examples and exercises are only to memorise formula  
g) To some extent examples and exercises are to understand math concepts.  
h) To some extent examples and exercises promote application math knowledge in real life situation.

15. Suppose two students are given the same problem. One of them follows the problem solving approaches steps but his/her answer is not correct. The other does not follow step by step but reach to the correct solution. According to your point of view:  
a) The first one understands more  
b) The second understand more  
c) Both of them understand how to solve a problem  
d) None of them understand how to solve the problem

16. What is difference between below questions  
I. The volume of an object is 5 lit and the smooch is 0.9kg/l, find the mass of this object?  
II. There is 5 lit blood in human body. Can you say how much mass in kg it has?  
(you can select more than one option)  
a) Both of them are exercise  
b) Both of them are problems  
c) The first one is an exercise while the second one is a problem  
d) The first one a is problem while the second one is an exercise  
e) The first one require only to recall formula, while the other one promote understanding  
f) The first one is math while the second is not math question.  
g) Both are math questions

17. According to you, in order to learn mathematics which one is better  
a) Memorizing the formula  
b) Memorizing and understanding the formula  
c) Understanding the formula  
d) None of them

18. While teaching geometry which source help you better  
a) Only Text book
b) Class’ environmental object
   c) Other ………some geometric shapes……..

19. The teaching method that you follow, how much are sure that it helps students learning
   a) 100%  b) 75%  c) 50%  d) 25% e) less than 25%

20. How do you think, the way that you teach. It helps students more to be succeed
   a) In their other subjects
   b) In their life
   c) In their future
   d) In Kankor examination
   e) All

21. Do you differentiate when you teach math knowledge and applying math knowledge for real life problems?
   Yes  No

   If yes, how (give an example): ………………

22. Do you teach your students only math knowledge or also how to use math knowledge for real life problems?
   a) Only math  b) Both

23. If both, how often do you teach both?
   a) Always  b) Often  c) Only when it is in Textbooks  d) Rarely  e) Never

24. How mostly do you teach word problems of the textbooks to your students?
   a) I solve some for them and ask them to solve the remaining
   b) I read some for them, analyze the text to find what is given and what is asked for
   c) I read and ask students to analyze and find what is given and what is asked for
   d) I teach them to analyze and find what is given and what is asked for
   e) I don’t use any specific strategy
   f) If other, (please specify) ………………

25. How often do you give examples from other school subjects to be solved with math knowledge?
   a) Always  b) Often  c) Only when it is in Textbooks  d) rarely  e) Never
سوالنامه برای استادان ریاضی

نمبر مسلسل............

رهنمايی:

استاد محترم: سوال نامه ای که فعلا در اختیار شما قرار دارد، برای کار تحقیق درباره "طرق حل مسائل ریاضی" تهیه گردیده است. این تحقیق با هدف تیسیس ماستری پروژه تدریس ریاضی، آغازی آماده نماید. بنابر از جهاب شما خواهش می‌نماید تا این امر خیر مرأ هر هر کنید و طبق دانش و تجربه خود به سوالات ذیل جوابات مناسب را

ارایه نمایید.

I. جنس
   □ اناث
   □ ذکور

II. درجه تحصیلی را که فعالیتید یکی از گزینه‌های ذیل مشخص سازید.
   □ فارغ صنف نوزاده
   □ فارغ دارالمعلمین
   □ فارغ پوهنتون

III. عدد سال تجربه تدریسی دارید؟

IV. صنف درسی شما مشکل از کدام گروه‌های شاگردان است.
   □ ذکور
   □ اناث

V. در کدام صنف درس‌می‌پذیرید:
   □ صنف 7
   □ صنف 8
   □ صنف 9
   □ صنف 9-7
   □ صنف 12
   □ Inset I
   □ Inset II

VI. آیا در کدام پروگرام تربیت علمی اشتراک نموده‌ید؟
   □ Inset I
   □ Inset II

VII. کدام پروگرام خاص در مورد تدریس ریاضی.....

کاملا موافق هستم

موافق هستم

ندارم

مخالف هستم

کاملاً مخالف

سوالات

کاملا موافق

کاملاً مخالف

1. تا چه حد موافق هستید که: آموزش ریاضی یک پروسه خاص ذهنی است.

2. تا چه حد موافق هستید که: ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که ریاضی به شکلی که

3. تا چه حد موافق هستید که: ریاضی عبارت از مضمون در مكتب است که به مسایل زندگی ارتباط ندارد.

4. تا چه حد موافق هستید که: حل مسائل ریاضی مهارت های شاگردان را ارائه دهند.

5. تا چه حد موافق هستید که: تجارب درسی که قبل می‌آموزند آنها را در حل مسائل مکمک می‌کند.

6. تا چه حد موافق هستید که: تجربه ای که می‌آموزند در حل مسائل مکمک می‌کند.

7. تا چه حد موافق هستید که: ریاضی را در علم تجربی است.

8. تا چه حد موافق هستید که: ریاضی را در علم تجربی است.

9. تا چه حد موافق هستید که: ریاضی در هر مضمون دیگر دخل است.

10. تا چه حد موافق هستید که: ریاضی تهدی علمی سایس است.
آیا در جریان تدریس ضمیمه ریاضی، کدام مواد درسی دیگری موجود است که استفاده کنید؟

13. کدام نوع سوالات را برای پرسش شاگردان باید بپرسید؟
   a. در رابطه با کتاب درسی فعالیت چه نظر دارید.
   b. در رابطه با کتاب درسی، چه نظر دارید.
   c. در رابطه با کتاب درسی، چه نظر دارید.
   d. در رابطه با کتاب درسی، چه نظر دارید.

در جریان تدریس چه وقت تمرین ها را، خارج از کتاب درسی، همراه شاگردان تان کار میکنید؟

   a. همیشه
   b. اکثریت زمانی
   c. هنگامی که یک جزء از ریاضی را در مورد زندگی ترویج می‌کنیم
   d. هیچ‌گاه

کدام نوع سوالات را برای تمرین شاگردان می‌پرسید؟

   a. مساله مربوط به سوالات
   b. مساله مربوط به سوالات
   c. مساله مربوط به سوالات
   d. مساله مربوط به سوالات

فربت کیکی چه سوالهای ریاضی برای دو شاگرد جهت حل نمودن سپرده می‌شود. یک شاگرد طریقه حل سوال را درست کرده اما جواب نهایی اش اشتباه می‌باشد. شاگرد دومی بدون رعایت طریقه حل مساله جواب درست را ارائه می‌دهد. به نظر شما:

   a. شاگرد اولی بیشتر می‌فهمد
   b. شاگرد دومی بیشتر می‌فهمد
   c. هر دوی آنها میدانند که یک مساله چگونه حل می‌شود
   d. هیچکدام آنها نمیدانند که یک مساله چگونه حل می‌شود.

 shortcomings

15. فرض کنید یک مساله ریاضی برای دو گروه حل شود. یک گروه ریاضی حل می‌کند و گروه دیگر حل می‌کند. به نظر شما، کدام گروه بیشتر می‌فهمد؟

   a. گروه اولی
   b. گروه دومی
   c. هر دوی آنها
   d. هیچکدام

16. فرق بین سوالات زیر در چیست؟

   (a) حجم یک جسم 5 لیتر و کثافت آن 0.9 kg/l است. که چند است؟
   (b) حجم یک جسم 5 لیتر و کثافت آن 0.9 kg/l است. که چند است؟
   (c) حجم یک جسم 5 لیتر و کثافت آن 0.9 kg/l است. که چند است؟
   (d) حجم یک جسم 5 لیتر و کثافت آن 0.9 kg/l است. که چند است؟

17. به نظر شما، جهت یادگیری ریاضی کدام روش را بیشتر است؟

   a. حفظ تکرار
   b. حفظ تکرار
   c. حفظ تکرار
   d. حفظ تکرار

18. در جریان تدریس مضمون هدسه، کدام مانند شما را بهتر کمک می‌کند؟

   a. تکرار
   b. تکرار
   c. تکرار
   d. تکرار

19. میتوان هر چه در تدریس ریاضی ابزار که می‌باید چه ابزاری در ابزار رایج است؟

   a. 50 کیلوگرم
   b. 75 کیلوگرم
   c. 100 کیلوگرم
   d. 25 کیلوگرم

20. شما چه فکر می‌کنید؟ آیا روش که ما در تدریس می‌کنیم، شاگردان را بهتر کمک می‌کند تا آنها موفق باشند، در
1. آیا شما می‌توانید درصدی از زمان کلاس ریاضی با استفاده از ریاضیات حل کنید؟
   a) همیشه
   b) اکثر
   c) فقط وقتی که در کتاب باشد
   d) ندرتاً

2. آیا شما فرق می‌گذارید بین آموزش ریاضی به صورت بهداشتی و آموزش ریاضی به روش علمی؟
   a) چنین ندارم
   b) برای شاگردان من، آموزش دقیق و علمی بیشتر می‌باشد
   c) برای طرفداران من، آموزش دقیق و علمی بیشتر می‌باشد
   d) ندرتاً

3. سوالات عبارتی را اکثر بیان می‌کنید که با استفاده از آموخته‌های ریاضی حل شود
   a) همیشه
   b) اکثر
   c) فقط وقتی که در کتاب باشد
   d) ندرتاً

4. آیا شما صرف علم ریاضی را برای شاگردان تان تدریس می‌کنید یا علم ریاضی را برای استفاده در مسائل زندگی تدریس می‌کنید؟
   a) همیشه
   b) اکثر
   c) فقط وقتی که در کتاب باشد
   d) ندرتاً

5. سوالات عبارتی را اکثر بیان می‌کنید که با استفاده از آموخته‌های ریاضی حل شود
   a) همیشه
   b) اکثر
   c) فقط وقتی که در کتاب باشد
   d) ندرتاً

6. آیا شما روش‌های مشابه را برای حل سوالات مشابه در کلاس درس می‌پردازید؟
   a) همیشه
   b) اکثر
   c) فقط وقتی که در کتاب باشد
   d) ندرتاً

3. Structured observation

Age: ...................... years
Male □ Female □

Education: (Please select one option based on your highest level of education)
Grade 12 □ Teacher Training Institute □ University □

Teaching Experience ...................... years

Teaching Class: Boys □ Girls □

Teaching Level/Grade: Grade-7 □ Grade-8 □ Grade-9 □ Grade-7-9 □ Grade-7-12 □ Other □

Did you participate in in/service teacher training programs? Inset I □ Inset II □

Other special math training

1. Number of student in the class ...........
2. The title of subject ...........
3. Number of student who raising their hands for solving the problem
   a) All of them
   b) 50%
   c) More than 50%
   d) Less than 50%
4. How they work
   a) Individually
   b) In peer
c) In a group
5. How the teacher explain the word problem into mathematics symbols
   a) Clearly by analysing the problem
   b) The same as written in the book
   c) He or she does not help the students
   d) Gives as a group work for students and then he/she explains
6. Is the teacher gives time for student to discuss? If yes, how much ….
7. How the students practice in the class?
   a) individually
   b) in peers
   c) in groups
8. While solving the problem the teacher more attention is
   a) On the solution of the problem
   b) On the way that students think and give reason
9. Is there any other material that the teacher uses beside text book?
   Yes
   No
10. Does the teacher give other kind of exercises beside textbooks or not?
11. What kind of other exercises does the teacher ask from the students?
    b. From other subjects   b. Life related affairs   c. From the object in the classroom
12. Does the teacher use any specific method while solving a word problem
    Yes
    No
13. Who many of the students interested in solving problems
    a) All of them
    b) Over 50% of them
    c) 50% of them
    d) Below 50% of them
    e) None of them
14. Does the teacher say about the importance of mathematics to the students?
    a. Yes
    b. No
15. Which kind of problem seems in the class
    a) Lack of time
    b) Lack of materials
    c) They do not know about basic
    d) They do not learn strategies for solving problems
    e) None of them
16. On which activity the teacher emphasize more
    a) Memorizing the formula
    b) Understanding the formula
    c) Applying the formula
    d) Analysing the formula
    e) Evaluating the formula