

## Journeying Towards Transformative Mathematics Teacher through Critical Self-Reflection

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### Abstract

In this autoethnographic study, I have critically explored my past experiences as a student, teacher, and educational researcher. This study shows my transformation from a traditional practitioner to a critical and culturally responsive mathematics teacher. The main purpose of this study is to portray the episode of critical self-reflection on my experiences of engaging mathematical activities, aiming at improving my practices as a teacher, practitioner-researcher and an educator by exploring students' mathematical ideas constructed through de/contextual teaching. Through this autoethnographic research, I have critically reflected upon my experience and I explored the possible ways of using cultural heritage that is contextualized in mathematics class. To analyze critically the narratives, I employed three theories: living education theory, sociocultural theory and, transformative theory. I positioned myself as a ontology, is multiple subjective realities. I am guided three paradigms such as interpretivism, criticalism and postmodern research paradigms. During this study, I came to realize that culturally decontextualized mathematics education is not able to encourage teachers to implement empowering mathematics pedagogy in meaningful learning of mathematics. In addition, transformative learning plays a vital role in learning mathematics by through contextual teaching and learning in which constructivist and precarious viewpoints empower both teachers and students to observe their views and values to build knowledge through critical self-reflection.

**Keywords:** Critical self-reflection; Transformative Learning Theory; Autoethnographic; Beliefs and Experience.

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### Introduction

Many research studies (e.g., Luitel, 2009, 2013; Shrestha, 2011, 2018, 2019) show that teaching mathematics has been a challenging job for many teachers in Nepal. Even though its relevance in student's contextualized teaching and learning has not been the priority of school education of Nepal (Wagle, Luitel, & Krogh, 2019). In the Nepali context, only a limited number of mathematics teachers in both public and private schools appear to have implemented the curriculum with certain modifications due to its prescriptive and desk-based approach to curriculum development, leading to contextualization (Luitel, 2018). Teachers

may modify the mathematics curriculum based on students' experiences, prior knowledge, and daily activities. Such a curriculum tends to offer more flexibility in pedagogical and evaluation systems, making it more accessible to diverse students. As a mathematics teacher in a private school, I emphasize the creation of contextualized curricula to make the teaching and learning of mathematics more engaging and student-centered. However, a significant number of mathematics teachers, along with teachers from other subjects and school leaders, prioritize completing the recommended course using textbooks and guidebooks to prepare for summative evaluations. The prevalent examination-

driven mathematics curriculum followed by teachers and stakeholders in Nepal is likely to shift their role from scholars and intellectuals to technicians in the service of the state (Pinar, 2004). Such an approach may aim to prepare students for summative assessments rather than nurturing their creativity, imagination, communication skills, leadership abilities, and practical problem-solving skills.

In this context, I initially explore into the theoretical orientation and methodology employed in conducting this study. Subsequently, I reflect on my childhood experiences with mathematics. Following that, I engage in a critical reflection on my encounters with mathematics during my school years, with the aim of enhancing my practices as a teacher, practitioner-researcher, and educator. According to Tutak, Bondy, and Admas (2011), "critical reflection can lead to critical consciousness, which enables people to understand their lives in new ways and consider ways to change systems that routinely oppress particular groups" (p. 66).

The prevailing methods of teaching mathematics still predominantly revolve around teacher-centered approaches and algorithmic procedures. Consequently, mathematics is often perceived as a challenging subject. Despite the existence of various cultural activities incorporating mathematical elements, many individuals mistakenly believe that rote learning is the sole method for mastering mathematics. Unfortunately, formal education in mathematics has yet to integrate these diverse practices into its teaching and learning activities. Access to mathematics teaching materials is limited in rural areas, making it challenging for educators. The majority of teachers rely on textbooks as their primary source of knowledge for teaching and learning.

Consequently, students depend heavily on the teacher's lectures and the prescribed textbooks for their understanding of the subject. Through from my more than a decade of teaching experience, incorporating cultural heritage into the mathematics classroom could be one of the ways to establish a connection between school mathematics and students' cultural backgrounds. Additionally, I believe that linking mathematical content with context or culture is crucial. I emphasize that an approach centered on contextual teaching and learning can contribute to enduring comprehension. This approach encourages learners to be more engaged, creative, and positive in their attitude towards mathematics. Contextual teaching and learning is defined as educational activities that highlight the authenticity of mathematics and its relevance to real-world applications, aligning with students' future career paths (Bottge & Cho, 2013). The utilization of contextual teaching and learning in mathematics classrooms is not adequately widespread. Therefore, I wanted to transform myself in my professional practice by using contextualization approach in mathematics teaching. Therefore, this article serves as a tool for not only my own reflection but also for other mathematics teachers, researchers, and policymakers to reconsider their current pedagogy and curriculum development processes, envisioning alternative practices in both pedagogy and mathematics curriculum development.

### **My Theoretical Orientation**

I used three theories as theoretical referents that help me dig out my personal-professional life-worlds, they are: Living Theory Methodology (Whitehead 2008), Vygotsky's Sociocultural Theory (Vygotsky 1978), Transformative Learning Theory

(Mezirow, 1991). Whitehead (2008) explained, a living theory is description produced by an individual for their educational inspiration in their learning, in the learning of others and in the learning of the social construction in which they live and work (p. 104).

In my study, I found Living Educational Theory Methodology as one of the important methodological considerations which goals for improving practice and generating knowledge from questions to myself as How? Why? What? Pant (2015). In this research study, Living Educational Theory helps to build awareness in me about the question, how do I improve what I am doing?. Therefore, I reflect on myself in my narratives, in which direction will go me as an educational researcher. With awareness, I articulate about my existing teaching-learning activities as a mathematics teacher and educational researcher.

Valsiner (1988) argues that according to the Vygotsky, he presents sociocultural theory which is a different epistemological viewpoint from constructivism and to understand the sociocultural theory systemically by providing four key points. First, children construct their knowledge: knowledge is not transferred passively but is personally constructed. Second, language plays a vital role in mental development: the most momentous sociocultural device is language, as it would teach device use and is vital in the process of developing higher psychological roles. Third, Zone of Proximal Development (ZPD): the difference between what a child can do self-sufficiently and what the child needs help from a more knowledgeable person to do is well-known as ZPD. Four, Scaffolding: scaffolding is an instructional arrangement whereby the teacher models the anticipated learning

strategy or task then gradually shifts concern to the students.

According to Mezirow (1997), reflecting on premises entails critically evaluating distorted assumptions that may be epistemic, sociocultural, or psychological. Through reflection, meaning schemes and perspectives that prove unviable are subject to transformation. Critical reflection can also lead to the transformation of uncritically assimilated meaning perspectives, which influence what, how, and why we learn. Engaging in reflection on one's own premises has the potential to facilitate transformative learning. He emphasize, learning can take place in either instrumental or communicative domains. Communicative learning involves how individuals communicate their feelings, needs, and desires. Adults exhibit two kinds of learning: instrumental (e.g., cause/effect) and communicative (e.g., feelings). Learning involves a change in meaning structures (perspectives and schemes). Change to meaning structures occurs through reflection about content, processor premises. I found that transformative learning theory is very applicable in my study. For me, transformation means to change in person's worldview by integrating different worldviews into his/her own worldview. Moreover, transformative learning is about meaning making, not just like our everyday learning to acquire knowledge (Shrestha, 2018). As per Taylor (2015), transformative learning encompasses five interconnected modes of understanding. These include self-realization through cultural self-knowing, embracing diversity through relational knowing, political astuteness through critical knowing, forward-thinking ethical awareness through visionary knowing, and making a tangible impact through knowing in action. All of these aspects have

contributed to my heightened awareness of the connection between my internal and external worlds.

### **My Philosophical Foundations**

Different assumptions under philosophical considerations; ontological assumptions, epistemological assumptions, and axiological assumptions are consecutively arising, which in turn give rise to the issue of research instrumentation and data collection processes (Cohen, Manion & Morrison, 2007). The ontology of this study is multiple and contextual in which story, poem and texts on my learning and teaching experiences determine multiple realities in my study. As a mathematics teacher and researcher-practitioner, I positioned myself for multiple subjective realities throughout my research study. The epistemology of this study is existing knowledge of my beliefs that my knowing process is fallible. In my observation, individuals create their understanding of each phenomenon as the result of their previous practices in the present socio-cultural context.

### **My Research Paradigms**

I am guided from three paradigms such as interpretivism, criticalism, and postmodern research paradigms. These paradigms enable me to build local understandings of the life-world experiences of teachers and students and of the cultures of classrooms, schools, and the communities where i assist. Interpretive research paradigm focus on the significance of meaning making and understanding of self and others that is students, teachers, principal of the school, etc. so as to progress my pedagogical practices (Shrestha, 2018).

In this study, many times I used

interpretivism in my research study for meaning making and understanding of myself with my students, friends as well as my family members that improve my teaching learning activities. I used it as a door for me to develop practical interest as described by Habermas (1972). In addition, I guided criticalism research paradigm as giving question to question to my students for improving their mathematical concepts in my dramatic story or poems about my beliefs for teaching learning. In this type of research, the process of writing as inquiry (shared with the interpretive paradigm) has an added critical dimension and becomes a means of critical analysis and ideology critique of well-known strategy and practice. The researcher promotes his/her critical awareness (Brookfield, 2000) and he wrote that, when you are taking people to critical awareness of something, to investigate their assumptions, you can create a rational access point into it, you can create a narrative access point into it by sharing a dramatic story, or you can create a more artistic access point into it though film or poetry or music or some graphic representation. Also, I found their difficulties with questions to my students, after that, I try to decrease their difficulties in classroom activities. Through postmodernism paradigm I underlined alternative-inclusive logics such as dialectical, poetic, narrative, and metaphorical logics, which possibly report for a complex nature of knowing, being, and valuing (Denzin & Lincoln, 2005) which embraces that what goes on in our minds and hearts is not directly reachable to the world outside us. It helps me to be alert of the topic from multiple outlooks. It was an interesting task for me, as an educational researcher, to make sense of postmodernism and its uses in my study.

## Practicing Transformative Pedagogy

### *Episode I: Self- Reflection*

“Who is a good teacher? Hem!

Are you a good teacher? Look into yourself”.

This is conversation between me and my professor in M. Phil. Class. It could be any day of July 2020 when it was just one month passed of second semester since I started my journey of MPhil study. After that I said, when a teacher inter to the classroom, teacher, students and school like a small community. And in this small community there are guidelines to follow and jobs to be done and each student is aware that he/she is significant, essential part of the group. A teacher lets students know that they can be contingent not only on the teacher but also on the total class.

Another friend said, Sir...I have a formula for the teacher. Can I say?

Yes! Please.

He said, teacher to be DAFES: D-means Deep knowledge, A- Ability to build caring relationships with students, F- Friendliness, E- Excellent preparation and S-Strong work ethic.

During the interaction, the professor said, look into yourself.

We began to think about ‘Look into yourself’ and hence discussed each other, but no one of us could found what he expected. Later on, he told, look into yourself”.

What it is, he again told same thing. We were confused about what professor want to say. In addition, he explained,

I said that important point that is look into yourself. Meaning that as a teacher you may look yourself. It means ‘Reflective Teaching’. This is important point for a good teacher.

After that, I began to recall my memories when I was in master’s degree

student of TU. In the first year, *the ‘foundation of mathematics education* was a subject that we learn. Professor was come to our classroom every day and wrote the topic of that day. But he discusses only one thing in every day that is ‘*absolutist view and fallibility view of nature of mathematics*’. He explains deeply his contents around only one area. We board about him everyday discussion about only one thing. During his class, a day one student raises his hand. Professor stop from his explanation and said to him, *yes, please! What is your question?* And that student said, *I have a query about what are the characteristics of a good teacher.* After that he explains about teacher and about to be a good teacher as given below:

Teacher is an instructor who did not instruct only contents he instruct everything around the students. Sometimes he would evaluate himself for his instruction about his content in the classroom or outer of the classroom.

After that, I think Professor Point out only two things. One thing is that teaching is not only for the classroom, sometimes he would teach outside of the classroom also. And another thing that he focuses on the evaluation of teachers from himself. Today I realize that the thing that was pointed out from my Professor that day is ‘teacher evaluate himself for his teaching’. This shows that teacher to be a good teacher if he has characteristics: reflective teaching.

### *Episode II: Learning by Critical Self- Reflection*

This was that time when I just entered for teaching in secondary level classes of the boarding school of Birendranagar, Surkhet. The school’s named Children’s Paradise secondary school. It could be any day of April

2070. There is some class, which are class 10, class 9, and class 8. During that, class eight students used to have optional mathematics as a major subject during those days. They need to read twice a week where students don't know the simple concepts about optional mathematics.

do well and most of them failed to do the exercise. I was felt of with the students. I used to think that how to make them better in optional mathematics. Around twelve to fifteen classes later, I had completed the lesson. Later I thought of taking a test of the taught lesson and informed them, but very few were ready for it. Next week, I took the test and only one student got passed and the rest failed the test. I was very upset. I started thinking what's wrong??? How can make them better? I started questioning myself. Did I teach them well teaching technique?

Fig: 53, Source: Self

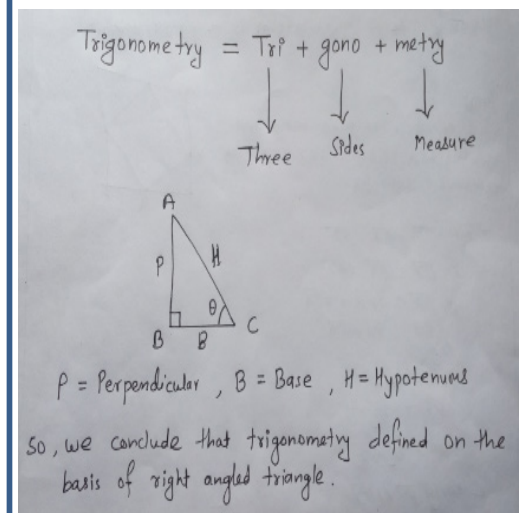
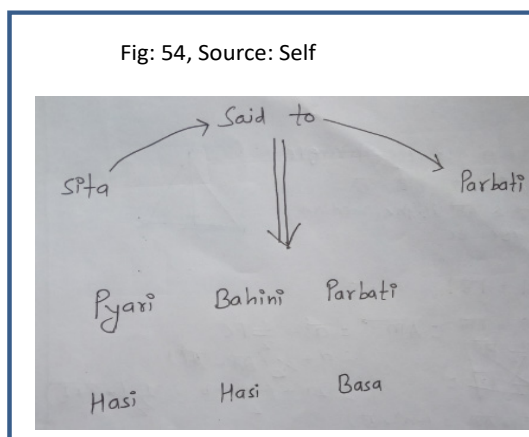


Fig: 54, Source: Self



So, I thought of teaching them from trigonometry, though it is a bit hard comparatively so I decide to start teaching optional mathematics from the topic trigonometry. First I start to write down formulae of trigonometry on the whiteboard and I told for memorizing all formulae to the students that Then I started to do exercise; I became happy when the student answers the formulae but had to beat some of them who didn't answer me. I used to tell them that, this lesson is a bit difficult than others, but if you know it well, you can do rest. I used to do the same as before for the rest of the class and class and exercise. Then I started to complete the exercise one after another.

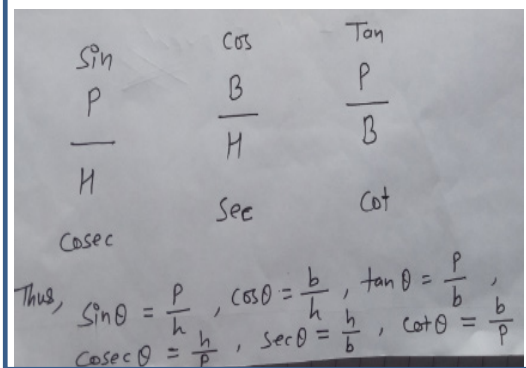
The next day, I went to the class and distributed the answer sheets individually, and collect them harshly. Even a few got punishment as well. When I returned back home that day, I again started for the solution of the students. I thought that I need to make it easy so that they can understand the process and matter of the problem. I thought and thought about it very seriously and deeply. Then I thought of teaching them the formulae in an easy way so that they didn't need too much up. Next week, I went to the class and requested Parbati and Sita to stand up in the class. I wrote their names on the board. Students were answered. They just looked at me. I requested Sita to tell a few words to

In this long run, some students could

Parbati as,  
Pyari Bahini Parbati  
Hasi Hasi Basa

Then everybody was shocked. After that I formed new formulae to teach them in the class in an easy way. Then the students were very happy and then we started were very happy and then we started the different ratios of trigonometry from the same formulae.

Fig: 55, Source: Self



After then a student Roshan said, *Wow! So interesting*. At that time, all look very happy. Then I showed the meaning of trigonometry as given below:

Sir, now, Mathematics looks interesting and so easy.....a student Madan said to me. And replay only by smile. Then after, I slowly started asking formulae before solving the problems of exercise.

Regarding the above teaching, the student shared his feeling about learning mathematics. He told me that his previous mathematics teacher for the previous class could not teach in this interactive way, he felt difficult for solving mathematical problems in class seven. This is a piece of evidence that students can bring their cultural capitals into the classroom.

From the above interactions, effective learning will be made if the teacher teaches

reflective teaching. So, what I came to know is whenever I think of teaching the concept of mathematical contents with relating the real-life situation. Also, I felt that the students are happy and satisfied with learning by reflective teaching. It shows that students and I both were transformed into the real-life situation for learning and teaching mathematics. This is an example of my transformative teaching in which I used student-centered teachings such as activity-based, collaborative-based, problem solving, etc. with the help of real-life concrete materials. Throughout the learning process, all the students actively joined in the activities, had communications with each other, raised questions to one to other, reflected critically on their actions, and learned to solve real-life lived problems (Shrestha at all, 2021). In addition, they increasingly alert of the bad habits and practices of their own or their friends, also family, teachers, and school.

Sometimes, I would present myself in the classroom aggressively upon students' extreme reactions and uncontrollable noisy classrooms. But later on, some of them would come to me and made me realize my mistakes. I then would make an apology for my mistakes in the classroom. In this condition, I would critically reflect on my mistake to realize it. Even today, some students still share with me via Facebook messenger their experiences about how I would punish and also motivate them for learning.

Transformative pedagogy is a praxis-oriented student-centric pedagogy that plays a major role in linking theory and practice by engaging both teachers and students in critical self-reflection (Shrestha, Luitel & Pant, 2020). In addition, transformative pedagogies such as collaborative, constructivist, problem-solving, project-based, etc. can be well implemented in teaching mathematics

only when a teacher can raise the critical awareness of self and students as well through critical self-reflection. Additionally, critical thinking is a major element of transformative pedagogy that helps both teachers and students to take the right act counter to their oppressive elements through consensual understanding. Thus the transformative pedagogy is devoted to bringing about individual and societal transformations in teachers and students by creating a dialectical connection between teaching and learning of mathematics.

Furthermore, transformative learning plays a vital role in learning mathematics. Transformative learning and teaching would work importantly in mathematics schooling, in which constructivist and precarious viewpoints empower both teachers and students to observe their views and values to build knowledge through critical self-reflection. I discussed my perspective on Mathematics, drawing from my experiences as a student, teacher, and researcher across different educational levels, from primary to university. Over time, I have examined and reconstructed my beliefs about the essence of mathematics, adapting my teaching and learning approaches from decontextualized to contextualized teaching and learning for mathematics education. These outline emphasize me that how my experiences in learning and teaching prompted me to see myself as a transformative learner and educator in mathematics. Furthermore, I transitioned from being a teacher with decontextualized beliefs and experiences to becoming a contextualized teacher and researcher.

### **Implications**

My investigation indicates that practicing critical thinking does not

equate to adopting a negative stance. Instead, individuals engaged in critical reflection within the realms of teaching, teacher education, academic research, and educational policymaking are dedicated to upholding democratic values such as equality, equity, and justice (Tutak, Bondy, & Adams, 2011). In this context, transformative learning encompasses the thoughtful examination of assumptions, which can occur either through group interaction or individual contemplation. For educators, teacher educators, and policymakers to enhance themselves, active engagement in critical reflection on their own practices is essential—a purpose aligned with transformative education research like the one presented here. Vital components for fostering critical dialogue include maintaining an open mind and empathetically listening with genuine respect for others' perspectives (Brown, 2013). Building knowledge with a focus on both practical and emancipatory interests can empower teachers, academic researchers, teacher educators, and education policymakers to comprehend their own methods. This, in turn, encourages a drive towards creating meaning and understanding by questioning established practices, and commonly accepted ideas.

Hence, it is imperative for teachers and teacher educators to develop critical literacy, allowing 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 guide teachers and teacher educators toward becoming transformative learners.

### **Concluding Remarks**

I believe that reflecting on my experiences could provide valuable insights for fellow researchers conducting comparable



studies in their respective fields. Additionally, engaging in critical self-reflection on my teaching learning activities in mathematics has allowed me to recognize the significant influence of my teaching fields in shaping my decision-making process. I envision that dialectic logic and genres can help me lighten my complex position as a teacher and teacher educator. Finally, I hope that narrative logic and genres will help me relating with the people around me by reading, listening, and interpreting their stories to improve my personal practiced life. Oriented to this notion, I am now aware of the habits of a critical mathematics teacher with transformative sensibilities, who critically re/examine, re/invents, and reflects on his pedagogical practices; however, I am pretty aware of the notion that being critical is not being negative; rather I am committed to democratic principles of equity and justice while teaching mathematics in the classroom. Finally, transformative learning is crucial in the process of learning mathematics. The significance of transformative learning and teaching is particularly evident in mathematics education, where both constructivist and challenging perspectives empower teachers and students alike to scrutinize their perspectives and values. This critical self-reflection contributes to the construction of knowledge.

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