UNDERSTANDING AND USAGE OF QUESTIONING BY MATHEMATICS TEACHERS: A NARRATIVE INQUIRY

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A Dissertation

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DECLARATION

I hereby declare that this dissertation has not been submitted earlier for the candidature for any other degree.

_____ November 3, 2017

Niroj Dahal

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DEDICATION

This work is profoundly dedicated...

To the teachers and the teacher educators who hope this work will initiate them to value the significance of understanding and usage of questioning in mathematics.

Master of Philosophy in Mathematics Education dissertation of *Niroj Dahal* was presented on November 3, 2017.

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I understand and agree that my dissertation will become a part of the permanent collection of the Kathmandu University Library. My signature below authorizes the release of my dissertation to any reader upon request for scholarly purposes.

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ABSTRACT

An abstract of the dissertation of *Niroj Dahal* for the degree of *Master of Philosophy in Mathematics Education* presented at School of Education, Kathmandu University on November 3, 2017.

Title: *Understanding and Usage of Questioning by Mathematics Teachers: A Narrative Inquiry*

Abstract Approved: _____

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Dissertation Supervisor

My inquiry portrayed the existing classroom practices in mathematics pedagogy on understanding and uses of questioning by mathematics teachers. For this, narrative inquiry approach has been used to focus on experiences of six mathematics teachers working in schools in Kathmandu Valley, Nepal, by using criterion-based selection strategy to choose my participants to be involved in this research (Roulston, 2010). It aims to examine the complexities of experiences by gaining insight into how understanding and uses of questioning in mathematics classroom are embedded in mathematics teachers' multiple and uniquely situated experiences, and in doing so, this inquiry views from various theoretical lens, namely, sociological perspectives, behaviorists to constructivists approaches, categories of questioning as per expertise, critical pedagogical perspectives and algorithmic and daily life practices, for analysis how interlock to create unequal power relations in mathematics classroom exist while questioning from teachers' view. With those issues in mind, this study was designed to explore the following research question: How do

teachers narrate their experience of understanding and usage of questioning in relation to mathematics pedagogy?

Subscribing to a narrative inquiry for meaning-making, my study foregrounds the six mathematics teachers voices and experiences, power relationship about whose experiences are valued and whose voice can be heard in their mathematics classroom while questioning the students. In keeping with narrative inquiry approaches, I use a more personal voice to reflect on mathematics teachers' understanding and uses of questioning which is an ethical challenge involved in the research process, namely: Issues of representation, as well as struggles relating to voice, is at the core of the study and reflexively considered throughout. Near to final, in conclusion of my study, the majority of the mathematics teachers seem to be conformist mathematics teacher at the beginning of their teaching career but later on, they were nonconformist by being flexible enough in questioning. Further, the majority of my research participants asked more questions within the simple to complex level and highly focusing on simple (low level) questioning, claiming to encourage students in mathematical discussion. Finally, it attempts to be an example of ethical and respectful research and claims to increase understanding of how mathematics teacher understanding and uses of questioning in the mathematics classrooms in Kathmandu Valley, Nepal.

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colleagues who cannot be individually named, but without whom this research would not have been possible.

ABBREVIATIONS

AD	Anno Domini
B.Ed	Bachelor of Education
B.Sc	Bachelor of Science
HOD	Head of Department
M Phil	Master of Philosophy
M.Sc	Master of Science
NCTM	National Council of Teachers of Mathematics
SEE	Secondary Education Examination
SLC	School Leaving Certificate
TU	Tribhuvan University
UNESCO	United Nations Educational Scientific and Cultural Organization

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CHAPTER I

INTRODUCTION

In this chapter, I articulate my research agenda demonstrating my position as a researcher. I started my journey retelling the event that led me towards such a research agenda. I raised the main issues of my research (i.e., understanding and uses of questioning in mathematics classroom by mathematics teachers) and articulate why this problem is significant in my inquiry. Further, I discussed the rationale of the study, purpose of the study, research question, structure of the dissertation and key message of the chapter.

Setting the Scene

As an educational researcher, it is interesting to realize how difficult it is to say who I am. I was born in Dolakha district of Nepal (see figure 1.1). Dolakha is a highly mountainous landscape making access to various complicated places. But, those landscapes offer a gratifying experience for those who love nature and scenery. Before, I came to study at Kathmandu University for master degree in mathematics education (February 2011-February 2013) and gradually joined M Phil in mathematics education (February 2014- July 2015). My teaching journey has started as soon as I completed my bachelor's degree in Arts. It initially began as a full time and part time mathematics teacher and now it's been more than a decade that I've not only been focusing in one school.

Figure 1.1: Dolakha of Nepal in the map (adapted from Google, 2017)

My initial teaching career started from a government school, thereby many private schools, visiting facility at one of the renowned universities and now in a private school as a community facilitator of mathematics. I want to see my students become successful through their education and pursue their career. A key motivator for me is teaching mathematics in ways that enhance student learning in mathematics.

As a student, I never raised any questions to my mathematics teacher during my schooling in mathematics classroom because asking questions was considered to be a sign of disobedience to the teachers during those days. In addition, not only me but my colleagues also never raised any questions. They merely recited whatever the teachers delivered, thereby many of my friends' views were that it was supposed to be a offense to ask any questions to mathematics teachers.

In recent years, the views have changed dramatically and even more, the content and process of teaching and learning have also undergone a change in one way or the other. So, the mathematics courses are set up in a problem-solving format where students discuss ideas and form a new understanding in a collaborative environment. Students work in groups as they progress in learning mathematical concepts of the curriculum. However, my communication is mostly dominated by a question that facilitates my students. What fascinates me is the nature and process of using questions that lead and challenge students to engage and seek clarity in understanding the mathematical concepts. Therefore, teacher understanding and uses of questioning in mathematics is the focus of my dissertation.

From my experience, it is always true that my major instructional strategies of using different types of questions are to find out whether students are aware of what they are going to learn in mathematics or not. My role, along with other mathematics teachers, in their regular classroom, is to encourage thoughtfulness in learning,

developing critical thinking and reasoning skills, reinforcing students' understanding, correct students misunderstanding and providing necessary feedback.

However, I also act as one of the agents to uplift the teachers' questioning skills in mathematics (Shahrill, 2013). Arriving at this stage, I agree that the questions teachers used to ask the students in mathematics were not frequently well organized and not helpful in strengthening students' understanding for that mathematics teacher requires consciousness of the types of question, strategies and the art of questioning to strengthen students' understanding (Shahrill, 2013). Thus, being a researcher, teacher educator, teacher trainer, and mathematics teacher, my role is to help mathematics teachers in strengthening their understanding to encourage questioning in mathematics.

Nature of the Inquiry

In the opening narrative, I tried to reflect the frustration which I experienced as a researcher, teacher trainer, and teacher of mathematics in Kathmandu Valley. The aim of the inquiry is to explore the mathematics teachers' understanding and uses of questioning in the mathematics classroom. As questioning has been identified as one of the most employed strategies in mathematics classroom but has remained under-researched, particularly with regards to teachers' understanding and uses of questioning in mathematics classroom.

As central, this inquiry is a concern about how the teachers understand and use questioning in the mathematics classroom. Hence, mathematics classroom is a form of society where socio-cultural practices also take place. Within a social-cultural perspective, my inquiry describes learning is possible when individuals interact and get involved in the discussion (Vygotsky, 1978). In a sociocultural perspective, learning is observed in a social context (Lemke, 2001). Similarly, the sociocultural

viewpoints express the social and cultural interactions. So, socio-cultural perspective helped me to explore my study in several ways. It allowed me to consider the context of classroom practices. Thereby, sociocultural perspective emphasizes language as a meaningful part of the culture and unique characteristic for individuals to form their thinking through questioning. Moreover, it has come with further meaning-making that teachers are expected to ask questions according to the level of the students and behave alike to their students and provide equal access and opportunity to all of their students for a response.

In this 21st century, my role as a mathematics teacher, teacher educator and educational researcher is to explore the recent trends of mathematics classroom teaching practices. As for me, I've been attempting to modify my mathematics classroom teaching from a conventional lecture dependent approach to student-centered approach to some extent. In this regard, mathematics teachers who blame teacher-centered approach to teaching to focus on the direct and time-efficient manner, providing information on a given topic through lecture, guidance or demonstration (Polly et al., 2014). Thus, a teacher in this tradition of classroom sees himself/herself as the deliverer of knowledge, seeking little input from students during the entire teaching process (Belo et al., 2014). The teachers, who use a student-centered model for instruction, believe that the students are active participants in constructing knowledge as opposed to the practice of passively receiving knowledge from a teacher (Seung, Park & Narayan, 2011). So, it reflects, the student-centered instruction is necessary to be adopted by teachers to offer opportunities for students to build up knowledge through experiences (Polly et al., 2014). Thus, classroom communication is an essential factor of teaching and learning in a student-centered model, whereas questioning is an important experience to be taken into consideration

within the context of communication. A teacher's questions are used as a guide for instruction in an appropriate direction to meet lesson's objectives, as well as to extend and solidify students' understanding in a particular topic (Chin, 2007).

Thus, effective mathematics teaching requires an understanding of what students need to learn and know and subsequently challenging and supporting them to learn well (NCTM, 2000). In this regard, NCTM (2000) has explained how to accomplish this by saying that teachers need to know, what questions are to be asked to the students who have a diverse level of knowledge. Also, suggesting the ways to support students if they are not interested in the process of discussion. Thus, as a researcher, from my lived experience, the frequently employed strategy in my mathematics classroom is questioning for instruction. I personally consider it to be the most important tool of a mathematics teacher to help students to develop confidence and understanding. For instance, I take the help of Cotton (1989), who has added that questioning is one of the primary and most influential teaching skills that teachers can use in a mathematics classroom.

In this regard, the ideas of Edwards and Bowman (1996) are worth borrowing: the teachers' questioning has been found to be a crucial part of mathematics classroom interaction, which seems to be significant to enable teachers to identify students' need in mathematics. In this regard, the teachers' major instructional strategies of using various types of questions are to find out whether students are aware of what they are going to learn in mathematics. However, mathematics teachers use different categories of skills such as problem-solving, critical thinking and reasoning throughout teaching but they are not always aware of which skills are really helpful to the students to study and understand mathematics (Sahin, Bullock & Stables, 2002). For example, the teacher uses different questions to elaborate certain

meanings but the students may understand the questions in a different way (Voigt, 1992).

Similarly, Caram and Davis (2005) found that when teachers' questioning is used successfully, they can improve learning of students by developing critical thinking skills, reinforcing students' understanding, correct students' misunderstanding and providing necessary feedback. Therefore, my views on how mathematics teachers ask questions in the mathematics lesson are one of the methods to be taken into consideration for the progress of teachers' questioning in the mathematics classroom.

Furthermore, Croom and Stair (2005) define that classroom questions in mathematics are the best used experimental tools to facilitate the students' academic improvement or to judge students' critical thinking. This view was also supported by Vogler (2005) who also stated that questioning can help to make connections to earlier knowledge and can inspire cognitive expansion.

In this regard, Danielson (1996) detects that good and skilled classroom questioning is well developed and structured which can connect students in a true pursuit of the content they are learning in mathematics. Further, it helps to allocate the time to students to demonstrate their understanding in any mathematical ideas, yet my another experience leads to the understanding that classroom questioning in mathematics, where teachers focus only on short answers, low-level questions, etc. only contributes to authenticate the students' knowledge.

Similarly, Hill and Fly (2008) state that the problems related to teachers' questioning in mathematics classroom are the failure of mathematics teachers to relate it with students' capacity. This is the reason which leads the questions asked by teachers in mathematics to be frequently not well organized and not helpful (Luitel, 2009) in strengthening students' understanding. In my view, mathematics teachers

require awareness of the types of questions, approaches and the art of questioning in order to strengthen students' understanding.

Rationale of the Study

Good questioning is regarded as a primary tool of successful teachers. However, mathematics teachers often fail to raise suitable questions in the mathematics classroom because they often make the prior assumption that students already know something about it. I have a personal interest in researching on this agenda so I am eager to contribute a body of knowledge from mathematics teachers' narratives. Thus, mathematics teachers' value has been found to be the single most significant factor related to students' success (Rice, 2002). A few of the popular measures researchers use to assess teachers' excellence are subject knowledge, pedagogical content knowledge, years of experience, the level of certification and achieved degree level (Youngs, 2003). Besides looking at who the teachers are (e.g., experience), this study examined, how mathematics teachers' understanding and uses of questioning such as starter questioning, questioning to encourage mathematical thinking, assessment questioning and discussion questioning in their mathematics classroom (e.g., from interview later on stories). This study portrays the discourse of understanding and uses of questioning in the mathematics classroom and identified characteristics of this discourse. Further, this discourse is examined through the lens of teachers' roles, orientations and their philosophical perspective. This exploration is important to know because outlining the skills, actions and dispositions required of teachers to create an environment that supports useful discussions and effectiveness of teachers in their pursuit in promoting students' learning.

Additionally, this study will be relevant for my future professional career. Firstly, this study will help me, as well as mathematics teachers, to improve and

enhance questioning skills in the mathematics. Secondly, the study will some extent help textbook writers and curriculum developers to comprise diverse levels of questioning patterns in mathematics and facilitate teacher educators to improve the questioning skills of teachers in mathematics in secondary level especially grade IX and X. Therefore, the findings of this study could facilitate mathematics curriculum developers, question papers designers, and textbook writers to improve their questioning skills. Lastly, the findings of the study might also indicate what teacher educators need to do to improve the questioning skills of teachers in mathematics. At the same time, this study will be an academic reference for further studies.

Statement of the Problem

The progress that took place in education in the 21st-century skills like problem-solving, critical thinking and reasoning has to be included by the mathematics teachers in teaching that helps to foster the students' abilities to engage in mathematical reasoning. With the help of teachers' questioning, teachers encourage students to become active participants in the learning process. So, teachers' questions can be helpful for encouraging and promoting students' reasoning ability (Van Zee & Minstrell, 1997). However, research explains that 93% of teacher questions are "lower level" knowledge-based questions focusing on recall of facts (Daines, 2016). Additionally, most of the students' performance in mathematics is not satisfactory to some extent because of above-mentioned views.

The teacher's ability to have adequate content and pedagogical knowledge are necessary. Therefore, useful pedagogical knowledge for teachers would necessitate having an understanding of the types of questions such as starter questioning, questioning to encourage mathematical thinking, assessment questioning and

discussion questioning to engage students in mathematical conversations and having skill and knowledge of how to scaffold learning by supporting students.

A mathematics teacher who would facilitate classroom discussion requires knowledge on the uses of questioning. Therefore, the framework for categorizing teachers' questioning is necessary for providing guidelines or techniques for asking productive questions and illustrating how productive norms in the classroom are established by the uses of questioning (Goos, 2004). In this regard, Cotton (1989) summarized the research carried on types of questions and clarified dualistic system. There are two general types of teacher questions in mathematics classroom namely: low-level and high-level. Low-level questions are also called closed, direct, knowledge and recall questions. On the other hand, high-level questions are open-ended, interpretive, evaluative, probing, inferential, emerging and synthesis-based. Addition to Goos (2004) emphasized the need for teachers to allow "wait time" for responses from students. When teachers allow processing time students have the opportunity to respond using higher levels of thinking. Substantial research has addressed how to start and end a discussion (Soucy McCrone, 2005). This information will contribute to the knowledge base in mathematics education on teacher questioning and discourse that may promote a deep level of student learning.

Thus, as a mathematics teacher, educational researcher and teacher trainer, I have always been worried about inadequate levels of students' performance in mathematics in SLC, now named as SEE. From my experience, mathematics teachers think that it is not necessary to plan for questioning, they ask questions in which they are habitual. Mathematics teachers even forget that every student is unique and ask same questions to all the students. So, the performance in mathematics has continued to decline. One of many reasons of this failure may be due to inadequate

understanding and uses of questioning by mathematics teacher which may restrain the student's critical thinking and logical reasoning. Further, there are many reasons that the students have learning complexities in mathematics classroom; one of these reasons is the responsibility of the mathematics teacher and their understanding and uses of questioning in the mathematics classroom.

From my teaching and learning experiences, the role of mathematics teacher is to develop the students' adequate personal self-confidence towards mathematics through questioning which seems to be insufficient in recent trends. In contrast, some mathematics teachers often fail to ask suitable questions in the mathematics classroom which may have an adverse effect on student's performance. Even more mathematics teachers have prior assumption that students already know something about the topic. For instance, some of the mathematics teachers who do not possess a strong content knowledge; they have problems in preparing suitable questions for learners (Danielson, 1996). Thus, it may be due to inadequate understanding and uses of questioning practices by mathematics teachers. My focus is to explore understanding and uses of questioning by mathematics teachers.

Purpose of the Study

The purpose of this study is to explore the mathematics teachers' narrative of their experience on using questioning approaches in relation to mathematics pedagogy and their traditions of questioning in mathematics classrooms in context of Nepal. Further, this study explores how teachers acquire questioning skills and what questioning strategies they use.

Research Question

This research examines how teachers' questioning in mathematics is being applied in the Nepalese secondary schools from the perspective of mathematics teachers. Thus, this research attempts to answer following research question:

- How do teachers narrate their experience of understanding and usage of questioning in relation to mathematics pedagogy?

Structure of the Dissertation

The dissertation is presented in six chapters, with this introduction as the first chapter. The second chapter deals with the relevant literature by competing conceptualizations which have been significant with regard to the framework for my study, as well as outlining examples of the ways in which questioning practices in mathematics classroom take place. The third chapter deals with my methodology, which begins by considering the ontological, epistemological and methodological positioning of the study before continuing with a narrative discussion of the particularity of the methodology of this specific inquiry. The fourth chapter that represents the narrative stories forms the core of the dissertation. It includes the (translated) stories as told by the six mathematics teachers in the Kathmandu Valley. However, there are also variations in voice and tone within chapters as well as between sections and this is further discussed throughout the study. Chapter five forms a discussion synthesized from the results of the narrative analysis for meaning-making, dealing with the understanding and uses of questioning from various perspectives namely; sociological, behaviorists to constructivists, critical pedagogy and day to day life practices of a mathematics teacher. The final chapter brings the dissertation to a conclusion by reflecting on the process and significance of the study as well as the contribution made and the possibilities for further research.

Key Message of the Chapter

In this chapter, I have explored how my research agenda emerged on understanding and uses of questioning. Then, I raised some issues with a number of deep-rooted questioning practices in the mathematics classroom. Reflecting upon my experience as a student, teacher and teacher educator. I articulated rationale of the study, problem statement of the study, the purpose of the study and formulated a research question.

CHAPTER II

LITERATURE REVIEW

Indeed, the basic reason for reviewing the literature is to improve the present level of understanding on the related concepts and practices of "understanding and uses of questioning" by mathematics teachers in the mathematics classroom. For this, the entire task has been carried out from three main sections. The first section outlines the literature reviews focusing on understanding and uses of questioning in the mathematics classroom from various perspectives such as sociological, behaviourism to constructivism, critical pedagogy and daily practices of questioning and the second section provides context to the study through the review of questioning in the mathematics classroom and the third section reviews the theoretical framing of my dissertation.

Questioning in Mathematics

In general, questioning refers to a problem or dilemma which is presented to a student in anticipation of their answers. In this regard, Seime (2015, p. 5) defined a question as “a statement for which a reply is expected”. From this idea, it can be further said that the word questioning refers to any idea that requires a response from the learner in the mathematics classroom. So, questioning within educational circles has been in existence from time immemorial. Questioning has been used to provide a variety of purposes so as to increase students’ involvement, to regulate classroom processes, to focus attention on a particular issue or concept, to structure a task in order to maximize learning and understanding, to assess students’ prior and current

knowledge and to determine whether the tasks assigned have been achieved properly or not in mathematics classroom (Callahan & Clark, 2014).

Thus, giving emphasis to the view that questioning is essential to the mathematics pedagogy, I have started this section with four goals in my mind such as clarifying the notion of Socratic questioning, explaining oral jigsaw, unpacking logical thinking and framing questioning. Firstly, Socratic questioning is a category including questions that assist in promoting and guiding student's thinking. During the time of Socrates, who used searching questions to make his students think, understand and justify their claims (Newton, 2012; Harrop & Swinson, 2013) and subcategories for Socratic questioning are pumping, reflective toss and constructive challenge.

Secondly, the verbal jigsaw is a technique used to focus on key concepts using content-specific terminology and subcategories for verbal jigsaw are an association of key concepts and verbal close. Thirdly, logical thinking is facilitated by questioning that helps students to put together a conceptual framework. Subcategories of logical thinking are multi-divided questioning, stimulating multi-modal thinking and focusing and zooming mathematical ideas. The last category framing is used to develop a problem or discussion topic and to frame the discussion. Subcategories of framing questioning are: introduction, outline and summarizing. This concept has used is chapter IV and V for meaning making.

Questioning and Critical Thinking

The notion of critical thinking may be one of the most considerable issues in mathematics classroom in Nepalese context which helps to compare the dynamic relationship between how students learn and how teachers teach mathematics (Mason, 2010). Critical thinking alters in mathematics classroom design that basically ignores thoughts to one that delivers enveloping and essential (Cohen & Tittle, 2010). So,

being able to differentiate between a statement of reality, an opinion or an assumption of the mathematics teachers and students is an important skill of critical thinking in the classroom. It is necessary to know, what can be verified directly, what is a legitimate suggestion derived from the facts and what is fair to enclose the mathematics classroom while questioning.

Thus, critical thinking in mathematics is an ability to think clearly and logically. It consists of the skill to engage in insightful and autonomous thinking while questioning in the mathematics classroom. Thus, critical thinking helps to understand the logical connections between ideas, construct and evaluate arguments in mathematics lessons. Further, it helps to detect inconsistency and common mistakes in reasoning while solving algorithmic mathematics problems systematically and in identifying the relevance and importance of ideas. It reflects on the justification of one's own beliefs and values on questioning and answering.

Hence, when students study mathematics in a “critical” way by questioning, they are likely to take ownership of a new mode of thinking, so they can internalize, generate new thoughts and understanding. Nowadays, the thinking of students is focused on a set of innovative questions which becomes a tool of insight. Mathematical content is changed into mathematical thoughts; as a result, they develop the skill to think critically within mathematics classroom and beyond.

Similarly, mathematics teacher used lower level questioning in the mathematics classroom by claiming to encourage students in discussion. At every level, mathematics teachers need to learn how precisely to set questions forward, define contexts and purposes, pursue relevant information, analyze key concepts, generate good reasons, recognize questionable assumptions, trace important implications and think empathetically (Dunn, 2010). Hence, critical thinking is not a

matter of accumulating information in the mathematics classroom. A student through a good recall and who knows a lot of truth is not necessarily good at critical thinking. A critical thinker can assume consequences from what s/he knows, and how to make use of information to solve algorithmic mathematics problems and to seek relevant sources of information to inform himself or herself.

So, critical thinking might be a key notion for all educational reform (Bulach, Lunenburg & Potter, 2011). Thereby, mathematics teachers would possess mathematical questions that could create a thought-provoking environment in the mathematics classroom and engage in practices that provide opportunities for questioning in the mathematics classroom.

For effective teaching, mathematics teachers would be consistently inquiring, well-informed, trustful, reasonable, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, careful in making judgments, willing to re-think, clear about concerns, logical in complex topics, hardworking in seeking relevant information, logical in selection of criteria, focused on investigation and incessant in seeking results which are as precise as the subject and circumstances of inquiry permission. So, critical thinking in mathematics helps to acquire knowledge and strengthen arguments in mathematics classroom while questioning.

Uses of Questioning in the Mathematics Classroom

In today's mathematics classroom, mathematics teachers would have been facing ever increasing pressures to create a suitable learning environment in both efficient and effective manner, which is useful for learners to attain good achievements in mathematics. For that, without considering a proper plan to use questioning as mathematical learning tools, teachers of mathematics are probably to miss an opportunity to generate the type of lively and interactive dialogue that

encourage an environment in which students actively analyze and process information to answer good questions.

So, by using a variety of questions for various reasons in the mathematics classroom, mathematics teachers can expand and enhance the high level of critical thinking and learn in the natural world inside mathematics classrooms. Similarly, questioning and thinking help to begin the planning of information and ideas which, in turn, provides an opportunity to develop new ideas and understandings in mathematics classroom (UNESCO, 2014).

Experientially speaking, the questions I used to ask and students' performance on high stake assessments are connected, since the stage of questioning reflects the stage of thinking standard within the mathematics classroom (Beyer, 2000). A common observation of my mathematics classroom is that I would do most of the talking (Treffinger & Isakson, 2001). So, efforts to progress questioning skills must consist of an amplified importance on providing the students adequate period to imagine and to prepare adequate responses which require enough period to share these responses with their colleagues (Blosser, 2000).

The knowledge on the purpose or goal of a question will help to determine the appropriateness of the question to be asked (Anderson, 2001). However, it is not as easy as just deciding to ask more questions during the course of a lesson (Hill & Flynn, 2008). I would suggest that mathematics teacher needs to reflect on the nature of the questions they use and actively plan to implement the uses of questions as part of their lesson. Once mathematics teachers replicate critically on their earlier practices, they should be able to develop and plan to use on mathematical questioning (Hill & Flynn, 2008). To accomplish this, mathematics teachers would think about

what is to be learned and how the questions are to be posed directly, in order to put for the purposes of learning.

In a similar fashion, Clarke (2006) added the idea that the rank of questioning and the kinds of question that could be asked will be able to take out students' ideas and their reactions towards what is being taught in any mathematics class. In addition, borrowing the ideas of Perrott (2012), one of the common problems in questioning sequences is the lack of understanding where to use lower order questions and higher order questions in the mathematics classrooms. This may be as a result of the failure in planning a strategy how to present questions in the mathematics classroom. Similarly, I agree with Seime (2015), who stated that without a strategy that specifies an objective or end in view as a goal, really is no logical basis for developing or selecting a questioning strategy. In this regard, mathematics teachers would teach logically that would be highly knowledgeable about the procedure of outlining questions so that teachers can direct students in the learning procedure in mathematics classroom (Eggen & Kauchak, 2006).

According to Eggen and Kauchak (2006), good questions are clear, purposeful, brief, accepted and modified to the rank of the mathematics class, and are also sequenced and thought-provoking. In this regard, Farrant (2008) agrees and observes that questions when used effectively help stimulate students to compare, conclude, infer, predict, apply, relate, design, generalize, probe and solve algorithmic mathematics problems. So, in my narrative inquiry, it provides a ladder up which the students climb to achieve the fuller and deeper understanding while questioning.

Teacher's Role in Choosing Questions

In order to ask suitable questions such as starter questioning, questioning to encourage mathematical thinking, assessment questioning and discussion questioning

to engage students in mathematical conversations and having skill and knowledge of how to scaffold learning by supporting students that mathematics teachers have to be well-informed about the content of mathematics. Hence, questioning provides chances for students to reinvent mathematical ideas through both investigations and cultivating of previous ideas (Martino & Maher, 1999). Likewise, the students should be given an opportunity to analyze other tasks, to find distinguishing features between tasks and verbalize generalizations about tasks (Wolfram, 1997). Thus, mathematics teachers would realize the fact that questioning is the ability and like all other abilities; it must be practiced beforehand so that it can be used as per the requirement (Vogler, 2005).

Further, the views of Wilen (1999), which is still relevant, provides seven suggestions for effective questioning skills, which is summarized as follows: teacher to plan key questions, phrase questions clearly, adapt questions to students' ability, ask questions in a sequence, ask questions at a variety of levels, teachers to make up on responses and allow for think time. I learned that a teacher cannot employ innovative teaching strategies if the questions themselves are not being thoughtfully considered (Wilen, 1999). For students to be successful, teachers need to incorporate all categories of questioning (Anderson, 2001) of the cognitive domain in their nature of questions and questioning which help the students and can be guided to reach higher levels of thinking and be able to tackle their regular tasks.

Teachers used to recognize that questioning is a key aspect of teaching and learning process in mathematics classroom (Anderson, 2001). Hence, questioning is used time and again, teachers may not even grasp the types or quality of the questions they use in the mathematics classroom. Stigler and Hiebert (2004) pointed out that it is not about the differences in class management, technologies, or even curriculum used in other countries that result in different levels of student achievement. It is the

value of questioning, clear connections and depth of thought expected that contributes to the gap in students' achievement. In contrast, McGrail (1997) recommended that mathematics teachers needed to integrate all levels of Bloom's Taxonomy into mathematics lessons, tests and assignments (Anderson, 2001). By using a variety of questions that are applicable to all of the students, become more personal and helpful to them.

Not only can Bloom's Taxonomy of the cognitive domain be addressed in assignments and tests, but it can also be included in class exercises and projects in mathematics. Studies show that teachers who use Bloom's Taxonomy of the cognitive domain on a regular basis in their lessons enable students to benefit and appreciate the levels of thinking. But, various questions occurred in my mind like: why is it that many mathematics teachers are unable to do this on a regular basis? Why is it that only a few mathematics teachers consistently use Bloom's Taxonomy of the cognitive domain in their mathematics lessons? Thus, lack of understanding of questioning in mathematics classroom can build up to teachers to modify high-level questions into the low level (Good & Brophy, 2003). This would occur when teachers reply the questions they request or write down solutions for mathematics learners in mathematics classroom without giving learners sufficient time to answer the questions properly. On the other hand, mathematics teachers who solve their own questions devoid their students, the chance to answer questions and share ideas with their friends which discourages them from using their thought-process on their own.

Furthermore, the students would hang around for the teacher's response in mathematics classroom because they tend to take the teacher's answer to be the best answer among all (Burden & Byrd, 1994). Teachers who do not organize their questions before any mathematics lessons and desire to be spontaneous in their

questioning have an inclination to ask a series of questions which may result in random and sometimes pointless questioning. In addition, that teachers' inadequate knowledge of the taxonomy of questions may limit their capability to expand their use of levels of questions according to the requirements and objectives they set for the mathematics lesson (Gall, 2010).

However, Morgan and Saxton (1994) made the mathematics teacher aware not to rely on the taxonomy in a large quantity. However, according to them, as a configuration, the taxonomy is not a constructive way of planning and asking questions. Further, Morgan and Saxton (1994) make it clear that to pursue the hierarchy of arrangement in the taxonomy from simple to the difficult evaluation could alter the place of questions in mathematics teaching. For example, the view that mathematics teachers would ask questions at higher levels only when they are sure that their students have understood and can perform at lower levels is unlikely. They whispered that if teachers used this as the base of the point of view they would observe that their students were not ready, still weak on the subject matter. This could result in a reluctance of students to perform the task and practice to other cognitive levels (Gall, 2010).

Teachers' Beliefs on Mathematical Questioning

Morgan (2004) states that teachers' awareness and viewpoint about questioning strengthen the way mathematics teachers ask questions in the mathematics classroom. According to Hancock and Gallard (2004), belief is an accepting thought by an individual that shows individual's purposes for actions. The knowledge and beliefs that the mathematics teachers have can greatly affect their methods of delivery in the mathematics classroom and the way they ask questions in the mathematics classroom. For instance, teachers' less knowledge of the subject

matter might be making them consider and rely strongly only on textbooks or resources provided to assemble mathematics questions (Carlsen, 1992).

In this regard, Ornstein (1995), Good and Brophy (2003) experimented that when mathematics teachers have beliefs to depend profoundly on teaching materials for constructing their questions, they might ask their questions so that students would be able to ensure and lift solutions only from the books. As a result, this might limit the scope of knowledge for the students only within the mathematics classroom, not expanding it away from the classroom and thus not allowing students to be imaginative.

However, some mathematics teachers in Nepal believe that teaching is all about lecturing where the teacher's role is to transmit mathematical knowledge and the student's role is to passively receive the information. This belief can make some mathematics teachers (i.e., not to allow), to raise any questions to the students in their mathematics lessons while teaching and also can get them not to ask students questions either.

Thus, from literature, mathematics teachers who like asking more questions at one shot stage might replicate a belief that their students are not prepared for questions in other shots and that their students require more questions to instruct for them to get ahead of their mathematics examination. This may make the mathematics teachers believe that the students are not skilled enough for the higher level of questions and are still in the low-performance level in mathematics. It may influence them to ask their students questions of lower order rather than higher order, which they might be capable of because the teachers by now may consider that their students cannot answer questions of higher order (Dean, 1996). Teaching in this way may not help students to do well in their mathematics examinations.

Hence, in my narrative inquiry, it may be that lecturing where the teacher's role is to transmit mathematical knowledge and the student's role is to passively receive the information from mathematics teachers who like teaching by copying exactly how questions are phrased in textbooks. Teachers are supposed to be resourceful and enterprising enough as to look for sources beyond what is specified in the syllabus and textbooks.

Categories of Questions

While questioning, teachers promote mathematical discussion to recognize student opinions. Likewise, Harris (2000) describes some purposes of questioning where teachers can use questions for checking students' understanding, starting a discussion, inviting curiosity, beginning an inquiry, determining student's prior knowledge and stimulating critical thinking. In addition, teachers ask questions in anticipation of or desire for the students' responses. As though Woolfolk (1989), use the lower and higher cognitive domains in describing questions and proposes categorizing questions into convergent questions with one correct answer and divergent questions with many possible answers. Moreover, Cunningham (1987) publishes an extended list of questions where convergent and divergent questions are each separated into low and high subcategories.

It can be seen based on the cognitive level of the students' response; low-convergent questions would ask students to convey information by comparing, contrasting or explaining. In contrast, high-convergent questions would ask students to support their reasoning and draw conclusions. Further, low-divergent questions might ask to solve a problem in a different manner and high-convergent questions might encourage students to elaborate, point out implications or go for open

predicting. With the discussion of these questioning levels, I find that teachers invite students to cognitively think about and process information in different ways.

As a matter of the fact, Hiebert and Wearne (1993) identify four types of questions: recall, describe the strategy, generate a problem and examine underlying features when they examine the types of questions asked by teachers. Similarly, Barnes (1990) cites three categories of questions that transpire in the mathematics classroom: factual by recalling facts, reasoning in putting together a logical argument, and open-based. With the help of this framework of these three types of questions in Vacc (1993) analysis furthermore and explored that teachers asking factual questions will find out the specific facts their students know, but teachers who ask questions in the open category will attain information about their students' understanding. Thus, in my study, I generally aim at identifying the types of questions teachers asked his/her students.

Equally, the hierarchy is a further categorization designed for teacher questions. Bloom's taxonomy (1956) is one of the most relevant hierarchies, where questions are labeled from simple to complex, and the cognitive objective is the most widely used hierarchy. In this regard, Wolf (1987) introduces a different hierarchy, which addresses the selection of challenging questions after observation in the classroom. This hierarchy enlarged Bloom's six levels of questions and included five more categories at the higher levels of thinking. They include inference questions, asking students to go beyond immediately available information; interpretation questions, asking students to fill in missing information and consequences of information; transfer questions, asking students to think about what can be predicted and tested; questions about hypotheses, and reflective questions asking students to

ponder on how they know what they know. The table below shows a summary of the teacher questions in the literature.

Table 1

Summary of Teacher Questions in Literature

Questions of Comparison Type	Author		
	Cotton (1989)	Cunnigham (1987)	Woolfolk (1998)
Dualist	Convergent: Low: predictable transfer of information High: encourage reasoning Divergent: Low: think of alternative ways to do something High: encourage creative thinking	Low: recall information High: manipulate information to create an answer	Convergent: one right answer Divergent: many answers
	Vacc (1993)	Hiebert and Wearne (1993)	
Category	Factual-name specific information Reasoning- develop one or more logically organized	Recall- give known information Describe strategy-explain solutions Generate problems-extend thinking to new areas Examine understanding features- generalize ideas	

	responses Open- have a wide range of possible answers	
	Bloom (1956), Androson (2001)	Wolf (1987)
Hierarchical	Remembering- recalling information Understanding- demonstrating understanding of information Applying- uses information to solve a problem Analysing- making reference Evaluating- Divergent, original thinking Creating- Judge the merit of ideas	Interpretation- understand consequences of information Inference-go beyond available information Hypothesis-predictive thinking Transfer- take knowledge to new areas Reflective-explaining how you know

(As cited in Ilaria, 2009, p. 34)

After all, the types of teacher questions defined by their anticipated (from table) student response: low and high cognitive levels, categorical types, and hierarchical student thinking levels. The researcher who defined the specific question types is identified. My narrative inquiry broadens this work by exploring the actual teacher questions from narratives of six mathematics teachers of Kathmandu Valley.

Review of Previous Research Studies

I have gone through various scholarly done researchers work from different countries, in which they have conducted research on mathematical questioning and focused on various aspects of classroom questioning which lead to different findings. The fashionable finding, particularly in the literature, was that higher-level questions lead to better cognitive growth (Dillon, 2004).

These visions characterized the school of thought of Gall (2010) and Andre (2015), who suggested that higher level of thought-provoking questions in mathematics classroom have encouraged students' performance and thinking. In this regard, Redfield and Rosseau (2013) concluded that application of the higher level of questions during mathematical instruction had a positive effect on students' achievement. Further, Hewit and Whittier (2007), stated in their conclusion that low-level questions were beneficial in helping to improve the performance of deprived and slow learners. They concluded that truthful questions seemed to be the most useful for this type of slow learner students.

A review of more recent relevant research on questioning indicates the range of issues pertaining to questioning in the classroom including teachers' beliefs and practice (Pant, 2015). The other parts enclosed in recent research on classroom questioning in mathematics consist of patterns of teachers' questioning within mathematics classrooms (Hamilton & Brady, 2012), learner approaches for tutoring in

using higher order questions and teachers' crucial reasons for asking certain types of questions in mathematics classroom (Ayaduray, 2016).

Questioning in my Inquiry

The literature review has indicated that various cognitive levels of questions draw out the different cognitive process of critical thinking. So, from my experience, after literature reviewed, questions are mainly separated into two categories: lower-level and higher-level. Thereby, lower-level questions are those asked at the stage of remembrance, understanding and simple application levels of revised Bloom's taxonomy. Higher order questions are considered important for encouraging students to think critically in the mathematics classroom. Higher-level questions require analyzing, creating and evaluation skills.

Going through various scholarly done research papers, journals, dissertations and term paper, I conclude that most of the researchers on questioning have been conducted on utilizing commonly used research instruments particularly observation and questionnaire. However, in this study, I have incorporated stories (e.g., teacher's experience) as a research instrument, to the best of my knowledge; this research instrument has not been used in previous studies yet.

The other point is that, till date research on understanding and uses of questioning in mathematics might not have been carried out in Nepal by using narrative inquiry (i.e., qualitative approaches). So, this approach will definitely help me to get in-depth data on what actually takes place in questioning in the mathematics classroom. It is from these gaps identified in the literature review. I felt that the current study on understanding and uses of questioning in the mathematics classroom is worth carrying out.

Theoretical Perspectives

Using the narrative inquiry as a method to explore the perspective on how questioning skills are being used in the mathematics classroom, I have examined the foundational beliefs that mathematics teachers hold towards understanding and uses of questioning in mathematics classroom teaching and learning practices, for making the theoretical standpoint clear. In my research, I'm going to use following learning theories as a tool of my theoretical referents.

Behaviourism

Behaviorist learning theories highlight the changes in behavior that results from stimulus-response associations made by the students in mathematics classroom (Orey, 2001). Even today, there are still instructional approaches that many mathematics teachers use in the mathematics classroom which correlates with the behaviorist learning theory. Mathematics teacher uses various methods to control behavior within the mathematics classroom. Questioning is an example of behaviorist applications used in the mathematics classroom by mathematics teachers to control or engage students in learning. According to Orey (2001), mathematics teachers use these strategies to ensure that their mathematics classrooms run smoothly and effectively.

In my research, the instructional strategy of questioning in mathematics classroom enhances students' accepting of the relationship between attempt and success by addressing their attitudes and beliefs about mathematics learning in the classroom through questioning (Pitler, Hubbell, Kuhn & Malenoski, 2007, p. 155). The attitudes and beliefs about effort and learning that students acquired through repetition and a behaviorist approach. This strategy is a clear example of how questioning can still be used in today's mathematics classrooms for behaviorist

principles. One way that students can change their outlook and attitude by questioning in mathematics classroom (Pitler, Hubbell, Kuhn & Malenoski, 2007), thus behavior and effort go hand in hand.

After examining the behaviorist learning theory (e.g., see in chapter V), I now understand how questioning strategies are employed in today's mathematics classrooms. There still continues to be many instructional strategies that correlate and coincide with behaviorist principles, no matter what learning theory we use. It is clear that the behaviorist theory, in questioning in the mathematics classrooms, still continues to be used in today's classrooms so it is useful in my research, too.

Constructivism

Constructivism, though it began as a theory of learning, this pedagogical framework has made an impact on education particularly in teaching and learning mathematics while questioning (Treagust, Duit & Fraser, 1996). A constructivist view of learning emphasizes that students construct their own knowledge using their own prior knowledge and experiences while questioning (Gunstone, 1995). As a theoretical referent, constructivism has embraced the four essential criteria to characterize constructivist teaching practices while questioning in the mathematics classroom namely: obtaining earlier knowledge, creating a cognitive gap, the relevance of the knowledge with feedback and reflection on learning. Using these criteria, I believe, it allows recognizing whether or not pedagogical practices are worthwhile while questioning. As a narrative inquiry researcher and writing as mathematics teachers' stories (i.e., experiences), the activities I am involved in (e.g., forming research questions, making sense of teacher’s experiences on questioning, writing the research report) are framed.

Further, constructivism is to some extent related to the tendency in mathematical instruction while questioning. So, it can play an active role in the relationship between how students learn and how teachers teach. One fundamental principle of constructivism, students keenly build up their knowledge, rather than merely gripping ideas spoken to them with the help of mathematics teachers' questioning (Larochelle, 2010). For instance, Piaget has proposed that through questioning, students are not recorders of information, but builders of knowledge structures (Pass, 2009). Thus, students are eventually accountable for their own learning within a learning environment through teacher questioning, where teachers value student thinking, initiate lessons that foster learning, provide opportunities for students, structure learning around primary concepts, and facilitate authentic assessment of student understanding.

Hence, in constructivist theory as the theoretical referent of my research, it is believed that students have to create their own knowledge individually and collectively through teacher questioning. So, mathematics teachers' role is to provide the environment, pose the challenge, and offer the support that will support the cognitive construction of knowledge by questioning. Since, students do not have the experience of being experts where teachers allow a great responsibility for guiding student activities, modeling behavior and as long as examples that will alter student group discussions into meaningful learning on the subject matter while questioning (Flynn, 2005). Hence, constructivism views of mathematics teacher questioning highlight that the practices by which students build and extend their own ideas for creating meaning that not only match but also challenge student's understanding, encouraging further growth and development of the intelligence (Leitner, 2010). Finally, constructivism is helping as the foundation for many of the recent

transformation of the several subjects matter while questioning. In mathematics classrooms; problem-solving, concept development and the construction of learner-generated solutions and algorithms are stressed rather than drill and practice on correct procedures and facts to get 'the right' answer with the help of teacher questioning. This theory has used in chapter V for meaning-making of the narratives.

Social Constructivism

So far, constructivism describes how humans (i.e., teachers and students) learn and acquire knowledge individually by questioning. In contrast, social constructivism focuses the significance of social interactions (e.g., classroom) and the role of culture in creating knowledge. Further, constructivism emphasis is on the individual (e.g., teachers or students) experiences whereas social constructivism emphasis is on social (i.e., classroom) interactions and culture. When examining communication between mathematics teachers and students in a mathematics classroom, the ideas of cognition alone cannot completely describe the learning that happens with the help of social experience. The theoretical referents of social constructivism provided me a clear outlook on the higher cognitive processes that can expand through social interaction for understanding and uses of questioning in the mathematics classroom.

Although many scholars in mathematics instruction generally support a constructivist view of culture, there are differing perspectives about the components involved in the learning construction process. In this narrative inquiry, I employ a theoretical referent of social constructivism, which emphasizes the idea that knowledge of a particular experience is produced and maintained through communal human action, thought, dialogue, or other social practices (Collin, 2013).

To some extent, this idea can be taking the position that learning occurs through the community of mathematics activity and a sharing of the mathematics

classroom culture. In this regard, even to the ideas of Vygotsky (1978), a positioned cognition theorist, higher cognitive processes develop from social interaction. In this narrative inquiry, I am particularly interested in understanding and uses of questioning in mathematics between mathematics teachers and students as they construct knowledge of mathematical phenomena throughout the classroom by teacher questioning.

This theory has been useful in my research and used in chapter V for meaning-making because its main motto is that students' engagement is a process of cognitive growth as they explain mathematics problems or tasks and construct mathematical facts, so questioning and connected theoretical frame move correctly to the field of mathematics. When learning the cognitive progress of students in the field of mathematics, it is caring to think in terms of cognitive illustrations of mathematical ideas. Students create mathematical meanings by themselves from some kind of interpretive activity.

In similar fashion, Bauersfeld (1992) also states the significant need for children to develop constructive competence through social interaction with their teacher and classmates inside the mathematics classroom. He recommends negotiation of mathematical meaning between teacher and students through the classroom questioning and solve the tasks and learning by contrasting with illustrations, and discussion of underdetermined tasks. Similarly, students progressively mathematize their experiences with the teacher's initiation and guidance (Cobb et al., 1992). Teachers in mathematics classrooms serve a similar navigator's role thereby helping students navigate between everyday understandings and the world of mathematics as the transition to the concepts, symbols and practices of the mathematics community in relation to questioning.

Criticalism

The critical theory emphasizes on reflection and imagination while questioning in the mathematics classroom. It is a sociopolitical process laze at the center of the discussion about the nature of questioning in teaching and learning mathematics. Without such reflection, future teachers may fail to become conscious of the consequences of particular pedagogical decisions in the mathematics classroom. Thus, the art of questioning practices suggests facilitating students to repeatedly shaped and reshaped through the maturity of intellectual tools and attitudes about the mathematical knowledge. Furthermore, the criticalism in my research offers a multidisciplinary approach in mathematics classroom culture which combines perspectives of different views that students have while questioning by mathematics teachers (e.g., see chapter V). Thus, criticalism can emancipate students in mathematics classroom from different disciplinary boundaries and it is concerned with creating mathematics classroom free from dehumanizing policies (Taylor, 2009). It is a meaning-making process through the reflexive voice of students in mathematics classroom through questioning. Being able to critically reflect on understanding and uses of the questioning in mathematics classroom helped me to realize the importance of being reflective of one's own practices.

Sociological Perspectives

Sociology studies human society and social behavior through social interaction and social phenomena (Schaeffer, 2011). So, sociological perspective is a perspective on mathematics teacher behavior and its connection to society as a classroom while questioning. It invites to look for the connections between the behavior of mathematics teacher and the structures of the classroom as a society. A sociological mindset is being able to connect individual (e.g., mathematics teachers)

experiences and societal (e.g., classroom) relationships in the process of questioning in the mathematics classroom. An awareness of the relationship between the individual and the wider society, both today and in the past" (Schaeffer, 2011) connects history (i.e., past) and biography (i.e., current personal experiences and context). The lens that an individual (e.g., mathematics teachers) chooses to view the scope of society form as a classroom. It goes beyond the obvious and question what is accepted as true or common sense. I used sociological perspective in my inquiry (e.g., see in chapter V) to see general social patterns of the behavior of mathematics teacher while questioning in the mathematics classroom and to offers insights about the social world that extends far beyond explanations that rely on mathematics teacher's quirks and personalities. Further, mathematics classroom is not about solidarity or social consensus but about the competition through questioning.

Key Message of the Chapter

In this chapter, I reviewed different literature related to my research issues. I went through the different literature of teacher questioning, regarding the sociocultural dimension of understanding and uses of questioning in the mathematics classroom from various perspectives (e.g., sociological perspective, behaviorists to constructivists, critical pedagogy and daily practices of questioning) and I discussed how I used these theoretical referents in my dissertation.

CHAPTER III

METHODOLOGY

This chapter begins by considering the narrative inquiry within which I locate my research. A brief outline of the ontological and epistemological positioning of the study is followed by a methodological story and has been narrated in a personal voice. The story was told within an ethical frame, showing how decisions about the method and the necessity for reflexivity are guided by my commitment to an ethical methodology. Further, this narrative inquiry design has been used to address the research question of my study. In this chapter, I discuss the following namely; philosophical consideration, research paradigm, research design, the context of research site and participants selection, nature and source of data, narratives generation, information handling, analysis and interpretation, quality standards, ethical consideration and the key message of the chapter. However, the methodology of my research is not covered entirely in this chapter alone but is found throughout the entire dissertation.

Philosophical Consideration

The narrative paradigm recognizes that reality is constructed, fluid and multifaceted. More specifically, it maintains that social reality is primarily a narrative reality (Spector-Mersel, 2010). Nevertheless, many narrative researchers share the worldview that we live storied lives and that our world is a storied world (Etherington, 2004). It has been noted that story is the ‘portal’ through which individuals enter the world and make it personally meaningful (Smith & Sparkes,

2009). Narrative constructs and shapes reality rather than merely reflecting or mirroring it. The narrative is reality and not just a representation of it.

In narrative inquiry, the research question is often generated from experience rather than being theoretically informed. As Josselson (2006), has emphasized, the focus of narrative inquiry is on the meanings that people ascribe to their experiences in order to provide insight that befits 'the complexity of human lives'. This means that in a narrative inquiry the ethnographic details that can be seen or observed, for example in Kathmandu Valley, are not the whole story, what is central to the inquiry is a focus on the ways in which people (in this case the mathematics teachers of Kathmandu Valley) interpret their understanding and uses of questioning (Trahar, 2011).

In a narrative methodology, the borders between ontology and epistemology become unclear. This is because the reality is shaped by the way we perceive it, understand it, interpret it and act upon it and how we shape reality is through stories (Spector-Mersel, 2010). The narrative is an organizing principle which narrators actively use to construct and make meaning in their lives (McCormack, 2004). This is complex because, as a researcher, I must not only examine my own epistemology but also take into consideration the epistemology of the participants in the study.

Discussing the narrative epistemology, it was obvious that narrative is rooted in context. Stories do not fall from the sky, nor do they emerge from an interior self. They are composed and received in context. Stories are not lived but told by mathematics teachers. Since "life" or "teaching profession" in itself has beginnings, middles, or ends (Riessman, 2008). The concept of working within a three-dimensional narrative inquiry space is useful because using this set of terms for my inquiry is defined by this three-dimensional space: studies have chronological

dimensions and address sequential matters; they focus on the personal and the social in a balance appropriate to the inquiry; and they occur in specific places or sequences of places (Clandinin & Connelly, 2013, p. 50).

This research is based on the assumption that there is a characteristically narrative structure to mathematics teachers' lives, which is always making sense of stories of one type or another and that these stories are my own interpretations and shape reality. As construction, they are partial and incomplete. They are from the vantage points of the present. They are created within a relationship with participants in mind, and they are embedded in specific locations and social fields. So, as a researcher, already, I am thinking ahead to the next section and considering 'what is the story I wish to tell?' (Clough, 2002).

Ontology of my research starts with the different perspectives on understanding and use of the questioning in the mathematics classrooms. Questioning in mathematics classroom also differs from teacher to teacher. So, as a result of my participant's multiple realities are replicated by ground reality.

The epistemological assumption in this study is that truth is constructed through interactions with mathematics teachers. "When we narrate something, even in telling our own story, it is the voice of our culture its many voices, in fact, that is heard in what we say" (Crotty, 2008). There is no extracting the meaning of the experiences of teachers in mathematics instruction from the context (classroom setting). The voices of teachers were steeped in culture and context as the stories were constructed via narratives. The nature of knowledge through the lens of social constructionism is one of construction, not of discovery. "Rather than opening with a theory, inquirers produce or inductively develop a theory or pattern of meaning"

(Creswell, 2013, p. 25). I co-created stories throughout my discussions with my research participants.

Addition to the epistemology of my research, knowledge is constructed by the community of mathematics, which aims at explaining sensory experience through mental constructs. The mathematics community is independent of human minds, but knowledge is always a human and social construction (Creswell, 2013). Thus, my epistemology is towards subjectivism that examines all of our knowledge as "constructed". It is dependent on convention, human perception and social experience (classroom setting). In my research, there are various affecting factors for classroom questioning in mathematics namely variation of ability of students, knowledge and skill of teachers, availability of classroom resources and future career of students, etc. So, there are several factors that affect questioning in mathematics for teachers.

Research Paradigm

While starting my research agenda, I was in dilemma with the limitations of the usual ontological and epistemological aspects of research. I found interpretivism appropriate for replacing the domination of usual research that was restricting my thinking and writing in conducting and constructing a research (Luitel et al., 2012). Thus, the paradigm of interpretivism helped me as a researcher to understand and construct a new meaning of understanding and uses of questioning that mathematics teacher hold. I believe that such new meaning can be drawn interpreting and reflecting upon mathematics teachers' narratives, based on the context of my own and my contemporaries' thoughts. My purpose of the study was how mathematics teachers' understanding and use of questioning in mathematics classroom to generate a new contextual understanding rather than duplicating the previously established understandings as truth. For this, interpretivism allowed me to provide substantial

descriptive of the details that are imperative in contextual understanding (Bryman, 2012). As, Taylor, Settelmaier and Luitel (2009) claimed, interpretivism is concerned primarily with generating context-based understanding of people's thoughts, beliefs, values and associated social actions. As an interpretive researcher, I have attempted to seek how mathematics teachers understanding and uses of questioning through experiences of mathematics teachers in my research.

Research Design

In this study, I have taken the narratives of secondary mathematics teachers' stories on understanding and uses of questioning and have been using the questioning in mathematical instruction. In this study, mathematics teachers' voices have distinguished sound.

Understanding and usage of questioning by mathematics teachers: A narrative inquiry focuses on six mathematics teachers' voices. Each participant was secondary mathematics teachers of Nepal. As a narrative inquiry, it is based on the stance that through our stories we construct our identities and "ways of knowing". As narrative inquiry is one of the best ways to reflect upon experience, this methodology is well suited for insights about how particular experiences influence mathematics teaching practices (Clandinin & Connelly, 2013). Through the narrative inquiry process, first interviews with each participant were taken in a different phase. Secondly, I formed the stories and I completed the third phase for meaning-making.

Narrative Inquiry as Research Methodology

Narrative inquiry is the study of experiences of a phenomenon as told through stories. "Narrative inquiry is an approach to the study of human lives conceived as a way of honoring lived experiences as a source of important knowledge and understanding" (Clandinin, 2013, p. 17). So, narrative inquiry is to be fully separated

from the more generic term narrative or narrative study and is concerned with experience and is grounded in Dewey's concept of educational experience (Clandinin, 2013). Narrative inquiry exhorts "experience as a storied phenomenon" (Clandinin, Murphy, Huber & Orr, 2009, p. 82). Thus, narrative inquiry can be described by its two component parts: The first is narrative: meaning the story being told (Riessman, 2008); and second is inquiry: representing a systematic examination or analysis using narrative as a research methodology means to study the ways humans experience the world and how they make meaning out of their experience.

Ontologically speaking, narrative inquiry is "continually working with and from, a transactional or relational" space (Clandinin, 2013, p. 16). The underlying assumption in the narrative inquiry approach is not one in which stories are simply documented faithfully. The inherent relational centrality of narrative inquiry is that the researcher is committed to the process of storing and restoring with the participants. This space of co-creation between the participants and the researcher allows for a complex co-creation of a story situated in time, space and culture. However, in practice, a working understanding of the interactions it describes is more complex. "Firstly, narrative research is alarmed with using individual life stories as the main source of data. Secondly, it is worried about using narratives of the 'self' as a position from which the researcher can produce social critique and advocacy"(Riessman, 2008, p. 12). It is a methodology through which researchers comprehend others' representations of the world around them from the stories those interviewed chose to share (Gomez, 1997). A narrative inquiry is not only an examines of a story told, but how the story is captured and analyzed. In a narrative "attention shifts to [recalled] detail" (Riessman, 2008, p. 12).

In this study, the narrative inquiry was used to capture teachers' experiences of questioning in mathematics through interviews (Creswell, 2007) and to develop personal stories of teachers' understanding and uses of questioning in mathematics during teaching mathematics in their classroom. Interviewing, recording and analyzing teachers' reflection concerning their questioning experiences in secondary school math provides insight. The experience-centered approach, a focus taken on retelling experiences as student and teacher that is recalled as highly motivational, is used in this study to support teachers' experiences as personal "truths". There is no 'cookie cutter' or singular right way, to conduct a narrative inquiry study. Narrative inquiry is developed on a spectrum. At one end of this spectrum "is the 'pure' narrative, a story told without explicit references to theories or research findings; the other end becomes the 'pure' academic essay," with references to theory but remains without the narrative themselves (Goodall, 2008, p. 61).

Context of Research Site and Participants Selection

This research study was carried out to describe, analyze and interpret the culture of a questioning in mathematics classroom from various perspectives of mathematics teachers of Kathmandu Valley. For this purpose of the study, I used a criterion-based selection strategy to choose my participants to be involved in the research (Roulston, 2010). Criteria based selection has used as a means of ensuring that the best participants is selected on the basis of their ability of knowledge on understanding and uses of questioning. In my study, it was important that each of the participants must have stories to tell of the phenomenon under study (Creswell, 2013).

To recruit a teacher for the study, I personally talked twenty secondary mathematics teachers' having at least five years of mathematics teaching experience (e.g., twelve from private and eight from public schools) over the telephone and

shared about the study. I briefly described the study and announced that participants must be able to allocate time for an initial interview, follow-up interview and telephone inquiry for further meaning-making. After six days, six teachers four from private and two from public schools were ready to be my research participants. Then, I contacted those six mathematics teachers to set up our first conversational interview. In contrast, qualitative research inquiry that uses narrative inquiry is likely to have one or two participants (Clandinin, 2013; Creswell, 2014). Taking into consideration, the timeframe, in which I had to carry out the conversations and later develop the narrative stories. I decided to invite those six mathematics teachers to participate in my research study.

Nature and Source of Narrative

With the help of narrative stories, I have found out a variety of unusual forms of talk that represent the mathematics teachers' perceptions, understanding and experiences of understanding and uses of questioning in the mathematics classroom.

Hence, the narrative is a term widely used in social theory and social research to portray either: (a) a tale or story, or (b) a form of talk or writing that aims at telling a story which is ordered in one standard format. However, the narrative story was generated from mathematics teachers' interviews. I have generated a narrative story from classroom practices of the mathematics teachers' experience as a student and teacher, with some of their evidence and experiences.

Narrative Generation

The six mathematics teachers (e.g., research participants) were interviewed in a series of six one-to-one interviews. For ease of access to teachers, each teacher was interviewed during the school day at a time considered appropriate by the administrative staff, i.e. in lunch time, teacher's free time (e.g., study room). Each

teacher was asked for their convenient time for the meet. I was very flexible when it came to scheduling interview times around each teacher's school schedule.

All interviews were conducted in a quiet environment which was free from distraction and peer or staff influence. Interviews were conducted in the school (e.g., the place was flexible, depending on room availability) to ensure the teacher's comfort and convenience.

Each teacher was interviewed minimum two times and maximum three times. The first interview helped me get to know the teacher and the second helped me to know their questioning experiences in their mathematics classroom and the third helped me to know more about their questioning skills (e.g., third was on the need base). Each interview was intended to last about 60 minutes, but their length varied according to the amount of information and elaboration each teacher desired to share their experiences from first interview, second interview and third interview.

All six interviews were conducted over the course of one and half month. One interview was conducted with each teacher per week, with time in between for narrating the story and reflections and to ensure the validity of transcribed data from all the six interviews, audio-recordings were made and transcribed (Creswell, 2007). To assist with validity teachers were given a summary of the interview transcriptions at the beginning of the next consecutive interview. Starting at the second interview the summary pages were shown to each participant. The first interview's summary page was shown to the teacher prior to their second interview, the second interview's summary page shown before the third interview (where the third interview was on needed base), and the third interview summary page was shown during the closure meeting. The closure meeting was not an interview. Instead, this meeting lasted only a few minutes and its purpose was to allow teachers to verify the third interview

summary and for me to thank them for their participation in the study. The interview summary time was allocated to allow teachers to be able to change, cross out, or add to the summary if they felt it was incorrectly summarized.

Narrative Handling

Narrating Process

After each interview, the recording was transcribed in a quiet location at my home within the same day, following the interview. I transcribed the audio-recordings myself to ensure the accuracy of the responses and the confidentiality of each response of the teachers. Each interview was transcribed accurately. To keep teacher's voice intact I transcribed the interviews laying the focus on the speaker (Riessman, 2008).

In transcriptions of the interview sessions, two columns were made for dialogue as text. The left column of the transcription interviews were the questions I asked while interviewing each teacher (see themes in appendix I). The right side was each teacher's response to each question. Spacing was used to assist with the natural flow of reading the dialogue. The only items removed from the transcriptions were individual identifiers and expressed pauses (i.e., um, like, uh, or stuttered/repeated words).

For confidentiality, I audio-recorded teacher interviews, teachers' names, their institutions and address are pseudo names. So, to assure confidentiality, any names mentioned were changed to provide all parties' confidentiality. After transcription, the recordings were destroyed and teachers were referred to by pseudonyms.

The transcriptions were reread after a few days to assist with a more individualized interview for each teacher's second and then again for third interviews.

Additional question prompts were personalized for teacher's second and third interviews where possible with the opportunity to amend, clarify, or add to anything mentioned the last session. Each summary then provided a starting point and foundation for the next sequential interview discussions.

Meaning Making of Narrative

Meaning making have started with the data collection tools I have designed. The data collected through interviews with mathematics teachers is later narrated in the story form. So, the narrative is a tool for transferring knowledge. It helps us to understand and to communicate new ideas (Riessman, 2008, p. 8). Because teacher interviews were allowed to flow naturally into storytelling, based on what each teacher felt, like sharing their experience in understanding and uses of questioning in the mathematics classrooms, each interview had its unique components. Themes were created through multiple readings (Josselson & Lieblich, 2003) of the full transcriptions of each interview session making an expert uses of an experience-centered approach (Squire, 2008). I used three guidelines from Squire (2008) for the experience-centered narrative analysis. First, I created themes from within each interview, supported by a thematic approach (Riessman, 2008). Then, I gave analytical explanations. Finally, I used top-down and bottom-up data interpretations.

Entry and Re-entry

In my inquiry, to represent the narrative stories (i.e., questioning experiences) of six research participants and myself as co-constructed stories of understanding and uses of questioning in the mathematics classroom. I have used the ideas of "entry and exit" to present the narratives of mathematics teachers. Additionally, I have analyzed each story and interpreted the narratives relating it to different theoretical perspectives and practices for meaning-making for that I used the ideas of "re-entry and exit" for

the meaning-making of the narratives (Mitchell, 2011). Thereby, I analyzed the narrative data using this combination of experience-centered along with thematic approach. I conducted a further interpretive review for searching the various perspective of teacher questioning (e.g., see in chapter V). Teachers' stories are presented in general themes and individual teachers' views in questioning. Teachers' values, personalities and personal interests are seen within the data collected. Six interviews of mathematics teachers became the first set of themes or 'nodes' createdRiessman, 2008). As I read the narrative story, I looked for possible meanings behind what each teacher was sharing. After the themes were listed as nodes, I was able to find portions of interviews relevant to each teacher's narrative and tag or attach them to the themes addressed.

Quality Standards

The essential issue for qualitative researchers is that of trustworthiness. As a qualitative researcher, I am concerned with the lived realities of mathematics teachers' experiences on understanding and uses of questioning in the mathematics classroom and how their lived realities relate to my lived reality as a teacher and scholar. From the narrative angle, trustworthiness marked itself through deep accounts that are judged by the reader to be authentic (Geertz, 1983; Mishler, 1990). Eventually, the reader will "find out the trustworthiness of this research undertaking" (Craig, 2013). My concern as a qualitative researcher is how teachers understand and use of questioning through "rich, thick descriptions," teachers will be able to live into the stories in ways that resonate and translate into the classrooms with the teachers' contexts (Creswell, 2013, p. 252). As, Denzin (1989) proposed that when the rich, thick descriptions align with the stated perspective of the researcher, the study is trustworthy. Thus, it is clearly seen, in my research, I have to bear a burden and

responsibility to carry out this study to maintain quality standard. Thus, to uphold the rigorousness in my study, it is one of the threats to maintain quality standards. In addition, qualitative nature of the study does not follow the same rules for design as experimental or quasi-experimental studies.

Thus, trustworthiness is a way for qualitative researchers to control potential sources of bias in a study's design, implementation, analysis and interpretation that parallels the notions of internal validity, external validity, reliability and objectivity from more conventional, scientific studies (Lincoln & Guba, 1986). The four criteria were considered in the design and implementation of this study. As Webster and Mertova (2007), discussed in their book "Using Narrative Inquiry as a Research Method" have used quality standards namely access, honesty, verisimilitude and authenticity, familiarity and transferability, which is useful in my inquiry too, were explained as follows:

Access

In my research "access" is viewed in two ways (Webster & Mertova, 2007). First, there is access to the research participants, their understanding and uses of questioning and the process of construction of knowledge between me and my research study.

The second means of "access" in my research is the availability and the representation to the same audience of the research notes, transcripts and data on which the researcher has based the finding. Further, access to the context, process, data and construction of knowledge shared with research participants.

Honesty, Verisimilitude and Authenticity

Guba and Lincoln (2007), in their exploration of the human as a research 'instrument' in what they call a naturalistic inquiry, highlight the following

characteristics that support a claim of trustworthiness of narrative research, namely responsiveness, adaptability, holistic emphasis, knowledge base expansion, procedural immediacy and opportunities for clarification, summarization and opportunity to explore atypical responses (Webster & Mertova, 2007).

Trustworthiness is shown through the steps put in place to allow for the most accurate interview, data collection and interpretation. First, to help obtain more reliable interview responses, I asked questions that were of teachers' comfort level. During interview sessions, relationships and trust were established through the creation of a natural environment and reciprocity or mutual exchange of conversational dialogue. Teacher's dialect and interactions were reviewed after interviews to help address legitimacy concerns. Additionally, Eder and Fingerson (2002) suggest that analyzing the discourse styles of teachers' interview can help assist with rapport and validity concerns "If dialect codes and styles of talking that respondents use during the interview are those they use with people they know well and with whom they are comfortable with, the researcher can be assured that a high level of validity has been achieved" (p. 194).

I used three aspects of verisimilitude of the narrative research. Firstly, my research and reporting of the stories and their critical events resonate with my experience. Secondly, the reporting appears to have a level of plausibility. And thirdly, when using a critical events approach, the truthfulness of accounts and reporting results was confirmed through like and other events.

Another concept that I used for evaluating narratives is authenticity. It is intertwined with the concept of verisimilitude. Thus, authenticity can perhaps be most powerfully achieved when I provide enough information in order to convince the

reader that the story is told in a serious and honest way. The sense of authenticity of a story may be, for instance, achieved through sufficient narrative coherence.

Familiarity

Amsterdam and Bruner (2000), refer to familiarity as ‘dulling’ in that when my ways of conceiving of things become routine, mathematics teachers may disappear from consciousness and cease to know that I am thinking in a certain way or why I am doing so. Mathematics teachers point out the importance of interpersonal distancing to make the familiar strange again, to rescue the taken-for-granted and bring it back into mind. In my research familiarity was used as suggested by Bruner (2002), there to be a story, something unforeseen must happen. The story is enormously sensitive to whatever challenges our conception. It is an instrument not so much for solving problems. In that respect it can be argued that critical events themselves capture that ‘unforeseen’, and this in itself has the capacity to provide a perspective that practice, in that it enables to look at particular professional practices, not of thinking, ‘a way of life’ (Amsterdam & Bruner, 2000).

Transferability

A narrative “gives us an avenue into human consciousness and thus may be a powerful tool in tapping into the complexities of human-centeredness in a wide range of environments where learning takes place” (Webster & Mertova, 2007, p. 16). All research participants in this study do have their own sense of self and experience, but it is through analysis of their stories that others may start to understand and uses of questioning in the mathematics classrooms, further teacher’s shared experiences and the collective themes of importance they create.

So, transferability represents the applicability of a study’s exploration to other situations and policy makers. In particular, researchers are concerned with the extent

to which the “results of the work at hand can be applied to a wider area such as for question paper design, policy, etc.” (Shenton, 2004). My study describes results for a small number of participants that are specific to those individuals and environmental contexts. Lincoln and Guba (1986) suggest that it is the researcher’s responsibility to provide “sufficient contextual information about the fieldwork sites” to let the reader determine the transferability.

An approach recommended by Shenton (2004), to help to ensure transferability is a substantial explanation of the phenomenon being studied and also helps to develop the framework. So readers can judge whether or not to apply all or part of the findings to other contexts in narrative research. I have used this strategy in this study.

I utilized member checking to help authenticate stories in the form of interview summaries. In these summaries, I used the same terms that each mathematics teachers used in their interviews and copied as many statements expressed as possible into very concise sentences. I chose a summary method to make it more likely for teachers to read all that was written and to help with possible interview time restraints. Prior to teachers’ reading each summary, as well as after they finished the summary, I reminded them that they could change or add to anything. No teachers opted to change their interview summaries. This check made through the use of the interview summaries helped to construct a truth, capturing the meanings and experiences shared their stories; to represent their reality as accurately as possible (Goodall, 2008).

Ethical Consideration

In conducting, narrative inquiry research, there are also certain ethical concerns that are being raised every now and then. In this regards, Johnson and

Christensen (2008, p. 101) suggest that ethics are “principles and guidelines that help us uphold the things we value”. For me, ethics is an important consideration. I received a permission letter from the Kathmandu University, School of Education to enter the schools for conducting interviews with mathematics teachers. As I believe that worth of exploration depends as much on its ethical honesty as on the originality of its discoveries (Walliman, 2011).

I, with the approval from participants, take pride in stating that their participation is voluntary and statements are kept confidential and that the information is only for research uses. Therefore, I do not mention my participant’s names, their school names, and addresses in order to preserve their privacy; likewise, the objectives of the study are also stated in the interview. I followed those instructions in compliance with an ethical clearance at the schools.

Key Message of the Chapter

In this chapter, I have discussed the philosophical consideration, research paradigm, research design, context of research site and participant selection, nature and source of data, narrative generation, narrative handling, meaning making of the narratives, quality standards, ethical consideration and the key message of the chapter through the lens of narrative inquiry.

In the next chapter, I represented the narrative stories of my six research participants and myself as co-constructed stories of understanding and uses of questioning in the mathematics classroom.

CHAPTER IV

ENTRY WITH NARRATIVE

In this chapter, I present six mathematics teachers' narratives with a view to offering insight into their understanding and uses of questionings experiences in their professional careers in the mathematics classroom. Thereby, each of the six participants shared their questioning experiences in the classroom assuming the role of student, teacher and teacher trainer. The text consists of interviews, written responses to reflective questions and several rounds of follow-up interviews and telephone conversations for accuracy purpose. Thus, the stories are the product of several rounds of interviews and telephone conversations. Finally, the names and institution and address given to the six teachers are pseudonyms to preserve their identities.

Entry with Rebina's Story

On the way to Aksharaa School, I began my reflection on my preparations for an interview. I was thinking about the reading, planning and the discussions with my research supervisor, and I questioned myself of how I could still feel too little and how all my careful preparations could seem so isolated and unrelated. When I entered the premises of Aksharaa School, I was greeted by the students and my colleague, and then I accumulated myself and started greeting them back. As soon as I shifted my focus, everything else moved away and my concentration was focused on my immediate environment: with teachers talking to me and my own reactions. I realized that I was already inside the school and I was not supposed to give my entire concentration to all that is going on around me.

There is much to be done in the initial days. As I had good connections with all staff of the institutions and I had discussed my plans and expectations with principal and coordinator and everything was generally settled. I noticed some changes occurred in years, new faces in schools around the year, a new building under construction, new playground, students playing cricket, football and basketball. I was happy to notice that the dialect is familiar to me. I hope that I can use these factors to my advantage, in my research, especially when preparing the journal and listening to teacher's stories.

Rebina's Story

It is around 9:30 am to 4:00 pm in the second week of Chaitra[1](i.e., March-April), when the annual examination of the year 2017 AD is ongoing in Aksharaa School. I along with Miss Rebina, after having snacks at around 2 pm on the particular day of the interview, sit in the research room, so that we will not get disturbed by any means. Earlier in the day, I had requested Rebina for the interview. I had already explained her about what I have been doing over the weeks and why I was there so soon. She had agreed to share her story with me.

As, I share my expectation for my research her. Though she would have many stories about her understanding and uses of questioning in mathematics in the classroom, I had never heard of them. I requested her to tell me about them, first, as a student and then as a mathematics teacher in Kathmandu Valley. The interview is being audio-recorded in my own mobile and I make myself busy taking notes in my diary. She spoke gently and thoughtfully. There is no sense of hesitation in her while sharing her story because it has already been a year that we have been working together in an institution where I'm community facilitator of mathematics. I am

[1] Last month of the year in Nepalese calendar

totally absorbed in listening to her narrative as it gains momentum and her narrative takes the following shape…

She completed her SLC level from Kanya Ma. Vi., 10 +2 from CCI (Classic College International), and Bachelor in Microbiology from Amrit ScienceCampus. Now, she has been studying Master Degree in Sociology in Tri-Chandra campus. She has started her teaching career from Pragati School where she worked as a mathematics and computer teacher from grade 5 to 8. Recently, she has been teaching mathematics at the secondary level (i.e., grade IX, X) in Aksharaa school.

She started her schooling at the age of five. She was a favorite student of her teacher because of her eagerness in learning mathematics. There was no specific subject for her in her school because she was talented and was able to secure good marks in all the subjects. As she believed that school alone was not only enough for the excellent performance, she continued her dedication and practice to strengthen herself in mathematics. Her teachers' continuous encouragement and habit of questioning on the confusing topic made her more accurate. According to her, "The questions asked were, more related to recall questions from algebra, understanding questions from arithmetic, organizing existing knowledge from geometry to experience in order to create new understanding and meaning". She never needed tuition classes in her school life because of her independent and hardworking habits, along with the expert support of her teachers which played a positive role even in absence of the internet.

At that time mathematics was taken as a hard subject but she never realized it because she was interested in mathematics. In the secondary level, her mathematics teacher was also her class teacher who used to ask algorithmic mathematical questions from practice books, question bank and in addition to from the textbook.

According to her, "In the fraction, Rebina's teacher used to ask algorithmic mathematical questions like 'find a fraction that is less than $\frac{4}{5}$ *but greater than* $\frac{3}{5}$*, what the missing fraction might be?* $\frac{\cdots}{\cdots} < \frac{4}{5}$ *etc". Thereby, her mathematics teacher used to ask questions as follows: does anyone have the same answer but a different way to explain it? Would you ask the rest of the class that question? Do you understand what they are saying?, Can you convince the rest of other that makes sense of your solution? Can you give me an example of ……?. There was no support class in her school. So, she used to discuss and practice among her friends and also that she used to support her classmates and juniors.*

Her father was the first positive catalyst for her foundation in mathematics because he used to question her all the time. She said it is hard for her to remember all those questions now, but then tries to recall some that were asked during her home assignments: how does this relate to your topic? What ideas that you have learned before were useful in solving this problem? Have you ever solved a problem like this one before? And what is similarity and difference about your method of solution and how would I support you now?, etc. which helped her develop her foundation better in mathematics. She was also inspired by her teachers in school. She said, "My first lesson of mental mathematics began from my home". In addition to this, mathematics was the main subject that helped her secure good marks and upgrades her total percentage so she always tried her best. Her school provided her with an opportunity to teach her juniors after her SLC (Schooling Leaving Certificate) as a respect to her talent and teaching quality, which later on proved to be a strong foundation of her teaching career. Because of her inexperience during that period of time, she could not remember algorithmic mathematical questions properly but could recall some as she

said, while she was teaching shapes in her mathematics class, she asked the questions like: Does a square not always have four sides?, Is the product of 2 x 3 not equal to 6?". Further, she said these questions really do not require an answer. Her intention was to engage students in the discussion where she asks why? How do you know it? Can you explain it? And can you give an example?

During her school days, she was often asked hard and tricky questions by her mathematics teacher and was provided time to think and solve it in the classroom itself because she was considered to be the only talented one. The questions from algebra were like 'if $a^b = c, b^c = a, c^a = b$ *prove that abc = 1'.Although she could not relate all the questions her teacher asked, some of them that she remembered are 1) Did you understand the today's topic? 2) How many of you still did not understand it, I'm here to support you? 3) Do you need further help on this topic? Is there another way to solve this problem? Is there any easier way to solve this problem?, etc.*

She said, "Our teacher used to ask algorithmic mathematical problems of grade 10 when I was still in grade 9". She hardly remembers the questions her teacher used to ask them, but some that she could recall are: Is that true for all algorithmic mathematical problems? Could you explain it? Can you think of a counterexample?, How could you prove that?, and What assumptions are you making?. Then she realizes that her teacher did it all to upgrade her mathematical knowledge. During her school days, as there was no practice of printing or photocopy, the algorithmic mathematical problems that were out of the textbooks were written in blackboard and assigned for practice.

Her teacher had categorized the class into three levels according to the performance level of the students: the upper level, average level, and lower level so that the questions could be asked accordingly. Obviously! she was asked hard

algorithmic mathematical questions: more of subjective and word problems and other oral and discussion questions because she was one of the talented students in the class. She realizes now, her mathematics teacher wanted 100% marks from those who secured 90% and more. She said, "We have studied mathematics, sir, but not by using real material and connecting to real life, as is done nowadays". We only used to study mathematics to secure good marks in the examination. Our teachers used to focus on the specific topics from the curriculum which was more important from the examination point of view with regard to algorithmic mathematical problems.

Finally, according to her, the University education was not very different from that of her school. But in university education, she was free to ask the questions and hardly get the reply from course facilitators. She hardly remembered the questioning by course facilitators.

She has started her teaching career around six years back. She enjoyed solving algorithmic mathematical problems so she has chosen mathematics for her teaching profession. She said, "To teach mathematics is not only to teach someone but is also an opportunity to gain innovative knowledge". She is trying to teach her students by making uses of local available real materials and connecting them all with real life. She added, "My teaching practice is evaluated on the basis of how much students can link it to their real life". I take it to be my proud moment when I see them connecting their learning skills to their real life". We have to base our teaching on the curriculum set by the government of Nepal. So, I prefer teaching my students from the examination point of view. Further, she said, "I teach mathematics by connecting it to real life along with molding it with examination point of view". She makes her mathematics class active by posing some questions in between like, 'Do you see a pattern? Explain it in your words now? What are some possibilities

here? Can you predict the next one? What about the last one? How did you think about the problem? What decision do you think he/she should make?' etc. In addition to checking students' answer sheets, she asks one of her students to solve the given algorithmic mathematical problems on the whiteboard and as she is familiar with peer checking. She asks her students to check their peer's copy, too. She shows her students about the marking scheme of each step in mathematics solution on the whiteboard as an award to the student's good work and participation. In her experience, this method of the teaching-learning process helps to fulfill her objective but the allocated time is insufficient most of the time. She enjoys when her students ask questions in between the classes. She said, "Her students used to ask the questions like 1) What is the main process of this algorithmic problem ma'am? 2) Where is this topic/formula connected to real life ma'am? 3) Is there another process of solving this question, ma'am?" Further, she never expects the answer based questions of the algorithm from her students in her class.

At the beginning of her class, she asks relational questions to her students like "How are you all?". If someone was unwell in her class, she used to give more attention to him/her and kept inquiring all the students if they have any confusion regarding the previous class. She helps her students if they came up with any kind of confused topic in her leisure time. Only after she was convinced that there were no problems left, she went forward with another topic. For instance, if she was to start the topic "Fraction", she asks the following questions as warm up and allowed them some time to think. 1) Can you tell me about the topic? 2) How many of you have heard about this topic? If you have, please share your views. 3) Have you studied about this topic in your previous grade?, etc. She did this all to access their prior knowledge and in-depth understanding. Further, she shared her experience on the

topic "profit and loss" where she asked questions like: 1) Have you heard about profit and loss? 2) In which price does profit take place? 3) Can you give some example, please? After the students respond, she starts to teach "profit and loss" connecting their answers to the previous discussion. In between the class time, to check their concentration, she requests one of the students to complete the remaining solution in the whiteboard. For further confirmation, she often posed the questions like, 'How many of you have understood that? Did everybody see that? Do you want me to repeat again? Do you have any questions regarding the process? What do you do?' The questions were often connected with their name and their daily life. She said, "Sir, I used to ask 'yes/no', 'how' and 'why' types of questions and I used to focus on 'why type' of questions a lot".

At the end of the class, she asked the following questions: 1) Do you have any queries or confusion regarding this process? Please ask about profit and loss to your parents. She expects at least two examples from each of them.

She has been researching about the types of questioning skills in mathematics, that would both increase teacher's satisfaction and the student's standard level. From her experience, there should be different levels of questions for different levels of students. She said, "Talented and active students can solve any types of questions but there should be an appropriate level of questions for the students who are weak and somewhat uninterested in mathematics". Finally, she added that mathematics should not be difficult and terrifying subject for less talented students.

Entry with Sudha's Story

Sudha's Story

I was warmly welcomed into Balkumari Secondary School for an interview with Sudha ma'am. She is the HOD of the Department of Mathematics. She seems

pleased to see me. I was not new to her at all because we often meet in various seminars and conferences. Once the introductions have been taken care of, I explain my background and purpose of the research. After we get started with the discussion, she indicates that I can start to record the interview and she begins formally with her introduction and continues in a rehearsed way. Her interview is recounted as follows:

She has been engaged in the teaching profession for more than ten years. She has completed her Bachelor degree in commerce, also B.Ed. in mathematics education from Lalitpur Campus. Now, she is continuing with her master's degree in mathematics education at Tribhuvan University. She used to teach any subjects assigned in school but mathematics has always been her favorite one. So, she has selected mathematics as her major subject in her Master Degree.

According to her, she has divided her school level education into the primary and secondary level. She found all the subjects quite easy during her primary level and algorithmic mathematical problems were solved easily. She said, "But sir, the chapter 'Volume', while I was in class five, was a bit challenging to me". The question asked by the teacher in mathematics classroom was to calculate the volume of water pipe whose length is 20cm and radius is 14cm. The teacher helped with her problems and also kept inquiring if she understood it. Thereafter her teacher assigned the questions of same patterns as homework but, to her dismay, she couldn't solve the problems at home. Then, she realized that though she understood the process in the mathematics classrooms, even when she tried to solve the same problem at home, she failed. So, her mind was totally occupied by that unsolved problem. It took her whole month to understand and solve the algorithmic mathematical problems.

She was very good at arithmetic but not at algebra because algebra was not included in mathematics curriculum (in their school) until grade 6. She was studying

in "Amar Sisu" school and her friends in Gyanodaya school, where algebra was taught from grade 4. When she saw her friends practicing algebra, her curiosity made her go to her friends but her friends couldn't support her. Her parents had changed her school from grade 6 where algebra was also included but her mathematics teachers of new school used to teach grade 6's algebra in grade 5's and accordingly. She said, "Imagine sir, what happened to me at that time when I was at zero level in algebra?" Without any basic knowledge and foundation, she had to go ahead with her friends. So, she was almost in tension and anxiety. She said "When in bed, I fell asleep thinking all about Algebra, I even dreamed of some questions regarding it, then made a note of it the following morning. Later when I opened the mathematics book, there seemed to be similar types of questions. I looked up the watch, it was 4 am in the morning and I started solving those questions till 6 am". This practice became the foundation of algebra that boosted her level of confidence and she never worried about algebra.

Her mathematics teacher in secondary level was always punctual and started the class with relational questions like, "Have you completed your homework? Do you have any confusion regarding the previous class? Can you solve the question on board?" Those who could not complete their homework or had any confusion in the algorithmic mathematical problems, the teacher made a point to help them individually. The teacher also used to repeatedly inquire them to confirm their progress and understanding in mathematics. For that, her teacher used to ask questions like, "Why did you choose this problem-solving method? Can you find a more effective strategy? Do you think this would work with another number? And what do you notice when you have completed assignment? For example, in the topic fraction, her teacher used to ask the algorithmic mathematical questions like "If two

fractions have the same numerator, which fraction is smaller? How do you know? If two fractions have the same denominator, which fraction is larger? How do you know; what happens to the value of a fraction if the numerator is increased by 1, but the denominator stays the same? ,etc. She could relate some of those algorithmic mathematical questions to their textbook and some from practice book. He used to ask exam oriented algorithmic mathematical questions and assign those types of questions for homework as well. She used to practice them a lot without knowing any significance of them.

During her university-level education, the professor rarely asked any questions. Sometimes her professor asked questions like find out the facts about the topic, what is the latest research on the topic? Have you thought about all the possibilities?, etc.

She has started her teaching for more than 10 years before. During her childhood, she used to act as a teacher to her juniors as a role player. In absence of her juniors, she used to treat bags, pillows, books, tables, etc. as her juniors and used to check her senior's copy, given them tick mark and remarked as 'good' and 'very good' and sign just below the tick mark in absence of seniors; and she used to ask questions like; did you understand? Did you copy the homework? ,etc.

After completing bachelor degree, one of her friends asked her for home tuition, she agreed, but at the same time she saw three vacancies in the newspaper and she applied for it all. Each school she applied for, offered her the job but she joined Balkumari Secondary school and is continuing her teaching career, in the capacity of HOD, till date.

She recalls the very first day of her mathematics class which was so noisy and massive. When she started teaching each step of the problem/s with genuine logic, the

class became calm and quiet within a week. The class was active and they seemed to be overjoyed when she started to connect the mathematics class with their daily life. During the early phases of the class, she asked questions like: 1) How are you? 2) Can you remember something about yesterday's class? 3) Have you solved the given question? 4) Is there any confusion about yesterday's class? As far as possible, she used to connect mathematical concepts with real life. She said, for example, when she has to teach the topic of patterns. She used different materials like potatoes, garlic, tomatoes, etc. When she keeps them in a pattern such as at first potatoes, in second garlic and at last tomato, after making two patterns, she used to ask the students what should be kept after potatoes. After completing and sharing examples, she used to define the word 'patterns' relating with their answers. One day when she was sharing the example of patterns, a child said that his mom smiles sometimes and cries sometimes and again smiles. Is this also a patterns ma'am? To this, she answers 'yes, this could be a type of pattern'. Sometimes the class becomes boring, at that situation, she often asks, "Can you sing a song for me? Does anyone want to share a joke?"She uses imagination and meditation technique for the class such as "please close your eyes, imagine that we are not in classroom…, we are on swimming pool, we see clean water there and start to swim. After swimming for 15 minutes, we take ice-cream and sing a children song by the time we have returned to school. Now you are on the school ground. Then, I say please open your eyes. After this imagination meditation technique, all the students seem to become active and I can continue with my class".

She likes her students asking questions. Her students used to ask "how and why" types of questions. She used to ask the following questions in between the mathematics class: 1) Do you see everything clearly? Do you know how to derive the formula? Can you give some examples? Are you feeling sleepy? She also said that she

had to be careful if her students were not asking any questions. If they have not asked any questions in between, she realizes that this teaching technique is not working for her students or they are not interested in the topic.

In her thought, the uses of real materials are more effective than the pencil, paper, and blocks, to arouse the students' interest, as it is a must because without interest any teaching strategy won't work perfectly. She used to ask the questions about the topic relating to the previous knowledge. She said, "When I have to teach the lesson "Time," I used to ask what time is it now? What time did you reach home yesterday? What time did you get up today?" If I have to teach the lesson "Shape", I used to ask, have you seen gas cylinder? Have you eaten ice-cream? Which shape of ice-cream did you eat? Is there anything of triangle shape in your home?" She mentioned that if her students could come up with the proper answers to her questions, she was somewhat successful; otherwise, she would have to modify her strategies in teaching and learning in mathematics class.

She recalls, "One day, I had to teach the topic 'Fraction' so I have prepared bread and brought them in the class. After chopping it in equal two parts and I asked, holding one part in my hand, what is the piece of chopped part (of whole bread)? I chopped the half-breed in two equal parts again and asked what is chopped part of the whole bread? Now, before starting it all, I had asked the students, how many pieces would be there if I chopped all of these pieces again? Some of them told sixteen and others told 12. But before I have chopped all the bread they had already told the correct answers. Hence, I related it to the topic, that class became memorable for both of us, the students and me". She said that all the students understood the topic 'Fraction'.

She narrates her teaching days like this: One day, she had established the 'Model market' and had asked students to buy some materials making uses of real money and asked the same question in an examination, their language was not so much good but all the students identified the note (piece of paper money). She also said teaching is more effective if she can relate the topic to the students' favorite cartoon, film, song, etc. Her questions varied according to the level of her students, she posed simple questions for average ones, hard and tricky questions for talented students and some easy questions for less talented students. She was satisfied with the three-quarter part from her questioning patterns but she couldn't find that remaining part, could be, because of her fault or that of her students, she had no idea at all.

Her keen observation led her to realize that roughly three-quarters of the students cannot understand more word problems, thereby leading to only one-fourth of students to understand and solve them. But she strongly opines that students should be able to solve any types of questions in any situation. In the examination, she used to ask direct questions and words problems in equal proportion. Now, she is thinking about how to help them in a more effective way to strengthen the students' understanding in mathematics.

Exit from Rebina's and Sudha's Story

We leave after an agreement to meet again for yet another interview, but Rebina's and Sudha's story stays with me over the coming days. I could hear their voices; see expressions and understanding and uses of questioning in their classroom. I begin to realize the opportunity but also the expectations and responsibilities that come along with being a listener - a 'receiver of stories'. I wonder about the stories I am collecting and the thoughts in my mind that seem to be as scattered. I know that patterns and connections will emerge from the data, but it is too early to look for

them. Now at this early stage, I am comfortable to admire the wonder and contemplate the breadth and depth of what I am researching.

That evening, I met with my supervisor to reflect my firsts and second interviews and how to start to write the narrative story. Thereby, I entertain some of the mistakes I made and the questions I asked. As I reflect on Rebina's and Sudha's story I realize that I have still so much to learn about the questioning in the classroom and that there is much that mathematics teacher can teach me. I do not feel, I have done that much in the last few days. Now I am exhausted and ready to sleep.

Entry with Lal Bahadur's Story

Lal Bahadur's Story

Before the sun rises up in the sky, I walk up and head to Lal Bahadur's home at Jadibuti for an interview which we had fixed on a particular day. I had often consulted Lal Bahadur for an interview. That very day, he was there and was happy to welcome me in his home. He served me milk tea and we sat on the top floor. He speaks consciously and seriously because he has been working as a mathematics teacher for a decade but oftentimes, in between our conversation, he breaks into a smile or laughter. After getting into the discussion, he indicates that I could start to record the interview and begins formally with his introduction. I have narrated his interview as follows:

He has completed Bachelor degree in mathematics from Tribhuvan University and has been studying Master degree in the same University. He has been engaged in the teaching profession for 10 years.

Lal was interested in learning mathematics from his childhood. He was curious and active student in his school. He always enjoys reading and practicing mathematics. In his childhood, his father used to bring bananas and would ask him to

serve it to all the family members one by one, and would ask him to tell the numbers of the bananas he distributed? How many members are there in our family? Sometimes his father used to send him to buy sugar, biscuit, razor, etc. and asked him to tell the price of each of them. These daily asked questions were the foundation of his mathematics.

While in grade three, his mathematics teacher would start the class with questions like, "Have you completed your homework? Are there confusing questions? Can you solve yesterday's algorithmic mathematical problems?, etc. He would give the whole exercise as homework. His teacher used to praise those students who could solve the questions even if they were wrong but his teacher would punish those students who had not even tried. As a punishment, the student who had not done the homework was slapped by the one who had done it; and Lal Bahadur was one who usually completed the homework.

At that time, mathematics was considered to be a tough subject; his teacher would ask, "Have you solved the mathematical problems, even in the tiffin time? In mathematics class, his teacher used to ask, "Have you tried to solve the algorithmic mathematical problems"? If yes, he should submit the copy to his mathematics teacher. Sometimes, some of his friends used to lie that they have forgotten the copy. Then, his teacher used to ask to submit the copy in next day. The next day, they were punished because that was not the truth and also they had no new copy to solve the algorithmic mathematical questions.

In grade five, his mathematics teacher used to ask, "If one angle is 45^0 of supplementary angle what will be another angle?" While teaching "Set" in grade six his teacher used to make uses of placards of A, B, etc and ask questions like, "What does it indicate? What is the meaning of AB? How can you explain AB? Similarly, in

grade eight he had read about "simple interest". After returning from his school, he had been to his uncle's home, where his grandmother was receiving money from someone and asked him to calculate the interest of Rs.5, 000 at the interest of Rs. 3 per month of Rs 100 which he could not do.

He enjoyed Algebra, Indices but never knew any significance of them. His arithmetic teacher used to ask, "According to the rate of electricity charge Rs. 8 per unit for 0-50 units and Rs. 9 per unit for 51-150 units. How much will be charged for the consumption of 150 units?" He calculated the charge but never knew about the significance of the topic because there was neither electricity nor charging in his village. He realized the importance of topic when he enrolled himself in 10+2 level in Kathmandu Valley. In between the class, his teacher would ask the algorithmic mathematical problems like "In a survey of a community, it was found that 55% of the people preferred summer season, 20% liked winter season, 40% did not like both the seasons and 750 liked both seasons, Illustrate it in Venn-diagram.

In his school days, he found additional mathematics a bit tough. He could not recognize any significance in those topics except in "height and distance", sequence and series and all the questions his teacher used to ask were from an exact textbook, no new and creative questions were ever introduced. His teacher started teaching from practice books and question collections set just before SEE (now SEE). There were hard and tricky algorithmic mathematics problems like, "A man gained Rs. 3, 000 by selling a watch allowing 10% discount on the market price. If he allows a discount of 5% on the marked price, he would have gained Rs. 4, 000. Find the market price of the watch". His teacher used to ask questions like: Who can solve it? What would be the solving procedural for this problem? What will be the answer?

Can you guess it? ,etc. He was talented among his friends and was often asked such questions.

In his Bachelors level, his teachers rarely asked the questions by calling name but his teacher used to ask questions to all the students like: How are you doing? Are you maintaining your notes? Do you have any questions? How can I help you? ,etc.

He has started his teaching profession in 2007, from a government school and after a year switched the job to a private school mathematics teacher. He began his class by recalling the problems of previous class either from reference book or asking questions like, "Do you remember about previous class?,Can you tell me the formulae of the previous topic? Can anyone of you solve the question no. 1 a. of exercise 1.2? According to the need of the students, he used to revise it providing hints about the topic. Sometimes he used to ask one of the students, "Can you explain about it? Can you relate it with formula? If he had to teach the mathematics problems in relation to formula, at first, he discussed how the formula has been derived with the help of various activities related to the topic.

If he had to teach about "Shapes, he discussed the topic relating it to the real object and explain the relation within shapes and asked the students if they had ever thought about it; if they could describe other shapes inside the classroom. He used to ask algorithmic mathematics questions not only from their textbook but also from another reference book.

Mainly, he used to ask these questions in between any class such as Did you understand? If not which are the steps I need to revise? Are you able to use formula? ,etc. He used to ask objective questions, yes/no questions short answer questions, long question, etc. Further, from his experience, logical questions are used to develop critical thinking skills in mathematics such as what is the difference between 4x and

x^4?, How sum of angles of triangle is 180^0?, etc. . Sometimes he used to ask direct questions in mathematics.

Similarly, in almost every class he used to ask, "How many of you have exactly understood the process? Can you share me an example of when we can apply this problem in our daily life? If he is teaching about "Cuboid", he asks his students to find the LSA (Lateral Surface Area) and TSA (Total Surface Area) by relating to their classroom. If he is teaching the chapter "Triangle", he asks," Why is the sum of the angles of a triangle 180^0? At last, he asks," Do you have any questions about today's mathematics class? What are main ideas that you learned today? Can you represent the solution in other ways also? If you have any problem I am here to help you all.

In his mathematics class, he used to ask the questions without any discrimination such as 1) Someone tell me the definition of the set. 2) Can anyone give me an example of the null set? 3) Who wants to tell me about this topic? To make his class active and interesting he asks the questions like, "How would you describe the problem in your own word? What's your prior knowledge regarding this topic that would help you figure out the solutions? Can you make some similar questions like this?

He used to ask five categories of the questions, altogether, in the mathematics classroom. They are multiple-choice questions, true-false questions, yes/no questions, match the following questions, short answer questions, and formula derived questions. In his experience, students used to be confused in objective questions and logical questions but found the formula derived question and short answer questions are easy.

Entry with Iswar's Story

Iswar's Story

Some days later, I had to see another mathematics teacher, Iswar, at his school who also works in the same institution where Lal Bahadur works. But while some of the discourse and content is possibly overlapping, the contrast between Lal Bahadur, Sudha and Rebina's speech, appearance and attitude could not be more marked. His story started as follows

He is from Shankhuwasava district of Nepal and has completed his Master degree in Physics from TU. He has been teaching about nine years in different schools in Kathmandu Valley as a fulltime and part-time mathematics teacher.

He remembers his school days around15/16 years ago, the source of teaching and learning mathematics; at that time he used to have a book only. There were no teaching-learning materials and his teacher never related the mathematics class with the real world. At that time mathematics was taken as a tough subject but he never took it as a tough subject. However, his secondary level mathematics teacher has completed B. Sc in Botany. The teacher had many obstacles during the time but then he gave his continuous support to him. His continuous practice from practice books, question bank, and group discussion helped him to reach the target.

He remembers that his mathematics teacher usually used to enter in the class with a stick. Those who had completed their homework and submitted their copies on time, they were his favorites as an old system. But those who were weak at mathematics found it much harder to deal. Further, he shared that mathematics classes were not tough for him in secondary level. His hard-working habits made the time memorable, whereas for the teacher it was not so.

In regular classes, his mathematics teacher used to ask the algorithmic mathematical problems like, "In algebra, expand, $(a+b)^5$, in arithmetic formulae of profit and loss, in coordinate geometry formula of distance between two points, in trigonometry, if $\sin 30^0 = \frac{1}{2}$, *find the value of* $\sin^4 30^0 + \cos^2 30^0$, *In geometry, who can define center and inscribed angle standing in the same arc, etc.*

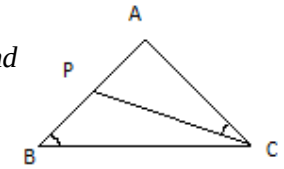
Addition to, his mathematics teacher asked the questions like: Who can do it? How can I help you? Are there any alternative ways to find the solution?, etc. By the time, one of his friends had to solve the given problem on the board each day. Students who were incapable of solving the given problem had to take support from the talented one and therefore he had to support his classmates a lot. In his university-level study, his mathematics teacher used to ask questions like: "Do you know it? Do you have any confusion? Do you need my help?" but he rarely asked questions to his teacher. He used to mug up the entire contents; accordingly, he did in his examination.

He has started his teaching career after completing his B. Sc. At the beginning of his teaching career, he used to follow the same patterns and technique followed by his own mathematics teacher. Now, he realizes that mathematics is not so much difficult subject but their fixed mindset about the subject itself, made it seem difficult. He has started to gain sound knowledge about teaching-learning practice with the help of technology. He realizes that his teaching-learning practices had to be improved. Further, from his experience he had, he believes that teaching and learning in mathematics should be followed by linking it with day to day life. So, that the mathematics class becomes more enjoyable and interesting.

At the beginning of his class, he used to ask simple questions on any particular lesson. In place of asking, "Do not you know this?" he used to ask, "What did you

know about this topic?" These types of questions made the students interesting and were motivated to some extent. Accordingly, he was able to understand the student's basic level of understanding to react for questioning. His way of questioning is, "How many students have understood it? He also cross-checks either they have maintained their standard level in a previous academic year or not. He used to recall and identify the background in any topic (curriculum) for basic requirement so his mathematics classes would be more effective.

Basically, he used to link mathematics to the day to day life. In arithmetic, it was easy to relate to their daily life, but in geometry and algebra, it's little hard for students to link up. In that case, he used to ask algorithmic mathematical problems like "factorize a^2+6a-8*, simplify* $\frac{3^{x+2}-3^x}{4\times 3^x}$*, solve if* $x = 3y$ *and* $x + y=16$ *and in geometry from given figure, PC=8cm,* $\angle ABC = \angle ACP$*, AC=6cm, BC=10cm, find the length of AB by using the concept of similar triangles". Further, from above questions, he used to access their level of knowledge. He further asked the following questions like," Did you notice anything special in those topics? Give me an example? Can you show the steps of solving this problem in the board? Can you relate these problems with real materials? This way, he used to link up his mathematics classroom with the day-to-day affair, which shows effective changes in recent trend.*



In his views, "In some cases, he used to ask an algorithmic mathematics question like 'the ratio between the ages of Ram and Sahara is 2:1. After 10 yrs, their ages will be in the ratio of 3:2 then find their present ages and ask the questions to whole class like, Do you need help?, How can I help you? Do you know how to solve it? What is your answer rather than pointing one student at a time? He also asks cross questions to an individual by giving him or her opportunity and asks them to

raise his or her hand if they knew the answer to the questions which have been directed to them.

He also gives the whole class time to share things if they have any ideas on the topic corresponding to the lesson which was being discussed. He also uses a random method to find out the level of students and see whether they are able to answer and solve the problems that they have in the specific chapters. From this, he can find out and observe an individual's level of understanding whether they have got clear ideas of the lesson which they have studied or not.

According to him, it's easy to relate it in arithmetic like in unitary method, he can directly link. For example, if the cost price of x pen is Rs. y, find the cost price one x dozen of the pen. Further, students may make a visit to any market with their parents and have an experience of buying the goods like vegetable and daily needed things and have experience of bargaining, discount, selling price(SP), cost price(CP), fixed price and various things that they have already learnt in school, and can relate it to their regular life. Instead of asking the questions directly, he would link the questions with their buying procedure experience by jotting it down on the whiteboard, for that, he used to ask algorithmic mathematical problem like, "A man gained Rs. 3, 000 by selling a watch allowing 10% discount on the market price. If he allowed a discount of 5% on the marked price, he would gain Rs. 4, 000. Find the marked price of the watch". Yet again, he used to ask: Can you solve it? What are the various ways to solve it? What is your answer? Can you solve it on the whiteboard? ,etc. to strengthen students' understanding.

To fulfill the objective of the lesson, in the mathematics classroom, after testing the level of knowledge through procedural teaching, he used to ask algorithmic mathematics question like, "In algebra, two numbers are in the ratio of

4:5 and H.C.F is 15 find the numbers". Thereby he used to ask the questions like, "How many of you can solve it? Have you ever seen these questions before? Can you change this word problem into the equation? Does anyone have a question related to this question?

There are different levels of students in his classroom. Some of them are sharp and talented but some are not. He used to treat each of them differently keeping in mind their levels, so that none of them would be humiliated and deprived of knowledge. He prefers these strategies for the positive mathematical environment, for sense-making questions. Some exemplary questions are as follows: Does anyone know if…? Can anyone here give me an example of…? Okay, who wants to tell me about….? He said that after completing any lesson, it's not necessary to treat them as students because after getting the knowledge from the teacher they are also of the same level.

From the beginning to the end of the mathematics classroom, he used to ask varieties of questions. They are: Yes/No questions, True/False questions, and one-word-answer questions. Thus, he prefers interesting types of questions to the long questions.

For encouraging students in mathematics class, he uses many examples. If he is going to teach mensuration topic, he asks, "Calculate the area of the gas cylinder you have been using at home". Such problem is closely related topic to our daily life. At the end, he used to ask the questions like," Do you have any questions? Do you have any confusion on today's' class?, etc. He used to ask positive and requesting types of questions.

At the end, whatever the problems, he used to support them in the classroom sometimes on the whiteboard, and also individually according to the need. He was

habitual in asking the following types of questions in his mathematics classroom namely: "Can anyone of you explain its procedure in details? Do these types of methods work for all problems or not? Are there any better methods to answer the problems? Did you develop the possible solution or not? Did you develop any patterns?.

Finally, from his experience, he has concluded that, the art of questioning plays a vital role in teaching and learning process in the mathematics classroom. He used to pause and ask questions. According to his experience, the mistake is the root of success. So he always motivates and encourages his students to ask the questions in mathematics classroom from a different perspective. Similarly, to enhance the level of understanding in mathematics he used to ask several questions namely: 1) how many of you understood these problems/solutions? 2) Can you understand the procedure and explain it for us? Do you want to repeat the process again? He followed the procedural process with some example for an illustration like in set question by using Venn-diagram. At the end, he used to raise the questions like, "Do you have any questions?" and ended any mathematics class.

Exit from Lal Bahadur's and Iswar's Story

I leave Iswar's school after having a cup of water, Lal Bahadur's and Iswar's story still continues with me. Firstly, I could hear their influences clearly in my head; I had keenly observed their expressions and their uses and understanding of questioning in their classroom. That very evening, I met my supervisor to reflect on my third and fourth interview and how to grasp the momentum to write the narrative story differently. As I reflect on Lal Bahadur's and Iswar's story I realize that I still have so much to learn about the art of questioning in classroom practices because I still feel, I have not done much in this field.

Entry with Rajkumar's Story

As I was wondering about next person for an interview. I choosed Rajkumar as third praticipant among six for my research work on the area of understanding and use of questioning in the mathematics classroom. I found his ideas, and techniques and issues are stated in the following section:

Rajkumar's Story

Rajkumar (pseudo name) is well established and one of the renowned mathematics teachers of Middle Point School. He is seen in a formal dress. He speaks politely and at times his voice sounds sympathetic. I have visited the school he teaches in and I know about his popularity in the field of mathematics and classroom practices that he has been using for the understanding of questioning method in mathematics. The main excerpts from the interview are in narrative story form below:

Rajkumaris enrolled in master degree in mathematics education in the Kathmandu University, School of Education. He has completed his B.Sc. from Tribhuvan University and started his teaching career just after B.Sc. He has selected mathematics for his master degree because of his inclination in mathematics. He has been engaging in the teaching profession around 10 years. During his school life, the classes were only of 45 minutes and the only thing his mathematics teacher did was to make them read, to recite the difficult ideas which they had to follow without any comments or complaints. Similarly, he would repeat the same schedule day by day. When he reached the upper grade, but when he decided that he would solve different questions in different ways, the foundation of his mathematics was then set in his mind. His teacher used to ask algorithmic mathematical questions from textbook such as: if f(x) =2x+3 and domain D= {0, 1, 3, 5} find the range of the function, expand and evaluate $\sum_{n=1}^{4}(-1)^n(n^3-2)$*, solve* $\sqrt[3]{3x+1}$*=4, construct 2×2 matrix whose*

elements are given by $a_{ij}=i+3j$. Those questions were exam oriented and his teacher used to ask the questions like: Have you understood? Will you able to solve it? Regular questions asked by his teacher were like, "Can you tell the formula of simple interest? Usually, no questions were raised from student's side because there were more than 75 students in a single classroom and so asking questions or having any sort of interaction was a very rare. Interaction among them was possible only in grade IX which was when he started understanding mathematical questions easily. His teacher had begun teaching from practice book and question bank only just before SLC (now SEE).

In his 10+2 and bachelor level, there was very less interaction among his friends and teachers since teacher-centered teaching and learning practices were in practice at the time. But, in master degree there are quite a different questioning practices, students are motivated to search and create new ideas. His course facilitator used to ask: Do you need any help? How can I help you? What reading materials do you need? If you need to meet me, please visit my chamber, etc.

He has started to teach additional mathematics since 2005 from lower secondary level. There were no any new ideas for teaching and questioning. So his teaching technique and questioning practice were akin to his own mathematics teacher. During the initial days of his teaching career, he also would ask the formulas mainly and he would solve few questions as an example, and let them practice rest of the questions on their own. He had asked questions without analyzing them in-depth. But after working in this field for three to four years, his thoughts changed which led him to search different process of solving the same problem and ask questions that were different from that of a textbook (e.g., Do you know the uses of trigonometry in

day to day life? Can you share the ideas to use coordinate geometry in local knowledge? ,etc.).

These types of questioning have changed the mind of students and increased their interest and also motivated them. Nowadays, before starting the topic, he has made it a rule for himself to ask about the topic for example: if he is going to teach the topic 'sequence' he asks 1) Have you heard about this topic? 2) Have you studied about this topic in your previous grade?, 3) Can any of you give an example of the sequence?, 4) Do you know about the increasing and the decreasing order?. After asking these types of questions he defines the sequence relating to students' answers. He also uses real materials of shapes and asks the students to analyze the interval of each shape. In between, he again asks the questions, like, whether they are repeated in the fixed interval or not. At last, he defines the sequence as the pattern followed by a fixed rule. Mainly, numbers are kept in sequence and those numbers repeated in the fixed interval and they are governed by the rules.

Sometimes, he thinks that an active student might sometimes lead the whole class for good because his response gives answers before completing the questions. To facilitate the situation he asks the questions like 1) Can anyone share an example of sequence expect Hari?, For Hari, he would ask another question. Sometimes, students respond differently which cannot be forgotten. For example, a student asked,"Is traffic light not an example of patterns sir?". In between the class he used to ask the questions like 1) Have you understood this process? What will be another step? Can you explain me about this step? Please solve question no. 14 of exercise 2.2 in your copy.

At the end of the class, he used to ask planned questions to know whether he has fulfilled his objectives or not. The questions were asked verbally or in a written

form such as in the topic 'height and distance': if the angle of elevation is x^0 and angle of depression is y^0 calculate the height of a man. This is an example of written questions. In topic 'set' he asks the algorithmic mathematical question like; there are 50 total students in class 20 of them like tea only, 15 of them like coffee only, 5 of them like neither tea nor coffee, how many students like both tea and coffee? Represent the above information in Venn-diagram (this is an example of the question whether the students can present the word problems in the diagram or not).

Further, in a right angle triangle, he asks: if two sides are given, find the third side. He thinks that teaching-learning practice will be effective if they ask logical questions rather than direct questions. To motivate his students, he appreciates those students who bring new ideas in the mathematics classroom. He used to ask questions like 1) How $h^2=p^2+b^2$ in the right-angled triangle? What is the meaning of this formula? Where can you apply this formula?

He is not completely satisfied with his question preparation practice because he should prepare the questions based on the curriculum of the government of Nepal, which is a pre-requisite for securing good grades. He thinks the question should also be connected with their daily life such as if he has to teach billing he used to ask the students to bring electricity bill and asked the following questions 1) What is the unit of current month?2) What is the unit of previous month? 3) How much unit is consumed in this month?.

According to him the questions asked on the topic "time and work", the questions are not so much relevant for example," If 5 people can complete a work in 10 days, how many people are required to complete the work in 1 day? Here, it is hard to complete the work in 1 day by many people though they work together. To

teach time and work, he prefers to take the students to the field/site and asks questions like 1) Why are you all here? After student's response, he makes it clearer.

Accordingly, to calculate mean, median, mode of certain observation in statistics, he used to have a survey of the student's marks in mathematics in any terminal exam and list them on the whiteboard. Thereby, dividing them into different groups, he assigned them different calculations: mean, median, mode, etc. For this purpose, he asks the following questions 1) Do you know how to calculate mean, median and mode?, 2) What does mean, median and mode indicate?, 3) What is the use of statistics in our daily life?

The different types of questions he often asked the students in the mathematics classroom are 1) knowledge and understanding based question: he asks these types of question in the beginning of class 2) skill-based questions: in between the class to confirm whether the students understood the concepts or not. 3) higher ability questions: for talent and active students.

Sometimes, some questions posed by his students really puzzled him as these questions were of higher level or they asked questions relating to another topic. In this situation, he used to ask them to find out the solution by themselves at first. Later, students would find the solution but sometimes he himself discussed the problems with them and find out the possible solution. He usually asked the questions based on the curriculum. For lower level students he used to prepare somewhat easy questions and did not set any boundary for the talented students, they could even explore a higher level of questions.

Exit from Rajkumar's Story

After few more of informal conversations and plenty of questions from my side about his understanding and uses of questioning in his mathematics classroom, I

thanked him and took leave. As I went out of the school I was totally consumed up in reflecting on his narrative, I had a feeling that I was lucky enough to meet him for my interview. I could easily identify some of his transformations in threat of questioning in mathematics classroom situations, his roles, and responsibilities as a mathematics teacher.

Entry with Indra's Story

Indra's Story

I decided to visit Kavya School for an interview and hear Indra's story. I know that Indra is highly experienced mathematics teacher who has by now become a renewed teacher trainer and is struggling to continue his studies. The stories I have heard so far have mostly been from his various stages of life being a student, an in-experienced mathematics teacher, an experienced mathematics teacher, a novice researcher and finally also a teacher trainer. So, I am hopeful that this will be an opportunity to hear another perspective and gain further insight. I am also interested in hearing a story that will, to some extent, complement the fore mentioned five teachers without necessarily being congruent with it.

Initially, we started our conversation in the principal ma'am's office but there are competing demands on Indra's attention and at times we are distracted by what is going on around us. Later we moved into the library room and it was easier for us to focus well. Even more, I am better able to follow Indra's narrative and he seems more willing to share in a personal manner. His story started as following…

Indra was born on the ward no. 3 of Phulbari V.D.C of Taplejung District. He has completed his schooling from St Joseph School, Biratnagar, B. Sc from Mahendra Morang and M.Sc from Patan campus. He has been teaching mathematics and science since 1994. Now, he is an established mathematics teacher.

His experience of mathematics during his school age is interesting. At that time, mathematics was taken as a tough subject. His mathematics teacher used to pressurize to mug up the formulae like,

$\sin C + SinD = 2\sin\left(\frac{C+D}{2}\right).\cos\left(\frac{C-D}{2}\right), a^2 + b^2 = (a+b)^2 - 2ab$ *etc. and he had to practice on the basis of formulae. He said, "It took me many days to memorize those unknown formulae. So, we were compelled to mug them up even during our playing or free time." He never understood, what 'x', 'y',* $\sin\theta$, $\cos\theta$ *and* $\tan\theta$, *etc. were. He does not have any experience of practical learning in mathematics, whereas he found algebra and geometry terrifying. He practiced a lot, secured excellent marks in the examination but he could not relate it in his daily life. He realized this only when he became a teacher himself. He used to go to school with a bag full of books. As soon as the teacher entered the classroom, his teacher used to ask them to open the book and assigned them some task from a textbook.*

The algorithmic mathematical questions were like: 8 cm long chord is drawn in a circle having radius 5cm. What is the distance of the chord from the center? Suppose from the pack of 52 cards, a card is drawn at random. Find the probability of choosing a black card, and there are 20 students in grade IX of any school. Among them, 9 are boys and remaining girls. What is the probability of selecting girls as a classroom representative? Then his teacher used to ask some questions to facilitate them: Can you solve it? Do you need any help? Do you remember the formula required here to solve the question?, etc. His teacher helped them with one or two mathematical problems for example, and assigned the rest questions as homework. His teacher used to check the homework the very next day by giving tick mark. There were many tick marks in his copy also.

He recollects his past,"Mandal sir was his mathematics teacher who used to assign some questions and asked them to come up with solutions. Another day, he asked them to solve the same questions on the board. For that, he used to mug the solution step by step. But when he found himself in front of the class, he got nervous as he saw a stick in his teacher's hand which made him forget all the steps at once. They were not supposed to pause or make any mistake during the process of solution, otherwise, the teacher would disappointed them. So, he used to discuss and practice with friends. Because of all this, he did not find his school life enjoyable.

In his university education, his teacher rarely asked any questions because there were about 200 students in a class. If there were any, they were all generalized ones like: Can we start the new lesson today? Did you read today's topic at home? , etc. He used to recite the entire content for a better result.

He has started his teaching career 21 years earlier. His teaching career started as a mathematics teacher in his school age. At the beginning of the teaching career, he used to teach whatever was here in the book like addition, subtraction, etc. He used to punish his students as his teachers used to. After teaching for 2 years, he realized that mathematics is not a subject to be taught in pressure. So, he thought to change his teaching-learning practice. Then he started to teach in fun full and pleasing environment by providing opportunities to express students' feeling.

He remembers his suffocated school days and realizes that had he got better environment, he would have a better understanding of the subject itself. He started to research on how he could change his teaching techniques so as to make his students understand mathematics better. So, he started teaching mathematics making uses of local and no-cost materials. Hence, the classroom environment became enjoyable and as the students became interested they started to understand it easily.

When he entered the classroom, he often used real materials for teaching initially and he used to ask questions from the textbook when their understanding level seemed to increase. For example, if he had to teach the topic 'shape', he used to show the real object at first and asked the students, "What kind of shape is this? Have you ever seen any object/s like this?". Students used to make many mistakes initially where they termed oval shape as a circle, rectangle as brick, etc. But then as he used real materials and supported the students, they were able to grasp the concept more clearly. Further, to teach the concept of two dimensions shapes like rectangle, area, vertex, a line he used to assign different students to bring the objects of different shapes and taught connecting them. Here, the students could understand the concept of higher level also. So, he believes that classroom environment should be fun-filled and enjoyable.

He linked it with the help of example like, if he asked, 'Do you know what circle is?' .Students responded by nodding their head 'round sir' and again he asked 'Can you draw it?' Then students drew the circle in their copies. Further, he asked the students like, 'Can you show the real object that looks like a circle?' Then each of students responded with different examples like the sun, moon, coin and ring, etc. Again, he asked the students, 'What should be there to be a circle?' Students said round again. Again he asked 'Is a football circle?', because his intention was to make them creative. Again, he asked, 'Is t-t ball a circle?", 'Is globe a circle?', because students had already had an idea of the globe at this level. In that situation, students used to become confused. In addition, he asked 'Is Apple also a circle? The students also discussed with themselves. He would make them curious and expect multiple answers from them. This way, the students would learn slowly and gradually and would never forget about the topic. Even in class two and three, he used to relate the

difference between the circle and sphere by using the knitting thread. He used to tell the students that there are infinite circles in a sphere by displaying it with the help of knitting thread so that his students would understand the concept well.

By the time his students were young, either those students remembered their classes or not but he did not let any stone unturned. He would practice in the concept that the students would become interested in search about the topic.

He never understood about 'x' and 'y' during his school days. So, in his first class of algebra in grade five, he said that 'x' is a variable. And students asked," What is meant by variable sir?.Then he replied that if we don't know the value of something, and the value may be any number that is variable, for the variable we use x, y, z. Again one student asked, 'in place of 'x', cannot we use 'an' or 'the' sir? At that time, mathematics classroom would be enjoyable because he let the students ask any questions related to the topic. He replied for those students, 'an' or 'the' also can be used as a variable but 'x', 'y', and 'z' are used as a variable and 'a', 'b', and 'c' are used as coefficients or constants in our practice. He never knew the significance of algebra despite being a mathematics teacher but he taught the concrete algebra in effective ways as discussed in the same paragraph. So, his students understood algebra easily. Now, he can teach algebra by showing an object.

In between the classroom, he observed if his students were attentive or not, for that, he used to ask, 'Do you have any confusion about the process?', 'Do you need my help?'. By the time a student asks him, 'What is the meaning of 3x sir?'.First, he told the student, "Try to find out the answer, please. Then, she replied '3 is a constant and x is a variable sir'. Sometimes, students were confused in '3x' and 'x^3', either that was not in their curriculum but we tried to incorporate those ideas so that the foundation of algebra would be better for students. He would explain the students,

that $x+x+x=3x$ and $x.x.x=x^3$. Further, he explained to the students that, in place of the variable if we let $x=2$, then $3x=6$ and $x^3=8$. So, the students knew the exact difference between the '3x' and 'x^3' properly.

At the end of his mathematics class, he used to ask the questions which made them curious so that they would ask that questions even to their parents or their seniors. He used to ask contextual questions like, 'Where is the use of algebra in our daily life?' and he said, "Do not worry, if your answer is wrong, try to find out the answer". Students used to search and find out the answer only sometimes. Sometimes, he used to request the students to bring the materials from their surroundings. He used to give at least a question as a home assignment either in the written form, oral or to search some concept or materials related to the context.

Some questions for him, were really answerless, such as: "Where x^2+2x+3 is used in our daily life?" Further, the rule of indices such as $x^n .y^n$ asked by the students, he thinks, is the abstract ideas in mathematics. For these types of questions, he used to ask the students to research on the topic and he also researched on it. In absence of the answer also the mathematics classroom would be fruitful for him. This type of hunger, in mathematics, may lead many students to enter in the research sector in their career. If he did not know the answer to any questions, he never said that was the final point/answer. There is no more about this topic in the book, he used to say, there are possibilities in everything.

He faced "how and why" types of questions from his students but not any" what" types of questions. Because of students hunger for the knowledge, they always asked "how and why" types of questions but sometimes he was himself not in a position to answer them.

Exit from Indra's Story

I thank Indra for sharing his experiences despite his busy schedule. He assures me that he enjoyed sharing his ideas about the uses and understanding of questioning in the mathematics classroom. In addition, he says that he has never tried to tell about his educational life and teaching career to anyone before because no one asked him. As I have done with everyone's narrative, I outline what I will be doing with all the stories I hear, and check once again whether he is happy for me to use his story as apart of my dissertation. He gives permission and asks if there is anything else that he can help me with.

Myself in the Story

I am tired and uncomfortable. So often, I feel overwhelmed by what I hear and sense. My ethics is clear that I have fulfilled the recommended ethical guidelines but still, I find it difficult to walk away from teacher's professional career I've stepped into by encouraging them to share the significance of understanding and uses of questioning in mathematics classroom with me. What I hear around raises me strong room to strengthen students' understanding in mathematics through interaction, communications to react in the mathematics classroom. But, I know that I cannot act as someone else and do what they did but to some extent I may do it differently. I try to fit all narrative in as much as possible through journaling continually.

The mathematics teachers offer me blessings and well wishes, telling me to return soon with research finding, perhaps even with a dissertation. But, I wonder, how I will be able to prepare and share any of this story in my research. I wonder how anyone would ever understand. I only understood a part of it myself, being a mathematics teacher, an educational researcher and M Phil scholar of mathematics education.

Key Message of the Chapter

In this chapter, I have presented the narratives of six mathematics teachers (i.e., experiences on understanding and uses of questioning). I have also explored their understanding and uses of questioning in mathematics classroom as students, as a teacher and to some extent a teacher trainer. Further, I have articulated the opportunities and challenges they faced. In next chapter, I have analyzed each story and interpreted the narratives relating it to different theoretical perspectives and practices for meaning-making.

CHAPTER V

MEANING-MAKING OF NARRATIVES

This chapter contains a discussion of the main concepts that emerged from a synthesis of the stories (i.e., presented in Chapter IV). The discussion is built on the understanding and uses of questioning in the mathematics classroom. I have also linked the themes with supporting literature. The chapter attempts to recognize the uniqueness of the teacher's narratives but also to consider how their stories are expressions of what is valued and shared collectively. The ways in which questioning within the teacher's narratives are now be considered briefly. Due to the complexities involved, each of the six narratives is examined separately.

Re-Entry with Rebina's Art of Questioning

Reflecting on the Rebina's story, she describes herself as an well-respected mathematics teacher in her school and hardworking teacher. Although her experienced questioning from her childhood, her father was the first positive catalyst for her to build up the foundation of mathematics because her father used to question her, in every step of her mathematics solution like, how this relates to her topic. The ideas that she learned before were useful in solving the problems in the current context or not. Did she ever solve a problem like this one before? And what is alike and what is different about her method of solution and the ones her father is supporting her with? As the relationship between attempt and success address her attitudes and beliefs about mathematics learning through questioning (Pitler, Hubbell, Kuhn, & Malenoski, 2007, p. 155). Therefore, it could be said that Rebina is relatively lucky with regards to questioning practices. However, at the time of the interview, to

some extent, she had an assumption that questioning was limited only to the algorithm mathematics problems (Lubienski, 2000).

So, Rebina focuses her narrative little more on the algorithmic mathematical questions, rather than on her art/nature of questioning in mathematics classroom practices. In contrast, she emphatically added, questioning by her teacher in the mathematics class was like recall questions from algebra, understanding questions from arithmetic, organizing existing knowledge from geometry to experience in order to create new understanding and meaning on the confusing topic (Hiebert & Wearne, 1993). In this way, Rebina emphasizes, her mathematics teacher's continuous support in the mathematics classroom and her hard-working habit became always positive for her to empower her understanding. Similarly, Rebina's hardworking habit indicates that she believes in drill and practices which are strongly driven to behaviorism. As, Rebina is aware, mathematics is a hard subject. So, she believed that her teacher used to ask the algorithmic mathematical questions from practice book and question bank for her friend, it was different where questions are labeled from simple to complex (Woolfolk, 1998) for practice. Rebina also points out that many of her friends do get fewer questions than her. She acknowledges that her student life in the school with a supportive mathematics teacher, who is a class teacher, is good compared to her friends, which was significant to her on understanding through algorithmic mathematical problems and questioning.

By the way, Rebina comments on her teachers' algorithmic mathematical question in the fraction, her teacher used to ask questions like 'find a fraction that is less than $\frac{4}{5}$ but greater than $\frac{3}{5}$, what the missing fraction might be? $\frac{....}{....} < \frac{4}{5}$ etc'. Thereby, her mathematics teacher used to ask questions without its procedural understanding and asked the following questions: does anyone have the same answer

but a different way to explain it? Rebina said that she was chosen by her teacher and was asked the questions like, “Would you ask the rest of the class that question? Do you understand what Rebina is saying? (with rest of her friends), Can she convince the rest of other that makes sense of her solution?, Rebina, can you share an example of …….?”. Rebina uses to struggle to find the solution as she was a talented student, the tensions that arise when various processes in the particular solution had to be used. She outlines the ‘rules’ which apply to find out the solution (von Glasersfeld, 1995). As I noticed, Rebina describes these practices as valued by a mathematics teacher.

Furthermore, while Rebina is teaching shapes in her mathematics class, she asks the questions like, “Does a square always have four sides? Is not the product of 2cm x 3cm equal to $6cm^2$?” Indeed, Rebina’s strong intention was to engage students in the discussion by asking very basic questions (Cotton, 1989), which seems to be useful for encouraging students in learning mathematics.

Adding the ideas of school life, Rebina continues that, she was often asked hard and tricky questions by her mathematics teacher and also provided time to think and solve. Then her teacher used to ask the questions like 1) Did you understand the today’s topic? 2) Do you need further help on this topic? 3) Is there another way to solve this problem? 4) Is there a more easy way to solve this problem? It is strongly seen that Rebina’s teacher intention was to encourage her to find the solution. In this regards, her teacher focused on encouraging questioning to challenge students to discover their ideas, inviting students to take risks, motivating and evaluating their level (Schurr, 2000).

From this narrative story of Rebina, I can assume that her teacher frequently asked algorithmic mathematical problems of grade X when she was in grade IX”.

Thereby, posed questions like, “Is it always true? Why or why not? Is that true for all algorithmic mathematical problems? Explain? Can you think of a counterexample? How could you prove that? What assumptions are you making? Rebina realizes that her mathematics teacher wanted to upgrade her mathematical knowledge by asking various algorithmic mathematical problems followed by questioning. Taking the support from the ideas, Harrop and Swinson (2003) also agree that asking good questions is one of the most important skills of the teachers to help students for their better understanding of mathematical concepts.

Rebina’s mathematics teachers have categorized the class in the upper level, average level and lower level (Cotton, 1989). So her teacher used to ask the questions according to the level. Obviously, she has to face hard algorithmic mathematical questions, more subjective and more word problems. Rebina’s university education was not much different from that of her school education. But in university level study, there was freedom to ask the questions and hardly get the reply from course facilitators. Possibly her facilitator was highly influenced by Steele (2003), who describes, “I give them the opportunity to think. I am silent. I wait. I listen. I encourage them to test their ideas. I encourage them to talk to each other. I wait. I listen”. Thus, he is giving students time to think about mathematical ideas and allows for the development of their own ideas.

Rebina started her teaching career with the slogan “to teach mathematics is not only to teach someone but also the opportunity to gain innovative knowledge”. I appreciate it and believe it to be true. So, Rebina tried to teach her students using locally available real materials connecting with real life. Rebina always tries to keep her mathematics class active by questioning in between the class like, "Did you notice any changes in solving the problems? Can you predict the next step? How did you

think about the problem?, etc. I thought her intention here was to test the mathematical concepts taught recently.

Rebina asks the questions while checking her students' answer sheet, she asked one of her students to solve the given algorithmic mathematical problems on the whiteboard and she is familiar with peer checking. So in her mathematics class, Rebina asks her students to exchange and check each other's copy making sure that they know the exact solution. She makes uses of the whiteboard to mark scheme of each step. This approach that she practices here is strongly based on behaviorism. So, Rebina, to some extent believes in behaviorist too. Rebina always seeks for professional training on how to use questioning but the school never provided that opportunity to explore. So, she used to research on the internet.

Rebina further observed, she enjoys when her students ask questions in between the classes. Rebina generally used to ask questions after completing any algorithmic mathematical questions like 1) What is the main process of this algorithmic problem? 2) Is this topic/formula connected to real life? 3) Is there another process of solving this question? In this context, Rebina's intention was to develop the curiosity of students to respond to the questions and deepen their concepts and pose questions to students with a goal of making them think (Cazden, 2001).

Rebina started any class by asking relational questions to her students like how are you? so as to identify the condition of the classroom and inquires the students if they have any confusion regarding the previous class. Hence, teacher's relational questions can encourage students to justify their reasoning verbally (Cazden, 2001). If Rebina is going to start the topic fraction, at the beginning, she asks the following questions and allows them time to think it. 1) Can you tell me about the topic? 2) How many of you have heard about this topic? If you have heard about the topic

please share your views?, 3) Have you studied about this topic in your previous grade? ,etc. As I notice, to know the prior knowledge of the topic and encourage them to participate in the discussion she used to pose those types of questions. In addition, if all students are involved in sharing, teacher questioning can have a positive influence on the students' mathematical thinking (White, 2003).

Further, on the topic profit and loss where Rebina asks the questions as 1) Have you heard about profit and loss? 2) In what price does profit take place? 3) Can you share an example? Rebina starts to teach profit and loss by connecting with their answers from their response. Rebina asks the questions connecting with their name and their daily life practices. In contrast, teachers who use a student-centered model for instruction believe students are active participants in constructing knowledge as opposed to passively receiving knowledge from a teacher questioning (Seung, Park & Narayan, 2011). Finally, Rebina is habitual to ask 'yes/no', 'how' type and 'why' type questions and focus on 'why type' of questions a lot in her mathematics classroom. Rebina completed her class by questioning, 'Do you have any questions?'

Exit from Rebina's Art of Questioning

In Rebina's narrative story, I found the sociocultural perspective of teaching and learning while questioning in the mathematics classroom to produce new knowledge, understanding and meaning. Rebina is to some extent, nonconformist mathematics teachers and well known about the democratic practices in her mathematics classroom because her behavior or views do not conform to prevailing ideas or practices in mathematics classroom while questioning. Additionally, Rebina is habitual with the notion of behaviorism (Cherry, 2014) because she used to bind her classroom in learning by reinforcement thoughts. Rebina, to some extent, assumes that good mathematics teachers ask good questions to their students for active

participation, to strengthen understanding and engage in meaningful discussions in the mathematical discussion. Addition to categories of questions, Rebina is habitual to ask simple to complex questions and highly focused on simple and average types of questions to engage students in learning mathematics (Anderson, 2001). In Rebina's narrative story it is clearly seen, she is aware of her teaching and learning practices to enhance students' understanding and for those students who are struggling, she used to help them through questioning with the notion of critical pedagogy for unjust practices and understanding.

Talking about Rebina's algorithmic and day to day life practices in mathematics classroom while questioning, she is well aware that questions are a way that teachers use to bring students around to the correct mathematical concepts and procedures through the negotiation of meaning for the necessary condition of learning (Voigt, 1992). Thus, she is not following exactly one way of questioning for a particular topic. As I noted, it is clearly seen in her narrative, Rebina used varieties of questioning and questions in her mathematics classroom to strengthen students' understanding.

Re-Entry with Sudha's Questioning to Identify Students' Understanding

Reflecting on the narrative of Sudha's story, she is one of the well experienced, encouraging and motivated mathematics teachers. However, at the time of the interview, to some extent, she thought questioning was limited to algorithmic mathematical questions only (Lubienski, 2000) as Rebina did. Sudha believed in drill and practices in mathematics which are behaviorism driven as Rebina also did. Therefore, Sudha took whole one week to understand and complete the assigned work in her childhood.

Sudha was very good in arithmetic and able to answer the teacher's questions but not in algebra in her schooling. Sudha's mathematics teacher in secondary level used to enter in the class at the exact time and started the class with relational questions like, "Have you completed your homework? Do you have any confusion of previous class? Can you solve the question on the board?" As I thought, to some extent, he is trying to develop rapport and encourage students to ask the questions. Similarly, he used to support, those who were confused or have not completed their task or could not solve the algorithmic mathematical problems. Further, Sudha's teacher used to support them individually. By the time, Sudha's teacher also used to ask questions to confirm students' progress and understanding in mathematics. For that, he used to ask like, 'Why did you choose this problem-solving method? Can you find a more effective strategy? Do you think this would work with another number? And what do you notice when you have completed the assignment?' In this context, teachers who encourage students to elaborate on and clarify their thinking through the uses of probing questions to encourage learning because such questions drive students to think more deeply about the topic being discussed (Krupa, Selman & Jaquette, 1985, p. 453).

In addition to Sudha's story, in the topic fraction, her teacher used to ask the algorithmic mathematical questions like: if two fractions have the same numerator, which fraction is smaller? How do you know? If two fractions have the same denominator, which fraction is larger? How do you know, what happens to the value of a fraction if the numerator is increased by 1, but the denominator stays the same?, etc. Sudha remembers those algorithmic mathematical questions were from their textbook and some from practice book. She used to practice them a lot without knowing any significance of them. However, according to Hill and Flynn (2008), it is

not as simple as just deciding to ask more questions during the course of a lesson. Thus, mathematics teacher needs to reflect on the nature of the questions they use and actively plan to implement the uses of questions as part of their lesson and cross-checks the students' understanding in his/her mathematics classroom.

Being a mathematics teacher, Sudha has a responsive role to help her students. In any particular lesson, Sudha used to ask the questions like, "Did you understand? Did you copy the homework? But, Sudha's intention here is to know either her students are active learners or passive learners during the course of questioning. As noted by Clarke (2006) and Isoda (2006) the level of questioning and the kinds of questions that could be asked will be able to extract students' ideas and their reactions towards what is being taught.

Sudha has a lot of experience of teaching mathematics by connecting the mathematics class with their daily life. Additionally, Sudha likes her students asking questions of subject matter and recently learned the topic. Sudha used to ask the following questions in between the mathematics class: '1) Have you seen it clearly? Do you know how to derive the formula? Can you give some examples?' Sudha also said that she had to be careful if her students are not asking any questions. I can easily reflect, if students have not asked any questions in between, she must realize that her teaching technique is not working or they are not interested in the topic (Cohen & Tittle, 2010). So, Sudha made it her habit to ask the question for various purposes like checking understanding, starting a discussion, inviting curiosity, beginning an inquiry, determining student's prior knowledge, and stimulating critical thinking (Harris, 2000).

Sudha knows that to activate students' interest is necessary because without interest in student any teaching strategy doesn't work perfectly. In this regard, Ortenzi

(2002) added, through various strategies the teacher may lead students into active thinking: the way the teacher wants them to think and increase the interest. Hence, Sudha used to ask the questions related to the topic by relating with their own experience. In this context, Sudha justified when she is going to teach the lesson time, she used to ask what time is it now by showing the clock. To teach the lesson shape, she used to ask, have you noticed the shape of the classroom? Sudha, mentioned that if her students can share the proper answer to her questions then she is in right track otherwise she has to modify her strategies in teaching and learning mathematics in her mathematics classroom (Dunn, 2010). With reference to research, it indicates that teaching technique which aims at helping in challenging and struggling against any form of classroom oppression and the related customs and beliefs embedded on Sudha (Freire, 1968). In this regard, Sudha may change her teaching and learning process if her students do not understand any mathematical concepts while questioning.

Sudha links any mathematical concepts with day to day life activities by questioning. Sudha asks almost all the average level of questions but she also includes hard and tricky questions for talented students and some easy questions for less talented students (Blosser, 2000). Sudha is satisfied with the three-quarter part from her questioning patterns but she could not find the remaining part effective enough. She wonders whether it is because of her fault or perhaps the students could not understand. Finally, Sudha is thinking about how to help them in effective ways for strengthening students' understanding in mathematics through effective questioning.

Exit from Sudha's Questioning to Identify Students' Understanding

In Sudha's narrative story, it seems that she is a highly flexible mathematics teacher and uses the democratic practices in her mathematics classroom while questioning. Additionally, As Rebina did, Sudha is also habitual with the notion of

behaviorism (Cherry, 2014) but to some extent, she follows constructivism approach of asking questions to the students for meaning-making. Additional to categories of questions, Sudha asks average level of questions almost but she also includes a hard and tricky question for talented students and some easy questions for less talented students (Anderson, 2001). In Sudha's narrative, she is aware of her teaching and learning practices to enhance students' understanding and is satisfied with the three-quarter part from her questioning patterns. Sudha seems to be highly influenced by algorithmic and day to day life practices in mathematics classroom while questioning.

Re-Entry with Lal Bahadur's Questioning for Meaning Making

Reflecting on the narrative of Lal Bahadur, Lal is a decent and well-experienced mathematics teacher. At the time of the interview, as Rebina and Sudha did, Lal also highly focused on algorithmic mathematical questions; later on, he was able to distinguish them thoroughly. Lal was a curious and active student in his schooling age and enjoyed reading and practicing algorithmic mathematical questions. Lal was habitual to calculate and distribute any material to his family from his childhood by mathematical techniques. Addition to Lal, his father used to bring the banana and asked him to serve all the family members one by one then asked how many bananas Lal distributed. Sometimes, Lal's father used to send him to buy sugar, biscuit, etc in the shop and asked how much money is necessary to buy these goods. So, Lal is well aware of daily life mathematics practices which were his foundation of mathematics. Lal remembers his grade three experience, where his mathematics teacher used to ask questions about any particular topic at the beginning of the class like," Have you completed your homework?, In which questions you were confused?, Can you solve the algorithmic mathematical problems of yesterday? It seems that

Lal's mathematics teacher was highly driven by the notion of behaviorism because of his belief in drill and practices to be perfect in mathematics.

In Lal's childhood, his mathematics teacher was so strict and never listened to the view of students and also used to punish the students who did not solve any mathematical problems. Reflecting Lal' view, his teacher does not know about the democratic practices in the mathematics classroom. So, his mathematics teacher is highly driven to negative conformist teachers. Further, Lal's teacher would ask, "Have you solved the mathematical problems?" even in the Tiffin time.

When Lal was fifth grade student, his mathematics teacher used to ask algorithmic mathematical problems "If one angle is 45^0 of supplementary angles what will be another angle?" and request to solve or find out the solution of it. Lal was so happy to find out the solution. Similarly, Lal enjoyed algebra, indices but never knew any significance of them. So, Lal realized that questioning should be contextual and situational based on the topic. In his school days, additional mathematics was hard for Lal. He could not recognize any significance of those topics except in height and distance, sequence and series and all the questions his teacher used to ask, were from an exact textbook. This indicated the notion of behaviorism somehow: to follow the same patterns and techniques of teaching and learning, no new and creative questions and believe in learning by reinforcement. His teacher started to teach from practice books and question collections set just before SLC (now, SEE).

After assigning any algorithmic mathematical problems, Lal's teacher used to ask, 'Who can solve it? What would be the solving procedural for this problem? What will be the answer? Can you guess it?'etc. This focuses that his teacher believes in practice and drill so that student will get mastery on the subject matters by providing opportunities to the students to relate mathematics ideas differently.

Talking about Lal's, university education, his teachers rarely asked questions by calling name but his teacher used to ask questions to all the students like, "How are you doing? Are you maintaining your notes? Do you have any questions? How can I help you?"etc. I noted that his university-level teacher seems to be more democratic and could understand the feeling of students while questioning.

At the beginning of Lal's teaching career, after entering the classroom, he used to recall previous class by questioning: "Can you remember about previous class?, Can you tell me the formulae of the previous topic?" Then, knowing the current status of the students, Lal used to support those who have forgotten about the previous topic; he used to revise it by providing hints about the topic. By the time, Lal took the support of students and requested for help by asking,'Can one of you explain it? Can you relate it with formula?' If Lal has to teach mathematics problems relating to formula at first he discusses how the formula has been derived by engaging them in activities related to the topic, only then he goes for procedural. As I noted, Lal is to some extent constructivist teacher she always keeps his students active through questioning and seeking the answer from the students for meaning-making. Thus, while ensuring students active involvement and participation central to learning, constructivism encourage the teachers to focus on the students' strengths (Confrey & Maloney, 2006).

Lal is aware of teaching through the uses of daily life uses materials, in one of the classes, where he had to teach about shapes, he discusses the topic relating to the real object and explains the relation within shapes and asked the students, "Have you ever seen these objects? Can you describe other shapes you may get inside the classroom?"

Lal used to ask questions in between any class like, "Did you understand? If not, which is the step you have not understood? Are you able to uses formula?, etc. Even more, Lal is familiar with objective questions, yes/no questions, short answer questions, long questions, etc when, where, why and how to ask with students and sometimes emergent questions during the course of teaching.

Further, Lal asks logical questions to develop critical thinking skills in mathematics. Sometimes he asks one-word answers questions (Ilaria, 2009). Additionally, from his narrative story, in one of the lessons, Lal asks, "How many of you have exactly understood the process? Can you share an example of when we can apply this same problem in our daily life? If Lal is teaching about cuboid, he asks his students to find the surface area by relating to their classroom. At the end of the class, Lal asks, 'Do you have any questions about today's mathematics class? What are main ideas that you learned today? Can you represent the solution in other ways also? If you have any problem I am here to help you.' Further, I noted that Lal's ways of summarizing mathematics class through questioning would serve as a revision for the whole class which would be helpful in strengthening students understanding.

In his mathematics class, Lal used to ask the questions without any discrimination such as:"1) someone tells me the definition of the set? 2) Can anyone give me an example of the null set? 3) Who wants to tell me about this topic?" Further, to make his class active and interesting he asks the questions like, "How would you describe the problem in your own word? What do you already know that would help you figure out the solutions? Can you make same questions like this?"

Finally, Lal asks five categories of the question in the mathematics classroom (Anderson, 2001). They are multiple-choice questions, true-false questions, yes/no questions, match the following questions, short answer questions, and a formula

derived questions in any mathematics classroom. In his experience, students used to be confused in objective questions and logical questions but when it comes to formula derived question and short answer questions they can easily solve it. Here, Lal is highly focusing on the algorithmic mathematical question rather than questioning in pedagogical perspective.

Exit from Lal Bahadur's Teaching Mathematics for Meaning Making

Similarly, in Lal's narrative story, I found the sociocultural perspective of teaching and learning while questioning. Lal is to some extent, conformist to nonconformist mathematics teacher and well known about the democratic practices in his mathematics classroom while questioning. Additionally, Lal is habitual with the notion of behaviorism to constructivism (Cherry, 2016) because he binds his classroom in learning by doing thoughts. Lal is well aware of daily life mathematics practices in his mathematics classroom. Additional to categories of questions, Lal is habitual with asking five categories of the question in the mathematics classroom namely multiple-choice questions, true-false questions, yes/no questions, match the following questions, short answer questions and a formula derived questions in any mathematics classroom (Anderson, 2001). As I noted, it is clearly seen in his narrative, Lal is not rigid in using one type of questioning but he used varieties of questioning in his mathematics classroom.

Re-Entry with Iswar's Transformation of Questioning Practices

Iswar is highly experienced mathematics teacher. Iswar seems to be supportive and friendly. Iswar tries to understand the feeling and respect the students' ideas in his mathematics classroom which is vice versa comparing to his school life. Other ideas of Iswar, his teacher never used material and asked the questions to engage in mathematical learning. Regardless, Iswar's mathematics teacher was not professional

because his teacher was not from the mathematics background so, there were no any types of questioning practices and highly driven to solving algorithmic mathematics problems from practice books, and question bank only. This strategy is a clearly an example of behaviorist principles of teaching. One way that students can change their outlook and attitude by questioning in mathematics classroom (Pitler, Hubbell, Kuhn & Malenoski, 2007), thus behavior and effort go hand in hand.

Addition to Iswar's mathematics teacher usually used to enter in the class with a stick and did his regular work without understanding the feelings of students. Equally, his teacher used to ask the algorithmic mathematical problems from algebra, trigonometry or geometry and asked the questions like, Who can do it? Are there any alternative ways to find the solution, find it? As I noted, Iswar's mathematics teacher was conventional mathematics teacher because Iswar has to follow accepted behavior or established practices as his teacher did.

Talking about Iswar's university-level study, his mathematics teacher used to ask the questions like, "Do you know about it? Do you have any confusion? Do you need my help? But Iswar rarely asked the questions to his teacher because he is habitual in reciting. As I noted, Iswar is highly driven by the notion of behaviorism because he believes in drill and practice as a student (Orey, 2011).

Likewise, in Iswar's teaching career, he used to follow the same patterns followed by his mathematics teacher as his schooling. Interestingly, Iswar had changed his teaching strategies of mathematics after two years. Iswar has started to gain sound knowledge about teaching-learning practice with the help of technology, he realizes that his teaching-learning practices had to be improved even more questioning too. Further, from his narrative story, Iswar claims that teaching and learning in mathematics should be followed by linking it with day to day life and

questioning should be of students' level. So, the mathematics class becomes more enjoyable and interesting. In that stage, Iswar seems to be a constructivist mathematics teacher. As the constructivist view of learning emphasizes that students construct their own knowledge using their own prior knowledge and experiences while questioning (Gunstone, 1995).

Adding the ideas of Iswar, at the beginning of any class, he used to ask simple questions (one-word answer) of any particular lesson (Anderson, 2001). Iswar seems to be habitual in place of asking "Do not you know this?" he used to ask "What did you know about the topic?" As I noted by asking these types of questions, students become interested and motivated. So, that Iswar can able to understand the basic level of understanding of the level of students to react for questioning in the mathematics classroom. In between his class, Iswar used to cross-check either student have maintained their standard of the previous academic year or not. So, Iswar is habitual in asking recall questions to identify the prior knowledge for basic requirement so his mathematics classes become more effective.

From the narrative story of Iswar, basically, he used to link mathematics in the day to day life problems. Iswar added, it was easy to relate to their daily life of arithmetic and questioning to the students but little hard in algebra and geometry. Addition to Iswar's narrative story, by asking any algorithmic mathematical problems, he used to ask the following questions like, "Did you notice any special in topics?, Will you want to share an example? Can you show the steps of solving problem in board? Can you relate these problems with real materials? By this way, Iswar used to link up his mathematics classroom, which seems to be necessary for effective changes in the recent trend of the mathematics classrooms (Flynn, 2005). Furthermore, Iswar used to ask the questions to whole class after completing any solutions and raise

multiple questions like, "Do you need help? What can I help you? Do you know how to solve it? What is your answer rather than pointing one student at a time? Iswar also, asks cross questions to an individual student by giving students an opportunity and ask them to raise his or her hand if they are able to find the answer to the questions which have been administered to them. As I reflect on Iswar ‘s narratives, he is well known about the democratic practices in mathematics classroom to provide equal opportunities for students to ask the questions and provided the whole class time to share their thoughts. If they have any ideas on the topic corresponding to the lesson which has been discussed (Leitner, 2010). Iswar is also familiar with the random questioning to find out the level of the students and notice whether students are able to answer and solve the problems that they have learned in the specific chapters. Uniquely, Iswar can find out and observe student’s level of knowing whether they have got clear ideas of the lesson which they have studied or not through questioning.

Addition to Iswar, in the state of asking the questions directly, he would link the questions with student’s experience by jotting them on the whiteboard with the help of students for meaning-making which emphasizes the idea of social constructivism that knowledge of a particular experience is produced and maintained through communal human action, thought, dialogue, or other social practices (Collin, 2013). Generally, Iswar asks the questions like, "Can you solve it? What are the various ways to solve it? What is your answer? Can you solve it on the whiteboard?, etc.to strengthen students' understanding.

To fulfill the objective of any lesson in the mathematics classroom, after completing through procedural teaching, Iswar to some extent believes in behaviorism to constructivist approaches of teaching mathematics. Further, borrowing the ideas of Iswar, in his class, there are different levels of students in the classroom, some of

them are sharp and talented and vice versa. Even to the ideas of Vygotsky (1978), higher cognitive processes develop from social interaction. Thus, Iswar used to treat differently to different students. So, that none of students will be humiliated and no one will be missed to get the knowledge. Thereby, Iswar prefers these strategies for the positive mathematical environment for the meaning-making. Some exemplary questions, Iswar asks as follows: does someone know if…? Can anyone here give me an example of…? Okay, who wants to tell me about….? Thus, from beginning to the end of the mathematics classroom, Iswar asks varieties of questions like yes/no, true/false and one-word-answer questions. Consequently, Iswar prefers interesting types of questions to the long questions (Andre, 2015).

Iswar uses many exemplary questions for encouraging students in mathematics class. If he is going to teach mensuration topic, he asks to calculate the area of the gas cylinder you have been using at home which is closely related topic to our daily life. Finally, Iswar asks the questions like," Do you have any question? Do you have any confusion on today's class?, etc. Iswar asks positive and requesting types of questions expecting a response.

At the end of any mathematics class, whatever be the problems, Iswar supports them in mathematics classroom sometime on the whiteboard and often individually on need base. Iswar is habitual in asking the following types of questions in his mathematics classroom like, "Can anyone of you explain its procedure in details? Do these types or methods work for all problems or not? Is there a better method to solve the problems? Did you develop the possible solution or not? Did you develop any patterns? ,etc. Iswar, also states the significant need for children to develop constructive competence through social interaction with their teacher and classmates inside the mathematics classroom (Bauersfeld, 1992).

Exit from Iswar's Transformation of Questioning Practices

As I noted, Iswar's teaching practices and questioning are totally different from that of other participants mentioned above. So, Iswar concludes his narrative stories saying "the art of questioning plays a vital role in teaching and learning process in mathematics classroom". Iswar tries to engage students by asking various questions and further he pauses and asks the questions which are simple to complex (Anderson, 2001). Iswar was also convinced to the fact that mistake is the root of success. So he always motivates and encourages his students to ask questions in mathematics classroom from a different perspective. In contrast, to enhance the level of understanding in mathematics, Iswar asks the questions like 1) How many of you understood these problems/solutions? 2) Can you understand the procedure and explain it? Do you want to repeat the process again? Iswar follows the procedural process with some examples. Indeed! Iswar raises the question, "Do you have any questions?" and ends the class.

Re-Entry with Rajkumar's Questioning for Meaningful Teaching

Rajkumar is a devoted and experienced mathematics teacher. Rajkumar did lots of struggle to be in this position. So his inclination to the world of mathematics is different than that of Rebina, Sudha, Lal Bahadur, and Iswar. Rajkumar has developed sharing cultural inside and outside of the mathematics classroom and accepts feedback from students and teachers which are necessary for every mathematics teacher.

Rajkumar's experience being a student was different. Mathematics classes were of 45 minutes. Mathematics teacher used to come in his period, make him read, to mug up not understood ideas and used to gout of class. As well as Rajkumar along with his friends repeats the same schedule day by day.

In so doing, Rajkumar reaches to upper grades, he started to solve different algorithmic mathematical questions in different ways with the help of friends or another mathematics teacher. Rajkumar's teacher used to ask algorithmic mathematical questions from a textbook and example only. Thereby, Rajkumar's teacher used to ask the questions like," Have you understood? Will you be able to solve by looking at examples? In addition, Rajkumar shares, usually, no questions were raised from students' side because there were more than 75 students in his classroom. So, there was no chance of asking the questions. Rajkumar has started asking the questions to his mathematics teacher when he was in grade 9 that made him understand mathematical questions easily. Rajkumar had started to practice algorithmic mathematical problems from practice book and question bank just before SLC (now named as SEE). Despite that, at the time of the interview, as of Rebina, Sudha, Lal Bahadur and Iswar, Rajkumar also focused on algorithmic mathematical questions at the beginning. As I noted, somewhere in his interview, Rajkumar said that he is not completely satisfied with his question preparation practice because there were no such practices and even he had not attended any professional development training on questioning in the mathematics classroom. So, it reflects that Rajkumar is focusing only on algorithmic mathematical problems but in contrast, the main focus of teacher questioning has been to identify teachers' skillful uses of questions that is, skillful in eliciting student thinking or engaging students in developing mathematical understanding (Teuscher et al., 2010).

Discussing Rajkumar's10+2 level and Bachelor level study, it was teacher-centered teaching and learning practices. Generally speaking, his teachers were conventional and expect the same procedural as he did. However, in Rajkumar's master degree study, there are quite different questioning practices. Students are

motivated to search new ideas and encourage the students to create new ideas. His course facilitator used to ask," Do you need any help? How can I help you? What reading materials do you need? If you need to meet me, please visit my chamber, etc. From Rajkumar's narrative, it reflects that in his university study, his teacher was flexible and he experienced new practices in teaching and learning.

When Rajkumar has started his teaching career, there were no any ideas for questioning. So, his teaching technique and questioning practices were as same as his own mathematics teacher did in his school which is highly driven to behaviorist's approaches and he believes in learning through external reinforcement. Further, in his starting days of his teaching career, Rajkumar also asks the formulae and also solves few questions as an example and let students practice rest of the questions. Ironically, Rajkumar had asked questions without analyzing its depth.

Even though Rajkumar, realizes his practices of teaching approaches were not the benefits to students even with his lots of hard work. Although, as I noted, teaching approach should emphasize the students' construction of meaning by encouraging students to collaboratively grapple with and reflect on what a teacher is trying to say (McKeown & Beck, 2004, p. 392). Further, around three to four years of teaching experience, Rajkumar had started to think differently, search different process of solving the same problem and ask the questions relating to daily life as follows," Do you know the uses of trigonometry in day to day life? Can you share the ideas to use coordinate geometry in day to day life? ,etc. help the students to strengthen students' understanding. Further, I reflected, those types of questioning have changed the mind of students and increased their interest and motivated them to think differently.

Now and then, before starting the topic, Rajkumar asks the questions about the topic for example; if Rajkumar is going to teach the topic 'sequence' he asks 1) Have

you heard about this topic?, 2) Have you studied about this topic in your previous grade?, 3) Can any of you give an example of the sequence?, 4) Do you know about the increasing and the decreasing order?. After asking these types of questions Rajkumar defines the sequence relating to students' answers. Rajkumar also uses real materials of shapes and asks the students to analyze the interval of each shape. In between, he again asks the questions, they are repeated in the fixed interval or not. At last, he defines the sequence as the pattern followed by fixed governed by the rules. These types of teaching help the students in mathematics classroom practice to initiate the negotiation with students (Cobb & Yackel, 1996) and help for meaning-making, which evolves from the interpersonal (social) to the intrapersonal (i.e., individual) (Lerman, 1996).

As Rajkumar shares, sometimes an active student, seems to lead the whole class because he/she gives answers before completing the questions. In this situation Rajkumar asks the questions like 1) Can anyone share an example of sequence except Hari (Hari is treated as talented student here)?, For Hari, Rajkumar asks another question. At the end of any class, Rajkumar asks planned questions to know whether he has fulfilled the objectives of the lesson or not. Indeed, the questions were asked verbally or written form.

Rajkumar's teaching-learning practice is effective because his students ask logical questions than direct questions (Ilaria, 2009). To motivate his students Rajkumar appreciates students who bring new ideas in the mathematics classroom. Rajkumar thinks question should also be connected with their daily life such as if he has to teach billing he asks students to bring their electricity bill and asks the following questions 1) What is the unit of current month?, 2) What is the unit of

previous month?, 3) How much unit was consumed in previous month? As I noted, it helps the students to connect their ideas in real life.

Rajkumar is well aware of using various teaching approaches. Accordingly, to teach, to calculate mean, median, mode and other statistics topic, Rajkumar does the classroom survey of the marks of the students secured in mathematics in any terminal examination and lists them on the whiteboard. Thereby, he assigns to calculate the mean, median, mode, etc. to the students where he asks different groups of students to calculate mean, median and mode. For this purpose, Rajkumar asks the questions 1) Do you know how to calculate mean, median and mode?, 2) What does mean, median and mode indicates?, 3) What is the use of statistics in our daily life? It seems that Rajkumar is more familiar with social norms in the mathematics classroom. There are also socio-mathematical norms and classroom mathematical practices of which the teacher needs to commence the negotiation with students (Cobb & Yackel, 1996).

From the narrative stories of Rajkumar, the types of questions he asks the students in the mathematics classroom are 1) knowledge and understanding based question where he asks these types of question in the beginning of class 2) skill-based questions: in between the class to confirm whether the students understood the concepts or not. 3) Higher ability questions: for talented and active students (Cotton, 1989). Rajkumar, usually asks the questions based on curriculum according to the level of students. For lower level students he prepares little easy questions and there is no boundary for the talented students, they can explore higher level questions.

Exit from Rajkumar's Questioning for Meaningful Learning

In Rajkumar's narrative story, I found, Rajkumar is to some extent, conventional (at the beginning of teaching career) to radical mathematics teacher and

well known about the democratic practices in his mathematics classroom while questioning after having two to three years of teaching experience.

Rajkumar also believes in the notion of behaviorism while questioning at the beginning of the teaching career but after two to three years of teaching, he has incorporated various teaching strategies while questioning. Rajkumar has started to engage students while teaching by relating mathematical ideas by questioning to daily life mathematics practices and let the students develop the mathematical concepts for meaning-making which is highly driven to constructivist approach (Cherry, 2016). Additional to categories of questions, Rajkumar is habitual with asking knowledge and understanding based question, skill-based questions and higher ability questions (Cotton 1989). As I noted, it is clearly seen on his narrative also, Rajkumar is not rigid in using one type of questioning.

Re-Entry with Indra's Questioning Practices

Indra is an experienced mathematics teacher. At the time of the interview, he seems to be well aware of the recent trends and practices of mathematics pedagogy. Indra has been facing ever-increasing pressure to create a suitable learning environment for his students. In this context, to encourage students, questioning is a useful tool for strengthening the level of the students' understanding. Further, in Indra's schooling, his mathematics teacher used to pressurize to mug up formulae of trigonometry, requests to open the book and assigned him (and all friends) to solve questions from textbook and his teacher requested to redo the example too. It took many days to remember unknown formulae and to understand to complete those exercises for him. Accordingly, when Indra has started teaching career, Indra also follows the same procedural largely guided by the notion of behaviorism. According

to behaviorist view, reality exists independently of learners and knowledge is received exclusively through the senses (McInerney & McInerney, 2010).

When Indra started his teaching career, he used questioning to the students like," Can you solve it after completing the questions in the example? Do you need any further help? Can you remember and be able to use a formula to solve the question? Moreover, when his students failed to relate any mathematical concepts, Indra realizes, mathematics is not a subject to be taught in pressure and it is not a transformation of knowledge from head to head. So, Indra thought to change his teaching-learning practice. Then he started to teach in the fun-filled and pleasing environment by providing opportunities to express students' feeling. He also provided room for asking and responding the questioning in his classroom.

Another side, in the beginning of his teaching career, Indra seems to be a traditional mathematics teacher, he teaches whatever in the book like addition, subtraction, etc. He punishes his students as his teachers did. Indra takes the full authority to ask the questions either student is ready or not. Further, with reference to research, traditional mathematics teachers, who were conforming to accepted behavior or established practices as was practiced by Indra. Indra never realizes in his starting career that democratic practices had started from mathematics classroom. In contrast, Saha (2002) argued, students are empowered to participate democratically in the mathematics classroom. So, students feel free to ask and respond the questions, wherever they are confused on any topic of mathematics. Indra is well aware of democratic practices after two years of his teaching career. Then he changes his behavior or views. Indra thereafter does not conform to prevailing ideas or practices while questioning. Indra provides opportunities to the students to respond the questions asked by him.

Indra's mathematics classroom practices as a student were sophisticated. Mandal sir was his mathematics teacher who used to assign some algorithmic mathematical questions and asked to come up with solutions and strongly requested to be able to do on the blackboard. Indra used to recite the solution step by step but he was able to make it correct on the blackboard because of multiple reasons such as timing, relating to day to day life, etc. In comparison, being a mathematics teacher, Indra at the beginning of his teaching career followed the same patterns. Now, Indra provides time to think and request the students to try it on the whiteboard if solution may not be correct. He never minds but advises him/her to try in different ways. Indra is now highly constructivist mathematics teacher. So, Indra claims that a student's knowledge is constructed by herself or himself inside and outside of mathematics classroom.

Being a student, Indra does not have any experience of practically learned mathematics lesson. Some questions had made Indra answerless, such as where does x^2+2x+3 exist and where to use it in our daily life. Now, being as a mathematics teacher, for these types of questions he asks the students to research the topic. Indra adds, by research skills many students enter in the research sector in their career? If Indra does not know the answer to any questions he never says that it is the final solution, he says that there are possibilities in everything. By the time, Indra started questioning to his mathematics teacher practices (Lunenburg & Potter, 2012), had he got the better environment, he would have understood better. So, Indra started teaching mathematics using local and no cost materials thereafter the classroom environment became enjoyable and students became interested and started to understand easily and ask and respond the question wherever they were confused.

In his class, Indra asks the questions like recall, describing, to generate a problem, and examines underlying features (Hiebert & Wearne, 1993). But Indra added, there is no limit in asking the questions as per cotton, Cunningham, Woolfolk, Vacc Hiebert and Wearne, Bloom and Wolf (Ilaria, 2009). During his student life, Indra never understood what is ‘x’ and ‘y’ and never asked a question to his mathematics teacher because he felt uneasy to ask a question and even though there were no such practices.

In between the classroom, Indra observes if his students are attentive or not. So, Indra asks the questions like, "Do you have any confusion about the process?’Do you need my help?’ to make his class and students active. Indra further regards, at the end of his mathematics class, he asks the questions which make them curious so that they would ask those questions to him, their parents or their seniors. Hence, Indra asks contextual questions like, "Where is the use of algebra in our daily life?’ and Indra is so flexible now that even if students’ answer is wrong, he suggested the correct answer.

Exit from Indra’s Questioning Practices

In Indra’s narrative story, I found some proportion similar to Rajkumar’s story, Indra also to some extent, seems to be a traditional teacher (i.e., at the beginning of teaching career) to radical mathematics teacher and well known about the democratic practices in his mathematics classroom while questionings after having two to three years of teaching experience.

Indra thought mathematics learning is through learning by reinforcement, drill, and practices at the beginning of his teaching career but after some years of teaching, he has incorporated other teaching strategies while questioning by realizing this is not ultimate. Thus, Indra has started constructivist approaches of teaching and started to

relate any mathematical concepts to daily life by using different strategies for meaning-making. Additional to categories of questions, Indra asks the questions which make them curious so that they would respond. Hence, Indra asks contextual questions, how and why types of questions. Indra is so flexible, if students' answer is wrong, he never minds and suggests the correct answer.

Key Message of the Chapter

This discussion for meaning-making has examined how mathematics teachers' understanding and uses of questioning in mathematics in the classroom are intricately embedded in their experience with various role models (like being as students, teacher, teacher trainer and educational researcher). It has looked at how mathematics teachers' experiences interlock to control as well as create opportunities for students to ask questions and it has also considered how questioning is perceived as having the potential to interact and to change existing power relations between mathematics teacher and students and purpose to reform new approaches to strengthen students' understanding.

This contrasts with the six teacher's narratives when they talk about their own experiences on questioning in the mathematics classroom. As has been pointed out in the discussion earlier, there are some indications in the teacher's narratives that they value questioning for its direct functional purposes but there appears to be more emphasis in their narratives on the algorithmic questions.

Historically, in Nepal, asking questions to the teacher seems to be embarrassing to the teacher because of lack of consciousness or empowerment. There are many references in the teacher's narratives that bear this out. However, this discussion has also attempted to point out that how the teachers value or perceive questioning in the mathematics classroom.

Teachers' narratives have been explored and through examining for meaning making. This discussion has been able to gain insight into the shifting, complex and unstable nature of the construction of power relations and students' understanding in mathematics classroom through questioning. In next chapter, I have concluded my reflection and conclusions.

CHAPTER VI

MY REFLECTION AND CONCLUSIONS

This chapter reflects my research process as a research journey as well as its significance in the recent trend in mathematics education. I discuss the beginning of my research ideas, formulating research agendas and articulating research question, returning to the theoretical referents that have assisted me to find out the appropriateness of the choices that I have made. The approach was taken and the lens used, in response to the research question that frames my research issue. Similarly, I explore my key learning and insights with implications and conclusions with my future directions.

Envisaging My Research Agenda

My research agenda on questioning is based on my professional career. I have started my career in teaching field as a secondary mathematics teacher. I suppose that teaching job needs to focus on strengthening students' understanding with activities supported by adequate knowledge and skills with various questioning strategies. Similarly, I believe that strengthening students' understanding through questioning could be a great help to students. On the basis of my teaching experience, I entered education stream in M. Ed. in mathematics program after completing BA with the view to becoming a professionally sound and competent teacher. After my M. Ed. in mathematics education study, I worked as community head of mathematics in one of the renowned schools in Kathmandu Valley. The supportive role of the school principal and various training professionals helped me to foster my ideas in the field of questioning in the mathematics classroom. Thereby, I felt the need and importance

of questioning in the mathematics classroom. Further, as I was engaged in preparing standard level question paper of school level (e.g., Grade III, V, VII & IX), my interest in the development of research grew up. So, I decided to carry out this research project in this area.

As I concentrated my study on understanding and uses of questioning in the mathematics classrooms. I consulted my colleagues, teachers and shared my interest in this particular area of research. They expressed their happiness and thanked me for choosing a relevant and worthy research issue. I documented my issue into the plan of research. As a result of my beginning interest, ideas, efforts and activities for my research work in the field of understanding and uses of questioning in the mathematics classrooms, I documented them in my research proposal, which was approved by the research committee of my university last year.

Formulation of my Research Question

This is my second report to achieve a degree. In master degree, as I know, research questions are essential components for research process by helping the researcher to focus on the particular chosen area of study. I concentrated on documenting and developing my research question on the basis of my professional career as a research scholar and an educational professional. Similarly, my initial visit to the field also provided clear insight to formulate the research question. In the process of formulating my research question in the preliminary phase, I concentrated on exploring the idea of understanding and uses of questioning in mathematics classroom even with my pedagogical practices being as a community head of mathematics in one of the renowned school of Kathmandu valley.

I was in dilemma for choosing my research question, which becomes a pertinent research question in my inquiry. I am aware that narrative analysis is

something that would be ongoing and continual. So, my role is clearer about the process. Further, I talked with my supervisor as he shared that field reality could support the researcher to shape and focus on reformulating or finalizing the research question. I follow the same process for finalizing research question. I arrived at the situation for deciding my research question, which is related to understanding and uses of questioning in mathematics classroom in secondary level.

Looking back to my Theoretical Referents

I chose three theories as referents. Those theories were behaviorism (Skinner, 1976; Pitler, Hubbell, Kuhn & Malenoski, 2007, p. 155), Constructivism (Vygotsky, 1978 & Larochelle, 2010) and Crticalism (Taylor, 2009). In this section, I have discussed how those theories guided my study.

At first, my profession was (and has been to some extent) guided by behaviorist learning theories which tend to rely on so-called “skill and drill” exercise to provide the consistent repetition necessary for effective reinforcement through questioning. In this research, the instructional strategy of questioning in mathematics classroom enhances students' acceptance of the relationship between attempt and success by addressing their attitudes and beliefs about mathematics learning in the classroom through questioning. There still continues to be many instructional strategies that correlate and coincide with behaviorist principles, no matter what learning theory we use. It is clear that the behaviorist theory, in questioning in the mathematics classrooms, still continues to be used in today's classrooms so I have used it in my research.

Secondly, my study is guided by constructivist perspectives, which views learning as a process that happens when the learner, or student, experiences an event in the lesson, and that experience causes the students to engage in thinking critically

about how these new ideas fit with their current ideas or conceptions. The teacher's role, in this case, is to engage students by questioning them to think deeply about the concepts at hand. As the teacher asks questions to the student, the student's responses give the teacher a clearer picture of the student's current level of understanding, which informs the teacher's future questions. This is an iterative process that is intended to eventually result in the expansion of the student's realm of current knowledge.

Finally, my study is guided by critical pedagogy which emphasizes on reflection in the art of questioning in mathematics classroom by mathematics teachers. Without reflection, mathematics teachers may fail to become conscious of the consequences of particular pedagogical decisions in the mathematics classroom. Hence, the art of questioning practices suggests facilitating students to repeatedly shape and reshape through the maturity of intellectual tools and attitudes about the mathematical knowledge. It helps to offer a multidisciplinary approach in mathematics classroom culture which combines perspectives of different views that students have while questioning. Thus, critical thinking can emancipate students in mathematics classroom from different disciplinary boundaries and it is concerned with creating mathematics classroom free from dehumanizing policies. It is a meaning-making process through democratic practices in mathematics classroom while questioning. It helps to critically reflect on understanding and uses of the questioning in mathematics classroom to realize the importance of being reflective of one's own practices.

Reflecting on my Methodological Map

My study is based on narrative inquiry. To find the answer to my research question, I selected four mathematics teachers of private schools and two mathematics

teachers of public schools. I used a criterion-based selection strategy to choose my participants to be involved in this research (Roulston, 2010). So, I could get easy access to those teachers and collect the stories from them. Further, narrative inquiry permits the gathering of a wide range of different kinds of 'data'. While the six narratives (two female and four male mathematics teachers) are central to my research study. I also talked to educational stakeholders even after completing those stories by relating with my journal, what I gained through the interview and what was going on around me. As acknowledged by Trahar (2011), notes recording informal conversations, events, images or feelings can be just as useful in a narrative inquiry as more formal interviews which help me to reflect my narrative stories in richness. Thus, there was a challenge, I faced as, how the collection of data in a narrative inquiry is a creative, dynamic process and how engaging as a participant within the research experience rather than remaining detached from it, produces richer and more significant stories.

In the context of researching the issue on understanding and uses of questioning in mathematics classroom in Nepal seemed particularly appropriate to use narrative methodologies because this methodology helped me to explore the mathematics teachers' understanding and uses of questioning experiences in the mathematics classroom. I have selected narrative inquiry as it is the most appropriate methodology for my study because I was exploring meanings of experiences of mathematics teachers' questioning strategy. At the same time, the process itself was a series of experiences, a journey (Trahar, 2011). In contrast, as has been shared, the approach taken has not been straightforward. I have faced complexity and confusion. Thus, behind every story, there is always another story, and beyond every layer, there is always another layer, So, there was a risk for lingering in the stories than being

concertinaed in my area of study. Therefore as intended, this methodology helps me to find out the foreground practices of mathematics teachers. I hope that this methodology, as well as the content of this study, will be useful in influencing the international community, Nepali academics and policymakers.

Responding to My Research Question

Based on the developed research question and constructed the methodological map, this section portrays the spirit of my research journey to answer my research question outlined in chapter I. I collected the stories of six mathematics teachers from five different schools of Kathmandu Valley. Based on understandings and uses of questionings in mathematics classroom by mathematics teachers. Then, I synthesized the stories of my research participants. I responded to the research question as followed:

Awareness About Classroom Questioning in Mathematics

To begin with, there would be agreement among mathematics teachers that questioning is an essential skill for useful teaching and that teachers' lack of knowledge may prevent them from being good at asking questions. Improving their knowledge of useful skills to ask questions would emphasize them to ask questions. There are several ways of teaching the same topic so mathematics teacher has to realize this fact and help them to discard their beliefs about ways of asking questions according to their students' capability. For mathematics teachers, being alert of their insufficiency in asking questions would help them to take steps to fix them to improve their performance.

Democratic Questioning in Mathematics Classroom

Mathematics teacher would realize the importance of democracy in mathematics classroom while questioning. Even more, they would be aware of social

norms and values such as equal opportunities, equal rights, etc. Further, traditional mathematics teachers such as Rebina, Rajkumar and Lal Bahadur at the beginning of teaching career, who were conforming to accepted behavior or established practices, need to think and provide equal opportunities to the students while questioning and taking the responses. So, mathematics teacher must exhibit their inclination to democratic mathematics teachers (e.g., Sudha, Iswar & Indra), who do not conform to prevailing ideas or practices in mathematics classroom while questioning and provide equal opportunities for students.

Balanced Incorporation of both Low and High-Level Questions

Mathematics teachers appreciate that a good lesson or test must have balanced inclusion of both low and high-level questions and to select questions that give emphasis to major position and encourage lively dialogue. In general, there are two general types of teacher questions in mathematics classroom found in this study namely: low-level and high-level. Low-level questions are also called closed, direct, knowledge and recall questions. On the other hand, high-level questions are open-ended, interpretive, evaluative, probing, inferential, emerging and synthesis-based. Thus, giving questions which slot in both lower and higher levels would facilitate learners practice in both categories and also help them to answer accurately

Thereby, lower-level questions are those asked at the stage of remembrance, understanding and simple application levels of revised Bloom's taxonomy. Higher order questions are considered important for encouraging students to think critically in the mathematics classroom. Higher-level questions require analyzing, creating and evaluation skills. In this inquiry, the mathematics teacher does not rely only on one slot but they tried to balance them.

Planned and Emergent Questions

Planning questions is very important in mathematics lessons. Therefore, teachers plan their questions prior to they go to the classroom. If they plan questions well in advance, they would reduce making mistakes in formulating questions and would be clear about the rationale of asking questions. Similarly, development of questions and questioning help mathematics teachers ask the various natures of questions in the mathematics classroom.

Similarly, pre-planned questions in mathematics classroom are included into the teaching that would be asked during teaching mathematics to begin the new concepts, focus the discussion on the certain topic, guide the discussion in specific directions, or identify student understanding or altitude on the topic. Accordingly, emergent questions develop from the discussion and the specific answers given to previous questions. Think fast and act positively to these questions truthfully and pose them at suitable time in the discussion. It definitely strengthens students' understanding while questioning as done by Rebina, Sudha, Lal, Iswar and Indra.

Conclusions

In conclusion, my research journey, the information that was gathered during my study through narratives of secondary mathematics teachers would be an eye-opener to instruct mathematics teachers on understanding and uses of questioning in mathematics classroom from various lenses namely sociological perspectives (found minimal use), behaviorists to constructivists approaches, categories of questioning as per expertise, critical pedagogical perspectives and algorithmic and daily life practices. The understanding and uses of questioning in mathematics among teachers (Rebina, Sudha, Lal Bahadur, Iswar, Rajkumar, and Indra) may provide a spring entry

for the easy take off to go aboard. As I noted, the understanding and uses of questioning as an instructional tool has been in existing since ancient era to the present time and confirms its significance as an essential tool for teachers in the mathematics classroom. However, even researchers and educators have pointed out the fact those teachers understanding and uses of questioning have been improving much over the years, even though improvements in curricula, teaching materials, teaching methodologies and incorporation of ICT in mathematics classroom (Newton, 2016). This statement supports the conclusion of my study that majority of the mathematics teachers seems to be conformist mathematics teacher at the beginning of their teaching career but later on, they were nonconformist by being flexible enough in asking the questioning. Further, the majority of my research participants asked more questions within the simple to complex level and highly focusing on simple (low level) questioning, claiming to encourage students in mathematical discussion.

I found that lower levels questions asked by the mathematics teachers showed that questioning had been used in a skinny way in their lessons. According to Cotton (2004), low cognitive level questions concentrate on factual information that can be memorized easily. This type of questions can restrain students by not helping them to acquire a deep, elaborate understanding of the subject matter and to think critically in the classroom. Therefore, teachers would ensure that they have a clear purpose for their questioning rather than just testing what knowledge is learned. Similarly, Tan (2007) also asserted that high proportions of lower cognitive level questions do not encourage or guide students to formulate their own judgment by analyzing, evaluating, or creating when teachers use questioning at the lower level of cognition. In contrast, high-level-cognitive questioning involves students to use higher order thinking or reasoning skills (King, 1995). Nevertheless, effective questioning involves

planning and practice and effective questions would stimulate interest in new topics of mathematics, ideas, and challenges, it encourages students to be reflective about their own beliefs, assumptions and comprehension. Teachers' skills of asking questioning and sourcing of questions determine the levels by relating to daily life and types of questions they ask their students (Good & Brophy, 2003) which reflect teachers' knowledge and beliefs pertaining to questioning and their students' needs and ability.

Teachers' lack of higher knowledge of effective questioning strategies (Morgan, 1994) may have led them into asking questions that were not contributing to motivating their students' thinking. In contrast, teacher's higher knowledge on effective questioning strategies may have led students for higher level of understanding. So, teachers' classroom questioning would be helpful and essential part of the mathematics lesson. When teachers' classroom questions and the questioning are not used in actual fact, there may be unhelpful results in the teaching-learning process.

This study also indicated the factors that hindered teachers' questioning in the mathematics classroom such as, insufficient wait-time provided by the teachers, teachers' views about students' abilities and lack of students' interaction. Keeping the above-mentioned factors in mind, teachers can help to promote their questioning by anticipating words in their questions that students may have difficulties to understand and plan to use a variety of strategies. In addition, teachers would plan a series of questions that initiate with less difficult content that eventually leads to more difficult content (Meyers & Jones, 2015). Finally, the teacher would afford students with background knowledge relating to the topic of the lesson before discussion and present questions with enough information to support students to think critically and formulate a meaningful answer. The teachers, whose narratives have been included in

the study, less claimed that they knew about categories of questioning which they applied in their questioning. However, their claims of asking questions at various levels in their lessons seem to be inconsistent. Thus, knowledge of taxonomy is useful for mathematics teachers to ask questions at various levels and would help them to ask questions of different types.

Implications

It is marked that mathematics teachers know some of the challenges and factors that affect the questioning in mathematics lessons. However, mathematics teachers are not aware of the other challenges which they may face when it comes to questioning in mathematics. As a result, mathematics teachers, in this study seem not to have developed questioning strategies that may help them in preparing the students to pass mathematics examinations. Therefore, institutions would need to conduct workshops, professional development meetings and encourage mathematics teachers to go for in-service training too. Mathematics teachers would also improve the way they utilize sources available to them, relate their tendency to dominate classroom interaction and make their lessons more learner-centered and make informed contextually appropriate strategies while questioning in mathematics lessons.

I hope, my research study is not extremely implacable for all. In contrast, it can offer some insights to the readers, novice teachers, novice teacher trainers and educational researchers. Mathematics teacher would be highly benefited from my research process to strengthen their knowledge on understanding and uses of questioning in order to focus and improve student learning in mathematics. My research is

Source: (Democratic Classroom, 2017, p. 1)

highly implacable to the mathematics teacher for classroom practices while solving algorithmic mathematical problems. Those teachers, who are unaware of questioning strategies in the mathematics classrooms, my research study will be an eye-opener for them and even those started their teaching career recently. So, mathematics teachers would work to open up questions and promote more discussion among students which help students to gain more shared authority in constructing the meaning of mathematical concepts and encouraged to think more critically (Chin, 2007).

Mathematics teachers would be able to distinguish different types of questioning, such as instruction with regard to lower-level and higher-level thinking questions with reference to Bloom's taxonomy (Andorson, 2001; Harris, 2000) and Convergent to Divergent (Cotton, 1989; Woolfolk, 1989) and their role and responsibility. Thus, mathematics teachers become more purposeful about the questioning they ask, they also reflect upon their roles and the roles of their students in learning, potentially re-examining or reconstructing their belief structures in this process (Seung et al., 2011). In my study, the purpose of questioning is to stimulate student thinking which is useful for mathematics teachers.

My study would certainly help mathematics teacher to be more responsive while questioning, the purpose of understanding students' processes in problem-solving and prompting students to consider connections within and outside of mathematics (Polly et al., 2014). My research indicates, teachers have a rich mastery of mathematical concepts and the interconnectedness between different representations and topics to be able to ask questions that promote thinking. Similarly, my study will support policymakers and curriculum designers to make some provisions of the questioning strategies in mathematics classroom practices.

Future Directions

After completing my M Phil dissertation, I am always keen to share my research process and findings with my colleagues, my research participants, my seniors, policy makers and research scholars. This process would help to enrich knowledge on understanding and uses of questioning in the mathematics classroom. As I reflected from narratives, teachers' questioning is one of the common teaching strategies of mathematics teachers in the mathematics classroom.

I suggest that teaching and learning mathematics needs to be in accordance with the cognitive level of the students in mathematics classroom while questioning. We need to teach mathematics for strengthening students understanding through questioning. More importantly, whenever teachers encounter with the challenges of questioning in their classrooms, they need to employ different strategies.

As an M Phil scholar and practitioner-researcher in the field of questioning in the mathematics classroom, it will be vestibule with mathematics teachers, mathematics department head and policymakers. It helps to promote students' thinking and strengthening students' understanding. It is said that the effect of questioning on student achievement has been researched for many years in mathematics. This study will be an academic reference for further studies. Finally, future researchers may delve even deeper into other dimensions of understanding and uses of questioning.

Key Message of the Chapter

Research is an ongoing process. Arriving at this stage, my research journey was engaging, emerging and adorable to know the narratives on understanding and uses of questioning in the mathematics classroom and meaning-making from their narratives which assists in strengthening my patience, maturity, and insight for my

future research career. All of my research participants have to some extent similar stories.

When they were students, by the time when they have started teaching career, at the beginning, also they all are supposed to follow the notion of behaviorism. When students failed to grab the ideas and do not understand their mathematical language of teaching all teachers started to think of changing their teaching and learning process and even questioning. However, some participants were conformist and others were nonconformist. Some participants followed the notion of behaviorism but others were following constructivism. Some participants were knowingly or unknowingly following the Bloom's taxonomy (1956) while others were using different questioning strategies that have discussed in chapter II and V. Some participants were aware of how to do justice while questioning but others may not. Additionally, all participants were aware of connecting mathematics in day to day life while questioning.

Thus, questioning used in the mathematics classroom is a process that traces back to Socrates in historical accounts. In Plato’s The Republic, Socrates used a series of strategic questions to help his student understand the concept (Tienken, Goldberg & DiRocco, 2009). Even today, teachers at all levels still use questions as one method of helping students to develop productive thinking skills and understand concepts and ideas.

Final Thoughts…!

This study is significant to me because it helps me to expand my professional ability and questioning practices. In spite of various challenges such as time duration, teachers' understanding on questions and questioning, etc., I have prepared this research report which improved my questioning strategies to explore the kinds of questions teachers asked and responses in the student-centered classroom. In the

student-centered environment, I know, the teachers ask more reasonable questions and receive more proof-building responses. Sometimes, different teachers expect different answers from same questions. In the stories of Rebina, Sudha, and Indra, they ask initiating questions to the whole class, whereas in stories of Lal Bahadur, Rajkumar and Iswar, they accepted, volunteering responses from students.

Thus, I request mathematics educators for supporting mathematics teachers to become more comfortable with mathematical discussions through questioning in the classroom. To strengthen students' thinking through questioning is an active and challenging task for mathematics teachers. The support system along with professional development training is necessary to encourage and activate future mathematics teachers (Ilaria, 2009). Those support systems include the teacher's awareness through the reflection of the type of questioning they ask.

Near to final, successful mathematics teachers use focused questioning to assess student's understanding, prompt critical thinking, reasoning, and sense-making of mathematical ideas (NCTM, 2014). The questions asked by the teacher would encourage students to clear their thinking as meaningful contributors. Teachers would able to ask questions that evaluate various levels of students' understanding and support students in asking their questions. NCTM (2014) proposes that asking questions alone is not enough to ensure that students can make sense of mathematics and improve their understanding. Hence, the type of questions asked and pattern in asking them are also important factors to reflect on.

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APPENDIX I

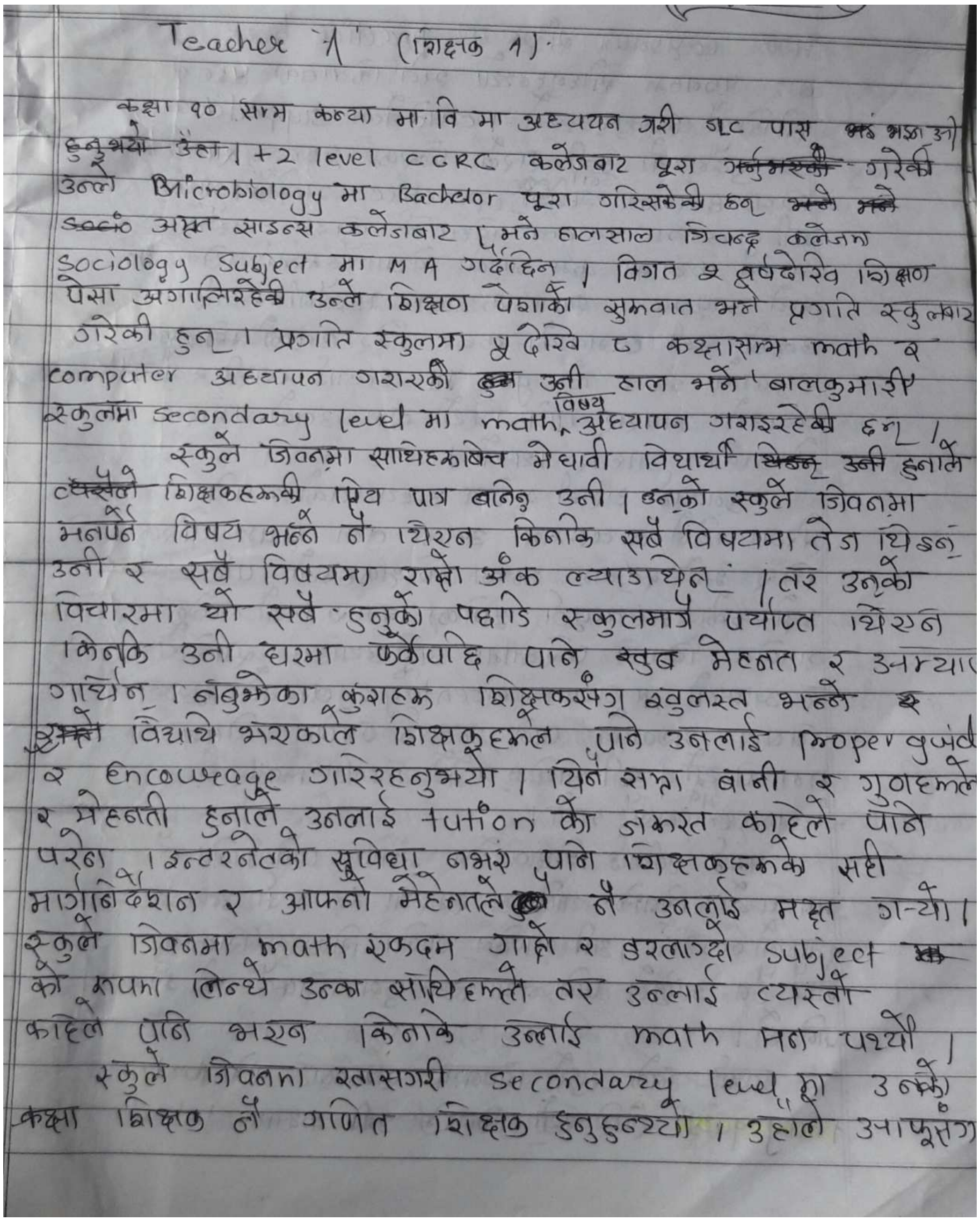
Thematic Concepts

1. History of learning mathematics as a student, teacher and teacher trainer.
2. The factors that inspired to study mathematics.
3. Meaningful mathematics learning as a student.
4. The questions used to ask in regular mathematics class by a mathematics teacher.
5. Questioning as a method to make teaching meaningful.
6. Types of questions asked in regular mathematics class.
7. Difference between questioning in mathematics classroom as a student and teacher.

APPENDIX II

TRANSCRIPTION EXCERPTS (FROM REBINA'S STORY)

Sample Story in Nepali



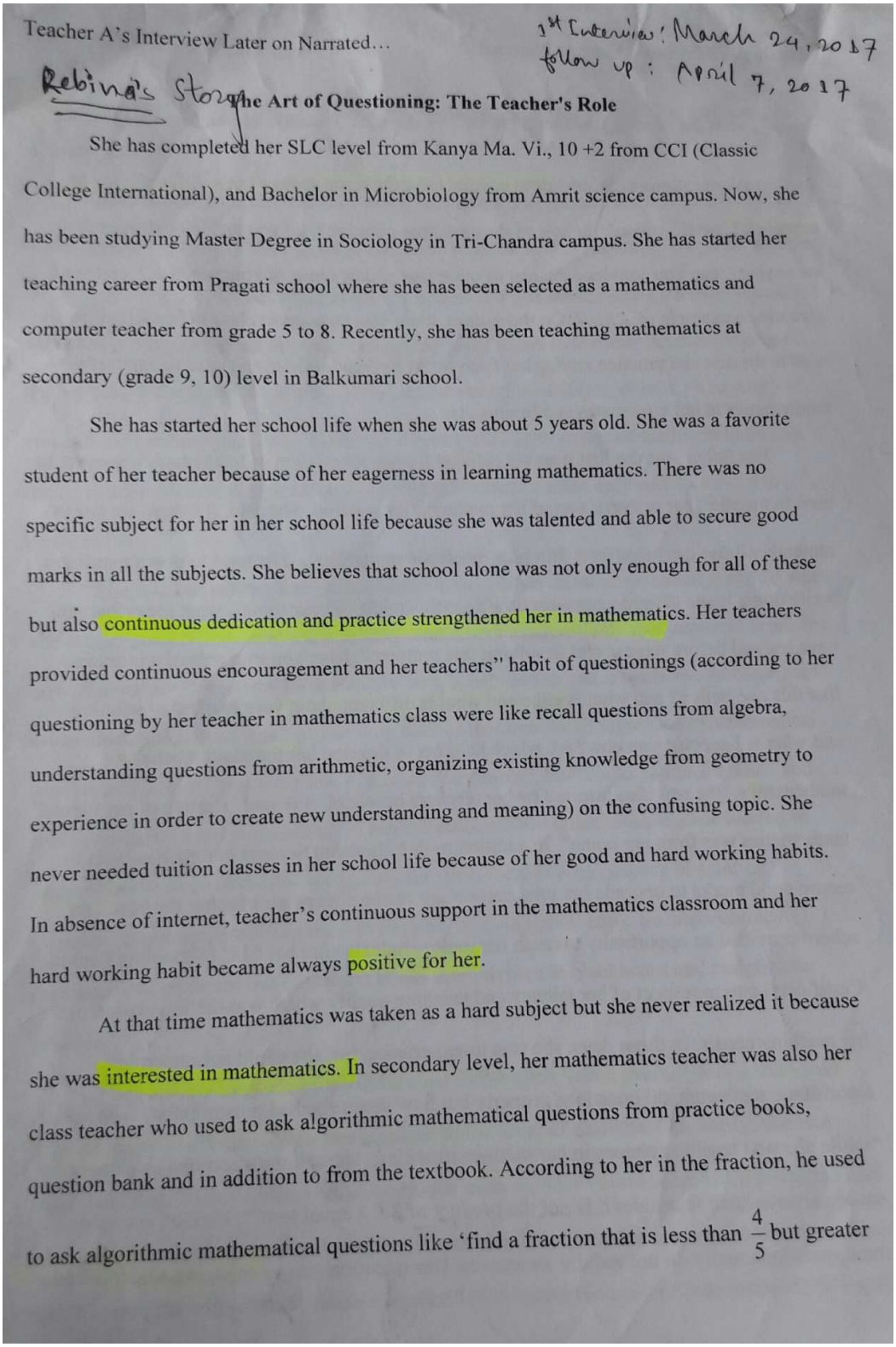
Teacher '1' (शिक्षक 1)

कक्षा १० सम्म कन्या मा वि मा अध्ययन गरी SLC पास भइआउनु भएको उहाँ। +2 level CCRC कलेजबाट पुरा गरेकी उहाँले Microbiology मा Bachelor पुरा गरिसक्नु भएको छ भने अमृत साइन्स कलेजबाट। भने हालसाल त्रिचन्द्र कलेजमा Sociology Subject मा M A गर्दैछिन। विगत ७ वर्षदेखि शिक्षण पेसा अँगालिरहेकी उहाँले शिक्षण पेशाको सुरुवात भने प्रगति स्कुलबाट गरेकी हुन। प्रगति स्कुलमा ५ देखि ८ कक्षासम्म math र computer अध्यापन गराएकी उनी हाल भने 'बालकुमारी' स्कुलमा secondary level मा math विषय अध्यापन गराइरहेकी छिन्।

स्कुले जिवनमा साथीहरूबिच मेधावी विद्यार्थी उनी हुनाले पनि शिक्षकहरूकी प्रिय पात्र बनिन् उनी। उनको स्कुले जिवनमा मनपर्ने विषय भन्ने नै थिएन किनकि सबै विषयमा तेज थिइन् उनी र सबै विषयमा राम्रो अंक ल्याउथिन्। तर उनको विचारमा यो सबै हुनुको पछाडि स्कुलमात्रै पर्याप्त थिएन किनकि उनी घरमा फर्केपछि पनि खुब मेहनत र अभ्यास गर्थिन। नबुझेका कुराहरू शिक्षकसँग खुलस्त भन्ने र विद्यार्थी भएकाले शिक्षकहरूले पनि उनलाई proper guide र encourage गरिरहनुभयो। यिनै राम्रा बानी र गुणहरूले र मेहनती हुनाले उनलाई tution को जरुरत कहिल्यै पनि परेन। इन्टरनेटको सुविधा नभए पनि शिक्षकहरूको सही मार्गनिर्देशन र आफ्नो मेहनतले नै उनलाई मद्दत गर्‍यो। स्कुले जिवनमा math एकदम गाह्रो र डरलाग्दो Subject को रूपमा लिन्थे उनका साथीहरूले तर उनलाई त्यस्तो कहिल्यै पनि भएन किनकि उनलाई math मन पर्थ्यो।

स्कुले जिवनमा खासगरी secondary level मा उनको कक्षा शिक्षक नै गणित शिक्षक हुनुहुन्थ्यो। उहाँले आफूसँग

Sample Story in English



Teacher A's Interview Later on Narrated…

1st Interview: March 24, 2017
follow up: April 7, 2017

Rebina's Story

The Art of Questioning: The Teacher's Role

She has completed her SLC level from Kanya Ma. Vi., 10 +2 from CCI (Classic College International), and Bachelor in Microbiology from Amrit science campus. Now, she has been studying Master Degree in Sociology in Tri-Chandra campus. She has started her teaching career from Pragati school where she has been selected as a mathematics and computer teacher from grade 5 to 8. Recently, she has been teaching mathematics at secondary (grade 9, 10) level in Balkumari school.

She has started her school life when she was about 5 years old. She was a favorite student of her teacher because of her eagerness in learning mathematics. There was no specific subject for her in her school life because she was talented and able to secure good marks in all the subjects. She believes that school alone was not only enough for all of these but also continuous dedication and practice strengthened her in mathematics. Her teachers provided continuous encouragement and her teachers'' habit of questionings (according to her questioning by her teacher in mathematics class were like recall questions from algebra, understanding questions from arithmetic, organizing existing knowledge from geometry to experience in order to create new understanding and meaning) on the confusing topic. She never needed tuition classes in her school life because of her good and hard working habits. In absence of internet, teacher's continuous support in the mathematics classroom and her hard working habit became always positive for her.

At that time mathematics was taken as a hard subject but she never realized it because she was interested in mathematics. In secondary level, her mathematics teacher was also her class teacher who used to ask algorithmic mathematical questions from practice books, question bank and in addition to from the textbook. According to her in the fraction, he used to ask algorithmic mathematical questions like 'find a fraction that is less than $\frac{4}{5}$ but greater