Developing Culturally Contextualized Mathematics: The Journey to Becoming a Transformative Teacher

Hem Lal Dhungana[1], Ruma Manandhar[2], Niroj Dahal[3], Indra Mani Shrestha[4]

[1]Graduate School of Education, Mid-West University

[2]Departments of Social Sciences and Education, Nepal Open University

[3,4]School of Education, Kathmandu University

ABSTRACT

This article studies the first author's (Hem) transformation from a traditional practitioner to a critical and culturally responsive Nepalese mathematics teacher. This paper is developed from the perspective of the first author's experience using the first person "I". I have thoroughly examined my past experiences as a student, teacher, and educational researcher in schools within the Surkhet Valley, Nepal. The main purpose of this study is to critically explore my experiences of learning and teaching mathematics, both within and outside their contexts, and to envision myself as a transformative learner, teacher, and educator in mathematics. This study is framed through the research question: How can I envision myself as a transformative learner and teacher of mathematics? This study aims to explore the mathematical concepts that learners have acquired through context-based instruction. Moreover, I gradually shifted my focus from merely solving mathematical problems to effectively teaching my subject through a decontextualized mathematics teacher to a contextualized mathematics teacher. At this moment, I am navigating a critical point and actively searching for more effective alternatives to enhance culturally meaningful learning for students through a shift toward transformation. This study employs a narrative inquiry approach to deeply reflect on my lived experiences as a student, teacher, and educational researcher in mathematics education. In this approach, narratives of pedagogical practices analyze traditional decontextualized mathematics and investigate transformative pedagogy as contextualized mathematics. I utilized three theories: living education theory, sociocultural theory, and transformative theory.

Keywords: auto/ethnography, narrative inquiry, de/contextualized, mathematics

INTRODUCTION

This paper is drawn from one section of the first author's MPhil dissertation in mathematics education with the help of second, third, and fourth authors. The second author, Ruma, served as a principal supervisor and fourth author, Indra, served as a second supervisor by offering various perspectives from inception to finalizing the article. The third author, Niroj, helped me shape and reshape the paper at the publication level by offering critical comments throughout the article. The article describes classroom and outside practices in mathematics teaching and learning that transform decontextualized traditional mathematics teacher into contextualized culturally responsible mathematics teacher. A narrative inquiry approach has been used to focus on the experiences of my beliefs about nature of mathematics as a mathematics teacher working in schools in Surkhet Valley, Nepal.

I currently serve as a novice practitioner of mathematics education as a teacher, researcher and educator at a school and a university in Nepal, and I have dedicated over a decade to teaching mathematics at the school level. Throughout this period, I have encountered diverse teaching and learning methods. During my postgraduate studies, I utilized a variety of research approaches, including multi-paradigms and critical auto ethnographic research, to critically reflect on my personal beliefs and experiences related to the teaching and learning of mathematics, aimed at improving my practices as a teacher and learner by envisioning better alternatives. My life experiences have motivated me to transform from decontextualized mathematics teacher into a culturally contextualized mathematics teacher. In this regard, I express my stories through the lens of transformative learning theory [1]. In this article, I utilized narratives or stories as a tool for capturing and examining my beliefs and practices. I hold the view that narratives offer meaningful opportunities to grasp the lived experiences within mathematics pedagogy, to delve into reflections on teaching mathematics, and to gain insights and alternative perspectives that can positively impact my behavior and practices. As mentioned by [2], humans are inherently storytelling beings, leading lives shaped by stories both individually and socially. From my perspective, studying narrative entails understanding how human experiences unfold in the world. Consequently, I employed narrative as a diverse descriptive method, as an outcome of methodology, as a means of making sense of life, and as a phenomenon, drawing upon the works of [2], [3].

Misunderstanding Vs Sound Understanding

Chutti Makai Bhutti

Chutti Makai Bhutti….

I still remember I along with my sister and other friends used to joyfully sing together Chutti Makai Bhutti, Chutti Makai Bhutti…….. when on the way back home from school. It may be any day of 1990. The meaning of the song is "school gets closed and reaching home we can have maize for tiffin." I started schooling from a private English medium school named Sunrise English Boarding School where I studied up to UKG and shifted to government school. I was admitted to Grade 2 directly without studying Grade 1.

On the very first day at Shree Karnali Secondary School, a government school, a sack was sent with me. It was a seat which I understood after seeing other friends sitting on the floor spreading the sack that they had brought with them. I carried a sack to read in the school. There were no desks and benches in classrooms. I remember that I would to sing about multiply of 2, as given. I feel happy and interesting to read it with loud sound. Such as, in multiply of 2, Dui Akane Dui, Dui Duna Chhar, Dui Tiha Chha, Dui Chauko Aath…. The meaning is, two one is two, two twos are four, two threes are six, and two fours are eight and so on.

In fact, I started learning mathematics and other subjects through rote learning in my childhood.

For example: - (i) Add $6 + 5 = ?$

(ii) Subtract: $7 - 3 = ?$

Solution, (i) Here, Step 1: $We\ know\ that,\ \ 6 = ||||||$ and $5 = |||||$

Step 2: $6 + 5 = |||||| + ||||| = ||||||||||| = 11$

(ii) Here, Step 1: $7 = ||||||| \ \ and \ 3 = |||$

Step 2: $7 - 3 = ||||||| - ||| = |||| = 4$

I failed in mathematics in Grade 8. I felt mathematics the most difficult subject after that. In the second year in the same Grade, one of my friends helped me learn the mathematical formula in the following way. $(a + b)^2 = a^2 + 2ab + b^2$ as given below in three steps.

For example, factorize: $(x + 5y)^2$

Step 1: We know that, $(a + b)^2 = a^2 + 2ab + b^2$

Step 2: Here $a = x \quad and \quad b = 5y$

Step 3: $(x + 5y)^2 = a^2 + 2ab + b^2 = x^2 + 2.x.5y + (5y)^2$

$= x^2 + 10xy + 25y^2$

I felt that I understood mathematical formula and went back home and practiced those formulas at home myself. And finally, I developed confidence that I could use that formula $(a + b)^2$, anywhere else. I became happy on that day and continued practicing at least two problems of mathematics every day and became competent in mathematics. From that day, I developed my habit of solving mathematical problems with sound understanding. I completed my school and 10+2 study from the nearby school in my home, Shree Karnali Higher Secondary School.

On April, 2020, I was at my home town Tikapur during the lockdown due to the spread of Coronavirus in Nepal. I remember that, teacher Mr. Jhoo would teach us on the ground in front of my class in school. That day maybe I was in class eight. Many of the days we learn mathematics through algorithm. According to [4], algorithm is a finite, explicit step-by-step procedure for solving a definite problem. I used to learn about mathematics operations such as addition and subtraction as given algorithm.

The decontextualize methods refers that memorizing word by word such as memorize synonyms, antonyms and flashcard [5]. I remember that at the time of studying SLC, my teacher who taught me at primary level advised me to understand concepts and not to memorize the rules. He further added that learning never becomes permanent through memorization. I knew this ideology was also one of the non-contextual strategies of learning. This reductionist ideology was also one of the disempowering forces that were preventing me from relating the material and non-material worlds [6]. The contextualization is defined as an instructional approach that generates explicit connections between the teaching of reading, writing, or math [7]. He wrote on his paper that contextual learning method helps students connect the content they are learning to the life contexts in which that content could be used. In addition, learner constructs their mathematical ideas with the relations between learner, teacher and context about the problem. And one manner to create this relationship is through contextualization or the teaching of basic skills in the context of disciplinary topic areas [8].

Theoretical Position

Along the way, I've come to recognize that there isn't a singular 'royal road' to transformative pedagogy. Rather than relying solely on grand theories, I find value in locally developed frameworks that provide to both my personal growth and the needs of others in my study. According to [9], the traditional perspective on theory lacks utility for me. This perspective offers a broad explanatory framework with descriptions and explanations for empirically observed patterns and individual behaviors. Pant suggests that theories should enhance our teaching and learning. In addition, I sensibly choose Living Educational Theory [10], Vygotsky's Sociocultural Theory [11], and Transformative Learning Theory [1].

In this research study, Living Educational Theory serves as a powerful tool for self-awareness and professional growth. It prompts me to ask the fundamental question: "How can I enhance my practice?" Through Living Education Theory, I engage in reflective narratives, exploring my journey as both a mathematics teacher and an educational researcher. As I gain awareness, I articulate my existing teaching and learning practices, weaving together my experiences, insights, and aspirations. It empowers me to evolve, adapt, and contribute meaningfully to the field of education through my study.

In my research, I use sociocultural theory to use knowledge about how students learn to enhance their understanding of teaching and learning activities. It's essential to recognize that how students learn is distinct from what they learn. To explore this further, I have selected Sociocultural Theory as one of the theoretical frameworks for my study. In my stories, I discovered the Zone of Proximal Development (ZPD). In my research, the Transformative Learning Theory, as proposed by [12], provided me with novel ontological,

epistemological, and axiological foundations. Ontologically, it facilitated the integration of diverse worldviews into my own, leading to a transformation from my current state of being to a state of becoming through critical self-reflection. Epistemologically, my instrumental knowledge shifted to communicative knowledge, aligning with transformative learning theory. Axiological, this broadened my understanding, combining instrumental and communicative knowing, ultimately promoting contextualization in mathematics education through transformative pedagogy.

RESEARCH METHODOLOGY

I used three research paradigms, namely, interpretivism, criticalism and post modernism. I draw guidance from these different paradigms and these paradigms empower me to construct localized understandings of the life experiences of educators and students, as well as the cultures within classrooms, schools, and communities where I work. The interpretive paradigm emphasizes the importance of interpreting meanings and understanding oneself and others, including students, teachers, and school principals, in order to enhance my teaching practices [13]. Throughout my research, I frequently employ interpretivism to grasp meaning and understanding within my interactions with students, friends, and family, thereby enhancing my teaching and learning endeavors.

I view interpretivism as a gateway to nurturing practical interest, as described by [14]. Additionally, I integrate the criticalism research paradigm by posing challenging questions to my students to enhance their grasp of mathematical concepts within my dramatic stories or poems about teaching beliefs. This approach incorporates a critical dimension into the writing process, alongside the interpretive paradigm, facilitating critical analysis and critique of established strategies and practices. By promoting critical awareness, I aim to encourage students to question assumptions and address difficulties encountered during classroom activities, as outlined by [15].

Through the postmodernism paradigm, I explore alternative and inclusive logics such as dialectical, poetic, narrative, and metaphorical logics, which acknowledge the complexity of knowing, being, and valuing [16]. Postmodernism allows me to approach topics from multiple perspectives, recognizing that internal thoughts and feelings are not directly accessible from the external world.

In my exploration of auto/ethnography as a research methodology, I employed narrative writing as an investigative tool. This method facilitated my comprehension of experiences through ongoing collaboration between me as the researcher and the participants, unfolding over time within specific locations or a series of places. The intention behind utilizing narrative inquiry was to extend an invitation to readers to embark on a shared journey with me as the researcher, one characterized by mutual discovery and collaborative creation [3].

Being an auto/ethnographer in field

As an auto/ethnographer, the research field serves as a backdrop that encapsulates the contexts and settings portrayed in the researcher's narratives. In this dual role, I functioned both as an autobiographer and an ethnographer. In my capacity as an autobiographical researcher, I recounted my personal and professional lived experiences, including any contradictions, which served as my primary data. As an ethnographic researcher, I immersed myself deeply within the realm of teaching and learning, engaging with students as central research participants, along with parents, teachers, and friends, to capture their own lived experiences and contradictions as additional data. The study took place at a private school in Birendranagar, Surkhet, focusing on students in grades X and XI. Data collection methods included informal conversations and interviews conducted within and outside classrooms, as well as interactions with parents, colleagues, and the head teacher. Field notes were recorded, and photographs and videos were taken using my cell phone and social media platforms such as Facebook. These materials were later transcribed into journals, and I critically reflected on my role as an auto/ethnographer throughout the research process.

Moreover, I gathered narratives as data pertaining to my pedagogical approaches, wherein my reflections on mathematical concepts, emotions, and observations served as a means of comprehending the social environments. Through this process, I interpreted the collected data to derive meaning from them. Consequently, my data serve as textual representations of my subjective experiences, aiding in the critical examination of the social contexts and phenomena linked to my de/contextualized teaching and learning. This analysis allows me to envision potential pedagogical avenues within my professional realm.

My Student's Solution

Problem: If $\sec\theta = -3$, what are the possible values of $\tan\theta$?

Sol^n Given $\sec\theta = -3 = \dfrac{h}{b}$

$\therefore h = -3, \quad b = 1$

So, $P = \sqrt{h^2 - b^2} = \sqrt{(-3)^2 - (1)^2}$

$= \sqrt{8}$

$= \pm\, 2\sqrt{2}$

Now, $\tan\theta = \dfrac{P}{b} = \dfrac{\pm\, 2\sqrt{2}}{1}$

$= \pm\, 2\sqrt{2}$

Ans

DISCUSSIONS

Practicing De/Contextualized Mathematics

As a student and teacher of mathematics at different levels, I have been gaining various experiences about the decontextualized nature of mathematics. I shifted from one belief of mathematics to another that is 'no change to changeable' nature of mathematics. My narratives of my experiences shift from the absolutist view of mathematics concerning the fallible nature and beyond have been taken believing that stories could provide meaningful prospects to make intellect of lived experiences on the nature of Mathematics and to generate meanings and alternative perspectives on the nature of mathematics that influence my behaviors and practices in various ways in teaching and learning Mathematics.

I now came to realize to clarify my beliefs and practices on how have I been developing myself viewing the learning and teaching as a learner, teacher and as a teacher educator. Moreover, I frequently engaged bringing various episodes with examples from the contextualized practices of learning and teaching of

mathematics of Nepal. Those episodes portrayed the spiraling moments that I have been facing as a student, as a teacher at various levels, as a researcher and as a teacher educator.

Episode I: Mathematics for Secret Tricks

I remember that it was October, 2016. I used to teach in a secondary level school in Birendranagar Surkhet. During that time, I was teaching trigonometry of optional Mathematics in grade 9. In the very first day of that chapter I memorize some formula and some basic tricks. On some day, I was teaching a problem of trigonometry. It would take couple of minutes to solve it and make students clear about concept. One day, one of the students suggested me to apply tricks in solving trigonometric equations. I suddenly internalized the application of tricks in Mathematics and thanked him. Thereafter, I began to teach using trick method which motivated the students a lot managing their time. I did not only manage the time, along it students' learning process became so easy and comfortable. In addition, I articulated by an example of trigonometry which I discussed in the paragraphs above. I solved the same problem by using two different methods. One of the methods is simple and the next one is simple. I compared and contrasted both the methods.

One day during the lockdown period while i was studying at my room, my lovely daughter came close to me. At that time she was at grade 3. And asked to teach me simple addition, subtraction and multiplication problem. Immediately i paid attention at her and asked her. The following conversation took place in my home.

A: Where do you have a problem?

B: Here, in my mathematics book

It was difficult to do…… Uncle!

A: It is addition, please concern to me….It is not so big, my dear!

B: I never learnt this problem………

After that I came to know her problem, it astonished me because the problem was not so big. I took her math's book and saw a very good example of using tricks in addition. I taught her accordingly the tricks given in that book. Finally she understood it. What I learnt was her math teacher rarely used math tricks in teaching math to the pupils. I have presented a part of dialogue between me and my daughter given below. Where A refers to me and B refers to my daughter.

A: Now, listen me!

B: Yes! Uncle…..

A: With the help of basic principles of tens and unit places, the addition of two-digit numbers is performed by…….

First, take 43+34 as a problem

Next, split the second number into tens and unit places…..

B: It's interesting!

A: That is 34=30+4

Now, finish the ten's addition as 43+30=73

Did you understand? My pretty daughter!

B: Yes! Uncle

A: Finally, add the remaining unit place digit as 73+4=77

How do you feel about math trick…?

B: Awesome, Uncle! I understand….

A: Now, I give you a problem, solve it, Problem is

Add: 54+34

B: Yes! Uncle, I will do.

After that she solved that question and she finished her all addition problem related to it. Similarly, I continued to facilitate her mathematics problem. Next day, she asked me as:

B: Uncle! How do multiplied by 15

A: I said, what? …..

B: Do you teach me about multiplication of 56 and 15…………

A: Yes! Dear I teach you math trick that multiplied by 15

B: Ok, Uncle.

A: First, Consider the multiplication of two numbers say 56 and 15

Now, add zero at the end of the first number, it becomes 560

After that, Divide that number by 2, we get 560/2=280

Then, add the resultant number with 560, so 560+280=840

So the answer for 56 and 15 is 840

B: Awesome! Uncle! I understand…..

I enjoyed a lot uncle!

A: Yes! It is a math trick of multiplication by 15……..

B: Yes! I understand

After teaching her about using math tricks for addition, she began to practice using tricks in addition problem. Next day she came with some attempts which were absolutely correct. She did well applying the tricks in addition and subtraction. Some of the attempts by her are given below: About 5 years ago, I used to teach the fifth graders in a secondary level school of Birendranagar, Surkhet. During that time, I would take two periods for class 5 in a week. One day when I entered into a classroom, a student asked me a problem of division. I solved that problem step by step using the whiteboard. Just at the moment I also realized that why not teach students some tricks so that they can easily grasp that sort of problem. I asked the students, do they need tricks of division? They replied yes with a single voice with great excitement and vigor. Being exhilarated by students apt of knowing I mentioned the given below tricks with appropriate examples. What sensed to me that the students unknown about the tricks, the mathematics is foreign to them? The students familiar with tricks are completely friendly to it. I argue that simple mathematics tricks help us with fast calculations and

develop our mathematical skills. For example, the multiplication tricks will help students to learn mathematics tables and fast multiplication [17]. I found that the mathematical tricks do not only help students but also support managing time in final exams as well as in the competitive exam and solve the mathematics questions with accuracy. The well-known fact is that our human brain is similar to a computer. It means our brain is like the hardware of a computer whereas our mind is like the software [17].Regarding the application of Math trick, the problem depends on how individual defines and accepts a trick. If we understand by a trick a "skillful act" that can be put in simple sequences of logical steps, then it is a mathematical action. If we understand by a trick an act planned to "deceive or mystify" others or oneself, then this clearly cannot be conventional. The problem is accepting illogical ideas put in deceptive bright capsules [18]. Thus, learning simple arithmetic tricks will help the students to gain their confidence and enhance problem-solving skills. With these learning skills, they can achieve big success in their upcoming future [17].

As an educator, I argue that mathematics curriculum may develop to solve tricky mathematical problems by connecting real word problems. In Nepal, we have a practice of traditional algorithmic problem solving methods without connecting the textbook problems to the cultural life world of students [13]. When I learner, I would learning and teaching mathematical problems which were tricky I did not solve easily. I believe that if all tricky problems of mathematics connected to the real world, we may solve them in time and easily. How to connect mathematics problems with the real world? I question myself. It helps for understanding mathematics easily. As a learner, many of my teachers would solve easily by using tricks in mathematics problems but some of my teachers sometimes could not solve mathematical problems. Thereby I conclude that if my teaching and learning activities to be decontextualized then I can solve this type of tricky problem. But anybody cannot memorize anything for long life, so decontextualized way of teaching and learning cannot produce permanent learning.

Episode II: True to Myself: Me as a Practitioner Learner and Teacher

This is not my Mathematics, Hem! How do you improve it, this is only for people having a mathematical mind like you!

I still remember when I was not a good student of mathematics in school days. I couldn't be upgraded to 9th standard from 8th standard because of the least marks in five subjects. In comparison among the five subjects mine marks in mathematics considerably poor. I was baffled taking my progress in the study. I felt mathematics very hard and challenging subject. I was very upset and discouraged from getting the result of the 8th standard. I have been compelled to re-continue the 8th standard. When I resumed my 8th standard, at the very beginning of the class I remember my conversation with one of the friends who were also not promoted to 9th standard in the classroom. I told him, I am failed in the 8th standard because of weak in mathematics.

Again, I asked, my dear friend……please help me to improve my mathematics.

I also told him, Because of not understanding the formula I can't solve the mathematical problems.

He replied, I already known about that formula and can use it…but I am also failed…..how could fail I am. I got surprised listening to him. Meanwhile, I requested him to teach me the formula which he learned in the classroom. He immediately took the pen and copy and started to facilitate me.

The formula is $(a + b)^2 = a^2 + 2ab + b^2$

Let's solve related problem as,

$$(x + 2y)^2 = a^2 + 2ab + b^2$$

$$= (x)^2 + 2.x.2y + (2y)^2$$

$$= x^2 + 4xy + 4y^2$$

After that he did gave me a problem to solve immediately that $(2y + 3x)^2$,

And I solve it as, $(2y + 3x)^2 = a^2 + 2ab + b^2$

$$= (2y)^2 + 2.2y.3x + (3x)^2$$

$$= 4y^2 + 12xy + 9x^2$$

Again he gave me another problem as $(x - 2y)^2$, but immediately I feel difficult and asked to him: This is different from the previous problem, is it friend?

He told me, "Yes, this is different, but so easy.

At first, you may learn the formula: $(a - b)^2 = a^2 - 2ab + b^2$

Let's solve the related problem as,

$$(x - 2y)^2 = a^2 - 2ab + b^2$$

$$= (x)^2 - 2.x.2y + (2y)^2$$

$$= x^2 - 4xy + 4y^2$$

The formula which is mentioned was so difficult to understand me through the teacher taught us many times. But I easily grasped the formula through the facilitation of that friend. He made me clear about that formula using his style and method. Since that learning phenomenon in my life, a twist came in my study. The student who used to very apathetic towards mathematics suddenly turned motivated and encouraged to learn mathematics. After that, I started to love and practice mathematics and improved a lot. I started to secure more marks due to the motivation which I get from my classmate.

It could be any day when I study in tenth class in a nearby government school. I remember those days before the final examination that is School Leaving Certificate. Me and my sister (daughter of uncle) were studied in the same class and would be preparing for that examination. My sister come to my house and said to me, hey! What are you doing?

At that time I was practicing mathematical problems in my room. And I answered,

Yes! Sister I am here.

This is not my mathematics, Hem! How do you improve it, this is only for people having a mathematical mind like you!

Don't worry; it is easy for practicing people.

No, I don't believe you. I also practice many times.

After that, I convince her and we were going to discuss some mathematics problems which were she didn't understand in the classroom. One of the problems which were I solved is given below: Question: Let Ram an engineering student, was asked to make a model shaped like a cylinder with two cones involved at its two ends by using a thin aluminum piece. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model that Ram made.

For solution, at first, I introduce about cylinder and cone and its real-life examples such as the example of the cylinder are: bucket, water tanks, battery, cold drinks, etc. also examples of the cone are: ice cream, funnel, Christmas tree, traffic cone, etc. Now, we have to find out the volume of given solid that is we need to find out volume of two cones and one cylinder. After that we add them thus finally we get the required volume of

solid.

Is it clear…….

It is clear until now.

After that I solve it step by step slowly with interactions and discussion to her.

Now, we understand that,

Volume of air contained in the model = Total volume of the solid

Given, diameter of base of each cone = 3 cm.

So radius of the base of the cone $= \frac{3}{2}\ cm.$

Height of each cone = 2 cm.

Now, volume of the cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(\frac{3}{2})^2 \times 2 = \frac{3}{2}\pi cm^3$

Now, volume of both cone $= 2 \times \frac{3}{2}\pi cm^3 = 3cm^3$

Now, volume of the cylindrical portion $= \pi r^2 h = \pi(\frac{3}{2})^2 \times 2 = 18\pi cm^3$

Now, volume of contained in the model $=$ Total volume of the solid

$$= \text{Volume of two cones} + \text{Volume of cylindrical portion}$$

$$= 3\pi cm^3 + 18\pi cm^3 = 21\pi cm^3$$

$$= 21 \times \frac{22}{7}\ cm^3 = 66\ cm^3$$

Finally we found the volume of contained in the model which is a solid made by two cones and a cylinder. After that I show relation between formula of cone and cylinder as shown in given below:

Volume of the cylinder $= \pi r^2 h$

Volume of the cone $= \frac{1}{3}\pi r^2 h$

$$= \frac{1}{3} \times \text{Volume of the cylinder}$$

From the above interaction, we enjoy with discussion of the volume of cone as one-third of a cylinder. As the volume of the cylinder is $\pi r^2 h$, the volume of the cone is one-third of $\pi r^2 h$. After that, she said me, Woo! ……….It is interesting……..how nice?

After that, I smile and told to her, yes! Sister, mathematics is fantastic……then she told me, Sometimes, I will come here to learn some problems of mathematics.

Then I also promised to learn mathematics through discussions with her. On the next day, she comes to my house and we were discussing the next topic of mathematics that related to our examination. Through these interactions, my practice was doubled as an active learner. In addition, this interaction leads my learning process and ability was transform day by day.

I realized that I transformed my learning; a passive learner to an active learner. I believe that the transformation of learning not easy but the appropriate facilitation in the learning process can do it. I think that day was a day for transforming me as a practitioner learner. From that day onward I always question myself that, how to learn mathematics? And I want to be an excellent mathematics student. In addition, I conclude that learning mathematics with the help of friends with brief interaction makes mathematics interesting and it connects real-life situations with mathematics contents. In this process, it could lead to permanent learning of mathematics for me.

Sometimes, I could be upset by my teacher's teaching. It could not understand for me. And I question myself, what a boring class, how to understand it clearly? After thinking, yes! My mathematics textbook will help me to understand more. At that time I saw some examples of books one by one and make a note with understanding, which is self-learning. Self-learning is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals [19]. Self-learning includes learning through self-directed, self-monitoring, self-regulation, and self-evaluation that construct the knowledge, skills and abilities. In my learning process of various levels, I learn many contents of mathematics through a self-learning process that transforms me into a practicing learner of mathematics. It could be my transforming process from a passive learner into an active learner of mathematics content.

Transformative learning is the procedure of implementation transformation in a frame of reference [1]. A frame of reference includes a student's habit of the mind. Also personal point of view about anything. The habits of mind are precious by previous learning practices and cultural norms, while the points of view are the student's personal beliefs and attitudes [1]. Also, he identified four procedures of learning [21] and they are; one-elaborate an existing point of view, two-establish new points of view, three-transform the previous point of view, and four-transform habits of the mind. Though, the educational experience starts to transform the student and he starts to examine substitute points of view.

These substitute points of view may be replaced or be added to the existing point of view to generate a new point of view. This transforms into a habit of the mind when the learner can learn to appearance at things differently. This contains acknowledging potential biases of previous points of view, also new points of view [1], [20].

I think it has been on the month of August, 2015, I used to teach at secondary level in Children's Paradise Secondary School in Surkhet District. Teaching in class 10 is the most challenging job due to the perception of Iron Gate for the higher level of study. One day I was teaching about the mensuration chapter and a few days ago I had given project work on the same topic.

All the students were asked to submit the project work but one of the students project work submitted to me was a bit different.

Then I asked to her,

Me: Wow, how interesting your project

(She told me with smiling…..)

Student: Sure Sir….?

Me: Yes, it is interesting

    Good work my dear….

There was a figure of a man of a different geometric shape like a sphere, cylinder, rectangle, and square on the cover of the project work. I became astonished looking at that figure and went to the office and shown that figure to a senior mathematics teacher. Looking to figure he responded to me that

Hem sir, Gaṇitamā rasa chha bhanēkō yahi nai hō, math juice is the same as that. I became delighted and so happy getting his word. On the same day in the evening while return at home, much more things started to revolve and play in my mind. One that I obliged to think that how can I make the learning of mathematic much more interesting. I took the photo of the figure made by that student and posted it on my Facebook for account sharing purposes. I wrote the caption: "Mathematics as Body".

Episode III: Who is the Best Teacher- a Friendly Teacher?

Manisha! What's your problem, dear? Tell me how I can help you.

Sir, I can't understand mathematics. It never goes into my mind. Many times, I try to understand but it can't digest to me.

This is the conversation between me and a very weak-in-mathematics student of grade X. it could be any day of March, 2019. When I finished the mathematics course of grade X in Eager Bridge Secondary school in Birendranagar, Surkhet. The school administration divided all grade X students into four new sections: A, B, C, and D respectively. The school had instructed me to take the remedial classes that are in section A. there were 20 students altogether. According to my plan, I didn't teach any content on the first day rather I had to tell a story that motivates them for learning and I had a wide interaction with them. I had an assumption that one of the many reasons why students didn't like mathematics could be the distance maintained between teacher and students. I have heard from my friends (teachers) that, a teacher should maintain a distance with students. Otherwise, students don't obey the teacher, and it will be very difficult for teachers to teach them effectively. However, I had a different view that a teacher should build a good rapport with students to gain a positive attitude towards teachers. With this assumption, I dealt with those 20 students and interacted with one by one in the classroom. They had many hidden and untold stories deep seated into their mind and heart, which I wanted to be unfolded though it was a tough task.

I motivated them as, my dear students you have various talents in individual differences so want to say that you do not hide your talents. You don't have to go study but in general basic knowledge must go. Until now I was angry many times but from today I but don't be angry now if you understand my words. I myself what do think that if I arranged time, I must pull you to become zero to pass marks even to a student who doesn't know anything. It's my promise for you that to pull from zero to at least pass marks in your SEE examination. Many people say, they can do anything they want. When I at little, I listen at that time that, 'Agrakh grows at night'. Just similarly, you are the human and what cannot do by human? What do you think, do not get just pass marks in mathematics? Why not…Sure! Its only 40% from 100%. You do it. But there must be preparation for it from your side. I am prepared for you, what's about your side? You are prepared to get at least pass marks in mathematics…? Today I promise you that I have passed anyway if you are prepared to work hard.

After that, they seem to smile and happy, and a student said that, Yes sir….we are ready to go…. I answered, Good. Again another student also said to me for prepared to learn. After that many of them were promise me that to do hard work in mathematics. Then I am happy and said, good! I am happy. From tomorrow we will start our journey to get good marks in mathematics.

But sometimes such activities directed us another way. But I connect these activities with mathematics carefully. When they know about my focus on mathematics content, they were laughing with a smile. Then I also laugh and start to solve mathematics problems.

From this discussion I think learning being not only strict way it also being friendly way. Students produce more ideas for solving mathematical problems when they feel friendly, when they interact openly with teacher about their mathematical contents.

After digging out their anecdotes and narratives and my experience, I came to realize that most of the students learn effectively when they interact freely with his/her mathematics teacher. I also realized I transform from a strict teacher to the best teacher of students that is contextualized teacher. It means that I transform a

traditional teacher into student centered teacher. Student-centered teaching-learning is a collaborative approach that primarily focuses on cooperation, flexible learning, and experientialism to achieve learning objectives [21]. I conclude that student-friendly teaching produce increases student's interest in learning and practicing mathematics and their better results also.

REFLECTIONS

My investigation suggests that engaging in critical thinking does not imply adopting a negative viewpoint. Rather, individuals involved in critical reflection within the realms of teaching, teacher education, academic research, and educational policymaking are committed to upholding democratic values like equality, equity, and justice [22]. In this context, transformative learning involves a careful examination of assumptions, the status quo, or commonly accepted ideas, which can take place through either group interaction or individual contemplation [1]. For educators, teacher educators, and policymakers to enhance themselves, active involvement in critical reflection on their own practices is crucial—a purpose consistent with transformative education research, as demonstrated in this study. Key elements for fostering critical dialogue include maintaining an open mind and listening empathetically with genuine respect for others' perspectives [23]. Therefore, it is essential for teachers and teacher educators to cultivate critical literacy, enabling them to question aspects such as: Why have I chosen to be a teacher or teacher educator? What does it truly mean to fulfill this role? This process has the potential to steer teachers and teacher educators toward becoming transformative learners [24].

FINAL REMARKS

I believe that reflecting on my experiences can provide valuable insights for fellow researchers undertaking similar studies in their respective fields. Furthermore, engaging in critical self-reflection on my teaching and learning activities has enabled me to acknowledge the substantial impact of my teaching domains on shaping my decision-making process. The family undoubtedly plays a crucial role in nurturing the development of a transformative learner. I anticipate that dialectic logic and genres can assist me in navigating my intricate position as a teacher and teacher educator. Ultimately, I aspire that narrative logic and genres will enable me to connect with those around me by reading, listening, and interpreting their stories, thereby enhancing my personal and professional life. Guided by this perspective, I am now conscious of the practices of a critical mathematics teacher with transformative sensibilities, someone who critically reexamines, reinvents, and reflects on pedagogical practices. It is crucial to note that being critical does not equate to being negative; rather, I am dedicated to upholding democratic principles of equity and justice while teaching mathematics in the classroom.

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