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A Textbook Problem-Solving Student Becomes Transformative Contextualized Mathematics Teacher: Journey of Learning and Teaching

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Abstract

This reflective paper portrays my personal-lived experiences via autoethnography (as a method of inquiry); Ethnodrama and narrative (as representational methods); and transformative learning theory (as a theoretical referent). Emphasis on textbook, realization, and obligation were/are the characteristics regarding my transformative journey from a textbook problem-solving mathematics student to being a contextualized mathematics teacher. As a student, the lure of scoring ≥ 90 *marks led me towards the path of solving as many textbook problems (as possible) with the only goal to perform well in examination. While on the verge of entering the teaching profession; reflecting back to school days, made me think about the question: "Do I desire to give my prospective students (mathematics education) in the same contexts or in the same manner that I experienced during my school days?" Immediately, each time both my heart and mind used to answer, "Not really, No!" This sense of realization led me to the obligation of approaching my two years of Fellowship journey as a mathematics fellow that primarily emphasized linking mathematical contents with the local surroundings (of the learners). This study is beneficial for educators who aim to bring necessary reform regarding educational practices (particularly, in mathematics), so as to provide the outlook (to the learners) that 'Mathematics is everywhere around the surroundings'.*

Keywords: autoethnography, textbook-problem solving, decontextualized and contextualized mathematics education, transformative, local materials and surroundings

Introduction

This paper portrays my transformative journey from a school mathematics student, who used to emphasis on practicing more and more textbook problems to becoming a mathematics teacher, who emphasis on linking school mathematical contents to surrounding scenarios/situations. Therefore, the paper firstly, incorporates my journey as a mathematics student (back in school days). Then, the paper incorporates how I came across contextualized mathematics education. And finally, the paper incorporates my journey as a contextualized mathematics teacher. Therefore, the prime purpose of this paper is to explore and examine my that journey of transformation. Hence, the guiding research question is: How have I been

transforming myself into a contextualized mathematics teacher from a textbook problem-solving mathematics student?

A Synopsis of my Journey of Learning and Teaching

Back in school days, I was confined just to a mathematics textbook. My emphasis was always on solving as many textbook problems (as possible), in order to maximize my chances of obtaining ≥ 90 marks in any terminal examinations. In that process, however, I did not try hard enough to look out for application of mathematical contents in real-world scenarios. I was just focus on solving textbook problems using abundant of formulae, theorems, and by following set of procedures (taught by the teacher in the classroom).

Professionally, in April 2019, I started my teaching career, when I got an opportunity to do "Fellowship" by joining one of the NGO's (Non-Governmental Organizations) located at Kathmandu, Nepal, as a mathematics fellow. I got placed in one of the public-schools of one of the rural municipalities of Lamjung. There, I got an opportunity to facilitate around 180 students from grades 7-10 regarding Compulsory Maths. Before, going to the placement school, I got a residential training of 42 days. It was there, where I got an opportunity to be aware with teaching approaches, which were different from what I experienced as a student (back in my academic days). For instances; teaching mathematical contents through art forms like song, and through exploration of it on the local surroundings. I found that training fruitful, in regards to my Fellowship journey. My teaching to mathematics was primarily linked to local surroundings, daily-life activities, and student's interests. I used to emphasis more on teaching mathematics through collaboration, setting real-world scenarios, exploration outside the classroom, locally available resources, etc. For instances; field work, shop, wooden hallo, river flowing in their locality, scenario of festivals (Tihar, Bhai Tika), etc.

Fig. 1. Wooden hallo

Supporting Literatures

This study is guided by some major concepts/ideas, which are discussed briefly below:

Textbook Problem-Solving

During my school days, my mathematics teachers used to refer solved-example and exercise problems as a mathematics textbook problem. Where solved-example problem refers to problem whose solution is already provided in the textbook and in contrast to it, exercise problem refers to problem that require solution (Morina, 2022). My mathematics teachers used to assign problems as a class work and home work from the textbook itself. Therefore, in this study, textbook problem-solving refers to solving of mathematical problems (by an individual) given in solved-example and exercise sections of the textbook.

Decontextualized Mathematics Education

In this study, decontextualized mathematics education refers to that education model that encourage rote-memorization, or copying and pasting process of learning (Manandhar, 2022). That is, the learners learn by hard the formulae, theorems, and properties. And even follow the procedures (step-by-step), rules required to solve a particular kind of mathematical problem (as provided in the textbook or taught by the teachers/classmates). Moreover, here the learners indulge themselves in the learning process confined to a four-walled classroom where the learning process is teacher-centric, one-dimensional (no activity, no optimum discourse among the learner and the teacher or between the learners), and the learner is being afraid of asking or clearing their doubts, as the classroom environment is controlled by the teacher (Shrestha, 2011).

Contextualized Mathematics Education

In this study, contextualized mathematics education refers to that education model that encourage local learning and can reduce the domination of decontextualized education (Manandhar, 2022). That is, contextualized mathematics education emphasis on imparting mathematical contents to the learners by linking it to their daily life activities scenarios (which they are observing or experiencing). For instance; teaching home arithmetic (electricity bill) content using electricity bill provided by electricity department monthly. In contrast to decontextualized mathematics education, here the learning process is not confined just to the textbook. It is more student-centric, students are actively engaged, and involves discourse among the participants during the teaching and learning process (Mbelede et al., 2020).

Transformative Learning Theory as a Theoretical Referent

How and when transformation took place within myself - from a textbook problem-solving student to being a contextualized mathematics teacher? This question guided this study in the sense of critically reflecting about the beliefs, perceptions and lived-experiences, I carried back in my school days (as a mathematics student). Additionally, in regards to the sense of critically reflecting on my teaching practices, I carried out during my Fellowship (as a mathematics fellow), in relative to theory of transformative learning (Mezirow, 1991). As transformative learning theory is defined as a process by which one's can transform his/her "taken for granted frames of reference, in order to make it more inclusive, discriminating, open, emotionally capable of change, and reflective, so as to generate beliefs and opinions that can prove truer or justified to guide action" (Mezirow, 1991, p. 133).

Methods

This paper adopted autoethnography as a method of inquiry (Ellis et al., 2011). Additionally, adopted Ethnodrama (Saldana, 2011) and narrative (Shrestha, 2011), as representational methods to illustrate my lived-experiences (as a mathematics student and as a mathematics teacher as well), in regards to my contexts (e.g., social, etc.). I itself acted as a

storyteller and had made an attempt to present my reflective stories in an entertaining form (Saldana, 2011). I had illustrated my reflective stories predominantly from the lived-experiences of grades 7-10. This paper is guided by multiparadigmatic research paradigm: interpretivism, criticalism, and postmodernism (Taylor et al., 2012). Furthermore, in order to regulate the study, I adopted non-maleficence as ethical standard (Bryman, 2012), in order to be mindful regarding well-being, privacy, and dignity of others, I used pseudonym.

Discussion

Based on developed research question, this paper presented my transformative journey from a textbook problem-solving mathematics student to being a contextualized mathematics teacher in a series of three episodes: 1, 2, and 3 (in the form of stories), which are presented below:

Episode 1

Story 1: Teacher's Saying: Dear Students, Mathematics is a Scoring Subject; Practice Makes an Individual Perfect!

Once in grade 8 (April 2006), on the very first day of new academic session, the mathematics teacher told the classroom that *"Dear students! mathematics is a scoring subject, if you all work hard and practice it well, then you all can score good marks. Getting above 90 marks is very much accomplishable. And you all have surely heard about the famous proverb (especially in English): Practice makes an Individual Perfect! Therefore, you all should practice textbook problems as many times as possible. Practice whole textbook more than once (at least twice) in an academic year. Open mathematics textbook each day and practice at least a problem each day (if not possible to practice many)."*

Those keywords (scoring subject, practice) and the proverb quickly caught my mind. And the lure of obtaining ≥ 90 marks in mathematics made me started seeing it as the best pathway to perform outstandingly in mathematics.

Story 2: Everyone See Q. No. 5 of Exercise 9.1; Now, Copy the Solution!

Act 1

(*The stage is set; the director makes an announcement of Act 1 of story 2; and addresses the audience regarding the nature of drama to be performed soon.*)

Curtain Opens

(Background music is on)

(It could be any day of October in grade 8, 2006. The English period had just finished. The next class was of mathematics. Suddenly, there was pin-drop silence in the classroom. Mr. A (mathematics teacher) with a textbook, a chalk and a duster in the hand entered the classroom.)

Whole class (stands up and greet): Good afternoon, sir!

Mr. A (hand gesture): Good afternoon, Sit down everyone!

(Whole class sit straight, hands on the desk, and face towards the blackboard.)

Mr. A (writing simultaneously on the blackboard): Today, I am going to start new unit: mensuration.

Whole class (with low voice): Ok, sir!

(Mr. A writes rhombus as a heading on the blackboard and then below it, area of rhombus $= \frac{1}{2} \times d_1 \times d_2$ where d_1 and d_2 are the two diagonals.)

Mr. A (facing the class): In mensuration, first we will study rhombus and the area of rhombus is this. . . (looking on the blackboard). So, the area of the rhombus is. . . (facing the class).

Whole class (altogether in one voice): $\frac{1}{2} \times d_1 \times d_2$.

Mr. A (facing the class): where d_1 and d_2 are . . .

Whole class (again altogether in one voice): The two diagonals.

Mr. A: Let us solve one problem. Everyone open mathematics textbook and notebook.

(Some students responded that we already had open it.)

Mr. A (seeing on the book): Open page no. 106; exercise 9.1; and see Q. no. 5.

Mr. A: Did everyone get it?

(Some back benchers were talking to each other's.)

Mr. A (shouts angrily, loudly, looking into the last row): . . . hey! why you both are talking?

(Everyone starts looking to them, I also turn back to know, who are they? Both students are not able to make eye contact with Mr. A.)

Mr. A (commanding voice): Again, did everyone get it?

Whole class (loudly): Yes, sir!

(Mr. A pick up the textbook.)

Mr. A (read the question): The diagonal of a rhombus is 7.5 cm and 12 cm. Find its area.

(Mr. A put down the textbook on the table, pick up the chalk and the duster, and begin writing solution on the blackboard.)

Mr. A (facing the class): What is given in the question?

Mr. A: Everyone sees the question. The diagonals . . .?

I (quickly, loudly): The diagonals of a rhombus are 7.5 cm and 12 cm.

Mr. A (looking to me): Yes . . . the diagonals of a rhombus are 7.5 cm and 12 cm.

Mr. A: Write, given: $d_1 = 7.5\ cm$ and $d_2 = 12\ cm$. You can take anyone as d_1 and d_2 (as per choice) unless and until it is mention clearly.

(The classroom is pin-drop silent. I am listening attentively on what the teacher is saying and so my other bench mates.)

Mr. A (facing the class): We just read, the area of rhombus is. . . (*Hoping that anyone will respond correctly)*

(One of the high achiever students: D responds.)

D: Sir, the area of the rhombus is $\frac{1}{2} \times d_1 \times d_2$.

Mr. A (with ease): Just put the value of d_1 and d_2 on it and you will get its area (It is simple). Aren't simple?

(Some students responded Yes, sir! I too find it simple.)

(Mr. A solved the problem in the following way:

Solution: Given: $d_1 = 7.5\ cm$ and $d_2 = 12\ cm$.

We know that (W.K.T), the area of the rhombus (A) is $\frac{1}{2} \times d_1 \times d_2$.

$\Rightarrow A = \frac{1}{2} \times 7.5\ cm \times 12\ cm$

$\Rightarrow A = 45\ cm^2$

Thus, the area of the rhombus is $45\ cm^2$.

Mr. A: Everyone copies it.

(Whole class copy the solution.)

Mr. A: Open your diary. Your homework is Q. no. 1 – 6. It is based on what we study today. These problems can also be solved by using this same method (i.e., through same procedures).

(Whole class open their diaries and write the homework. The bell rings. Some of the students feel relief that the class is over.)

(Background music is off; Curtain downs; Light off)

Episode 2

Story 1: 42 Days Fellowship Residential Training: The First Encounter with Contextualized Mathematics Education

During the period of (February 03 – March 17), 2019, I got 42 days of residential training, as a part of my Fellowship before going to the placement school. Some of the sessions are discussed briefly below:

Session 1

Once, there was a session where four fellows (including me) got a collaborative task to prepare a song (of any genre) based on any mathematical contents of any grade. On discussion, we mutually selected "Profit and Loss" of grade 7 as a content and decided to present it in the form of 'rap.' We found the task challenging. However, at the same time, really interesting and we thoroughly enjoyed the process. After lots of hustle, finally, we prepared the song (see figure 2).

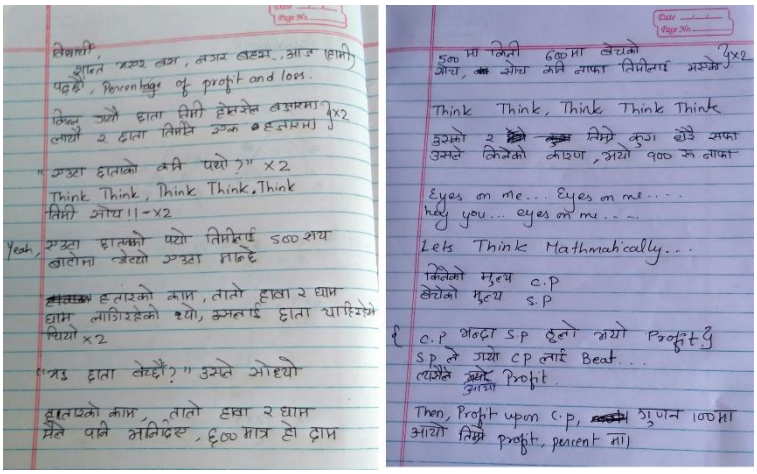

Fig. 2. Profit and Loss song

Next, we performed our task in front of the others.

Group 1 Performance

(The host (subject lead) makes an announcement of our group to the audience (fellows); one of the group members give introduction; and also explain regarding the nature of performance to be performed soon.)

Countdown 3, 2, 1, Starts!

(Background music is on)

(Mr. O starts)

Mr. O: विद्यार्थी . . . percentage of profit and loss . . . Think, Think . . .सोच!! × 2

Miss L (writing on the white board after hearing percentage of profit and loss):

Topic: Percentage of Profit and Loss

(The audience are clapping)

(Now, it is Mr. J turns)

Mr. J: Yeah . . . Rs. 500 . . . Rs. 600. . . Think, think *(The audience simultaneously singing think think)*

Miss L (writing on the white board Rs. 500 and Rs. 600):

Topic: Percentage of Profit and Loss
Rs. 500
Rs. 600

(The host is smiling, the audience are buzzing and are screaming YO, YO!)

(Now, it is my turns)

I: उसको 2 . . . C.P .... S.P ... *(Everyone please stands up and sing with me)* . . . profit . . . percent. . .

(The audience stands up from their seat, starts shaking their body)

Miss L (writing on the white board after hearing C.P., S.P.... profit percent): Lastly, white board looks like this:

Topic: Percentage of Profit and Loss

$$\text{C.P.} = \text{Rs. } 500$$

$$\text{S.P.} = \text{Rs. } 600$$

$$\text{S.P.} > \text{C.P.} \Rightarrow \text{Profit}$$

$$\therefore \text{Profit } \% = \frac{\text{Profit}}{\text{C. P.}} \times 100$$

(Background music off, performance ends)

(The audience are demanding once more, once more!)

(We are happy seeing the response of the audience and smile on their faces and the subject lead.)

Audience 1: It was nice; really enjoyed the performance.

Subject Lead: Great attempt, Thank you!

(We take our respective seat)

Session 2

Once there was a session where alumni were invited to share their two years of Fellowship experience. One of my takeaways from that session was that one of the alumni (Mr. R dai[1]) was constantly emphasizing on the word 'contextualization.' He said in his speech that *"You all as far as possible try to contextualized your contents to local materials/items available in your placement surrounding; present it in that way, it will make the teaching and learning process easier and effective!"* From that day, the word 'contextualization' stick to my mind by hard. Later, at the time of 2 weeks teaching practice, when I was allocated grade 8 and within it, I got an opportunity to teach the content 'congruency and similarity of triangles.' Then, at that time, I tried to contextualized the congruency symbol (≅) with the 'Rapti' river that flows in that area like this: Firstly, I asked the students *"Let us tell me any one of you, which river flows in your area?"* One of the students replied *"Sir, Rapti."* I said *"Yes! . . . it is the two*

[1] It refers to elder brother.

sides of a Rapti river (=) and how a river is flowing? Like this (≅). . . and finally, this is the symbol of congruent."

Story 2: Mathematics is Everywhere in the Surrounding: A Sense of Realization and Ought to Act on it!

In between the duration of completion of 42 days Fellowship residential training and going to placement school, there was a time period of 3 weeks. During that period, 'reflection' had become a part of my daily routine. I used to constantly reflect on my school days (up to grade 12) regarding (i) how my mathematics teachers used to be? (ii) how they used to teach us mathematics? (iii) in what kind of environment did I get mathematics education?

At the end of the reflection, one thing used to be constantly popped up in my head. I used to question myself: *"Do I desire to give my prospective students (mathematics education) in the same contexts or in the same manner that I experienced during my school days?"* Immediately, each time both my heart and mind used to answer, *"Not really, No!"* This sense of realization led me to think about the theme: *"Mathematics is not limited just to a textbook and a notebook; it is present everywhere in the surrounding"* (and it is the main concern of this study). Actually, I wanted to give my prospective students the different outlook regarding mathematics as a subject. Therefore, lastly, I made an obligation to approach my Fellowship journey through that theme.

Episode 3

Story 1: The Local Surroundings: Let's Explore Mathematics in it!

Once in grade 7 (July 2020), within simple interest unit, to make students familiar with the terms - principal, rate of interest, time, and interest, I made an attempt to explain it through a short story. I used 'G Bank' situated in that area as a bank and the students itself as a customer and the staff of that bank. The story was like this: *"Dear students, very soon Tihar is going to come, we all will surely going to celebrate it. Isn't it?* Student replied (enthusiastically): *Yes sir! So, for a while suppose that Miss R celebrated Tihar (Miss R and some students smiling) and in 'Bhai Tika' she collected Rs. 3000 (in total). Dear all! that amount is referred to as 'principal.' Now, suppose she got advice from her parents to deposit it in the bank (as she can make some extra money by doing that). Then guess what happened? She agreed to deposit her money in the 'G Bank' situated in our locality (near X bank of river). So, next day (after holiday) she went to the bank (alone). Since, she has no idea regarding how to deposit, what extra money she will get? How she will get it? etc. So, in order to get information, what she did? She talked to the branch manager. Do you all know, who is that person? That person is, Mr. W sitting behind you (Miss R) (all smiling). What information she got (pointing towards Miss R): Miss R you have to*

Fig. 3. Money note

deposit your amount for certain period and there is certain rate of the bank based on which you will get yours extra money. Dear all! that certain period refers to 'time' (usually in years), that extra money refers to 'simple interest or simply interest,' and the parameter on which it is based refers to 'rate of interest (%).' Furthermore, at the end, the actual amount that Miss R will get will be what? It will be equals to the sum of principal (money before going to the bank) and the interest (extra money after depositing)."

Once in grade 8 (December 2019), within statistics unit, after making students familiar with the concept of mean, median, and mode. And also, regarding its calculation, I took them outside (to the nearby shops, as shown in figure 4), which is described in Act 1 below:

Fig. 4. Student's exploring statistics in a shop

(The director makes an announcement of Act 1 of story 1 and briefly explain about the nature of the film scene to be shoot soon.)

(The instructions to the film cast are like this: *(i) We will make two separate lines of boys and girls; (ii) We will work in a pair (choose your pair by own); (ii) We will be in discipline (polite and silent). And, the task is like this: Boy's will go to Mr. B dai shop and girls will go to Mr. G dai shop (upper to Mr. B dai shop). Each individual will take a notebook, a pen, and a calculator with themselves. You all have to individually note down the cost price (selling price for the shopkeeper) of any 10 items available at the shop. In case, if you do not know the price, can ask to the shopkeeper. Then, everyone has to calculate its mean, median, and mode*.)

Light, Camera On!

Action Start

(Background music is on)

I (greet with smile): Dear students, welcome to our grade 8 mathematics class!

The classroom (enthusiastically with smile): Thank you sir, you too!

I: Dear students, today we are going outside to the nearby shops.

(Everyone seems happy and it is delightful to see their excitement)

The classroom (enthusiastically): Yahoo . . .! We are always ready to go . . . pair made; Let's go sir!

(Two separate lines are made, students walking happily in queue, silently with a notebook, a pen, and a paper . . . both groups reach their respective shop)

Boy's Group (A and C working in a pair): . . . (i) Oreo biscuit (Rs. 10), (ii) Rara noodles (Rs. 20), (iii) C: See there is Frooti, write it as Rs. 30, . . ., (x) A packet of Fortune oil (Rs. 150) *(Mr. B dai, what is the cost price of . . . that one packet of Fortune oil, it is Rs. 150 per packet.)*

Girl's Group (V and W working in a pair): . . . (i) Tiger biscuit (Rs. 10), (ii) ABC noodles (Rs. 20), (iii) W: See there is 1.5 litre of Pepsi, write it as Rs. 180, . . ., (x) A packet of Mustard oil (Rs. 200) *(Mr. G dai, what is the cost price of . . . that one packet of mustard oil, it is Rs. 200 per packet.)*

(Seems both boy's and girl's group are enjoying their task, everyone is participating actively)

I (To both groups): Those pair of groups who finished it, please start calculating mean, median, and mode. (In case of any difficulty, raise your hand.)

Boy's Group: Sir, we all finished.

I: Ok!

Girl's Group: Sir, we all finished.

I: Ok!

(The director makes an announcement that he is satisfied with the shoot.)

(Lights off! Bags pack!)

Once, in grades 7 and 8 (July 2019), within 'Line and Angle' unit, I made an attempt to give the concepts of pair of angles (e.g., corresponding angles, alternate interior angles, adjacent angles, etc.) through a trunk of tree and a plant (as a teaching and learning materials), as shown in figure 5.

Fig. 5. Tree trunk and a plant depicting angle

Furthermore, once in grade 7 (May 2019), regarding acute angle, right angle, obtuse angle, straight angle, and reflect angle, I made an attempt to explain it through hand gesture (e.g., peace sign, thumbs up sign, etc.) and also through the use of materials like markers, pen, etc., as shown in figure 6. Firstly, I made hand gesture (say, peace sign) and then asked the classroom, *"While clicking photos, what kind of hand gesture you all make? Which is the most popular hand gesture (among girls and boys)? Can you all find what kind of angle such hand gesture possesses?"*

Fig. 6. Student's displaying angle through hand gesture and materials

Moreover, I made an attempt to link the concept of various kind of angles (e.g., right-angle, obtuse angle, etc.) through easily visible daily items such as wooden hallo, house and water tap structure, as shown in figure 7.

Fig. 7. Daily items depicting angle

Story 2: Student's Corner

It includes some of the tasks performed by the students (of grade 7), which used to be different from what given in the textbook. Usually, I used to give an activity-based tasks as a homework at the end of each unit with the aim to let students explore mathematics in their surroundings. The emphasis was on exploring easily available materials/items in their locality. Some of the works are as follow:

Figure 8 illustrate items (stone, flower, leaf, etc.) depicting congruent and similar shaped objects. After giving the concept of it, the students were instructed to search for such items in their surroundings (preferably). Some of the students searched for it in their surroundings, while some students illustrated it through geometrical shapes (square, triangle, and rectangle) using paper.

Fig. 8. Congruent and Similar

Figure 9 illustrate various types of angles (e.g., adjacent, vertically opposite, corresponding, etc.). After giving the concept of it, the students were instructed to depict it in any form. Students depicted it creatively using items locally available in their surroundings. The students illustrated it using items such as flower, wooden stick, pulses, and also through application of color.

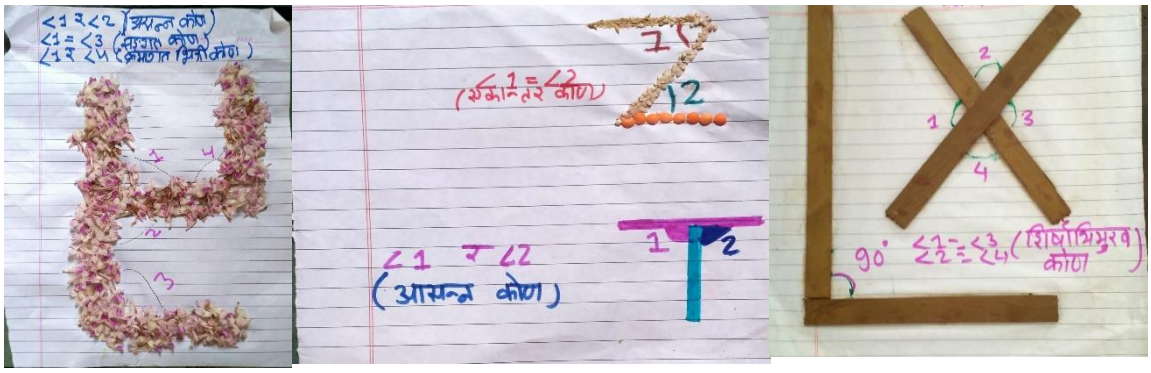

Fig. 9. Illustration of angle through locally available items

Figure 10 illustrate the work of one of the students depicting various set regions (of an overlapping set: P and Q) in a Venn-diagram. The student made use of locally available materials or items such as leaf, thin wooden stick, a piece of square shaped colorful paper, pencil residue, sketch color, and garlic cover.

Fig. 10. Overlapping sets

Figure 11 illustrate the work of one of the students depicting a non-overlapping set: G (A set of actresses) and B (A set of actors), which is further translated in the form of Venn-diagram.

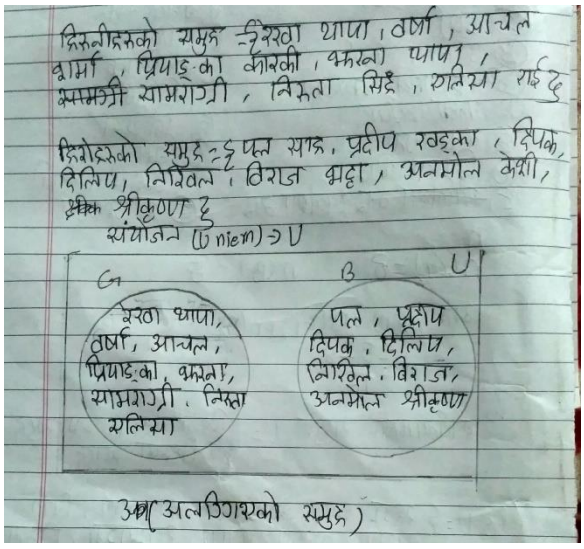

Fig. 11. Non-overlapping sets

Extending the Text . . .

Basically, the series of episodes: 1, 2, and 3 discussed above illustrate the following phases of my transformative journey. Episode 1 portrays my journey as a textbook problem-solving student, where I have explored my mathematical learning, back in school days (as a mathematics student). Episode 2 portrays my evolution as a contextualized mathematics teacher. And episode 3 portrays my journey as a contextualized mathematics teacher, where I have explored my Fellowship journey.

The decontextualized kind of mathematics education was profound, back in my school days, which Dahal et al. (2019) and Manandhar (2022), also highlighted in their studies, through instances relative to grade 10, 2004 (of first author); and grade 4, 2001 respectively. The sense of feeling that I perceived and the way of classroom teaching that I experienced, as illustrated in stories 1 and 2 of episode 1, made me bounded to textbook only. I could not see myself searching for application of particular mathematical concepts/ideas in our real-world scenarios, or even asking my mathematics teachers regarding it. My focus was just on matching my answer to the answer sheet of a particular problem provided at the end of a textbook through execution of certain set of procedures (learnt from the teachers). Only one thing was revolving in my mind, *"Practice, Practice, and Practice!"* just to secure ≥ 90 marks, so as to illustrate that I have performed well in paper-pen examination.

Basically, an emphasis on textbook teaching and learning act as a basis for promoting practice of textbook problems, dependency (of both teachers and students) on textbook, transformation of knowledge instead of creation, and inclination towards exam-oriented learning (Dahal et al., 2019). It makes student passive, afraid of the teachers, and teaching and learning process confined just to four-walled classroom. Thus, creating scenario, which is aligned to Habermas (1972) technical human interest.

However, such practice assists students in developing Procedural Knowledge [2] (PK), but not so in developing Conceptual Knowledge [3] (CK). Both of which are two necessary knowledge areas required by the learner, in order to be proficient in mathematics (Rittle-Johnson & Schneider, 2015). Particularly, CK in present era of innovation (Stern et al., 2017).

Moreover, across the world (and even much in Nepal), textbook plays a vital role in teaching and learning of mathematics (Basyal et al., 2023). However, Basyal and Mainali (2022) illustrated that Nepali mathematics textbooks are written with inadequate pedagogical content knowledge, didactical knowledge, extrinsic motivation (fame and fortune), and classroom teaching experiences (practice exercises) of the authors; where efforts are made to make content easier, oriented to problems that students actually prefer to solve and are

[2] PK refers to ability of learner to execute the known method step-by-step, while solving mathematical problem (Rittle-Johnson & Schneider, 2015).
[3] CK refers to ability of learner to apply abstract mathematical ideas (e.g., definitions, rules) (Rittle-Johnson & Schneider, 2015).

important for the examination. This depicts the unbalanced presence of lower (more than 92%; about 79% of it as procedures without connections) and higher-level (only 7% that too completely, procedures with connections) cognitive demand problems in Nepali middle-grades (6, 7, and 8) textbooks; along with presence of majority (80.4%) of exercise problems that are supplemented with similar worked-out examples that contributes to diminishing the cognitive level of the problem (Basyal et al., 2023). Additionally, Jäder et al. (2020) on examining secondary school mathematics textbooks from twelve countries (including Nepal), comprising five continents illustrated the presence of a significantly lower proportion of problems that promote construction of solution without the assistance of textbook. Therefore, risking the creation of such mathematics textbooks that majorly provide students with the problem-solving opportunities that demand lower-level of cognitive. Thereby, facilitating ineffective learning. As, in order to provide better problem-solving opportunities to future generations, Basyal et al. (2023) suggested about creation of such textbooks that comprises of a variety of levels of cognitive demand.

Eventually, that decontextualized mathematics education, arouse a sense of dissatisfaction in regards to my mathematical learning, as illustrated in story 2 of episode 2, likewise Manandhar (2022) and Shrestha (2011). That is why, in regards to Fellowship, I wanted to provide my prospective students the experience/exposure somehow different to what I experienced, back in my school days (as a mathematics student). As contextualized mathematics education possess the power to reduce the domination of decontextualized mathematics education (Manandhar, 2022). The sense of feeling, which I also felt while learning a trade of contextualized mathematics education during 42 days Fellowship residential training, as illustrated in story 1 of episode 2. In regards to group 1 performance, every individual found embedment of 'rap' song to 'profit and loss' interesting, illustrated higher level of engagement, and thoroughly enjoyed it. This is aligned to finding of Glaz and Liang (2009), who further stated that such incorporation (poetry as well) to mathematics results in enhancement of both learning and proficiency of mathematical concepts, and also helps in reducing math-anxiety. In relation to it (and to storytelling as well: illustrated in story 1 of episode 3), Shrestha et al. (2022) also stated about the significance of arts-based pedagogy, which can assist both teachers and students, in terms of promoting self-motivation, creativity, imagination, and critical thinking. Thereby, I found that 42 days training as a huge asset for me during my two years of Fellowship journey. The training (and so my Fellowship journey) was grounded to collaborative tasks, responsibility and autonomy, which are aligned to Habermas (1972) practical and emancipatory human interests. The same is grounded in my M.Ed. [4] where often we (students) construct knowledge through collaboration with the classmates, while performing project work as a part of assignment.

[4] It refers to Master of Education in Mathematics Education.

The students illustrate a good level of engagement during the teaching and learning process, when a particular mathematical concept/idea is linked to the local surroundings and to daily-life scenarios that interest them, as illustrated in story 1 of episode 3. They feel more connected to the teaching and learning process, if it is centric to them, as they are already familiar with the elements used in it. This followed the statement of Hunt and Andreasen (2011) who suggested for instructional method that is based on real-life context, in order for the teachers/educators to make their mathematics classroom better engaging. So, use of student-centric instructional approach such as Activity Based Learning [5] (ABL) assist students in regards to their enhancement of CK of mathematics (Manandhar et al., 2022), which is based on the hypothesis that when learners indulge actively in the learning process, then they learn best (Festus, 2013). The students creatively demonstrated the connection of particular mathematical concepts/ideas to surroundings using locally available materials, as illustrated in story 2 of episode 3. The students (even, shy/passive) love the idea of exploring mathematical contents beyond the four-walled classroom, in the surroundings. They illustrate excitement and active participation in the learning process, while working in the group. Fundamentally, success to activities was lie-down to my friendly relationship with the students, which Dahal et al., (2019) viewed as a tool to strengthen students learning. I focused on empathizing with them personally as well.

In addition to CK, such approach also provides an opportunity to the students to enhance their 4 Cs, associated as 21st century skills: Collaboration, Communication, Critical thinking, and Creativity (Khoiri et al., 2021). This is aligned to the objectives of revised compulsory mathematics curriculum of lower secondary level, grade 6-8 and secondary level, grade 9 and 10, where efforts are made to provide more contextual learning experience to the students, through incorporation of students daily-life activities to mathematics (Curriculum Development Centre [CDC], 2077 BS, 2078 BS). And it is visible in the latest editions (2078 BS - 2080 BS) CDC textbooks from grades 4-10 that comprises of contextualized 'project work' which was missing in previous editions textbooks. Thus, signifying the significance of contextualized mathematics education, in regards to enhancement of learning (of the learner's), which I also realized while going through the course: Teaching and Learning in Mathematics (in first semester), while pursuing M.Ed., 2021 from Kathmandu University School of Education (KUSOED), Nepal. As it can motivate the learner to indulge more and more in the teaching and learning process, and also promotes meaningful learning (Dahal et al., 2019; Manandhar, 2022). Basically, the teaching and learning process illustrated in episodes 2 and 3 were aligned to hallmark of constructivist learning – activity, and teaching - prompting learners to construct their knowledge by themselves (Stein et al., 1994). There is a concern regarding the learning outcomes of school students of Nepal. As per report from National Assessment of

[5] ABL refers to learning through hands-on activities, instead of traditionally just listening to contents only (Festus, 2013).

Student Achievement (NASA, 2022) regarding year 2020 (for grade 8) and NASA (2020) regarding year 2019 (for grade 10), in mathematics, most of the students have achieved less than 50% of learning outcomes (as mentioned in curriculum). Hence, based on above discussions, I feel that contextualized mathematics education is the need of Nepal school education (in this 21st century).

However, it was not a smooth journey for me to implement (and execute) contextualized mathematics education in public-school of rural parts of Nepal. Since in the eyes of administrative (of rural municipality), headteacher, school management committee, and parents, the marks obtained by the students depict its actual academic level, and in relative to it, the quality of the teachers. I felt the pressure of it. So, when examination used to come nearby, I focused more on making students prepare for ways to obtain maximum marks, ignoring their actual understanding. Indeed, Panthi and Belbase (2017) argued that examination does not measure students actual understanding of the subject matter and their creativity, as it lacks such test items (Basyal et al., 2023).

Concluding Remarks and Implication

While examining my transformative journey from a textbook problem-solving mathematics student to being a contextualized mathematics teacher, I got critical awareness regarding my mathematics classroom (back in school days) and also regarding my Fellowship journey. It were/are characterized by emphasis on textbook, realization, and obligation. The decontextualized mathematics education was profound (back in my school days) regarding which I was not satisfied. That scenario helped me in developing PK, but probably would have diminished my skills regarding CK and 4 Cs. Consequently, in the present scenario, it would have been difficult for me to come up with those demanding 21st century skills. I realized that the lay for foundation - as a contextualized mathematics teacher, actually begins the day I joined the Fellowship. I looked upon contextualized mathematics education coupled with arts, as an alternative that can minimize decontextualized mathematics education. As a practitioner, although it was difficult to execute constantly, I realized that certainly, it empowered me as a mathematics teacher. So, my students as well. The students were enjoying teaching-learning process, were able to explore surroundings and link particular mathematical concepts/ideas to their locally available materials/items, and were also getting an opportunity to enhance their 4 Cs skills. Thereby contributing to their enrich learning experience. This study particularly might be beneficial for teachers/educators those aiming to bring necessary reform regarding educational practices (particularly, in mathematics), so as to provide the outlook (to the learners) that ‘Mathematics is everywhere around the surroundings.’

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