EXPLORING TRANSFORMATIVE PEDAGOGY IN TEACHING MATHEMATICS

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Abstract

This paper is based on the first author's auto/ethnographic inquiry into pedagogical practices based on his MPhil dissertation. The second author being the dissertation supervisor has played a facilitative role in developing the structure and content of the paper while the third author has provided critical comments and inputs on overall aspects of the paper. Various research studies show that teaching mathematics has been a challenging task for many teachers in Nepal. Based on our experience, most of the mathematics teachers including the first author are found struggling for improving their pedagogical skills to provide students with meaningful (authentic, empowering, justifiable and inclusive) learning. In so doing, instead of looking into their 'inner-selves", they oftentimes wander around the outer world seeking the better (and the best) possible pedagogical approaches. In this orientation, as an auto/ethnographer, the first author narrates his stories on pedagogical practices to examine his traditional teacher-centric pedagogical practices and explore the transformative pedagogy as student-centric pedagogy. The study helped him improve his pedagogical practices and envision a synergy of teacher-centric pedagogy and transformative pedagogy in his professional life-world. Therefore, this paper aims at sharing the research context, theoretical position, methodology, and reflection and lessons learned. This paper is developed from the perspective of the first author's experience using the first person "I".

Keywords: Auto/ethnography, transformative pedagogy, student-centric pedagogy, teacher-centric pedagogy, meaningful mathematics learning

Introduction

Various research studies (e.g., Luitel, 2009, 2013; Pant 2015; Shrestha, 2011, 2018, 2019) show that teaching mathematics has been a challenging task for many teachers in Nepal due to culturally decontextualized mathematics education that excluded cultural capitals of Nepali students. Despite its relevance in students' lifeworlds, contextualized teaching and learning has not been the priority of school education of Nepal (Wagle, Luitel, & Krogh, 2019). Based on our experience as teachers, teacher-educators and researchers, most of the mathematics teachers including the first author are found struggling for improving their pedagogical skills to provide students with meaningful (authentic, empowering, justifiable and inclusive) learning. In so doing, instead of delving into their 'inner-selves", they oftentimes wander around the outer world seeking the better (and the best) possible pedagogical approaches. In this orientation, as an auto/ethnographer who writes about culture via one's own experiences of others, the first author narrates his own stories of pedagogical practices to examine his traditional teacher-centric pedagogical practices and explore the transformative pedagogy as student-centric pedagogy. Therefore, this paper is based on the first author's auto/ethnographic inquiry into pedagogical practices based on his MPhil dissertation and beyond. The second author being the dissertation supervisor and the third author being a critical colleague both have played their facilitative roles in developing the structure and content of the paper by providing critical comments and inputs on overall aspects of the paper. The paper is developed from the perspective of the first author's experience using the first person "I".

The Context of My Mathematics Teaching

My journey of traditional teacher-centric pedagogical practices (e.g., chalk-and-talk, algorithmic problem solving, etc.) started in 1993, and it continued until my enrollment in a master's study in mathematics education in 2007. After that, as an MEd student, I started to critically reflect on my past through different lenses of transformative pedagogy as student-centric pedagogy (e.g., constructivist, collaborative, problem-solving, inquiry-based, activity-based, project-based, etc.) (Shrestha, 2011). Since then, I gradually realized that my pedagogical practices were guided by a renowned old 'positivistic' paradigm that separates the knower (e.g., students) from the known(e.g. knowledge) (Grundy, 1987). I was inclined more towards administering students through the teacher-centric pedagogy to make them able to achieve better grades under the controlled and managed environment.

Moreover, my teacher-centric pedagogy was guided by Habermas' technical interest (Habermas, 1972), and my mind-set was influenced by Freire's (1970) banking concept of education.

For Habermas, the technical interest gives rise to instrumental knowledge. To construct it, a human being as a researcher (e.g. a teacher) sets a possible hypothesis (assumption) and makes some predictions. After that, the hypothesis is tested through a series of experiments (e.g., teaching and learning activities) and observations using empirical rules and laws under the controlled and managed environment (e.g. classroom activities) and verified based on the results. Finally, the verified knowledge is established as an instrumental knowledge, which, in turn, gives rise to an instrumental action, meaning that a teacher, for example, assumes it as a universal knowledge and acts upon students using the same technical rules to achieve the intended learning outcomes. In this situation, the teacher acts as an authoritative knowledge transmitter and students become passive recipients of the knowledge.

For Freire, the banking concept of education treats students as empty vessels to be filled with knowledge – like financial transactions in banks. The teacher is all-in-all in depositing information as knowledge in students' empty minds through narration, talk, lecture, practice, etc. so that students can withdraw it whenever they need, for example, during exams. Thus, the banking concept of education limits the students' actions to receiving, filing and storing knowledge.

In this context, I portray an anecdote on my teacher-centric pedagogical practices guided by Habermas' technical interest and Freire's banking concept of education, followed by one more anecdote that reveald how I realized that becoming a successful teacher-centric pedagogue was my false consciousness.

Establishing Teacher-Centric Pedagogy as My Principal Pedagogy

When I started my journey of mathematics teaching in 1993, I had not received any degree or training in mathematics teaching. I was a fresh mathematics teacher who graduated with science and mathematics background. That's why; I had no option other than recalling how my teachers taught me at different levels of my formal education. And that was the teacher-centric pedagogy. I assumed teacher-centric pedagogy as the most effective teaching approach to teaching mathematics. I then began to teach mathematics as a strict teacher using different teacher-centric pedagogies such as chalk-and-talk, repeated practices, rote-memorization, algorithmic problem solving, use of predefined formulae, laws, rules and procedures, etc. within the four walls of the classroom.I continuously deposited mathematical knowledge in my students' minds, and gradually, the students began to score better grades in exams. The headteacher and parents were impressed by my teaching approaches. I became a brilliant mathematics teacher for my students, their parents and the school, which made me realize that the teacher-centric pedagogy was the most effective pedagogy. That's how the teacher-centric pedagogy became my principal pedagogy.

Embodied knowledge: I as a novice researcher developed a research hypothesis (i.e. teacher-centric pedagogy as the most effective pedagogical approach to teaching mathematics.), tested it through a series of experimentations (i.e. classroom practices), observed how it worked (i.e. learning processes), analyzed and interpreted the results (e.g. marks, grades) and hence verified that the teacher-centric pedagogy was the most effective pedagogical approach to teaching mathematics.

As a teacher-centric pedagogue, I was a transmitter of mathematical knowledge, and my students were passive recipients of that knowledge. In that, the students would put all of their focus on me. I would talk, narrate and explain the ideas, concepts and procedures using chalk on the whiteboard within the fully controlled and managed environment (e.g. classroom, activities, learning, etc.). The students would honestly and quietly listen to me and copy my texts from the whiteboard. Moreover, I would control and manage students' learning as if I was the ultimate source of knowledge. In this context, the students would learn independently and make decisions based on my instructions. I would entertain a quiet classroom and obedient students so that I wouldn't have to worry that the students would miss my important points. Most importantly, I deposited the mathematical knowledge in the minds of the students so that they could draw it whenever they needed, e.g. during tests, exams, etc. I was considered as the most successful teacher-centric pedagogue.

Moments of Realizing My False Consciousness

At the beginning of my teaching, I was not able to accept other's worldviews and change my style as a content-transmitting teacher. Yet, I recall an event of 1995 when I was a mathematics teacher at a private school in Kathmandu. A textbook writer (and a curriculum expert as he introduced himself) conducted a one-day workshop on "Teaching Mathematics Using Materials" in the school. I was the only person to oppose his pedagogical approach and complain to the headteacher that this approach could not help students score marks in the exams as the questions would not be asked on how to solve problems by using materials.

However, after I joined for a master's degree, I learned various mathematics courses on teaching, curriculum and assessment. The groundbreaking ideas of a teacher as a facilitator, reflective practices in teaching, critical pedagogy, etc. gradually challenged my style as a content-transmitting teacher, and hence I gradually realized that it was my false consciousness (i.e. wrongly held perspective) that teacher-centric pedagogy was an ultimate and effective approach to teaching mathematics. I also came to realize that the reason I was considered as a successful teacher was due to my sincere efforts to make my students ready with the routine problems of the textbooks for the tests and exams. Instead, the student-centric pedagogies could help students learn mathematics meaningfully by developing the competence in both "procedural and conceptual knowledge" among students through group work, project work, interaction, dialogue, and inquiry (Rittle-Johnson, & Schneider, 2015). However, I had still encountered some problems in translating such pedagogies into the benefits of students. I was in search of possible answers to the question "How could I improve my pedagogical practice?". Though I had encountered transformative learning (Mezirow, 1991) during my master's study, I was not fully aware of its practical implications. But, after my enrollment in MPhil study in 2014, I gradually realized that transformative learning would work effectively in mathematics education, in which constructivist and critical perspectives empower both teachers and students to examine their beliefs and values to construct knowledge through critical self-reflection (Mezirow, 1991; Shrestha, 2018). I affirmed that I wouldn't be able to make any difference in students' learning process until and unless I change my belief system (Pant, 2015). Then, I began to practice the student-centric

pedagogies (e.g. constructivist, collaborative, problem-solving, inquiry-based, activity-based, project-based, etc.) informed by transformative learning in school and university teaching.

As a teacher, the temporary problem with me was due to the entry of the transformative pedagogy into my long-practiced teacher-centric pedagogy. Transformative pedagogy refers to a student-centric pedagogy combining the elements of constructivist and critical pedagogy that empowers students to critically examine their beliefs, values, and knowledge to develop a reflective knowledge base, an appreciation for multiple perspectives, and a sense of critical consciousness and agency (Khedkar,& Nair, 2016,p. 1; Nagda, Gurin, & Lopez, 2003). As I began to practice transformative pedagogy, I earned many sweet and sour experiences while integrating it into my teacher-centric pedagogy. While bringing students into the process of transformative learning, I also faced many challenges, for examples, making them realize their mistakes and accept the new learning methods, engaging them in collaborative learning, etc.

Above all, there were mainly two issues in front of me: Why did the teacher-centric pedagogy oftentimes guided me despite being aware of transformative learning? In what ways the transformative pedagogy helped me teach mathematics to provide students with meaningful (authentic, empowering, justifiable and inclusive) learning? These issues led me to conduct my MPhil research entitled "My Pedagogical Sensitisation Towards Holistic Mathematics Education: A Practitioner' Inquiry".

My research aimed to examine my traditional teacher-centric pedagogy and explore the transformative pedagogy that contributes to my transformation from the teacher-centric to transformative mathematics teacher to provide students with meaningful (authentic, empowering, justifiable and inclusive) learning. More specifically, I was interested in collaborating with my students to develop and implement a synergistic transformative pedagogy through critical self-reflection by integrating the teacher-centric pedagogy into the student-centric pedagogy.

The Context of School Education in Nepal

Working as teachers, teacher-educators and researchers in the field of mathematics education, we three authors have realized that one of the major problems in school education in Nepal is to bring mathematics teachers into the process of transformative learning due to the culturally decontextualized mathematics curricula that have excluded our cultural capitals (Luitel, 2009, 2013; Pant, 2015; Shrestha 2019). All the Nepali schools have been following the centrally prepared curricula prescribed by the Curriculum Development Centre (CDC) that is borrowed from the British-India education system (Luitel, 2013). Despite giving space to the local curriculum in the education system, the CDC itself prepares the central curriculum and hands it over to the local authorities, which becomes a showcase in the local schools' libraries.

The home-schooling and Gurukula education system based on the eastern knowledge-traditions have been gradually disconnected from mainstream education once the Rana regime took over and established Durbar School as the first formal school in Nepal (Pradhan, 2020). The educational reforms since then brought only the cosmetic changes in the curricula restricting both teachers and students within the four walls to teach and learn the prescribed contents within the given time, and the students became so instrumentally robotic-like that they couldn't face the challenges in their life after their graduation. Moreover, over time, the education system in Nepal gradually became a victim of the borrowed curriculum in the name of globalization. And hence, our education system gradually fell into the trap of the neoliberal political agenda of labour market that always trapped both students and their parents within the milieu of securing good grades using the standardized tests and exams (Wagle, Luitel, & Krogh, 2019).

Though there are altogether 35,055 public and private schools in Nepal (National Education Policy -2076 B. S.), with the growing number of schools, the quality of education hasn't yet gone up in the same ratio. Instead, the education system still focuses on quantity because of the centrally prepared culturally decontextualized curriculum (Luitel, 2013). It seems that transformative education is not in a priority in school education. Because of such malpractices, teachers, students and parents are motivated to give major priority to scoring better grades in exams with the falsehood of securing students' future. That's why; the teacher-centric pedagogy has long been in existence in the education system of Nepal despite putting efforts into reforming education.

In this context, we three authors have realized that mathematics education is also victimized within such culturally decontextualized school education due to culturally decontextualized curriculum, pedagogy and assessment (Luitel, 2013; Pant, 2015; Shrestha 2018). Most falsehood assumption is that school mathematics is taken as the best scoring subject for securing students' place in science and technology streams after graduation instead of taking it as life itself. Due to this, it is very difficult to convince both the students and their parents that mathematics learning is to become a real-life problem-solver. Yet, the teacher-centric pedagogy is still prevailing, thereby neglecting or subordinating the transformative pedagogy as a student-centric pedagogy in teaching and learning of mathematics in schools of Nepal.

Theoretical Position

As a teacher, a teacher-educator and a practitioner-researcher, after a long journey in identifying well-known theories of my field, I became well aware of the notion that there is no 'royal road' to transformative pedagogy, and also hold a view that grand theories of teaching and researching may not be appropriate in developing myself (and teachers) as a change agent (Pant, Luitel, & Shrestha, 2020). Hence, I believed in the locally developed theory that could serve the needs of my 'self' and 'other-selves' (e.g., students, teachers, parents, school head, etc.) in my study. In this context, I carefully chose Transformative Learning Theory (Mezirow, 1991) and Living Educational Theory (Whitehead, 2008), both of which could serve my own as well as my participants' needs throughout the study.

Transformative Learning Theory provided me with the new ontological, epistemological and axiological grounds in research that advocate research as a means for transformative learning (Pant, 2019). Ontologically, it helped me shape my 'being' by integrating different worldviews into my worldviews so as to transform my 'being' into my 'becoming' through critical self-reflection. Epistemologically, my 'instrumental knowing as being' was transformed into 'communicative knowing as becoming' through transformative learning theory so that axiologically I could widen my horizon of knowing as a synergy of instrumental knowing and communicative knowing for promoting transformative pedagogy.

Living Educational Theory guided me in researching and answering a question of the kind 'How do I improve what I am doing?" with the implications that include the generation and sharing of a valid explanation of my educational influences in my own learning throughout the study. Whitehead (2008) explained that a living theory is an explanation produced by individuals for their educational influence in their own learning, in the learning of others, and in the learning of the social formation in which they live and work.

Moreover, both theories helped me examine my teacher-centric pedagogy and explore the new transformative pedagogy throughout the study.

Research Methodology

I used two key research paradigms, namely, interpretivism and criticalism within transformative research informed by multiple realities (ontology driven by relativist) and subjective knowledge (epistemology: knower and subject create understanding) (Denzin, & Lincoln, 2005).

Interpretivism helped me as a researcher to understand phenomena ("making sense of the world") by looking through other's eyes, abandoning the attempt to explain behaviour through measurements or general rules based on a cause-effect scheme (Di Martino, & Zan, 2015). As an interpretive researcher, I was guided by constructivist epistemology to unfold my subjectivity in shaping the process of the inquiry and hence generated context-based understanding of people's thoughts, beliefs, values and associated social actions (Taylor, & Medina, 2011).

Criticalism helped me raise my critical consciousness (Brookfield, 2000) and enable me to practice 'deep democracy' (Kincheloe & McLaren, 2000) which involves identifying and transforming socially unjust social structures, policies, beliefs and practices (Taylor, & Medina, 2011).

I used an auto/ethnography as a research methodology. Auto/ethnography is an approach to research and writing that seeks to describe and systematically analyze personal experience to understand cultural experience (Ellis, Adams, & Bochner, 2011). Moreover, I employed the auto/ethnography to explore and discover my position as a researcher in the research space. While so doing, I challenged my personal biases, positioned my research to make sense to a wider audience and had a greater impact on them. Rather than using auto (self) and ethnography (culture or other) as a dichotomy, I used a slash (/) to represent both autobiography and ethnography and hence embraced dialectical thinking to explore many permutations between auto and ethnography (Taylor, & Taylor, 2019).

Further, within auto/ethnography as a research methodology, I used writing narratives as a method of inquiry which helped me understand experience through collaboration between researcher and participants over time in a place or series of places, and in social interaction with milieus (Clandinin, & Connelly, 2000). The aim of using narrative inquiry was to invite readers to go on a voyage with the researcher, one in which researcher(s) and readers would be discovered and making something together (Bochner, 2014). Moreover, the narratives are so verisimilitude to the personal-professional life-worlds of readers that they are deeply engaged in finding their positionality concerning the social and political contexts portrayed by the researcher. Finally, their positionality potentially influences their understanding of their personal-professional life-worlds.

Being an Auto/Ethnographer in the Field

For an auto/ethnographer, the research field indicates the contexts and places in the stories of the researcher. As an auto/ethnographer, I had two roles – an autobiographer and an ethnographer. As an autobiographic researcher, I narrated my personal and professional lived and living experiences and contradictions as my data. While as an ethnographic researcher, I deeply involved myself in the research field (school) with my students as key research participants and other research participants

(parents, teachers, headteacher) to extract their lived and living experiences and contradictions as my data. I conducted the study at a private school in Kathmandu with the students of grades IX and X and collected data using informal conversations and interviews in the classrooms, corridors, canteen, ground, etc. wherever comfortable. I also interacted with parents, colleague teachers and headteacher. I collected field notes, took photographs and videos, used cell phone and social media (e.g. Facebook), which were later transcribed into journals, and critically reflected on my role as an auto/ethnographer throughout the research process.

Moreover, I collected stories as data associated with my pedagogical practices in which my subjectivity such as my thoughts, feelings and observations was a way of understanding the social contexts. In so doing, I interpreted the collected stories to make meaning out of them. Therefore, my data are the textual representation of my subjective experiences that helped me explain and critique the social contexts and phenomena associated with my pedagogical practices and envision the pedagogical possibilities in my professional life-world.

Practicing Transformative Pedagogy

It could be any day of the chilly winter season in 2017. As a transformative practitioner-pedagogue, I was inside the classroom of Grade X to facilitate students in mathematics learning at 6 AM. I was about to start the lesson, two students (brother and sister by relation) entered the classroom. After having a few conversations with them about their late arrival, I started the class with a short video of about 10 minutes. The topic was "Conceptualizing cone through visualization and making them by the paper-folding method". After watching the video, all the students worked collaboratively in groups to make cones. Twenty-four students were divided into five groups with five students in each of four groups and four in one group based on students' learning ability, caste and gender. At the end of the one-hour session, I assigned them to make cones at home and bring them the next day.

The second-day class was focused on deriving the formulae of surface area and volume of a cone. For that, I demonstrated the procedures of deriving the formulae using video, paper folding and cutting method, and drawing the figures on the whiteboard. Finally, I derived the formulae as follows: In a cone, r stands for the radius of the circular base, l and h for the slant and vertical heights respectively.

The cone (Fig. II) is made from a part of a circle (Fig. I), which is the curved surface of the cone. When that part is divided into 'n' number of equal right-angled tringles (OAB, ABC, ACD, … and so on) (Fig. III), each is infinitesimally small, then the sum of the areas of all the triangles gives the curved surface area of the cone. As the area of one triangle = half × base × height, then the area of 'n' triangles = n × half × base × height = n × half × b × l = half × nb × l = half × C × l, where nb equals the circumference C of the circular base of the cone. Hence, the curved surface of the cone = half × 2πr × l = πrl, where C = 2πr. As the area of the circular base = πr^2, the total surface area of the cone = area of the circular base + curved surface area = $\pi r^2 + \pi rl = \pi r (r + l)$

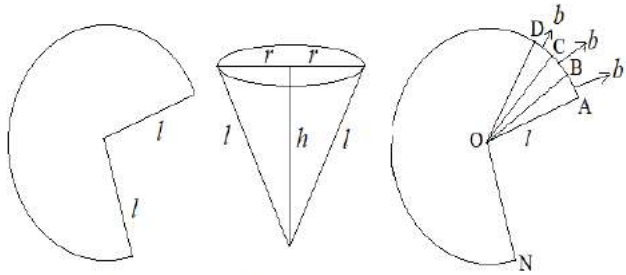


Fig. I Fig II Fig. III

Next, to find the volume of the cone, I played the video demonstrating the cone as one-third of a cylinder. After that, I derived the formula on the whiteboard. As the volume of the cylinder is πr2h, the volume of the cone is one-third of πr2h. In the end, I assigned them to write all the procedures of deriving the formulae of surface area and volume of the cone in their workbook and submit it the next day.

The most interesting event was that the two students again came a little late than the earlier day. I allowed them to enter the classroom after having a few conversations with them.

The third-day session was focused on finding the surface area and volume of their cones. For that, I assigned them to take the measurements of r, l and h and tabulate them. They worked collaboratively in their groups and calculated the surface area and volume of their cones based on their recorded measurements. In the end, I assigned them to do their work fairly on their workbook and submit it the next day.

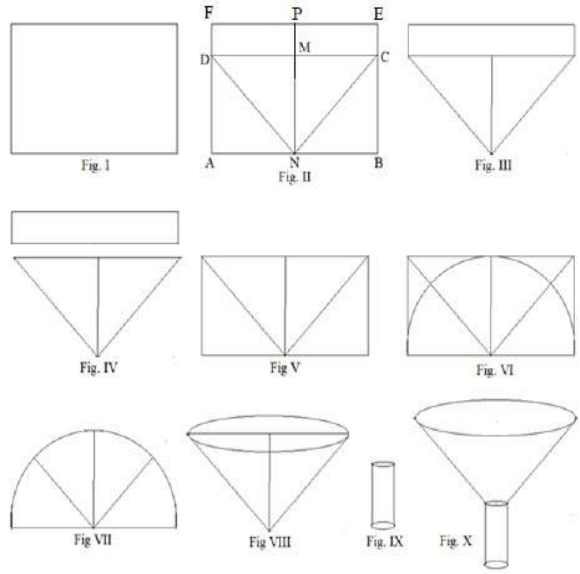
Not surprisingly, again the two students came in the middle of the class, but this time, I kept them outside of the class for a while so that the dynamics of the class wouldn't be disturbed. After about a couple of minutes, I interrogated them and allowed them to join their groups.

On the fourth day, they solved the problems of the textbook. However, I also assigned some contextual problems from their real life-worlds. One contextual problem was as follows:

Assume that your mother has got a problem while pouring oil from the packet into a bottle. One day, your mother asks you to make a conical funnel with a cylindrical pipe at its bottom. If you are given a thin metal sheet of size 30 cm × 20 cm.

Develop a model using a paper folding method and measure the surface area and volume of the cone. Note that the minimum part of the sheet as possible should be wasted.

All the students developed their models and submitted within a couple of days. One of the students demonstrated his model in the classroom as follows: He first folded the paper (Fig. I) into half along PN to get two rectangles FANP and PNBE (Fig. II). Then, he folded each of these two rectangles FANP and PNBE diagonally along ND and NC to form two squares ANMD and NBCM in such a way that AN and NB coincided each other exactly along the middle line MN and the points A and B coincide each other at point M. The two rectangles ABCD and DCEF so formed (Fig. II) were cut out along DC. The rectangle DCEF was then converted into a cylindrical pipe (Fig. IX). For this, with N as the centre and AN (NB, AD, NM or BC) as radius, a semicircle was drawn using a compass (However, his father used local tools – an iron nail tied at one end of a thread and a colour pencil at the other end) (Fig. VI). He then cut out the parts to get a semicircle (Fig.VII), which was converted into a cone (Fig. VIII). Finally, he inserted the vertex of the cone into the cylinder and marked the circumference. He then cut out the vertex of the cone along the mark to make a hole and adjusted the cylindrical pipe to form the required conical funnel (Fig. X).



Embodied Knowledge: There is an interesting story behind the late arrival of the two students in the morning class. Upon interaction with them separately, the girl told me that her brother always bothered her if streetwalkers would tease her while coming to the school early in the morning. That's why; he would always insist on moving her faster together with him. But she wanted to walk alone at her own pace. When I interacted with the boy, he told me that she would always walk slowly and hence they were late in the class, and upon suggesting her to move faster in his pace, she would start a verbal war with him. They blamed each other. I was in a dilemma who was right. For this, one day I talked to their younger sister studying at grade VIII in the same school. The reality was revealed. Moreover, the male-dominant attitude was common in their family, which was later confirmed by their father when I indirectly talked to him on the report-card distribution day. After that, I again talked to the boy and tried to convince him to allow her to walk alone at her own pace to respect her right to grow independently. My attempt worked and both started to come to the school on time but one after another. This was evidence that teacher's counseling helps resolve the problems of students. However, during my retrospective teaching era, I had malpractice of punishing students by keeping them outside the classroom and even sending them back home, which I completely quitted as soon as I began to practice the transformative pedagogy.

Regarding the model preparation, the student shared his story behind it. He told me that his father had a small factory in which such household utensils were made, and he took the help of his father to develop the model. This is a piece of evidence that students can bring their cultural capitals in the classroom.

This is an example of my transformative pedagogy in which I used student-centric pedagogies such as activity-based, inquiry-based, collaborative, problem solving, etc. with the help of concrete materials and technology. During the learning process, all the students actively participated in the activities, had interaction with each other, raised questions to each other, reflected critically on their activities and learned to solve real-life problems. Moreover, they gradually became aware of their own bad habits and the malpractices of their friends, teachers and school. Regarding me as a transformative practitioner-teacher, I had to work harder than ever to control and balance my egocentrism – a kind of habit that always made me feel that I was the ultimate source of knowledge upon which all the students should depend. I gradually learned to welcome critical questions of my students and to fairly reply to them. But it was very difficult to bring the school management into the transformative learning process. The headteacher and the managing director were especially very offensive towards me, because they would think that the students, parents and teachers had started raising voices against the unjust structures and malfunctioning of the school. Nevertheless, my students kept on raising their voices against such injustices politely with teachers in the classroom and with the school management.

Sometimes, I would present myself aggressively upon students' extreme reactions and unmanageable noisy classrooms. But later on, some of them would come to me and made me realize my mistakes. I then would apologize for my mistakes in the classroom. In this situation, I would oftentimes 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 motivate them for learning and raising their voices against socially unjust phenomena and structures.

Transformative pedagogy is a praxis-oriented student-centric pedagogy that plays a major role in bridging between theory and

practice by engaging both teachers and students in critical self-reflection. Moreover, various transformative pedagogies such as constructivist, collaborative, problem-solving, inquiry-based, activity-based, project-based, etc. can be effectively implemented in teaching mathematics only when a teacher can raise the critical consciousness of self and students as well through critical self-reflection. Further, critical discourse is a major element of transformative pedagogy that illuminates both teachers and students to take the right action against their oppressive elements (e.g., status quo, egocentrism, hegemony, neocolonialism, etc.) through consensual understanding. Therefore, the transformative pedagogy is committed to bringing about personal and social transformations in teachers and students by establishing a dialectical relationship between teaching and learning of mathematics.

Reflection and Lessons Learned

As an autobiographer, I reflected on my past experiences of pedagogical practices while as an ethnographer, I reflected on my immediate practices after the actions were taken during the study in the field. Both the roles taught me lessons that contributed to improving my pedagogical practices and envisioning the pedagogical possibilities in my professional life-world.

The process of my transformation from teacher-centric pedagogue to transformative pedagogue was not an easy task for me. I was oftentimes dragged into the realm of teacher-centric pedagogy because it was my comfort zone where I didn't have to work for planning the teaching-learning activities as everything was set in my mind. But while using transformative pedagogy, my most challenging situation was when I had to accept my students' critical feedback and comments. Practicing critical self-reflection to raise consciousness was not an objective reality that could be measured in number. Rather, it was a subjective reality that I accepted and denied throughout the study. Nevertheless, my prolonged and deep engagement in the process of transformation helped me fight against my disempowering forces, especially my egocentrism, and hence I was able to accept the transformative pedagogy as a part of my professional life-world.

My autobiographical inquiry helped me examine my teacher-centric pedagogy guided by the behaviorist learning theory. Moreover, such a teacher-centric pedagogy lies within the centrally- prepared subject-centric curriculum in which a series of discrete tasks are prescribed to perform for achieving the intended learning outcomes within a limited time. A teacher is trained to transmit the information as knowledge to students as passive recipients who reproduce the knowledge by following the teacher's rule-following procedures. Therefore, the knower (students) is detached from the known (knowledge). After learning to reproduce knowledge through various ways such as rote-memorization and practice methods, students become a master of instrumental knowledge which they have to apply in their real world. In this context, a few so-called intelligent students can recall the learned knowledge and become successful in applying it in their real-world while maximum students are left behind and become unsuccessful in applying the learned knowledge in their real-world. Overall, only privileged students are benefited while underprivileged students are gradually detached from the mainstream of mathematics learning.

Moreover, my autobiographical inquiry helped me build a basis for exploring transformative pedagogy. Subscribing to the teacher-centric pedagogical basis, my ethnographic inquiry helped me explore transformative pedagogy in the research field. My prolonged engagement in the field with my research participants (students, teachers, parents, headteacher, etc.)in the whole academic session of one year taught me many lessons about both teacher-centric and transformative pedagogies. The major lesson was that neither of these two pedagogies single-handedly could serve the students' needs and interests. Rather both pedagogies co-exist in teaching to provide students with meaningful (authentic, empowering, justifiable and inclusive) mathematics learning.

The auto/ethnographic study helped me integrate the stories of my research participants into my stories, thereby generating emergent transformative pedagogy. Moreover, I was able to find an observable distinction between teacher-centric pedagogy and transformative pedagogy. In that, teacher-centric pedagogy always helped me follow subject-centric curriculum (Schubert, 1986) under 'banking model of education' (Freire, 1970) to (re)produce instrumental knowledge (Habermas, 1972) and procedural knowledge(Rittle-Johnson, & Schneider, 2015) within the controlled and managed environment using rule-following methods (Grundy, 1987). I always tried to bring a behavioral change in students by continuously depositing knowledge in their minds and enforcing them to practice repeatedly the same textbook problems until they knew. While, transformative pedagogy became the praxis-oriented pedagogy that helped me develop curriculum as experience (Schubert, 1986) with the active involvement of students, parents, school and community people through consensual understanding to construct communicative and critical knowledge (Habermas, 1972) and conceptual knowledge (Rittle-Johnson, & Schneider, 2015) through critical discourses and consensual understanding within the democratic environment. I always encouraged students for problem-posing during interaction in a collaborative learning process to co-construct knowledge (Vygotsky, 1978).

As a teacher, teacher-educator and researcher, the transformative pedagogy as student-centric pedagogy helped me raise questions about my practices. My students were also empowered through critical discourse during interaction in the collaborative learning process of mathematics. Moreover, the study helped me raise consciousness in the students to the maximum extent and in the school to some extent about exercising democratic values for social justice through the transformative learning process. Above all, I envisioned the synergy of teacher-centric pedagogy and transformative pedagogy in my professional life-world, which empowered me to provide my students with meaningful (authentic, empowering, justifiable and inclusive) mathematics learning.

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