COUNTERACTING THE HEGEMONIC PEDAGOGICAL CULTURE AND ENVISIONING AN INCLUSIVE SCIENCE TEACHER EDUCATION IN NEPAL: AN AUTOETHNOGRAPHIC INQUIRY

Pratima Thapaliya

A Dissertation

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DECLARATION

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

_____ January 23, 2022

Pratima Thapaliya

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DEDICATION

This dissertation is dedicated…

To all known and unknown teachers who taught me to stand and inspire me to move ahead along this educational journey.

To my grandfather late Kul Dhoj Thapaliya, mother Bodh Kumari Thapaliya, father Sitaram Thapaliya, and all my beloved family members, and relatives for their encouraging words and support.

Master of Philosophy in STEAM Education dissertation of *Pratima Thapaliya* entitled *"Counteracting the Hegemonic Pedagogical Culture and Envisioning an Inclusive Science Education in Nepal: An Autoethnographic Inquiry"* presented on January 23, 2022.

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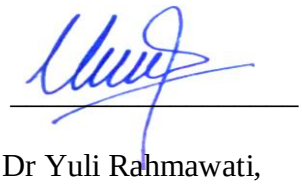

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I understand and agree that my dissertation will become a part of the permanent collection of the Kathmandu University Library. My signature below authorizes the release of my dissertation to any readers upon request for scholarly purposes.

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AN ABSTRACT

Of the dissertation of *Pratima Thapaliya* for the degree of *Master of Philosophy in STEAM Education* was presented at Kathmandu University School of Education on January 23, 2022.

Title: *Counteracting the Hegemonic Pedagogical Culture and Envisioning an Inclusive Science Education in Nepal: An Autoethnographic Inquiry*

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Prof. Bal Chandra Luitel, PhD

Dissertation Supervisor

I reflected critically on my lived experiences of science teaching and learning as a student, science teacher, headteacher, and science teacher educator by *reflection-on-action, reflection-in-action,* and *reflection-for-action* (van Manen, 1991). It helped me dig out my past, present dis/empowering knowing, being, and doing cultures, and envisage the possible ways to counteract the disempowering cultures. I felt that counteracting the hegemonic pedagogical culture and envisioning an inclusive science teacher education was the researchable and emerging issue. So, I developed the research purpose to counteract the hegemonic pedagogical culture in science education, envisioning an inclusive science teacher education in Nepal. I designed four research questions and emphasized data text generation and meaning-making based on it.

Emancipatory interest (Habermas, 1972) and transformative activist stance (Stetsenko, 2017) emphasize structural and individual transformation. Thus, I applied these theoretical perspectives as referents to excavate the hegemonic science

pedagogical cultures due to structures and individual beliefs and actions. Likewise, I employed a multiparadigmatic research design (i.e., interpretivism, criticalism, postmodernism, and integralism) and autoethnography as the research methodology. As an autoethnographer, I extensively focused on critically reflecting on my sociocultural, historical, and political aspects to do more evocative writing. In the process of data generation, meaning-making and expressing, I engaged in resisting, liberating, healing, and envisioning aspects of criticalism that made my writing more evocative while demystifying the hegemonic pedagogical cultures in science teaching and learning. Furthermore, I incorporated different arts-based research genres and logics such as narratives, dialectical logic, poetic reflections, and postmodernism metaphors that helped me represent my painful and gainful narratives, multivocality, and differences playfully. I also attempted to portray the emergent spatiotemporal context by incorporating the notions of interpretivism. Likewise, I applied the inclusive ideas of integralism for integrating individualized, localized, and globalized perspectives in envisioning an inclusive science teacher education. I followed the quality standard of different research paradigms like trustworthiness, crystallization, critical reflexivity, verisimilitude, and pedagogical thoughtfulness. Further, I also became conscious of the procedural, situational, and existing ethics in my entire research journey.

From this inquiry, I explored that science educational practitioners' taken-for-granted beliefs, values, actions, and rigor structures like *one-size-fit-all-dominated* curriculum, assessment, and institutional environment is responsible for the domination of hegemonic pedagogical cultures in science teacher education. I attempted to envisage education in the emergency sensitized curriculum, pedagogy, and assessment by incorporating the curriculum integration approach (Beane, 1995)

like STEAM education and transformational outcome-based education (Spady, 1994). While doing so, I metaphorically used the Hindu trinity (i.e., Lord Brahma, Lord Vishnu, and Lord Shiva principles) in the process of envisioning transformative visions, missions, and values for nurturing the inclusive science educational culture; maintaining, preserving, and practicing core values and practices for sustaining and keeping the culture alive; and destructing or minimizing less relevant practices manifested in my organization (Typically, science teacher education program). It could assist in nurturing the inclusive science educational culture, maintaining, preserving, and practicing core values and practices for sustaining and keeping the culture alive, and destructing or minimizing the less relevant practices manifested in my organization. Further, this inquiry explored the nature of *science education as inclusive (im/pure)*, *curriculum as/for social reconstruction*, *pedagogy as/for the public good and circular process,* and *assessment as/for learning*. These transformative ideas could be a catalyst for promoting socially responsible inclusive science teacher education.

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Pratima Thapaliya, Degree Candidate

ABBREVIATIONS

CDC	Curriculum Development Center
CDO	Chief District Officer
CLES	Constructivist Learning Environment Survey
DEO	District Education Office
DT	Design Thinking
etc	ET cetera
ICT	Information and Communication Technology
KUSOED	Kathmandu University School of Education
MOODLE	Modular Object-Oriented Dynamic Learning Environment
MPhil	Master of Philosophy
Ph.D.	Doctor of Philosophy
SIP	School Improvement Plan
SLC	School Leaving Certificate
STEAM	Science, Technology, Engineering, Arts, and Mathematics
TAS	Transformative Activist Stance
TU	Tribhuvan University

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CHAPTER I

INTRODUCTION

I enter my research journey by reflecting on my past, present, and future actions for addressing my professional problem. I can identify our disempowering pedagogical culture and transform our professional practice by acting as reflective practitioners. So, I problematize my research agenda related to science teaching and learning. Typically, I attempt to unfold the critical incidents I experienced as a learner, science teacher, headteacher, and science teacher educator. While doing so, I explain the research context, key issues, and usefulness of my research. For excavating and unpacking my autobiographical narratives related to my research purpose, I develop research questions and articulate the worth fullness of the study. It gives them a clear destination for my whole research journey.

The Origin of My Research

In the beginning, getting to learn through formal schooling was essential to the people. With the progressing time, there is a change in thinking and expectation of society. In the 21st century, transmitting disciplinary knowledge, skills and ideology are inadequate for a good life. We are preparing the citizen for the future, so their present learning has a dominant influence on their future life. So, *doing the things done* based on teaching-learning is less helpful for developing higher abilities such as communication, collaboration, creativity, and critical thinking. For the betterment of society, we need to prepare socially responsible citizens (Luitel & Taylor, 2019). As a Master of Philosophy (MPhil) scholar in Science, Technology, Engineering, Arts, and Mathematics (STEAM) education, I realized that I could portray my lived experiences to excavate my historical, socio-cultural, and political aspects to improve and

transform my professional practice. It could support to demystify the strong and weak sides I experienced in my science learning, teaching, and administrative journey. So, in the process of problematizing my MPhil research agenda, I reflect on some critical incidents related to my past experiences, present standpoint, and future direction of science teaching and learning by incorporating van Manen's (1991) retrospective reflection (*Reflection-on-action*), contemporaneous reflection (*Reflection-in- action*) and anticipatory reflection (*Reflection-for-action*).

Retrospective Reflection

For excavating the problems grounded in my past science teaching, learning, and administrative journey, I have incorporated van Manen's (1991) retrospective way of reflection. Now, I would like to share some representative critical incidents I experienced at the very beginning of my formal science learning journey to masters' degree level (Mid 1990's) by developing several headings: My science learning experiences as a student, my science teaching experiences as a secondary level science teacher, and my administrative experiences as a headteacher.

My Science Learning Experience: Lack of Connection with My Cultural Self

It could be any day in the late 1990s. I studied in grade four at Shree Saraswoti Primary School of Marsyangdi district. In that new academic year, we had to learn a new subject, "*Mero Batabaran*[1]," in which most of the contents were included from different branches of science. In the teaching process, one day, the science teacher Mrs. Luna said, "The substances need oxygen to burn." Meantime, I thought that firewood and kerosene suffice for burning because I used firewood for cooking and kerosene for lighting in my everyday life. I could not find the role of oxygen in my kitchen. The teacher was less able to reflect critically on our lived experiences, values,

[1]Mero Batabaran – the subject related with environment and science.

beliefs, and cultures. That might be the possible reason I felt uncomfortable assimilating the newer idea presented by the teacher. However, I memorized that idea without making sense. Metaphorically, I would like to represent that science teaching culture as *knowledge delivery*.

While critically reflecting on this incident, I realized that this science content is related to our everyday lives. So, the teacher could easily connect with the students' lifeworlds for meaningful learning. Therefore, I realized the lack of connection with my cultural 'self.' Likewise, in my childhood, I was curious about several scientific facts, such as how does photosynthesis occur? How does the Earth reveal around the Sun? Why don't we fall if the Earth moves? How is the shape of the Earth spherical? Although my curious "self" raised many questions in my mind, I was less able to express my curies in the classroom. So, I memorized the abstract scientific ideas without understanding what does it mean? How could I apply it in my life? My key intention was how do I deserve an excellent position in the examination? I faced such kinds of problems in my school level to masters' degree level science learning journey.

My other lived experience was related to science teachers' beliefs, actions, and the school's im/pathetic learning milieu. The science teacher generally made a pin drop silent over the period and focused on rote memorization rather than knowledge construction through engaging us in the discussion, metadiscourse for connecting the science teaching-learning with our everyday lifeworld. Although he demonstrated several experiments and was assigned to design improvised materials and other project works, he was less able to communicate with students to understand their multivocality. However, the students noticed that he was a *'strict and excellent teacher'*. At that time, I also thought that a good teacher was my teacher.

Similarly, I experienced the disciplinary knowledge, skills, and ideology dominated science teaching-learning cultures in my higher-level science education. The science teacher teacher-educator rarely engaged in interactive discourse. However, the teacher educator taught us several learning theories, child psychology, pedagogy, andragogy, recent trends in science education, and science teaching methods. However, the science teacher educators commonly applied the deductive reasoning and lecturer method in their actual classroom practice. The science teaching-learning process primarily focused on obtaining good marks (product) rather than developing the students' life skills (process). Thus, I envisaged science education as an *abstract-and-rigor* subject in that learning time. I learned from these incidents that the science teaching culture considered the students as *knowledge consumers* and the teacher as a *knowledge transmitter.*

My Science Teacherly Experience: Lack of Contextualized and Curious Self

I started my science teaching journey at Shree Baljyoti Higher Secondary School, which was a community school situated in the remote district Jarang. I was excited when I was appointed as a secondary-level science teacher in the remote village. I committed that I will be accountable and responsible in my professional actions. As a student of science education, I learned different science teaching pedagogy. For instance, I realized that we could contextualize science teaching-learning by connecting with the learners' lifeworlds. However, in my actual science teaching practice at the remote school, I faced many problems like lack of adequate textbooks even in the middle of the academic year, physical infrastructure, human resources, etc. There were around one-hundred and thirty-five students with cultural and linguistic diversity in a class. In such a context, I tried to apply student-centered methods like demonstrations, project work, discussion sometimes that contributed to

spreading positivity on the students and society to some extent. However, I could not create an interactive and inclusive learning milieu. Every day before wrapping up my classes, I asked them, *"Do you have any queries?"* Although I could not acknowledge the students' curious 'self' during science teaching-learning, and my interest was dominated rather than learners' interest, they collectively replied to me, *"We have no confusion. We are clear, Madam!"*

My Experience as a Head Teacher: Communication as War

In my professional journey, I have collected several good and bitter experiences. While reflecting on some critical incidents of my past administrative journey makes me thoughtful. Now, I would like to briefly reflect on the school environment where I had worked as a headteacher. There was a great dispute between the teachers. They divided into two groups based on their political ideology and formed two administrative offices. I mean, there were two headteachers in the same school, so there was a pathetic learning environment in school. The teacher and administrators strived to win or lose the administrative power rather than create an empathetic learning milieu. In this context, I have used the metaphor' *communication as war'* (Lakoff & Johnson, 1980) for representing the relation between teachers and administrators. Meanwhile, I became the headteacher of that school. To minimize the distance between the teachers and administrator was my priority, so I collaborated with guardians, political persons, District Education Office (DEO), and teachers.

After the long-struggling journey, I could counteract the disempowering learning milieu by reducing their egos. In my administrative period, I envisaged an excellent school by designing a school improvement plan and an academic calendar and passing several moral decisions from the School Management Committee (SMC). Further, I tried to create a synergy between teachers, students, and society for

implementing my plan. However, in my initial journey, I could not develop an appropriate learning environment like '*communication as dance'* (Lakoff and Johnson, 1980), where both teacher and students collaborate to better the individual and society. At that time, I thought all my actions were reasonable. I was doing this to better my teachers, learners, and community. In other words, I could not critically reflect my dogmatic beliefs, values, and actions critically. For instance, I could be viewing the issues from different vantage points, like why teachers display enemies-like behavior with each other? How could I act as a mediator for facilitating the pathetic situation of school?

Contemporaneous Reflection

For demystifying the dis/empowering cultures grounded in my present science teaching and learning, I have incorporated van Manen's (1991) contemporaneous way of reflection. Now, I would like to share some representative critical incidents I experienced as a science teacher educator and STEAM learner in these headings: My learning experiences as an MPhil scholar in STEAM education and My teaching experiences as a science teacher educator.

My Learning Experience: Transdisciplinary Inclusive Science Learning Milieu

I have learned the various transformative science teaching-learning pedagogies in my present STEAM educational learning and found that art's role is crucial in science education. It provides a dialogic space where each learner can autonomously and actively participate in the teaching-learning process. The facilitator assists us in our confusion and misunderstanding. The learning culture catalyzes me for connecting my past and present lived experiences. Teaching-learning aims to transform the learners' disciplinary thinking and move towards a transformative

learning direction. Therefore, I am engaging in the research work for knowing and changing the issues related to science teaching and learning.

Before my STEAM educational learning journey, I have never critically reflected on my past and present teaching-learning experiences. Recently, I have felt that we need to ask ourselves: Am I prepared to transform in assisting my students in transforming (Taylor, 2008)? The STEAM educational journey has allowed me to identify my weaknesses and also help to change my philosophy of life and professional belief. Several research-based articles are included for the modular activities; deeply engage in multidisciplinary research articles. The central focus of STEAM education is to transform the learners' traditional perspective and make them more socially responsible holistic thinkers. Thus, a transdisciplinary collaborative environment is created where we share our feelings, opinions, lived experiences with no hesitation.

The collaboration is based on contribution, so we actively engage in learning and respect the voice of others. The classroom is more inclusive where the facilitator invigorates the learners to express their understanding, problems and support them in their confusion. There is a dialogic space between the facilitators and the learners. Hence, I deeply interact, reflect, and develop the idea in each topic. Similar research articles are incorporated for multidisciplinary learners. I take the fundamental concept of the articles and connect it with different disciplines such as science, technology, engineering, mathematics, etc. I am impressed by such learning praxis. I had never collected such kinds of experiences in my past learning journey. It supports extending my thought and energizes me to move towards a transformative way.

My Teaching Experience: Shifting towards Transformative Knowing

I was less able to introduce the emergent social context playfully. I focused on the singular, absolute scientific knowledge construction process. However, learning one's comfort zone helps for innovative thinking, leading to a radically new vision and innovation in science education. The cross-disciplinary collaboration in science education generates disorienting dilemmas that can lead to transformative science learning (Pennigtonal et al., 2013). My teaching-learning was inadequate for generating disorienting dilemmas in the learners' minds. Some intelligent students actively engaged in my classroom; however, most of the students remained silent over the period. I focused on memorization and rote recall. As a teacher, my role was to transmit knowledge to the learner's seemingly empty mind. In this regard, Taylor (2014) argued that such teaching has been less popular in science education in recent years. So, to prepare a good citizen, we need to design and implement a socially responsible science curriculum and pedagogy.

As a novice science teacher educator, I taught specific chemistry content like definition, postulate, principles, formulae, equations, and so on by applying teacher-centric pedagogy. Metaphorically, a *sit-and-get* learning culture was dominated in my initial teaching journey. I was less able to connect chemistry concepts with other disciplines such as mathematics, engineering, technology and contextualized it by understanding the learners' frame of reference (Mezirow, 1996). Likewise, I taught different science learning theories, approaches, and teaching pedagogies. Although it emphasized the knowledge construction process, it was inadequate for changing the learners' taken-for-granted assumptions, deep-seated dogmatic beliefs, cultures, and actions. In other words, I attempted to change the learners' epistemology rather than ontology.

I face different challenges in my professional field among them research is a key part. For developing my research skills, I joined the MPhil in STEAM education. My STEAM educational journey greatly supports to development of my research skills. I learn that we need to critically reflect on our practice to know the dis/empowering parts of our practice. In this regard, Yusuf et al. (2017) also argued that we need to reveal and conceptualize our identity. However, I am less able to create the full reciprocity-based science learning where all my learners will be free from many constraints (such as time or content to care), coercion (bullying), and rep*resenting their undistorted self* (Taylor & William-Chambel, 1993). I also realize that every academic person needs to be aware of transformative research work that could assist to understand and overcome the problems in our professional field. My present educational journey largely supports to development of my research skills. Likewise, it increases my confidence level for designing the research work as well as guiding my students in their masters' degree research projects. Although my current practice is insufficient for enriching transformative learning in science education, I attempt to engage my learners in the discussion and scaffold them in their difficulties. It could change my teacher-centric science teaching culture in the following days

Therefore, from my lived experiences of the STEAM educational journey, I come to know that we need to be critical, collaborative to explore deep-seated educational problems. At first, we need to critically reflect on our professional practice to identify the problems in our practice. Whenever we change our dominant teaching practice and act as an agency, we probably transform the others like learners, co-workers, and institutions.

Anticipatory Reflection

In the present STEAM educational journey, I have learned that we could address the world's social, educational, and ecological problems through STEAM education because it assists in co-creation and co-learning (Ibarra & Sommerstad, 2019). The educational organizations are both a place of skill and knowledge transmission and a place of ideological transformation (Todd & Thompson, 2017). Furthermore, after being aware of our constraints and context, we can envisage the appropriate alternatives for addressing the problems, so we question the broadly trusted assumptions and examine the deep-seated beliefs and practices on teaching mathematics (Pant, 2017). As a STEAM learner, I am aligned with these transformative ideas on becoming a transformative science teacher educator. In my understanding, my research problems are also necessary to connect with a reflection for action as well. So, I would like to reflect critically on my personal lived experiences for excavating the sociocultural, historical, and political aspects by keeping the issues of teaching and learning at the center. In my understanding, it could bring back hope from hopelessness. I felt that I needed to raise the questions like how did I learn science education, how have I been teaching science education, how could I incorporate the trans-disciplinary STEAM approach/ or other alternative ways in science teacher education for counteracting the hegemonic science teaching-learning cultures, how I and my organization could create empathetic and inclusive science learning milieu and so on by myself for visualizing the deep-seated hegemonic structures, beliefs, values, and actions and developing socially responsible science education.

Statement of the Problem

As a teacher educator, I am more responsible for preparing socially aware and conscious citizens (Luitel & Taylor, 2019). My day-to-day professional activities may also contribute to developing the learners' hegemonic/transformative beliefs, assumptions, values, cultures, and actions. So, I need to critically reflect on my beliefs and actions for challenging with disempowering forces that remain in my professional practice that could help to shift my taken-for-granted assumptions, dogmatic beliefs, mundane science teaching-learning culture, values, and actions by connecting the science contents with the learners' real world. From the brief reflection on action, reflection in action, and reflection for my different modes of lifeworlds like a student, teacher, headteacher, and teacher educator in the above discussion, I perceived that different forms of hegemony are grounded in my science teaching and learning. Sometimes, my journey was more struggling. In this regard, Rai (2019) also argued that the indigenous knowledge, beliefs, ways of knowing, and worldviews are suppressed in the context of Nepal due to the domination of western modern worldview typically, universalization and homogenization-based pedagogical practices. However, I continued my professional journey by imagining a beautiful future. So, I would like to use the metaphor' mountain climbers' for noticing my journey. The mountain climbers attempt to continue their adventurous journey although they face ups and downs like a snowstorm, avalanche, tiredness, pain, and so on. In my understanding, they could imagine that beautiful mountain picks may come after crossing their painful journey.

In my STEAM educational learning journey, I reflected critically on my teaching and learning experiences and perceived some disempowering hegemonic science teaching-learning cultures. I came to know that being a responsible teacher is

more important than just being a teacher. Likewise, my trans-disciplinary STEAM colleagues also noticed that their learning was beyond their real-world and faced disciplinary egocentrism (Connor et al., 2015) in their past teaching-learning journey. Moreover, they also shared that there is a greater influence of their past learning culture in their current teaching-learning practice. For instance, before STEAM education, they also encouraged the learners to secure an excellent result in exams rather than solving real-world problems. But STEAM education helps counteract their dogmatic beliefs, taken-for-granted assumptions, cultures, and actions and supports becoming transformative-minded teachers and teacher educators. We also learned that the 'art' in STEAM has a central role in transforming our belief system and support for social justice (Ibarra & Sommerstad, 2019).

According to Beane (1995), the curriculum includes selective content, so the real-life themes are neglected because it is designed based on the academicians' interests rather than the learners' interests. As a student, science teacher, and science teacher educator, I also experienced the same in the context of our Nepalese science curriculum. It overemphasizes the selective representation of disciplinary knowledge, skills, and ideology rather than real-life related activities. Further, I also perceive that some teachers develop the identities based on the subject matter line (King, 1976) such as 'science teachers,' 'mathematics teachers' and create the status based on a subject area such as science education is more important than health education. Such a dominant ideology and practice may be less helpful for developing the empathetic learning milieu. I also agreed with Rajbanshi et al. (2021), who discussed that cross-professional collaboration could grow the teachers' professional autonomy by enhancing their professional agency to integrate curriculum, to practice child-centered pedagogy, etc.

I have used Schubert's (1986) curriculum images *to represent my professional problems as intended learning outcomes* that significantly focus on the product rather than the process. The specific objectives, content, instructional techniques, evaluation process, are designed to achieve particular learning outcomes. It also emphasizes analyzing the context and philosophical factors in the process of determining, designing, and realizing the intents of the curriculum. However, it neglects the various unintended (hidden) outcomes essential in our everyday lives and largely highlights the cognitive domain and controlled teaching-learning milieu. Moreover, the assessment system is more traditional; it just labels the students' performances, whether or not complete. The learners demonstrate their objective and competence-based performance in a particular time and place, such as in the examination or specific classroom environment. In this context, Rai (2019) explained that teacher-centric activities, disciplinary-based strict roles of students, and structured paper-pencil tests greatly influenced the modern education system of Nepal. After STEAM educational learning, I also realized that the compartmentalized, disciplinary notion-based teacher-centric science educational culture might be inadequate for developing creative-imaginative thinkers and holistic actors.

According to Wagle et al. (2019), the Western-modern educational ideologies initiate manifold challenges and dilemmas and ruin our rural or indigenous identities because of accepting our schooling agendas without being critical. So, to make school education more place-relevant, policymakers and curriculum practitioners should pursue an agency in school education. Likewise, Acharya (2020) advocated that activity-based learning, collaboration, and science teachers' epistemology positively influence chemistry learning. The teachers' dogmatic epistemology has a negative influence on students' understanding of school-level chemistry lessons. However, the

research was silent about counteracting the hegemonic culture in science teacher education. While reviewing some related literature and reflecting on my lived experiences, I perceived that counteracting the hegemonic pedagogical culture and envisioning an inclusive science education in Nepal is an appropriate research plan for revealing and re/conceptualizing my professional identity.

My role in this research is as a researcher and research participant. So, this research may provide me a good opportunity to critically reflect on my historical, socio-cultural, and political aspects. It might demystify the hegemonic cultures in my science learning and teaching journey. Then, I could improve and transform my hegemonic beliefs and actions and act as a change agent. In my opinion, other researchers and readers also may feel liveliness and lifelike from my lived narratives. It probably generates pedagogical thoughtfulness by connecting with their professional practice (typically, science education). For example, why do we need to reflect our historical, socio-cultural, and political aspects? How can we transform our dogmatic beliefs and actions embedded in science teaching-learning? In what ways can we create an empathetic learning milieu in school? How can we design a transformative curriculum? How do we change the cut-off point-oriented examination culture? Why being a responsible teacher more than a teacher is more important? Such kinds of thoughts may arise in the mind of readers. I have mentioned the research purpose and questions to address this research agenda and direct my research inquiry.

Purpose of the Study

For sensing the problems in science teaching and learning, I critically reflected on some critical incidents I experienced as a learner, science teacher, headteacher, and teacher educator in the background of the study. After demystifying the research

context, I tried to seek the issue for conducting my MPhil research work. I realized that I need to improve and transform my science teaching-learning culture by revealing the disempowering forces embedded in my practice.

Therefore, the purpose of the study was to excavate the dogmatic beliefs and actions embedded in science education for counteracting the hegemonic pedagogical culture, thereby envisioning an inclusive science teacher education in Nepal. While doing so, I critically narrated my deep-seated hegemonic and transformative beliefs and actions by zooming in and zooming out the emergent spatiotemporal context.

Research Questions

For addressing the purpose, I developed four emergent research questions. They are as follows:

1. How have I experienced hegemonic pedagogical culture in the science learning journey?
2. What beliefs did I hold for creating an empathetic science learning milieu?
3. How have I been experiencing an inclusive science teaching culture?
4. In what ways could I envisage an inclusive science teacher education?

Significance for Myself and My Contemporaries

The research aimed to counteract the hegemonic pedagogical culture embodied in science teacher education, thereby envisioning inclusive science education in the landscape of Nepal. While doing so, I narrated some science teaching and learning-related epiphanies for pondering positive and dogmatic beliefs, assumptions, cultures, values, and actions. It could assist in being aware of my false consciousness, taken-for-granted assumptions, and more relevant transformative pedagogical cultures. After revealing both more robust and weaker poles grounded in my science teaching and learning, it could help to incorporate transformative

pedagogy for improving and transforming my science teaching cultures that in/directly invigorates me to create my learners as an agency by raising the questions of how do I improve what am I doing (Whitehead, 2008)?

This research may also envisage different ways for transforming my professional practice towards inclusive science education. Besides, this research could generate pedagogical thoughtfulness to my contemporaries after reading my evocative and performative lived narratives. Therefore, I am inclined to believe that it could be significant to other contemporaries like novice science teachers, administrators, science teacher-educator, researchers, and other science learning communities for re/examining their beliefs and practices of science teaching and learning and re/conceptualizing their identity.

Luitel (2018) envisions various ways such as the pluralism, synergy, and montage for developing transformative curriculum visions for meaningful mathematics education to counteract the dogmatic disempowering assumptions within the mathematics curriculum of Nepal. Likewise, this research inquiry may also dig out the narrowly conceived disempowering assumptions, beliefs, and pedagogical culture in science teacher education and envisage better alternatives such as inclusive science education after reflecting critically on my personal experiences in science teaching and learning. From my lived experiences, I perceived that there is an interrelation between curriculum, pedagogy, and assessment system. So, the research may be worthful for envisioning transformative curriculum, pedagogy, and assessment system for enriching inclusive science teacher education that could shift towards the praxis-oriented science teaching-learning cultures.

Theoretical Referent of My Research

I followed the hermeneutic process and included the emergent ideas in the research process by incorporating two transformative stances: Emancipatory Interest of Human Knowledge Constitutive Interest Theory (Habermas, 1972) and Transformative Activist Stance (Stesenko, 2017) as referents. Furthermore, I also attempted to use the transformative notions of C*urriculum as Social Reconstruction* (Schubert, 1986) and C*urriculum as/ for Learning* (Qutoshi, 2016; Harapnuik, 2020) while addressing my research concerns.

I applied these as a referent rather than as a framework. My research acknowledged the multiple ideas and creativity for counteracting the hegemonic science pedagogical culture, envisioning inclusive science education. So, I used these stances as referents rather than a framework in the entire research inquiry process. Now, I would like to discuss the main concerns of these stances and how they support my research process?

Emancipatory Interest of 'Knowledge-Constitutive Interests' Theory

The knowledge-constitutive interest theory of Habermas (1972) acknowledges constructing the knowledge as being together because knowledge instead exists somehow separate from the people. In other words, it focuses on how knowledge is constructed. Further, an interest in rationality (reasonableness) is the most fundamental interest of the human species. The interest represents the pleasure that helps to connect with the existence of an object or an action. He discusses three types of human interests: Technical, cognitive interest, practical cognitive interest, and emancipatory cognitive interest. The task of empirical-analytic sciences, historical hermeneutic science, and critical-oriented sciences incorporate technical, practical, and emancipatory interest. The key concern of technical interest is control, and the

fundamental orientation of practical cognitive interest is understanding and interaction. However, emancipatory cognitive interest advocates for freedom that is directly connected with truth and justice. The critical pedagogy separated the emancipatory interest from a practical interest. It focused on self-reflection for emancipation (independence from all outside the individual) that promotes the autonomous, responsible action, which is the genuine fundamental interest of an individual (Grundy, 1987). In the context of critical reflection, Brookfield (2017) explains that critical reflection is the foundation for uncovering and challenging hegemonic assumptions. The critically conscious teacher neglects the naive assumption by exploring the accuracy and validity of our teaching assumption. Here, the assumptions are the taken-for-granted beliefs that direct our teaching-learning action.

The self-reflection process plays a central role in emancipating and liberating the dogmatic concept by developing authentic insight. So, critical self-reflection is the pathway in my research for liberating from dogmatic dependency. Further, it may contribute to becoming socially responsible learners, teachers, and teacher-educators in the upcoming days by developing them as critical and imaginative thinkers. The autonomy and responsibility are the foundation of emancipation that helps for liberating the teacher and learners from dogmatic and unfree existence. So, this interest-guided curriculum focused on critical perspectives such as self-reflection, critical inquiry-based activities that underpin being aware of false consciousness, counter the "hegemonic culture" (Gramsci, 1971), and liberate the teachers and learners from the dominant ideas and values by developing the authentic insight. In other words, we could shift towards emancipation by developing critical consciousness (Grundy, 1987). It supports recognizing the culturally structured nature

of educational institutions and debate between fundamental assumptions and taken-for-granted interests for reforming the social structures that constrain the emancipatory interests of teachers and students. Thus, the emancipatory interest-based curriculum emphasizes creating the ideal speech situation where the teaching-learning process is free from any constraints such as time, content to cover, free from coercion, and represents the undistorted-selves, that is, there is a complete reciprocity-based teaching-learning environment (Taylor & William-Chambel, 1993). This interest-based teaching-learning focused on active, meaningful, and critical reflection. And there is a dialogical relationship between the teacher and student, and the learners create the knowledge through their active engagement in learning that is the present need of science teacher education. Thus, this stance helped me to be aware of my dis/empowering cultures, beliefs, values, assumptions, and actions by critically reflecting on various incidents I experienced as a student, teacher, headteacher, and teacher educator. It also supported envisioning transformative missions, visions, and values for shifting towards inclusive science education.

While science education is oriented towards autonomous and responsible action, it could cultivate them socially responsible citizens. While doing so, we need to ask ourselves, am I prepared to transform in assisting my students in transforming? Self-reflection and relationships are very important in emancipation, and that helps to change society (Taylor, 2008). So, the emancipatory interest that emphasizes the critical ways of knowing is a referent of my research study. In my research journey, it is necessary to reflect critically on my personal experiences, assumptions, beliefs, values, cultures, and actions for pondering the hegemonic cultures embodied in my science teaching-learning. While doing so, I attempted to critically articulate the various dimensions of hegemonic cultures I experienced in my lifeworlds as a student,

science teacher, headteacher, and science teacher educator. Then I envisaged my organization's transformative visions, missions, and values for enriching inclusive science education by applying this stance as a referent.

Transformative Activist Stance

In my research inquiry, I applied Stetsenko's (2017) Transformative Activist Stance (TAS) as a referent. Because TAS tries to overcome the recent compartmentalization within socio-cultural approaches by restructuring a broad dialectical view in human development. It greatly focuses on the relational worldview rather than a transactional process. That means TAS catalyzes for continuous dialogue and participation, relatedness and interconnectedness, and the coming together of individuals and their world. Moreover, it emphasizes collaborative and unified (i.e., indivisible through not homogeneous) transformative ontological praxis rather than continual efforts to make things happen in the world. That is, it counters the product-oriented, routinely based teaching culture. It believes that the mind is a dynamic system, so people estimate reality through knowing, being, and doing in the process. The patterns arise from the connection between the organism's features and the environment. They reflect the history of the entire system, not just the immediate conditions.

Consequently, individuals can understand and actualize their relation to the world and other people. However, people emphasize adaptation, that is, deeply Darwinian views in which the goal of development is to adapt and fit in with the world as it is. To remove to grasp the universal laws and uniform, the present ideals of science need to hold variation and change. So, the ethical dimensions of development are required in science education for developing political imagination, relativism of knowledge, commitment, and visions.

The life agenda, commitment, and vision for a collective project are the central concern of TAS. Thus, I have realized that our science teaching-learning is also conscious of these aspects. Being an actor in the world, commitments are critically set in every act of knowing, being, and doing, and it is mainly purposive. Good perception is necessary for purposeful action, but it is impossible without a vision for the future. For that reason, a moral vision is essential for transformative learning in science education that can purposefully transfer the world through our activities. TAS advocates that the simultaneous process of transforming and being transformed by the other takes place and acknowledges divergences and differences based on non-instrumentalizing connection. Critical reflection helps scrutinize our assumptions by viewing them through different lenses such as students' eyes, colleagues' perceptions, personal experience, and theory (Brookfield, 2017). In this study, I tried to reflect critically on my personal experiences of science teaching and learning by using these lenses and digging out deep-seated hegemonic pedagogical culture, and also envisage the inclusive visions, missions, and values for counteracting the hegemonic teaching culture embodied in the science teacher education and enriching inclusive science education. Because the centrality of teaching-learning is to contribute to society, it is mandatory to know the vision. The connection between the past, present, and future is essential so that the relationship between the '*is'* and the *'ought'* to be both being held in a single vision. Thus, I tried to incorporate these transformative notions in the visionary part of my research.

TAS provides the guideline to change the traditional worldview (emphasizing universal and uniform disciplinary knowledge and following the adaptation process) and the relational world view (collaboration) because they are inadequate to unfold the idea of human development. It invigorates to move towards the unified, inclusive,

transformative world view (knowing, being, and doing) that can develop holistic thinking and socially responsible science education, which is also the key concern of visionary parts of my research. Therefore, I applied this stance for portraying my transformative knowing, being, and doing I experienced in my teaching and learning (typically, STEAM educational journey), meaning-making process, and envisioning transformative visions, missions, and values of my organization for enriching inclusive science education.

Curriculum as Social Reconstruction

Schubert's (1986) curriculum image- *curriculum as social reconstruction* emphasizes socially responsible schooling. The schools serve an agenda of knowledge and values that could improve social and cultural institutions, beliefs, activities, and develop good citizens. In this progressive curriculum image, students have a central role in designing and implementing the curriculum. Likewise, the purpose of education is to improve the social order for the betterment of the society where every social member realizes social justice. In the process of addressing my research questions related to science teaching-learning, I applied this image. It helped me to portray my curricular practice-related experiences and opinions that made me envisage socially responsible science teacher education as well.

Assessment as/for Learning

The transformative assessment goes beyond the *assessment as 'of' learning* (i. e. summative process like standardized test) for making better sense of learning in their real-life world. It also focuses on *assessment as 'for'/ 'through' learning* approaches (i. e. formative process like continuous assessment system). It could assist to develop knowledge, skills, dispositions, and positive behaviors of learners (Qutoshi, 2016). In this regard, Harapnuik (2020) also argued that] assessment *for*

learning occurs throughout the teaching and learning process to demystify the students' knowledge, understanding, and skills. Likewise, students could ask questions and use a range of strategies in the context of *assessment as learning.* They could act as their own assessors for deciding their knowing, doing, and assessing process for new learning. For preparing more autodidactic learners, we could shift from *assessment as/for learning* to *assessment as learning.* In the process of critically reflecting the hegemonic pedagogical cultures, and envisioning an inclusive science teacher education, I used this transformative notion-guided theme as a referent. It helped me to dig out my experiences related to assessing cultures in my science learning and teaching context. Typically, I focused on *assessment as/for learning* for counteracting the domination of *assessment as/of learning.*

Recapitulating the Chapter

Chapter I aimed to explore my research issue by critically reflecting on my autobiographical self that I experienced as a learner, science teacher, administrator, and science teacher educator. I tried to portray my own learning experiences in different spatiotemporal contexts to further learning journeys to seek how my professional self has been constructed and how I could bring hope to my science teaching-learning? Based on this I came up with my research purpose: Counteracting the hegemonic pedagogical culture embedded in science teacher education, thereby envisioning an inclusive science education in Nepal. I constructed my autobiographical, related research questions that emphasized hegemonic pedagogical culture, beliefs, empathetic relation, and inclusive science education to address my research purpose. I discussed the Emancipatory Interest of Habermas's (1972), Transformative Activist Stance (Stetsenko, 2017) as theoretical referents. Likewise, I also tried to incorporate the transformative intent of *curriculum as social*

reconstruction (Schubert, 1986) and assessment as/for learning (Harapnuik, 2020) in my research journey. I also explained the possible use of my research to me and others that I viewed from my eyes.

CHAPTER II

RESEARCH METHODOLOGY

In this chapter, I have designed a complete research methodology framework to accomplish my research project successfully and systematically. I have included the philosophical perspectives (i.e., Ontology, Epistemology, and Axiology), research design, methods, generating field text, meaning-making process, research site and participant, quality standards, and ethical considerations of my study.

Axiological Assumptions

To explore the hegemonic teaching culture embedded in science education, I reflected critically on my personal experiences excavating my deep-seated belief and practices. So, I prioritized my socio-cultural, historical, and political perspectives (Ellis, 2004) of science teaching and learning culture. While doing so, I became conscious of the critical reflection process because it helped assess the hegemonic teaching culture from the different vantage points and envisaged the transformative visions, missions, and values of my organization to better my current practice. So, my ethical standpoint was transformative being (Stetsenko, 2017), and my research was value-laden. I acknowledged the multiple realities. Because my rearing, learning, teaching context, time, and experiences were varied. Likewise, I held the ethical values as a change agent during the exploration or generation of narratives, scholarly interpretation, and meaning-making process. I also acknowledged writing as an inquiry process (Richardson, 2009) by opening the critical lenses.

Ontological Assumptions

As a STEAM learner, I have realized that the STEAM approach is constructive for transforming our deeply-seated disciplinary egocentrism (Connor,

2015) and catalyze for authentic, inclusive, and meaningful learning by incorporating this trans-disciplinary integrated approach in the curriculum, pedagogy, assessment system, and research. I want to apply this transformative approach in my everyday practice to transform my disciplinary egocentric professional practice. So, in my research journey, I hold TAS-based ontology for changing myself as a transformative being that emphasizes collaborative and unified (i.e., indivisible through not homogeneous) transformative ontological praxis rather than continual efforts to make things happen in the world. It emphasizes the relational worldview like continuous dialogue and participation, relatedness and interconnectedness, and the coming together of individuals and their world. Further, it believes that the mind is a dynamic system, so people estimate reality through knowing, being, and doing processes (Stetsenko, 2017).

For pondering the hegemony grounded in my science teaching and learning journey and envisioning inclusive science education, I also hold the unified transformative ontology by considering the mind as a dynamic system. Thus, I reflected critically on the socio-cultural, historical, and political aspects for transforming my dogmatic beliefs and actions. In other words, I became evocative for uncovering the multiple realities rather than a singular reality.

Epistemological Consideration

The research purpose, questions, and theoretical referent of my research evoked me to critically understand my deeply grounded dominant teaching. It enabled me to learn the culture and construct holistic visions (like STEAM approach-based) to counteract the hegemonic science teaching culture. In this context, Brookfield (1995) argued that engaging in critical subjectivity opens the critical eye and examines our belief systems through critical reflexivity; such an ideological critiquing process is

helpful to identify the repressive social structures and power relationships. In this regard, Taylor (2014) explained that we need to engage in the historical, hermeneutic, and dialectical knowledge re/construction for making them socially responsible science education. As a result, we could co-construct emergent knowledge (Shrestha, 2018). Thus, I critically reflected the socio-cultural, historical, and political aspects in the process of knowledge construction in my research.

Multi-Paradigmatic Design Space

A paradigm shift in research helps re-conceptualize the purpose of education (Luitel & Taylor, 2019). While addressing my research questions, I also incorporated the resisting, liberating, and healing of criticism; different art-based research genres and logics of postmodernism for representing the multivocality and differences; spatiotemporal, socio-cultural, contextual ideas of interpretivism for including the emergent ideas; and inclusive mode of reasoning of integralism for envisioning inclusive science education that could assist in counteracting hegemonic science pedagogical culture and in developing the socially responsible holistic imaginative thinkers for sustainable development. Now, I would like to briefly discuss how these multiple paradigms have supported my research journey?

Criticalism

This paradigm is also known as the transformative paradigm (Riyami, 2017) because these paradigm-based researches emphasize the social, economic, political, and cultural context for empowering and reforming participants' lives (Hammersely, 2013). Similarly, it has transformative intent to promote social justice like a democratic, fairer, more equitable, more inclusive society by identifying the hegemony of powerful social thought and action systems and contributing to emancipating our society. However, maintaining the opportunities for dialectical

thought and critical discourse associated with social change is a more challenging task (Taylor, 2014).

According to Larrivee (2000), critical reflection comprises critical inquiry and self-reflection. Where the critical inquiry is the conscious consideration of moral and ethical implications and influences of practice on learners, and the self-reflection is the deep examining of personal values and core beliefs encompassed in the assumptions that the educators make and the expectations they have for the learners. Thus, this paradigm supported digging out the hegemony embedded in my science teaching and learning journey through the critical reflexive process. Thus, for pondering the deep-seated hegemony in science teaching-learning and envisioning inclusive science education. However, this paradigm overemphasizes self-reflection, which is criticized as *a navel-gazing* (Rushton & Suter, 2012) paradigm. Thus, I introduced the key notions of the art-based postmodernism paradigm to understand and represent my lifeworlds' different complexities.

Postmodernism

The postmodernist research paradigm is the relatively new and challenging paradigm that brings the very significant concept of 'representation' in research. To do the best in our research work, we could represent the human feelings and thoughts in the research using various arts (Denzin & Linclon, 2005). I applied this notion in my research to represent my thoughts and feelings playfully by using various forms of genres like narrative logic, dialectical logic, metaphors, etc. While articulating my lived experiences of science teaching and learning by using this powerful new logic and genres, it helped make sense of my complex world (Taylor et al., 2012). Likewise, this paradigm enhances the plurality of language games and dynamism (Taylor, 2014). So, I tried to represent the difference, connect the cognitive and emotional aspects in

my research. I am inclined to believe that my reader could realize that it is my own narratives after reading my lived narratives. However, I also incorporated the emergent, socio-cultural, contextual notions of interpretivism paradigm for addressing my research questions.

Interpretivism

This paradigm is beneficial in addressing my research problem. To counteract the hegemonic teaching culture, my lived experiences, time, and context had an important role. I carefully documented the context (physical, social, cultural) and generated practical knowledge of the complexity. In other words, this paradigm encouraged me to construct insightful understandings of the 'meaning perspectives such as ideas, beliefs, values, and worldviews (Taylor, 2014). As doing so, I attempted to understand my culture subjectively which has also played an important role in the hermeneutic process of interpretation.

Furthermore, this paradigm encouraged me on progressive development by adding the emergent and reflective quality (Medina & Taylor, 2011). Thus, it guided me to clearly represent the different complexities in my research genres such as narrative, metaphors, etc. However, I also used integralism as a supportive paradigm that enabled me to envision holistically by crafting my narratives based on my personal science teaching and learning experiences. Although the above three paradigms greatly supported the research journey, I felt that an inclusive mode of reasoning is important for envisioning inclusive science education to counter the hegemonic science teaching-learning culture and prepare the socially responsible citizen. So, I also incorporated the holistic notions of integralism paradigm.

Integralism

This paradigm helped integrate my fragmented knowledge, skills, and ideology of science teaching and learning for shifting my hegemonic professional practice towards transformative learning. In creating a coherent system of thought, an inclusive mode of reasoning is very helpful for generating a holistic understanding of ourselves and our connectedness. Thus, we could shift from the dualistic (i.e., either/or) to an inclusive mode of reasoning (Taylor, 2014). For instance, in our Eastern wisdom traditions, we believe that matter, mind (knowledge), and spirit (self) are connected to one another, making us sustain ourselves in the world. Furthermore, it helps create ethical sensitivity in the future generation by including this notion in our curricula policies and pedagogical practice (Taylor et al., 2012). Therefore, for envisioning the inclusive science teaching culture for preparing socially responsible citizens, these paradigms supported me to envisage my organization's transformative visions, missions, and values. As a result, we could transform from the more dominant empirical-analytical way of knowing cultures of science education to historical, hermeneutic, and emancipatory ways of knowing cultures.

Autoethnography as Research Methodology

I used autoethnography as my research methodology for pondering the hegemonic pedagogical culture embedded in science teacher education. According to Jones et al. (2013, p. 283) autoethnography "offers a variety of modes of engaging with self, or perhaps more accurately with selves, in relation to others, to culture, to politics, and the engagement of selves with future possibilities for research." So, the researcher's relationship with others is meaningful in this methodology (Adams, 2008). I also acknowledged and valued my relationship with others in my research journey.

I agreed with O'Hara (2018), who explained that an autoethnographic methodology supports studying and analyzing the self and personal experiences and envisaging possible alternative ways. So, it is the science of writing our lived experiences. As professionals in academia, we could use autoethnographic writing to bring our past experiences to the present and give way to future professionals. It contextualizes experiences in cultural, social, political, and personal history and presents a story in a scholarly and evidence-based way. In this context of autoethnographic writing, claimed that it "confronts the tension between insider and outsider perspectives, between social practice and social constraint" (Reed-Danahay, 2009, p. 32). Therefore, I also applied this methodology in my research journey.

As humans, our experiences, beliefs, thinking, and actions are interconnected with our socio-cultural, historical, and political aspects (Ellis, 2004). In this regard, Luitel and Dahal (2021) discussed that autoethnographers could reflect critically on their lived actions, reactions, and interactions in the whole process of inquiry for unfolding their pain as well as gainful texts in the form of self-narration. Thus, I used autoethnography methodology to reflect critically on my personal experiences through a magnifying lens that helped demystify my true self by visualizing the dis/empowering science teaching and learning cultures and envisaging the possible alternative ways for creating an inclusive science education in the future. In the process of meaning-making, I greatly focused on the criticalism paradigm. However, I also became conscious of my other research paradigms. Now, I would like to discuss the journey of meaning-making in my research.

Meaning Making Process

I developed multi-paradigmatic research designs like interpretivism, criticism, postmodernism, and integralism research paradigms (Taylor, 2014) for addressing my

research purpose. I incorporated the notion of these paradigms in the process of meaning-making. However, I significantly aligned with the notions of criticism paradigm, so I followed the resisting, liberating, healing, and envisioning in the meaning-making process. In the resisting process, I was reflexive for challenging the hegemonic pedagogical culture in science education and questioning the '*status quo* embedded in my practice; in the liberating process, I critically reflected on my lived experiences for demystifying the dis/empowering pedagogical culture. Whereas my ethical standpoint was a change agent for transforming me and others (culture) as autonomous and responsible beings; in the healing process, I tried to bring back the hope through my research by representing my repressive voices; and in the envisioning process of my research, I reflected the key insights from my lived experiences for envisioning inclusive science education for counteracting the hegemonic pedagogical culture in science teacher education.

For constructing insightful understandings of the 'meaning perspectives,' I followed interpretivism. In the process of meaning-making, I connected the idea with emergent socio-cultural context and evoked the readers with pedagogical thoughtfulness by examining our practice from different vantage points. I carefully documented my research's physical, social, and cultural context and generated practical knowledge for addressing the complexity in our professional practice. Furthermore, I used narratives, dialectical, poetic, metaphoric logics, and genres of postmodernism research paradigm in meaning-making to represent the multivocality and multiple realities. It helped me to connect the knowledge with our emotions and artfully demystify the hegemonic pedagogical cultures embedded in my science teaching and learning. Moreover, I consciously composed my lived experiences through engaging narratives and created an evocative text for making my writing an

inquiry (Richardson, 2009). I am inclined to believe that the reader of this research could realize that it is my own story. At last, I also applied an inclusive mode of reasoning (Taylor, 2014) for envisioning an inclusive science education in Nepal. As an ethnographer, I attempted to unfold my original (ideal) science teaching and learning-related autobiographic narratives. However, many factors such as emerging spatiotemporal settings, time gap, engagement in transformative learning, and maturity might have influenced the data text generation and meaning-making process. Now, I would like to briefly explain how some logics and genres of postmodernism research paradigms assist me in meaning-making.

Narrative Logic and Genre

The narrative genre evokes articulating our lifeworlds and encourages us to generate thick descriptions of our professional practice (Luitel & Taylor, 2019). To explore hegemonic pedagogical culture, I also used the narrative genre that supported critically reflecting my teaching and learning experiences. My research paradigm extensively focused on criticism. So, I tried to maintain critically conscious writing while portraying my lifeworlds.

Dialectical Logic and Use of Slash (/)

I value dialectical logic in the meaning-making process because my research study emphasizes inclusive science education for developing creative, imaginative, and holistic thinkers. So, I tried to dig out the past, present, and future direction, of my science teaching and learning. While doing so, I critically portrayed my dualistic views like dis/empowering knowing, being and doing cultures, and beliefs on em/pathetic relation with transformative visions by using slash (/). Dialectical logic explicitly supported me for engaging on contradictions embedded in either/or dualistic mode of reasoning and generating synergistic and complementary perspectives (Luitel

& Taylor, 2019). For instance, I generated the meaning inclusive nature of science education by engaging in a dualism between science education's im/pure nature.

Metaphors Logic and Genre

The human conceptual system is metaphorical, so the way we experience and do in everyday life is centrally a matter of metaphor. Our conceptual approach is essential for defining our realities, so metaphors are a matter of rhetorical flourish or literary aesthetics and day-to-day communication. Metaphor is the decisive force in constructing and maintaining a worldview that governs our thought and action (Lakoff & Johnsen, 2003); therefore, the metaphor plays the role of a catalyst for changing in teaching and teacher education and in life itself (Craig, 2017). The metaphorical concept is essential for understanding and experiencing one kind of thing in terms of another. Thus, I used different concepts, images, and other non-linguistic metaphors such as pictures and cartoons to consolidate my narratives' fragmented ideas and develop crystallized views. It supported me in unpacking the deep-seated hegemonic and inclusive cultures I experienced in my science teaching and learning journey and envisaging my organization's transformative visions, missions, and values after a decade for flourishing inclusive science education.

Poetic Logic and Genre

I used poetic logic for noticing my experiential interiority, such as passions, joys, and sorrows that I accumulated in my teaching and learning journey. These logics helped demystify the in-depth and holistic understanding by knowing the deep relation between ideas, concepts, words, and meaning (Luitel & Taylor, 2013). So, I could change my conventional identity to an unconventional identity. Metaphorically, *an authoritarian teacher educator* to *social-democratic notion-*

oriented teacher educator. In other words, it may support transforming my dogmatic beliefs, values, assumptions, and actions.

Quality Standards of My Study

I designed multi-paradigmatic research and used autoethnography as the methodology for pondering the hegemonic pedagogical cultures in science education and envisioning inclusive science teacher education. Being a participant and researcher, maintaining the quality standards of my research work was a challenging job for me. However, I tried to ensure the quality standards of my research by applying the multi-paradigmatic-based quality standards like transferability, crystallization, critical reflectivity, verisimilitude, and pedagogical thoughtfulness transferability in my research. Now, I would like to briefly discuss these quality standards and how I have applied them in my research journey.

Transferability

I tried to address the different lived experiences of hegemonic teaching culture in my science teaching-learning journey by providing enriching details of research pedagogical contexts, events, moments, information sources, and information collecting methods in the research report for making the research work more transferrable. Hence, by identifying the similitude and dissimilitude of my research setting, it could be adaptable to a new context. In other words, an incoming researcher could use some important ideas of my research design to explore a similar research problem.

Crystallization

Crystallization was another quality standard in my research for understanding and representing the complexity of social realities (Taylor, 2014). In other words, it catalyzed me from representing the different convolution by using art-based different

research genres. The trustworthiness criteria motivated me to construct the multiple and contingent meaning perspectives; I applied Richardson's (1994) crystallization metaphor for developing the holistic, multi-faceted, and dynamic perspective. He metaphorically introduces the idea of light theory by imagining the multi-faceted crystal that could create a colorful spectrum through the refracting process. In the refracting process of light, both internal and external process is important. Thus, in my research process, I refracted my internal worldview and reflected my exterior world view while narrating the different lived stories and creating interrelating dynamic and colorful images like a spectrum of light.

Critical Reflexivity

In the process of the text generating process, I became aware of my dogmatic beliefs and actions during science learning and teaching. Moreover, I was conscious of the socio-cultural and historical aspects and political aspects (Taylor, 2014). I critically reflected on my lived experiences of the science teaching-learning journey. I knew my deep-seated, dominating cultural practice by developing authentic insight. So, I asked the questions by myself from different angles. Guba and Lincoln (1989) authenticity is an important criterion in the critical research inquiry.

I deeply engaged in my work and developed my organization's visions, missions, and values after a decade through this research inquiry. Because visionary and ethical knowing supports making the visions for a better world (Taylor, 2014), I also attempted to envisage an inclusive science teaching culture for preparing socially responsible citizens.

Verisimilitude

In my research, I incorporated different art-based research genres such as narratives, vignettes, and poems to represent the different hegemonic science teaching

cultures deeply rooted in our practice. For that reason, I became more conscious of creating a more authentic text so my readers can realize that it is my experience (Adler & Adler, 1994). In other words, through my ways of writing, I connected my research ideas with their feelings that make my research more believable, lifelike, and seemingly possible Ellis (2004). Consequently, my reader and I can broaden our perspective of science teaching-learning because it invigorates us to understand others from different viewpoints. That means I tried to portray the various ways of hegemony embedded in science teaching and learning from different angles and develop the transformative visions for enriching inclusive science education.

Pedagogical Thoughtfulness

I attempted to maintain the pedagogical thoughtfulness criteria in my research because the primary goal of my research was to transform the disempowering dominant ideology in science teacher education. Thus, I consciously represented the socio-cultural, historical, and political contexts in my research so my reader and I can critically reflect on our values and beliefs about teaching-learning (van Manen, 1991; Taylor, 2014). I generated a more evocative perspective and dialogic text by reflecting critically on my lived experiences of science teaching and learning so that I and other science learning communities can be aware of our deep-seated assumptions about learning. I also knew the hermeneutic-phenomenological (more interpretive and lived experience-based) approach, so my research writing was more oriented, strong, rich, and deep (van Manen, 1990).

Ethical Considerations

Ethical consideration is crucial in every point of research (Creswell, 2015). The autoethnography was my research methodology for addressing my research purpose and questions. So, I reflected critically on my personal experiences for

counteracting the hegemonic pedagogical culture in science teacher education and envisioning inclusive science teacher education. The 'self' is a significant source of exploration for transforming the deep-seated dominant pedagogical culture in my professional practice. Hence, I applied the procedural, situational, and existing ethics (Tracy, 2010) in my research to maintain the ethical aspects.

Procedural ethics represents the universally acceptable conduct that we need to incorporate in our research process. I honestly followed the ethical guidelines form of the KUSOED that supported addressing the different ethical aspects such as avoiding deception, doing no harm to others, and ensuring privacy and confidentiality (Sales & Folkman, 2000). While ensuring privacy and confidentiality, I used various arts-based genres such as narratives, dialogue, and poetic logic to ensure privacy and confidentiality. I hid the participants for securing all personal data such as name, address, and workplace. Thus, I protected my research from possible deductive disclosure (Tracy, 2010). I incorporated no harm to others' principles in my research journey.

I also followed situational ethics in my research inquiry to address the several important moments in my research process because prescribed laws are insufficient to understand all ethical reasons and context (Fletcher, 1966). I portrayed my lived experiences happened in a different environmental setting. Therefore, I repeatedly reflected on, critiqued, and questioned my ethical decisions. Self-reflexivity shows the "honesty and authenticity of one's self, one's research, and one's audience" (Tracy, 2010, p. 834). I became self-reflexivity for articulating my undistorted self like stronger and weaker aspects without hesitation. Moreover, I attempted to engage in my research subject boundary. While doing so, I critically reflected on my research processes such as methods, data, meaning making, and so on that could justify the

ends (purpose) or not. I mean, I followed contextual ethics in my research inquiry while making ethical decisions.

Finally**,** I followed the existing ethics to avoid unjust or unintended consequences of my research work and society. I used unbiased language and excluded the scandalous tales that could harm me and related others. So, I was reflexive before sharing my research's essential learning outcomes with the public (Tracy, 2010). I believe that my honesty in practicing ethical guidelines in my research journey could help enrich the transformative visions, missions, and values in science education. Here, I have mentioned the table for visualizing my overall research journey and the sources of narratives as follows.

Table 1

Data Generation Ways

Inquiry Themes	Representative Chapter(s)	Research Question(s)	Source and Timeline of Data
Crafting My Science Learning Journey: Revealing Hegemony	Chapter III	How have I experienced hegemonic pedagogical culture in the science learning journey?	From School Education to Higher Science Education (the late nineties-2015)
Crafting My Science Teaching Culture: My Beliefs in Empathetic Science Learning Milieu	Chapter IV	What beliefs did I hold for creating an empathetic science learning milieu?	From School Teaching to Higher Level Science Teaching Before STEAM

			(2014-2020)
Crafting My STEAM Educational Journey: Reflecting Transformative Knowing, Doing and Being	Chapter V	How have I been experiencing an inclusive science teaching culture?	My STEAM Learning and Science Teaching (2020-present)
Key Insights from My Lived Experiences: Envisioning Inclusive Science Teacher Education	Chapter VI	In what ways can I envisage an inclusive science teacher education?	(Childhood-Present)

Recapitulating the Chapter

In this chapter, I discussed the philosophical assumption of my research. While doing so, I portrayed my values as a change agent in the axiological assumptions. Further, I considered the mind as a dynamic system, held unified transformative ontology and became evocative for uncovering the multiple realities rather than a singular reality; and reflected critically on my personal lived experiences for pondering socio-cultural, historical, and political aspects of my science teaching and learning journey in my epistemological assumptions for constructing the emergent knowledge. As a STEAM learner, I experienced research as transformative

professional development and realized to research by incorporating this notion. While doing so, I acknowledged the key notions in my research notions of criticism, postmodernism, interpretivism, and integralism. Such a multi-paradigmatic design space supported me in the process of data text generation and the meaning-making process of my research. For demystifying my true self by visualizing the dis/empowering science teaching and learning cultures by reflecting critically on my personal experiences through a magnifying lens and envisioning the possible alternative ways for creating an inclusive science education in the future, I used autoethnography as methodology.

I crafted my lived experiences based on my research questions and constructed meaning using different art-based new logic and genres like Metaphoric logic and genre, narrative logic and genre, poetic logic and genre, dialectical logic and genre, and dialogic logic and genre. Likewise, I attempted to maintain the quality standard of my research by consolidating the different paradigms-based quality standards like transferability, crystallization, critical reflexivity, verisimilitude, pedagogical thoughtfulness in my research. While maintaining the ethical parts of my research., I consciously followed the procedural, situational, and existing ethics in my research. The criticism research paradigms largely guided my research. So, these ethical aspects supported me to escape from narcissism.

CHAPTER III

CRAFTING MY SCIENCE LEARNING JOURNEY: REVEALING HEGEMONY

I would like to interpret the data text and generate the meaning process to address the research question: How have I experienced hegemonic pedagogical culture in the science learning journey? In doing so, I have reflected on some critical incidents for revealing hegemonic pedagogical culture in my science learning journey (from my childhood to my masters' degree). The narratives support transforming our practice (Brookfield, 2015). The researcher needs to examine contradictions, dilemmas, and paradoxes embedded in their thinking and actions, beliefs and advocacy, personal and professional, and transform their identities by employing various transformative research methods like ideology critique, narrative writing, art-based logic, and genres. It enables to development of a vision for an inclusive and agentic educational system (Luitel & Taylor, 2019). Thus, I critically reflected on my lived experiences as a science learner to address the first research question. I am inclined to believe that I could identify the dominant, unjustifiable hegemonic pedagogical culture by critically reflecting on my science teaching and learning-related narratives.

For revealing the deeply grounded hegemonic pedagogical culture in my science learning journey, I have critically unfolded my lived experiences by developing twelve narratives: Demotivating from Formal Schooling: Learning with Nature; Multifaceted Science Learning: Nature, Culture, and Strict and Excellent Teacher; Difficult Timing: Life Worlds and Academic World; Bitter Experience of Civil War: Disturbing My Family and School Chemistry; Science Learner's Craze: Contextual Content and Colored Pictures; Enriching Communication: Inclusive

participation in Science Classroom; Dogmatic Beliefs of Teachers and Society: Influencing Learning and Everyday Life; Teacher's Beliefs: Dualism between Im/pure Science Education; Uncritical Pedagogical Practice: Knowledge Consumption; Invisible Forces: Transmit Culture Reproduction in Prospective Teachers; and My Prospective Science Teaching: Emphasizing Structured Task Performance.

Demotivating from Formal Schooling: Learning with Nature

It could be any day of 1997; my brother and I were going to Shree Saraswoti Primary School in Myangdi. While crossing around two hundred meters' distance from my home, my brother might have said, *"Today, I am not interested in going to school. If you agree with me, we will play different games and enjoy over a day."* I requested him to go to school to continue his studies. However, after walking around the one-kilometer journey, he was not ready to continue his journey. He put his bag on the big black stone and sat there, and he could have said, "*I do not go to school. Most of the teachers bit me. They said to memorize the content. I could not memorize the contents and solve the problems that they assigned for Today.*"

The teachers focused on controlling the students through crude punishment and conducted their classes as per their interest, even though corporal punishment negatively influenced the students learning (Zitieren, 2012). I observed the punishment like walking on knee around the ground four/five-time in the simple mistake of him and other students through the window and became emotional while observing their white bone in their knees with excessive bleeding that broke my concentration on learning. He had a severe wound in his elbows and knees but, he did not share to parents due to the fear of his mistake. The role of the teacher in the classroom is as *a controller* (Dougiamas,1998) rather than a facilitator. Likewise, my parents also could give more attention to their children's learning. Although they saw

the wounds, they did not consult with a related teacher. Oppositely, my father scolds him.

I agreed with his request because I could not go alone to school and realized his pain. Then he said, "*We need to hide from other friends. Otherwise, they will report to the teachers and our parents."* I think that is the best idea for escaping from the possible harm from others. Every day, we met another higher secondary school's English teacher on our way. We always greet him and ask, "*What time is it now?*" He replied to us, "*Paune Nau*[2]." We do not know the meaning of *Paune Nau*. So, we were interested in observing his watch. Every day we met him and repeated the same way of greeting and questioning, "*Sir Namaskar! What time is it now?*" Listening to our same question, again and again, maybe he felt bored and started to reply, '*Hijo ko jati*'[3]. One day, after greeting him, we humbly requested him to say the meaning of *Paune Nau. T*hat day he asked to observe the time on his watch. There was no 1, 2, 3, … so we were unable to read the time, but we were very excited by getting an opportunity to observe his watch.

Figure 1: 'Brother Sister' Source: 'Self'

[2]*Paune Nau* - quarter to nine
[3]*Hijo ko jati* - same as yesterday

Then we looked for safety place. Suddenly, we saw a small cottage near the *Bar-pipal Chautari*[4] made for adult education. Every evening, the adult people of the village came there for instruction. Then we silently lived inside the cottage. Meanwhile, we listened to the walking sound, and we thought our regular English teacher was coming. We thought if he saw us in the cottage, he would force us to go to school. Therefore, we lived silently until he passed from the cottage.

After this, we felt freedom. Then we started to play marble collecting fruit of *bar* and *pipal*. Suddenly, we saw *kumalkoti*[5] designing their nest by bringing mud. We calmly and enthusiastically observed their activities. After creating their house, they took insects like grasshoppers, spider into the nest and sealed their door. Observing the *kumalkoti's* activities, many curiosities arose in our minds. As I remember now, we could have asked our self, "*Why did kumalkoti seal the spider inside their cage? What will the spider do inside their cage? Does the spider still alive?*" Then we made a hole in their cage to observe the spiders' inner activity. We saw the spider is not entirely dead. After some time, the insect moved outside from the cage.

Figure 2: 'Mud Dauber Wasp' Source: 'Self'

Likewise, my brother loved to play with insects, birds, and animals. Thus, he said, *"There are different kinds of birds in our village. Today, we observe their nest, eggs, and nestlings."* Then he climbed up in *the Pipal* tree. He found a nest of dove having two eggs. He showed the nest to me and might have said, *"The dove is a too*

[4]*Bar-pipal Chautari* - resting place with banyan and fiscus trees.
[5] Kumalkoti – mud dauber wasp

lazy bird. Their nest is not properly designed, and they have white color eggs. I requested him to show the egg, but he could have said, *"We don't touch their eggs. If we touch it, their parent's dove could not hatch that eggs and move away from that place."* He climbed down without touching their nest.

Then we again searched other trees for exploring the nest of new birds. Luckily, we saw the green-colored birds come out from a small hole in *the Kutmero*[6] tree. My brother recognized its name *Kuthurke*[7] *(*Blue-throated Barbet bird*)*. Then we were interested in observing their nest. Therefore, he climbed up in that tree and tried to observe their nest from the small hole. However, due to the lack of proper light, he could not observe the inner condition of the nest. Then he put his hand inside the nest, and small nestlings started to make a sound. He brought a nestling in his hand. We observed it interestingly. Their parents began to move around my brothers' heads with a loud sound. We realized the love of parents to their baby. My brother kept the small bird in their nest as usual and climbed down. We observed their activities by living near the tree.

Figure 3: 'Blue Bird and pigeon' Source: 'Self'

They immediately entered inside the nest and lived with their nestlings. *"What will the parent do if we exchange their nestlings? Can they easily detect their nestling or not?"* My brother might have asked. Meanwhile, we decided to change

[6]Kutmero- Litsea polyantha
[7] Kuthurke- Blue-throated barbet bird.

their nestlings and observe their reaction. In doing so, we need the nestlings of another bird. Then, we started to search for nestlings of different birds. Fortunately, we found the little pigeons at the roof of the nearest animal *Goth*, then my brother kept them into the *kuthurkes'* nest and climbed down. After that, we secretly lived inside the same cottage and observed their reaction. The parent kuthurke came outside their nest but was not ready to go inside the hole for feeding and living. *"They easily detect their nestlings, so they are not going inside their nest,"* Brother might have said. After that realization, he took the little pigeons in their own nest.

We were thirsty and hungry. There was no tiffin with us. Then we went to the nearest water source for drinking water. We drank the water and came back towards the cottage. We saw a golden insect whose local name is *Suntiki*[8](golden ladybird) on the leaf of a creeping plant. We brought them in our hands. The *Suntiki*, having a beautiful appearance, lived without motion. We put the *Suntiki* on our forehead, noticed the beauties by looking at each other, and returned to the cottage.

Figure 4: 'Golden ladybird' Source: https://baynature.org/wp-

"It is a time to return our friends from school. So, we should live silently inside the cottage", my brother said. Meanwhile, we heard our friends' taking and walking sounds. They crossed the cottage and went home. After some time, my brother might have said, *"Our parents and other family members could not guess whether we go to school or not because it is our regular time to come back home. Let us go back!"* Then we returned.

[8] Suntiki- Golden Ladybird

In the evening time, we were helping our mother in the kitchen. We heard the sound of Nepali teacher Mr. Yam who was talking with our father. We curiously listened to their conversation. Mr. Yam loudly told us about our absenteeism in school that made us afraid. After the conversation, my father became angry. He scolded us and also beat my brother.

Experiencing such a learning environment in my very beginning of formal education, I am akin with the explanation of Mishra et al. (2010), where they argued that for developing the pupils' talents, providing children with a caring environment is a challenge for Nepalese society so offer fertile soil to grow into the capable and confident personalities. Generally, the existence of corporal punishment and the apparent predominance of children by teachers or parents reflect the low social status of children in society, the family, and in the classroom that has a severe impact on their physical, emotional, and social well-being. Further, I would like to represent my teaching culture and family culture as 'micro *culture'*. Also, Qutoshi (2019) articulated the classroom where he teaches and the family culture where he lives as a micro-culture. He emphasized cultural-self-knowing for transforming self and others. From this incident, I also realized to critically reflect our micro-culture for transforming our knowing, doing, and being that could support to create the caring learning environment and counteract the hegemonic science pedagogical culture.

Multifaceted Science Learning: Nature, Culture, and Strict and Excellent Teacher

It might be any day of the late 1990s. My brother and I studied at Shree Saraswoti Primary School in Myangdi. After school time, we returned home, changed our uniforms, and had tiffin. Then we planned to design a beautiful school garden using locally available materials. Then we moved towards the yard and selected the

place for creating the school garden. We collected the required materials such as wooden pieces, bamboo, stones, bamboo beard, hoe, soil, and water. Then my brother dug out the land and began to construct our dream school. We used the collected materials for designing the building. We became happy while designing the beautiful school.

Unfortunately, the construction broke down after some time. We realized that we could not make a proper combination of ingredients. Then we again began to construct our school building. For not repeating the previous mistakes, we expanded the foundation area; mixed other ingredients such as hairs of goats, cow dungs, and lady hair grass) in the mud because my mother mixed these things while designing the *'Chulo*[9]*.'* We consciously arranged a different shape and size of the stone, wooden pieces, bamboos; and designed various shapes and sizes of the window, door. As a result, we succeeded in making the beautiful school. Moreover, we also designed a toilet, and water tap, and a beautiful garden by collecting locally available flowers, full-color stones, color mud, bamboos, small plants, and small insects such as ants, butterflies, and grasshoppers. It looked beautiful. There was no proper management of the garden, sanitation, and drinking water in school. I questioned, *"How could we feel if we had such a beautiful school garden?"* We smiled.

Figure 5: 'Gardening demo at school' Source: 'self-created'

[9] Chulo – traditional Nepali stove that is made out of mud.

My older brother and sisters also came back from school. They studied at Shree Janasewa Adarsha Higher Secondary School, around six kilometers away from our house. They observed our design and might have said, *"Wow! You made such a beautiful school! How did you make it?"* They became excited. After a few minutes, they could have said,

"Our science teacher had told us in the morning, we can see 'Puchhre Tara[10]' in our northeast part of the sky. It looks like a 'Babiyo ko Kucho[11]'. It is rarely seen in the sky so observe it." We excitedly observed the comet in the morning.

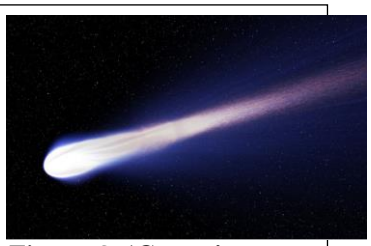

Figure 6: 'Comet' Source: https://pixabay.com/pt/espa%C3%A7o-estrelas-cometa-astronomia-1486556/.

My brother and sisters did several projects work as suggested by the science teacher. For example, they designed and demonstrated the working function of the hydraulic press by using locally available improvised materials like pieces of pipe, sticks, slippers, and water. They generally spend more than half an hour critiquing the behaviors and actions of a science teacher and students inside the science classroom. They might have said,

> *"Our science teacher is strict as well as excellent. He makes pin-drop silent while teaching his lessons. No one can speak in his classroom. If anyone makes a sound and disturbs him, he scolds two/three periods to all students. So, all students have to stay in strong discipline in their periods. However, we could observe or/take part in ambitious scientific experiments and demonstrations and design the scientific equipment using our surroundings' low cost and no-cost materials in his subject. He is more active than other teachers in the school, so larger mass of students and parents understanding as an excellent teacher as well."*

[10] Puchhre Tara - Comet
[11] Babiyo ko Kucho – The sweeping broom made from lady hair grass.

He had made a good reputation on the social level. So, I was hurried to complete my primary level and shift into a new school where he taught. After three years, my dream came true. I also began to study in the same school. I was excited to take his science classes. I had already known him as a *strict and excellent teacher.* For that reason, I honestly followed the class rules for being a good student. Generally, students were staying in the high discipline in science class. He demonstrated many experiments related to science topics such as the electrolysis of water, designing a simple cell by using lemon, demonstrating the function of a lever, pulley, inclined plane, reflection and refraction of light, magnetic line of forces, and so on, and tried to connect with our everyday life.

While critically reflecting on the above incident, I realized that science education is interrelated with our lived world and academic world. The science teacher motivated the students to observe naturally occurring scientific phenomena or laboratory experiments, using locally available materials in science teaching-learning and designing improvised materials to fulfill the lack of standard scientific materials. Meanwhile, the science teacher perceived his science classroom milieu as normal and natural, although the students should strictly follow the teachers' instructions without questioning. He might have thought, - I have been teaching well because I have enriching experiences of how to teach and how to evaluate. I am the best science teacher. I have the authority to control and run classes as per my interest.

Using the concept' *strict and excellent teacher'* reflected the dualistic view of students toward the science teacher. He became *an excellent teacher* when he did several science experiments compared to other neighboring schools; had enriched content knowledge; engaged students in designing improvised materials, project works, and connected with their everyday lives (ref). Meanwhile, students noticed

him as a *strict teacher* when he made pin-drop silence while demonstrating science experiments, delivering the science content, and punishing the students who were against his rules. While critically reflecting on my science teachers' pedagogical culture, I perceived that he frequently focused on the analytical knowing process. He loved to deliver the science contents and practical works in the pin-drop silence. Due to his strict discipline-based teaching culture, we could not raise questions while doing the experiments. Only a small number of students who were tagged as 'talented students' could raise the questions. Even though he did several scientific experiments and demonstrations, he was less conscious of participating in the learners' interactive discourse. He was sometimes incorporated hermeneutic knowing by connecting science content with learners' every day that supported us in understanding the lesson. However, I realized the lack of critical knowledge in his pedagogical culture. He was less able to dig out the learners' prior knowledge, beliefs, values, assumptions, and feelings; hear the voice of middle and lower level students by creating interactive classroom milieus like dialogic, dialectical, and trans-disciplinary collaboration; and act as a facilitator. Luitel and Taylor (2019) argued that education could and should prepare socially responsible and conscious citizens. In my understanding, providing enriched scientific knowledge without understanding the students' emotions, experiences, values, beliefs, assumptions, cultures are insufficient for making the socially responsible science education.

In doing so, I agree with Shih (2018, p. 234), who stated that "through true dialogic pedagogy, we can change classrooms into humanized ones" for creating social justice and developing the learners as holistic thinkers. So, before presenting the science lesson inside the classroom, the science teachers keep in mind that they will teach the human beings who might have their feelings, assumptions, values,

beliefs, culture, and experiences in the science lesson for making humanized science classroom. As a result, we could counteract the deep-seated hegemony in our science pedagogical culture.

Difficult Timing: Life World and Academic World

It could be any day in the early 2000s. I was in grade seven. My two brothers, two sisters, and I sat circularly on a mat and did our homework. We used *Tuki*[12] as a source of light. My mother was preparing dinner, and my father was helping her. We heard a walking sound outside the house that diverted our concentration towards outside. A new fellow entered my house. My memory suggests he said,

Figure 7: 'Kerosene lamp' Source: 'Self'

"Namaskar Buwa-Aama[13]*! We are your sons and daughter. Now, our Maoist party has been collecting Chanda*[14] *in this area. You must donate your rate of Chanda- five thousand rupees' cash and three Muri*[15] *Dhan*[16] *approximately within three days."*

When he completed his statement, I heard my father saying, *"Your donation rate is too high. How can we pay this large amount within three days? Please, show me the others' donation rate as well."* He showed the donation rate of other neighbors. My father scanned the paper and he might have said,

"Could you please rethink my donation rate? Why is the rate higher than other people's? Give the reason behind it."

"We have no time to discuss with you. You must donate it." Another lady loudly spoke by overtaking my father.

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[12] Tuki -A kin of kerosene lamp
[13] Buwa-Aama -Father-Mother
[14] Chanda- donation
[15] Muri – 1 muri contain 87.215 kg
[16] Dhan - rice

"It is difficult to pay this amount within three days, so sorry!" Father replied in a small sound.

The lady took out a piece of paper and pen from her pocket and noted my family's name for *Janakarbahi*[17]. She might have told,

"Our party will punish your family at any time."

I was frightened by listening to their conversation. Immediately, I heard my older brother and mother humbly requesting, *"Please, remove our name from the Janakarbahi list. We will pay within fifteen days." But, t*hey became angry and went away from my house. This incident made us more emotional. We felt restlessness. We could not continue our learning. Probably, to normalize the situation, my father might have said, *"Do not worry! We have not done any harm to others. May God protects us."* After my father's motivational speech, we felt relaxed to some extent. Then we had had dinner and went to sleep. I could not have a sound sleep that night.

I did not complete my homework yesterday. Then early in the morning, I tried to do my homework, but I could not continue it. After some time, my mother called us to have breakfast. Then after breakfast, we went to school. At the school, the first teaching period was English. The teacher did an attendance of all students. After that, he might have said, *"Everybody, keep your assignment in front of you. If you have not done your homework, you all stand up!"*

I had no other options to escape from the problem, so I followed his instruction. I bowed my head and stood up over the period. I felt moral pressure because I had a 'Talented Student' tag, and the teacher had never punished me. I did my assignment. The teacher checked the homework and did his regular classroom

[17] Janakarbahi- Maoist punishment

activities. I had no concentration in the teaching-learning. The period was completed. Then Nepali *Guru*[18] started his lesson. He looked at me and could have said,

> "*Aunshi ra Purnima lagchhaa ahileka bidhyarthi lai bujhnai garo. Hat ma pustak man ma dash thok. k bhayo? dhyan diyara padhne" (It is complicated to understand the learners. Their facial expressions are changing like a full moon and new moon. They don't have a deep concentration in learning).*

I did not have the self-confidence that I could share my inner pain and sorrow in the classroom. I could not make eye contact with him and remained silent. After a while, he shared a story, 'Sattyawadi Harish Chandra,' that he brought from the Hindu religious book. We listened to the struggling journey of Harish Chandra in the story that made us emotional. I also found myself in the story. I could not realize the time was over. Now, I reflect on my science teacher's classroom.

Yesterday, he taught us 'Element and Compounds'. He assigned us to remember the definitions, symbols, atomic number of elements (1-20), symbols of some metals, and their Latin names. He entered inside the room and wrote the topic Element and Compound' on the blackboard and looked at us and I heard him asking, *"Are you ready to answer my questions?"*

Figure 8: 'Corporate Punishment' Source: 'Self'

No one responded. The class became pin-drop silence. He said Anode for bringing a stick of *simali*[19]. Anode brought a stick from the jungle and gave it to the teacher. He caught the stick in his hand and my memory suggests he added,

"According to our definition of pressure, a stick having a small area can give more pressure than the sick

[18] Guru - Teacher
[19] Simali – lamiaceae (mint family)

having a larger area. I mean, pressure is inversely proportional to the area of a substance. Today you can realize the pressure practically if you give a wrong answer to my questions."

He asked questions to all students. Most of the students could not give the correct answers; among them, I was also one. He became angry and punished the students and gave them the same assignment for tomorrow. He could have told, *"I will give you more punishment than today if you say wrong answer tomorrow."* The period was finished. I came back from school with a sad face.

Shih (2018) suggested that on becoming fully human beings, we need to practice democratic and humanizing teaching that can raise teachers' and students' consciousness to critical consciousness. However, I did not feel the democratic and humanizing teaching culture in science and some subjects. They were less able to understand the learners' psychology, need, and interest. They gave physical, mental, and psychological punishment while unable to do and memorize the prescribed cognitive knowing-based homework.

For critically reflecting on this incident, I have used various metaphors. Initially, I would like to represent my outer learning environment as a *war* where I can lose or gain my life at any time; classroom learning environment as a *host of fear* where I cannot share my pain, sorrow, and happiness; teachers as *the controller* (Dougiamas,1998) who essentially forced the students for mimicking the discrete task in a controlled learning milieu; and students as *passive listeners* who were not ready to boarder-crossed standardized teaching culture.

Bitter Experiences of Civil War: Disturbing My Family and School Chemistry

It could be any day in the late 2000s. I was studying at the Lower Secondary Level in Marsyangdi. The Nepal civil war took place between the Communist Party of Nepal (Maoist) and the Government of Nepal from 1996 to 2006. Most of my school life was spent in that period. Hence, my teaching-learning journey was primarily influenced by the political moment of Nepal. All the teaching activities are guided by the policies and plans of the government. For that reason, we can easily assess that the whole education system of Nepal was highly affected by the civil war. In this narrative, I would like to share some lived experiences reflecting the contemporaneous political interference in my learning journey from my home to school and inside the classroom to some extent.

Figure 9: 'Maoist Military man' Source: https://www.google.co

The civil war had reached a peak. The Government of Nepal had declared a state of emergency. The impact of it was throughout the country. My village was approximately forty-three kilometers North of the headquarter of the Marsyangdi district, which was primarily affected by the civil war. We had to report the new events that happened in our village every fifteen days at the nearest army barrack. Moreover, the District Administration Office noticed the public people for not moving at night, not walking in a group, and so on. Most of the people were frightened.

On the way to our school, there was a post office. While my brother and I returned from school, one civil serviceman gave me my father's letter. I safely kept the letter in my bag. We had a great curiosity about the letter because before he left us, he might have said, *"I have emergency work in headquarter of Marsyangdi so that I will come back after two days."* However, he did not return home from that day, and

we could not get any further clear information about him. After returning home, we went near our mother. I opened the letter and started to read loudly. In the letter, he informed that he had stayed safe. He left home due to the Maoists ' *Janakarbahi* letter with *Jyandhamki*[20]. Moreover, he encouraged us to study hard and helped the mother. Then, we had mixed feelings. We became happy to know that he was safe and worried that the Maoist people gave him a life threat.

The following day, around half past eight, my mother called us for a meal. I was reading my books in my room. At that time, around seven people were coming to my house. They might have said,

Figure 10: 'Maoist military'
Source:https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.pinterest.com%2Fpin%2F532339618430562264%2F&psig=AOvVaw1z7333AN2ngl4x10uXNH5V&ust=1632456103111000&source=images&cd=vfe&ved=0CAsQjRxqFwoTCKC_qoqblPMCFQAAAAAdAAAAABAc

"Namaskar, mother! How are you? We are your daughters. We are striving to overcome our social and national problems such as exploitation, social discrimination. I hope to create social justice and equal rights for all Nepali people, so you all need to support our civil war. Likewise, our bourgeois education system is functioning less through our struggle we will be established the Janawadi Shikshya[21] *in Nepal."* At last, they requested my mother for breakfast.

My mother was silent for a moment by listening to their speech, and after sometimes she said, *"Okay! Breakfast is ready. You can have it."* They entered inside our kitchen. We, all sisters and brothers looked at one another. Then we decided to go to the school without having our breakfast. Then we walked towards the school. While going to school, we often saw the army's helicopter operation in the jungle,

[20] Jyandhamki – life-threaten
[21] Janawadi Shikshya – Socialist education

listening to the bomb blasting. Many colleagues have left their studies and joined in Maoist's campaign. Therefore, we felt unsafe on the journey to school.

After around one hour's walk, we reached school. The school bell was ringing. We made a straight column for the assembly. The headteacher could have said, "Today's we bring the sand for constructing our new building from the Syangdi river so we cannot conduct our regular classes. I was surprised because the headteacher has immediately decided to do that activity. Then after some time, I heard people saying that today was the Maoist's strike day, so the school family had decided to engage us in that work. The Syangdi river was around one and half an hour far from my school. We carried sand by honestly following the guidelines of our teachers. And after completing the work, we came back home.

Figure 12: 'School student' Source:https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DNibPh-

Our teaching-learning would be disturbed by the Maoists ' strike. The teacher would engage us in several laborious works. The reason behind that activity was that His Majesty Government of Nepal had directed to compulsory open the school. Meanwhile, the Maoist force threatened the headteacher to close all teaching-learning activities and support their strike. In this regard, Rai (2018) pointed out that teachers as government employees became more vulnerable from both sides due to the lack of proper security in the schools. For instance, there were attacks, strikes, destruction, and closing down of schools. Many Teachers' were shot dead in Nepal by picking from classrooms and school premises. In other words, they got into a catch-22 situation, so being present in schools was often a challenging task for them.

The Maoist Ladaku[22], *with* carrying a bomb in their waist, entered into the classroom that interrupted our regular classes occasionally. The teachers stopped their lessons and went outside. Then the Maoist *Ladaku began to* orient the interconnection of *Janayudhha*[23] and the education system. They could have said, *"The Nepalese education system is very traditional. It produced the bourgeois in the society. We are struggling for Shikshik Kranti*[24] *that will be helpful for establishing an egalitarian society."*

The national political movement badly affected the teachers, students, families, and society. The school was not running regularly and became the battleground of the government's security force and Maoists. It also disturbed the peaceful living of my family. Furthermore, I experienced physical, psychological, and cognitive pressure in learning science and other subjects. Many teachers could not be able to complete their courses at the end of the academic year. Now, I would like to portray my lived experience in the conflicting period to demystify the assessments practice.

It could be any day of mid two thousand. The civil war of Nepal was at its peak. My SLC examination was coming nearer. The school conducted a farewell program for SLC students wishing the best on the SLC examination. During that time, there were security challenges to conducting the board examination in rural villages. So, all SLC examination centers were centralized in district headquarter for safely conducting the examination. We had to go to the district headquarter for a board examination. I did know the way of that place. My mother and I walked around 12 hours carrying my books, notebooks, and clothes. It was a rainy day. We had to walk

[22] Ladaku- Maoist army
[23] Janayudhha – Civil war
[24] *Shikshik Kranti - Educational Revolution*

on the beach of streams and rivers. Unfortunately, I slipped on the stream. I became injured. My books and notebooks were scattered on the beach and streams. I began to cry. My mother collected all my bearing materials and packed them. We had no other option than to continue our journey. We again carried our luggage and continued our journey. In the evening time, we reached on headquarter. My father lived there for four years. I was so excited to meet my father after a few years.

My father and I went to my SLC examination center and received an admit card the next day. I grew up in a rural village in an urban area, I felt new and challenged to adapt to that environment. The new environment setting distributed my learning concentrations.

On the first day of SLC, my friend Nomi and I went together half an hour earlier, as they suggested yesterday. She also shared that she could not concentrate on learning and felt homesick. After some time, the bell was ringing. All students stud in different columns respected to their school. The examination superintendent read the examination rules and made us aware of the illegal actions. Thus, a lady army officer checked my body before entering the examination hall. She carried a gun as her right arm. After strong checking, we entered the examination hall. My heartbeat became faster. I felt blank for a minute. I looked outside a large number of security forces were administrated. I never gave an examination in such a fearful environment. My other friends also shared similar experiences during that examination period. They said, *"It is difficult to attempt the SLC examination in such a stressful new environment. It is costly as well as hard to adjust to a new environment setting. So, it is better to decentralize the examination."*

Family, teachers, and relatives used to give more pressure on getting good scores. Everybody views SLC as a main step forward for our educational life. They

represented an *iron gate*. This ends-oriented perspective gave mental stress to the students. While critically examining the assessment practice in a conflicting situation that I presented in the above incident, it raised several questions like did the examination incorporate the notions of equity? Could standardized tests assess the learners' developmental aspects? Was the examination held just for noticing passed/failed?

I recently learned that we could provide education in emergencies in the typical crisis situation like conflicts, violence, forced displacement, public health emergencies, and disasters by providing physical, cognitive, and psychosocial protection to save and sustain lives. In this critical context, education in emergency offers to all ages including early childhood development to adult education for quality learning opportunities (Enter-agency Network for Education in Emergencies, ([INEE]. 2018). However, the government was less able to access quality learning in school education by incorporating the notions of education in emergencies in the situation of conflict. I experienced the domination of technical interest and negligence of practical and emancipatory interest (Habermas, 1972) in teaching science and other subjects in that problematic timing. From the above incidents, I perceived a lack of education in the emergency sensitized curriculum, pedagogy, and assessment system in my learning journey. Therefore, I realized that the government could decentralize the examination by designing and implementing the curriculum, pedagogy, and assessment sensitized with education in emergency. It might ensure equality education in difficult timing like conflict.

Science Learner's Craze: Contextual Content and Coloured Pictures

It might be any day of the early 2000s. I was in grade six. My father said, *"The government provides free books for children at primary level. Therefore, we should*

buy the book for our younger daughter from this academic year." My father used to run a grocery and stationery store. So, he managed all the necessary stationery and household items. He brought the new books of class six. My brother and I were excited. We put a new cover in our books. We loved creating our books carefully and storing them responsibly. After a few moments, we decided to play the picture counting game. In doing so, we need to select the left-hand or/right-hand pages; count the total pictures of men/women, animals/birds, house/tree, and so on that was included in the books; and announce the winner based on the higher counting value.

Although there were some colorless pictures mentioned in the books, they were in/directly reflecting the positivity and providing intrinsic motivation to us. We carefully observed and described the images by incorporating our organic ideas. There was no barrier in our answers. We acknowledged the honest answers. In other words, we went beyond the right or wrong answer patterns and acted as autonomous learners. Strouse et al. (2018) explored that picture books are good sources to develop language, concepts, and lessons. It assists in children's learning and transfer of that information to everyday life.

There were several books. Among them, my favorite book was a Nepali book. In general, the poems, stories, dramas, dialogues, biographies, essays, letters, and a few more were related to my everyday life because the Nepalese writers wrote these genres by representing our socio-cultural context. My brother and I were deeply engaged in chanting, rhyming, and mimicking and searching the word meaning. The problematic words were bold, and their meaning was mentioned at the end of each lesson, making the lesson more understandable. Further, we also took part in extra-curricular activities by creating contextual songs, poems, and essays. As a science learner and teacher educator, I would like to reflect on a critical incident related to the

pictures and content of the science book. While teaching flowers, the teacher suggested observing the pictures and characteristics that were given in the textbooks.

I studied the characteristics like the calyx is a green part of the flower that protects the flower in the bud stage. Corolla refers to the brightly colored whorl of a flower. A flower's corolla supports pollination by attracting pollinating insects or birds and tried to relate with the pictures but, there was no co-existence between them. The colorless pictures were less able to grasp the content in a pictorial form. Most of the students were in confusion. We tried to memorize the content. According to Taylor (2016), science is a cultural activity rooted in a variety of communities of practice, but science educators are less conscious of our cultural activity. The next day, for facilitating the science learning, he distributed the colored flowers to us and revised the lesson by demonstrating the various parts of flowers that made comfort to understand the lesson.

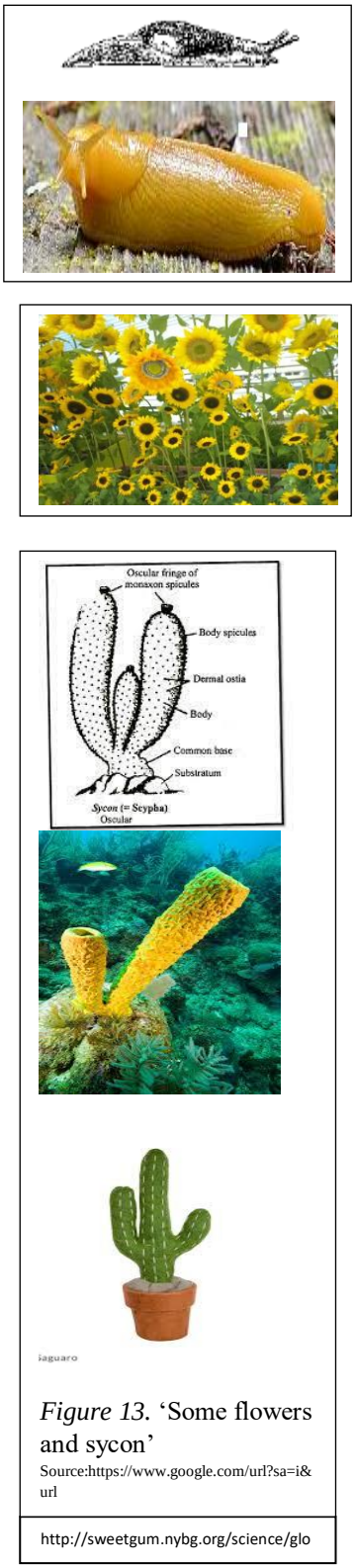

Figure 13. 'Some flowers and sycon'
Source:https://www.google.com/url?sa=i&url

Similarly, while teaching invertebrate lessons, the teacher assigned us to draw a minimum of two pictures of invertebrates from each phylum given in the textbook. Then I quickly portrayed the diverse colored pictures of invertebrates that I had seen in my surrounding. For instance, I drew yellow-colored slug having different positions, shapes, and sizes, although I observed black-and-white pictures in the book. I did not

see the actual animal, 3D images, videos of sycon.
However, I copied the picture of sycon from the book
and filled it green color. The next day, in the process of
checking my assignment, I heard the teacher ask, *"What
are you drawing? Cactus or sycon?"* I was speechless
because I also viewed the sycon looks like a cactus
plant in the textbook picture.

In the above incident, we were motivated by pictorial, contextual, and everyday life-related contents-based textbooks and teaching-learning. We became more autonomous learners in these learning milieus. Habermas's (1972) emancipatory interest also focuses on autonomous and responsible action for emancipation. However, I perceived that the school-level science textbook and teaching-learning were less able to incorporate these aspects adequately in my learning journey. Moreover, Taylor and Campbell-Williams's (1996) personal relevance scale of the Constructivist Learning Environment Survey (CLES) emphasizes students' everyday experiences to develop the students' scientific knowledge. In doing so, the connectedness between the school science and students' out-of-school experiences is essential.

Enriching Communication: Inclusive participation in Science Classroom

It could be any day of the mid-2000s. My secondary level science teacher had made a stethoscope at home by using low-cost and no-cost materials. He brought that stethoscope in the science classroom while teaching the human heart. He briefly expanded on the structure and function of the human heart. Then he had made a boys group and girls group for demonstrating the function of a stethoscope.

We were excited to do the activity. After that, he said, *"One boy and girl from in each group fastly revolve around the schools' building for three times and come to the classroom for listening to the internal sound (heart and lungs) by using a stethoscope."* We were excited about the activity. In doing so, at first, my classmate Photon was ready from the boys' group. He fastly circulated our schools' building according to the teacher's instruction and came back to the classroom. He had a red face and respiration fastly. He seemed tired. Then the teacher might have said, *"Photon, you should lie on the desk in a supine position and open the two bottoms of your shirt."* He honestly followed his instruction. After that, the teacher kept the stethoscope on his chest and listened to the sound. We all carefully observed that action. He suggested listening to the sound of the human heart to each member of the boys' group. All boys went in front of the class, turn by turn, and listened to the sound. They were happy to engage in the activity. Meanwhile, my friend Nebi passed a small cheat on the first bench. I opened the cheat and read it. They informed me that they were not interested in running outside. They did not mention the reason. Therefore, I might have asked Nebi, "Why have you disagreed with teachers' instruction?" I remember how she could have said, *"We feel shame. You can join because you are small."* She smiles.

Figure 14: 'Doctor checking heart-beat' Source: 'Self'

We discussed those issues in our first bench. None of them are ready to run. I heard them saying, *"We should run three/ four rounds in the ground; lying in a desk on a supine position by opening two-button of the shirt; the teacher put the stethoscope on our chest, how can we participate?"* I also felt uneasy about running. So, I informed our group decision to the teacher. I requested the teacher to join us in the boys' group. He allowed listening to the Photon's heartbeat. My friend Jenee and I heard the sound, but other girls were not ready to hear it.

For efficient learning, a refined process of communication is required. The teacher is not just engaged in giving out problems, presenting materials, and accepting answers back with enriching communication like the teacher and students' communication, students and students' communication (Dougiamas, 1998). Although he had improvised science materials, divided the students into two groups, and suggested the girls' group participate in the activities, he did not critically reflect on why the girls were demotivated and disengaged in his science classroom. From this critical incident, I perceived that we have to excavate the hidden disempowering things like physical problems, psychological problems for making inclusive participation in science learning. In doing so, the science teacher could critically observe the students' body language and actions; enrich communication with students; critically reflect his beliefs and actions. However, I realized that my school science teacher was less conscious of these aspects.

Uncritical Pedagogical Practice: Enhancing Knowledge Consumption

It could be any day of 2006. There was a seat choosing culture in my school learning period. My sister encouraged me to sit on the first bench. She said, *"You can collaborate with intelligent students and make the best friend. The teachers give more priority to the front side student. Further, you can listen and watch teachers'*

activities." For that reason, every first day of the new academic year, we reached school early in the morning and chose the seat on the first bench. I experienced the same as my sister had said while sitting on the first bench.

Our sitting position usually changed in my higher educational journey. We had to sit based upon first-come, first place. In compulsory (core-subject) classes, there were around 150 students in a class. Even though five/six students closely sat on a bench, some students who came late did not get the seat and left the classes.

I loved to sit front side of the classroom from my school level. So, I used to sit on the first or second bench. I perceived the inclusive sitting culture of girls and boys and no constrain of time for in and out from the classes during teaching time (comparatively, there was a more flexible learning environment than school). I felt that the learners also had less concentration and consciousness in teaching-learning as compared with school education. The teachers-educators also did not punish the students although they came late, in/out in-class time, got a low score in exams.

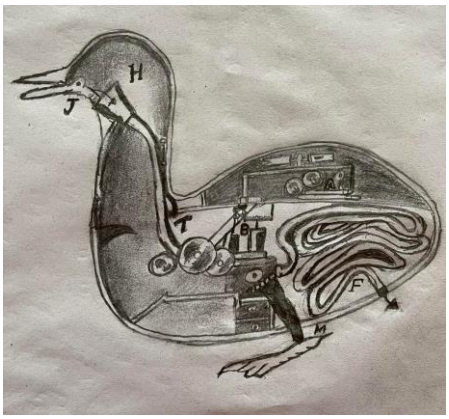

Figure 15: 'Mechanics view'

Source: 'Self-created'

In my understanding, the science teacher educators and other core subject teachers usually continue their classes by considering the *students as machines.* In other words, they were less able to open their humanistic lenses and hold the mechanistic beliefs. In my understanding, that could be the possible disempowering forces behind less prioritized the learners' engagement, understanding, cultures,

experiences, feelings, assumptions, and values, and frequently delivered the objective truth. For noticing the such, a role of teacher Qutoshi (2019) used the metaphors *re/teller, transmitter/translator.* The educators can transform their teaching culture and shift higher educational institutions towards transformative learning. In doing so, cultural-self-knowing supports creating appropriate conditions for enriching transformative learning. We could critically reflect our identity by questioning ourselves: Who is the self that teaches (Palmer, 1998) others?

Dogmatic Beliefs of Teachers and Society: Influencing Learning and Everyday Life

It could be any day of 2006. There was no sit in front side of the classroom. I moved my sight around the classroom. Luckily, I saw a seat at the last bench where two boys and a girl were sitting. There was no more seat. The chemistry teacher was entered. He opened his diary and started to write the chemical equation on the whiteboard. My friends were busy copying the equations from the whiteboard. I could not see the writing. I tried to copy it from my friends, but I could not understand their writing as well. At that time, I might have thought, *"Next day, I will come earlier and sit on the first bench, so I can easily copy the teachers' notes without any difficulties.*"

Figure 16: 'Hard to study due to eye problem' Source: 'Self'

Although I used to go to campus besides the Lions Club, I could not check my eyes. It was not that I was not aware about problems. I studied long-sightedness and short-sightedness vision defects from the secondary level to higher education in physics. I knew that we could resolve these defects by using lenses. In the classroom,

I could not see the teachers' writing from the last bench. So, I guessed that I suffered from short-sightedness and needed to use a concave lens (Lumen Physics, 2021). However, I could not ready to check it.

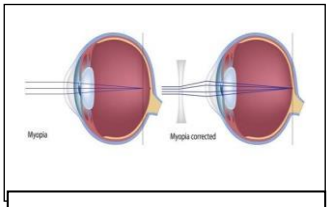

Figure 17: 'lenses' Source: https://www.quora.com/Why-do-we-use-convex-lens-for-myopia

When I faced a similar problem in my classes again, it reminded me to check-up as soon as possible. But, I again neglected it. Because I could have thought, *"How can I display my problems to others? If the doctor suggests ware glasses, how can I wear them? How can I face the people?"* People would criticize the girl who wore glasses like *Nakkali*[25], *Yasta rogi keti lai kasle bihe garchha*[26]? I heard such a type of dialogue from my childhood.

That might be the reason for being lazy to check up on my health. As a result, I repeatedly faced the visualizing problem for a long time that influenced my learning and other daily works. In this regard, I agreed with Habermas (1987), who advocated that we learn to know and start to change the unjust dominant ideologies embedded in our everyday situations and practices that frame behavior and keep an unequal system as views normal and natural. Further, Habermas's (1972) emancipatory interest also emphasized to counteract the dogmatic beliefs for emancipation. Now, I would like to portray another incident for excavating the deep-seated dogmatic beliefs of teachers on menstruation and its influence on science learning.

It could be any day of autumn late 2000s. I continued my campus after my seven days' cave living in my first menstruation period. Some of my colleagues asked, *"Why are you absent a week?"* I replied, *"I was suffered from fever."* Meanwhile, our biology teacher Mr. Neon entered the classroom. He wrote the

[25]Nakkali – Fake girl
[26]*Yasta rogi keti lai kasle bihe garchha* - Who will marry such a unhealthy girl

topic *"Cell Division"* on the board. Then he started to draw the picture of cell division. I also followed him and portrayed it. Around half of the class time, I felt bleeding. It was my first menstruation. I had no proper knowledge, skills, or experience of menstruation, such as what to do? How to manage and use a sanitary pad? How long do we need to manage hygienic pads? I felt bleeding for three/four days in my cave living period, and it stopped. Therefore, I did not use the sanitary pad and also kept it in my bag. I became shocked. I had no concentration on teaching-learning. Mr. Neon understood my psychology, body language, and emotion, *"Why are you worried? What happened? Are you hungry?"* He asked me.

We laughed at his funny questions. All colleagues focused on me. I tried to become active and regular to hide my menstruation problem. It was the last class of the day. I thought, *"How can I go out after completion of class?"* At the same time, the lecture time was finished. All of my friends were hurried to go back home. They immediately put their book and copy inside the bag. As I remember now, my bench mate could have asked me, *"Why are you delaying? Do fast!"* And they went out by the side. I slowly put my book and copies inside my bag because I wanted to hide my menstruation problem from my friends and teacher. At last, I was succeeded in hiding my pain. Consequently, I could not fare my friends' critique; I felt I had won the most prominent war.

I could not share my problems with others. I thought that they would tease me instead of supporting me. This critical incident reminds me of my schools' learning time. Typically, puberty-age girls who had rapid physical change dropped classes sometimes. I did not experience the menstruation problem at that time; thus, I thought they were not interested to learn. After experiencing that incident, I realized that the menstruation problem might be the possible reason for leaving the classes. For

reflecting on teacher and students' reactions while observing bleeding during the menstruation period, I would like to share a critical incident as follows.

It could be any day of 2000. Mrs. Hena was teaching health and population education. Meanwhile, she saw blood on the last bench of the girls' column. After that, she began to scold all girls. As I remember, the conversation took place accordingly-

Mrs. Hena: *Oh! Why do you not hide your problem? Bad girls! Hey boys! Bring the phenol from the health post right now and remove the pungent-smelling.*

Boys: (Seeing towards girls' column and loudly laughing) *Sure, madam!*

They brought the phenol and spread it in the classroom by teasing us. I felt that we committed the biggest crime. We could not share our voices with the teacher. She was a health and population as well as science teacher at the lower secondary level. She highlighted the regular menstruation problem rather than assisted the girls who were facing it. They might feel pain, fatigue, and so on.

We came from a different community, having different cultural backgrounds, socioeconomic statuses, and academic environments. There was no facility for drinking water, and bathroom for students. Mrs. Hena never raised these issues and focused the administrators' attention on them. In my perception, the girl' students face many challenges in the menstruation period that might be the possible cause of their dropout, irregularity, and less attention on science learning. The menstruation situation is viewed differently from society's cultural practices, although menstruation is a natural phenomenon in girls during puberty. They denied going to school while menstruating. There can be a variety of causes, such as shyness, poor menstrual hygiene at school, severe pain during menstruation, etc. The study also noticed that

girls could not go to school during their menstruation for fear of leakage and lack of safe cleaning and washing. Facilities option to remove sanitary pads (Karki, 2019).

I realized that the excellent relationship between teacher and students can support to reduce the problems. “By the mutual sharing of electron pair(s) each of the two combining atoms attains stable noble gas configuration” (Prakash et al., 2011 p. 249) in the covalent bond. I attempted to incorporate this idea for creating a good relationship between the teacher and students in an educational institution that could assist the students and teachers in sharing and solving their problems together. Therefore, I metaphorically used '*covalent bond'* for representing their interdependent relation. The reflection is central to the life of all educators for improving and developing teaching and learning, coping with change, and complying with regulatory systems (Rushton & Suter, 2012), and the way of reflective practice is lived (Larrivee, 2000). Thus, the teacher and students can transform their dogmatic beliefs about menstruation by critically reflecting on their beliefs and actions, which is the foundation for being autonomous and responsible (Grundy, 1987). Moreover, in improving the emotional state, successful coping skills, and attendance rates of young girls in school during the menstruation period, the government needs to maintain a more substantial hygiene infrastructure (Yilmaz et al., 2021). In this learning environment, the girls' students could be free from emotional stress and actively participate in the science classroom activities.

Teacher's Beliefs: Dualism between Im/pure Science Education

It could be any day of 2008. I was returning to my home from campus. I met my school-level mathematics teacher. Now, I would like to share our conversation about the teaching profession. The conversation is based on my memory reconstruction.

I: *Namaste, Sir!*

Teacher: *Namaste! Which subject are you studying in your higher education?*

I: Well, sir! I have been studying science education.

Teacher: *Science education! I think impure science (science teacher education) is like mathematics teacher education which greatly emphasizes pedagogy (How to teach?) rather than deep content knowledge (What to teach?). Although I am a teacher, I could not enjoy my profession. The teaching profession has neither name and fame nor easy work. I never encourage my learners and relatives to be a teacher. You could have studied pure science for being a doctor, which is a more prestigious profession. I encouraged my son to study pure science from his childhood because I have a dream to make him a doctor and settle him in America. I joined him at the* Lamarck Science Campus to study pure science. *Sapriya doctor bigriya master je ta hola*[27].

I: *You may be right, sir! But, I have a different view on this subject. All individuals have their dreams. I want to be a good science teacher. Others can enjoy other professions than me. So, our intrinsic motivation is essential for achieving success in the profession.*

Teacher: *I came to know that my opinion might hurt you. These are my actual feelings and experiences; therefore, being a teacher will be the last option for my children.*

I: *No problem, sir! Thank you for sharing your experience.*

However, Luitel (2013) employ the depending co-arising idea of Buddhism for overcoming the unhelpful dualism between mathematics as a body of pure knowledge system and mathematics as an impure knowledge arising from people's lifeworlds and envisage the term 'Nirvana,' to be used as a metaphor of inclusion

[27]*Sapriya doctor bigriya master je ta hola – this is a Nepali proverb means if a major science student study well they will be doctor and in worst case they will be teacher.*

which helps to represents the inclusive nature of mathematics. That is mathematics as an im/pure body of knowledge. I agreed with Luitel's views because, as a science learner and teacher educator, I also perceived science as a body of knowledge or a way of knowing. However, science education is the education provided through science (Holbrook, 2003) or/ as impure pedagogical and contextual knowledge. There is an unhelpful dualism between science and science education (pure or/impure) which is less helpful for developing the learners as holistic thinkers. Thus, we need to transfer our mundane beliefs of science as a body of knowledge or/science education as impure pedagogical and contextual knowledge to the inclusive(im/pure) nature of science education. Likewise, in this dialogue, the teacher had held an ego towards the teaching profession, which was less helpful for motivating the science learning communities like learners, prospective teachers, novice teachers.

We could shift our present science through education dominated practice by enriching education through science. It has high content and skills orientation with critical aspects for individual and social transformation (Sjöström & Eilks, 2018). However, from my lived experience, our present science curriculum, pedagogy, and assessment system of school level to higher education have high content orientation. In other words, our present science educational practice is inadequate to connecting science education to solve the learners' real-world problems. I experienced the lack of a curious and harmonious self in science education might be the reason for the domination of decontextualized science education. Thus, I advocate the inclusive (im/pure) science education to counteract the hegemony in science teaching and learning.

Visualizing Dis-empowering Forces of My Prospective Science Learning Milieu

It could be any day of the late 2000s. I studied master's degree in science education. For the partial fulfillment of the requirement of a method of teaching science, the subject teacher Mr. Head had suggested conducting mini-research. We need to develop a group with five members, select the leader, and submit it to Mr. Head. According to his instruction, we formed our group. The group selected me as a leader with the consensus of all members. We submitted it to him and waiting for our research topic.

The next day, he distributed the topics for mini-research. We got the topic *"e-Learning Practice in Science Teaching."* Meanwhile, we noticed that he had made a certain change in group leader for conducting the research activity in time. He read the name of a new leader. My friend Mica was selected as a group leader. There was no debate and dissatisfaction in our group while selecting as a group leader, so we happily welcomed Mica.

She was my best friend from the beginning of my higher education. But she felt uneasy. She worried and might have said, *"How can we do that work? Why need to change the leader? How could I take my responsibility?"* We all motivated her. I heard some of the friends also saying, *"He had chosen the students having similar political ideology with him."* That might be the possible reality because only the group leader who followed a different ideology and neutral students like me were replaced.

Although we felt discriminated against us, we were voiceless. The leading cause was practical marks. We were cautious in the possible harm that our complaint could make our practical examination. So, nobody had the potential to ask a justifiable reason for replacing the leader. Due to the lack of proper collaboration within a group member, we could not profoundly explore the e-learning practice in

science learning. We did that work just for fulfilling the course requirements and submitted it to the internal supervisor. After that, he conducted the group viva. It was my turn. At first, He asked me to introduce my research agenda. So, I briefly explained the background, objectives, and significance of the study. After that, the viva might have run as follows:

Mr. Head: *"What is stratified sampling?"*

I: *Sorry, sir! I have no idea about it (in slight sound).*

(Thinking, hmmmmm..... I have not learned that terminology in my learning journey; I felt the pressure.)

Mr. Head: (looking at me suspiciously) *What is null-hypothesis?*

I: *(*small sound with feeling panic) *Sorry sir! I do not know the correct answer.*

Mr. Head: *How have you passed your bachelors' degree? How many back papers have you had?*

I: *Whole back, sir! Sorry sir* (speak loudly with feeling emotional)*!*

I was emotional and left the interview. It was an open viva. Therefore, all of my friends were listening to our conversation cautiously. They were also puzzled by the scenery that lived silently. After that incident, I thought that I would fail the final exam. It was just five marks' viva. Meanwhile, I thought our practical marks were allocated to the research report, presentation, viva (internal and external), and regularity so that I would pass.

I was demotivated by his viva, which highly emphasized cognitive knowing. In other words, he tried to assess my theoretical knowledge rather than my field engagement, understanding, difficulties, feelings, challenges that I had faced in my research process. I was a novice researcher; I perceived the lack of positive feedback for invigorating the learners and improving their works. The science learning

environments forced the prospective teachers to memorize the science contents instead stimulated for understanding and applying in real life. In this context, Abbas (2002) explained that many novice science teachers continue their classes by creating very similar classes as they experienced as science learners. So, it seems experiencing a meaningful learning milieu in their prospective science learning journey is necessary for shifting their science teaching culture. This scenario made me think that did my science teacher educators assess a meaningful learning environment in their science learning?

After a few months, when I was going towards the campus, he was walking on the street of Saphalmarga near to my campus. I met him. Based on the reconstruction of my memory, the conversation would have been as follows.

I: *Namaste, Sir!*

Teacher*: (with a smile) Namaste! I felt that the viva questions were difficult as compared with other friends. Later I knew that you all had not studied the research subject earlier* (He reminded the incident that was happened in viva). *Your reaction to viva made me thoughtful. I never imagined such a reaction from you. My speech might hurt you. Do not worry! You will do your best in the following days.*

Me: (being happy from his positive comments and realizing my mistake on viva) S*orry, sir! I made a mistake. I will do my best, sir!*

After six months, the result was published and I just passed in that subject. While analyzing the board result, I also came to know that practical marks have a fundamental role in obtaining a good position (like topper). Therefore, there was an exercise of power and politics in higher-level science practical score for deserving topper position or high score. Likewise, when I raised my curiosity to the teacher, some teachers replied, *"Tapai badhi janni hunu bhako ho aghi aayra*

padhaunus. Ghok ni ho ghokni. Science bhanekai ghkne ho. Jasle ghokna sakchha, usaile parikshyama dherai anka thokchha. Maile pani bujheko chaina thaipani ghokeco ho. Bujheko bhay ta baigyanik bhai halthy ni (If you already know the content, you come in front of the classroom and teach others. Science means memorization. Who can memorize the content will deserve a high score in the examination. I also do not understand the content. However, I have memorized it. If I understood it, I could have been a scientist).

In this way, I have experienced the hegemonic pedagogical culture in my higher educational science learning, which in/directly transmits this culture in my science teaching. For that reason, the science teachers could incorporate the critical knowing of emancipatory interest (Habermas,1972) for counteracting the dis-empowering invisible forces like power, politics, domination, dogmatic beliefs, values, assumptions visible through critically reflecting their professional practice. As a result, the prospective teachers could apply socially responsible science teaching pedagogical culture in their future professional practice.

My Uncritical Prospective Science Teaching: Emphasizing Structured Task Performance

As a prospective science teacher, I did practice teaching for the partial fulfillment of the course requirement. I developed the lesson plan by studying the teachers' guide, curriculum, and textbook. I would like to represent that science curriculum *as a delivery mechanism* because of primarily emphasizes transmitting knowledge and information (Bartell et al., 2015). I tried to incorporate the key notions of these sources. I used to enrich teaching aids like charts, models, pictures, locally available real objects or/improvised materials, and a few more for doing things better. However, my central concern was attracting my supervisors' attention in internal and external supervision time to secure good marks in teaching practice.

I copied the contents like definition, difference, example, reason, and so on in my chart paper from the textbook. I drew the pictures by enlarging the images included in the textbook rather than connecting the learners' real world. For instance, while teaching the first-class topic lever of grade nine, I drew the pictures of an older man uplifting the 1000 N load by using a rigid bar with a fulcrum by applying a 200N force similar to the textbook. I could not apply my creativity in that pictures. At present, I realize that I could design the exact pictures by changing the size of load, effort, place of man to woman, the direction of pictures, involving the learners to design various first-class lever-like scissors and pliers by relating with their daily life. However, my teaching-learning was less able to acknowledge creativity, collaboration, and contextualization. I could evoke the learners in science teaching-learning by connecting with their real world. Pritchard (2009) stated that informal learning institutions, the teacher have commonly taken the role of the more knowledgeable others, so stimulating the groups and individuals to engage in dialogue

in a planned way is important for moving into and across the zone and looking forward to the next level of understanding in the process of learning. Although I used the various teaching materials, I was less conscious of scaffolding the learners to develop knowledge by enriching dialogue. I continued to deliver the facts of science.

From this critical incident, I realized that I emphasized *cultural reproduction*, in which I primarily emphasized transferring instrumental knowledge without questioning the status quo in micro-teaching and actual classroom teaching. Danish and Gresalfi (2018) explored that our activity is inextricable from the context, practice, histories, and place, so for unpacking the role of context in learning, we need to perceive and address the fundamental issues of equity and access. In this regard, Habermas (1972) also emphasized autonomous and responsible actions for equity and social justice. As a prospective science teacher, I was less conscious of these aspects. Thus, the metaphor *teaching as cultural reproduction could* represent my uncritical prospective science teaching culture.

Recapitulating the Theoretical Praxis

In this chapter, I attempted to unfold my experiences of hegemonic pedagogical culture in my science learning. While narrating my lived experiences, I was critical that analytical knowing was dominant in our schooling culture. It rarely incorporated hermeneutic and critical knowing culture. I tried to capture several critical incidents. I did enrich the discussion of how I experienced the hegemonic pedagogical culture and focused on shifting towards emancipation by counteracting the hegemonic pedagogical culture embedded in science teaching and learning.

In the initial formal schooling journey, I had crazed pictorial textbooks because I supported understanding the content and freely reflecting my feelings. I was demotivated from the decontextualized rigour nature of science contents, pedagogy,

and assessment of formal schooling and motivated towards the contextualized content related to my everyday life. The corporal punishment, lack of empathetic learning milieu in the school, and caring environment in the family-like less consciousness of my parent in our need, interest, problems, and learning were also the possible forces that were less able to promote our intrinsic motivation towards formal schooling. Further, I tried to connect my life world and academic world to visualize the deeply grounded invisible hegemonic science pedagogical culture that I experienced in my science learning journey. Especially, the civil war of Nepal/directly disturbed the internal chemistry of my family and schools. The government was less able to design and implement curriculum, pedagogy, and assessment systems sensitized with education in emergencies sensitized in that conflicting situation. My theoretical lenses related to emancipatory interest (Habermas,1972) made it easy to critically view the incident from the different vantage points for noticing individuals' hegemonic beliefs and actions due to the influence of rigor structures and searching the alternative ways to counteract the dis-empowering science pedagogical culture.

Several dogmatic beliefs of teachers, learners, and society towards the science teaching profession, mensuration, defect in vision, and unhelpful dualism between impure and pure science education negatively influenced science learning and fostered an unjust science learning milieu. Likewise, I applied TAS (Stesenko, 2017) lenses for being aware of my science learning and prospective science teaching cultures in the diverse spatiotemporal context. It supported to reflect critically on my knowing, doing and being cultures for visualizing the un/critical science pedagogical cultures that emphasized knowledge consumption/construction. Although developing the socially conscious and aware science learners is the present need of science education for sustainable development.

In my perspective of science teaching, I un/knowingly focused on structured task performance. In my understanding, my past science learning journey might contribute to developing my hegemonic beliefs and actions. Therefore, for inclusive participation, we could enrich the communication, counteract the hegemonic structures and connect science education with the learners' everyday life. Further, cultural knowing (typically, classroom teaching culture and family culture) could transform me and others.

CHAPTER IV

CRAFTING MY SCIENCE TEACHING CULTURE: MY BELIEFS IN EMPATHETIC SCIENCE LEARNING MILIEU

In the previous chapter, I demystified the deeply rooted hegemonic pedagogical cultures that I experienced at the school level to higher education (before MPhil in STEAM education) science learning journey. Here, in this chapter, I have tried to attempt the second research question: What beliefs did I hold for creating an empathetic science learning milieu? While doing so, I have crafted my science teaching and administrative-related thoughts and actions that I experienced in school level and higher-level education before the STEAM educational journey (2014-2020).

For addressing the research questions, I have articulated some critical incidents that were happened in my science teaching-learning and administrative journey in different ten narratives: Family as a Catalyst: On Becoming a Science Teacher; My Initial Professional Experiences at Remote District: Demystify the Hidden Problems; Influence of Power and Politics in School Leadership and Management; SLC Examination: Emphasizing on Cut-off Point/Learning; Teacher Selection Examination: Being a Teacher or/Responsible Teacher; Practical as a Time-consuming Matter; Negotiation, Collaboration, and Critical Reflection: Foundations for Creating Empathetic Milieu; Science Pedagogical Culture: Linguistically and Culturally Diverse Students; Dogmatic Beliefs of School Administrators: Practical as a Time-consuming Matter; and Dogmatic Beliefs of University Administrator: Adapting Defensive Science Pedagogical Culture.

Family as a Catalyst: On Becoming a Science Teacher

It could be any day of 2014. Most of my relatives, neighbors, colleagues, and even some teachers-educators criticized me when I was appointed as a secondary level science teacher in the Jarang district. It is a remote district of Nepal. The main reason for critiquing was my working place and the teaching profession. I heard greater demotivating voices than motivating voices that made me thoughtful. Unhelpful dualism such as continuing or quitting my teaching profession; how could I face the people if I do not adjust to linguistically and culturally diverse society? I was dis-empowered by their negative thinking and comments. However, my family always encouraged me to continue my profession. I was highly invigorated by their empowering voices, supports, and suggestions. Metaphorically, their supports were a *positive catalyst* for being a science teacher. In this regard, my family also encouraged me to be a science teacher as Rahmawati (2015, p. 34) mentioned her lived experience in her narratives:

> *"My mother always encouraged me to be a teacher. I remember this conversation with my mother. She always told me that I was good at teaching, and later on, I realized that teaching is my passion."*

Before two days of my appointment date, my father and I went to Jarang. We lived in the *Rara Hotel.* In that new geographical and cultural background, I felt difficult to communicate and collaborate with people. Therefore, I spent most of my leisure time inside my room. However, my father was more interested in visiting new places, communicating with local people. Hence, he shared his experiences after visiting and communicating. He reflected talk about the geographical situation, socio-culture, politics, etc. I was interested in listening to his reflections. It supported me to understand my workplace. He said, *"People are simple and straightforward. Do not*

worry." He motivated me again and again. We visited the district hospital for my health certificate. The next day was my appointment day, so we prepared well for it.

My Initial Professional Experiences in Remote District: Demystify the Hidden Problems

It could be the day of 2014. Mr. Ganendra Joshi was the District Education Officer. He called all candidates in his workplace; school supervisor, resource person, accountants, other civil servants of District Education Officer (DEO), and journalists. Mr. Gynendra started to address the meeting. He briefly reflected on the educational practice policy and connected it with the teaching profession and local context. He expressed his warm wishes of welcome and best wishes to appoint new teachers of the different subject; briefly reflected the educational practice, policy, and challenges with connecting the local context. As I remember now, he could have informed, *"There are some problematic schools. To address this problem, some of you will be called a headteacher in the recent future. We will be thankful if you take your responsibility."*

My Parent's Hands

Muscles are losing and bending out of shape
I could not feel such a care as you make
Your hands never hurt me when I grew
They support in my learning which is true
They never laid your anger on me
They do hard work for me
They reflect how did I grow up, and
What is the meaning of being parents?
I realize your struggle from your splitting hands
I assess your expectation from your open arms
I study your hands for my self-motivation
I perceive they are my source of inspiration
Father! Mother! I always remember your hands
I respect your caring hands
I salute your protective hands
They are always champion for me

After his invigorating speech, he handed over our appointment letters. They gave two letters together. My father was also interested to read the letter, so we

immediately opened and read it. According to the letter, I was first appointed at Kalika Higher Secondary, Sailu in 2014/8/11. Then, I transferred to Shree Baljyoti Higher Secondary School, *Thakuri Gaun* in 2014/8/12. My father could have said, *"Why did they give you hinge transfer? It could make us a problem in future. They should appoint you in full quota, and they need to modify the language otherwise; it could be problematic."*

After that, we talked with DEO, the school supervisor, and the schools' resource person. They convinced us by saying, *"You need to follow the rules of the DEO. We could not modify it. Do not worry! If you faced any problem, we would assist you."* Although we were not satisfied, we received the letters and returned home. Then my father could have said, *"It is a new place. There is a pour social security in our country. You will be alone. It is a new place. Thus, today we need to meet with Central District Officer (CDO) and District Superintendent Police (DSP). They could support you while working here."* We met them and introduced ourselves. They might have said, *"Do not worry about your daughter. We are here. She can inform us if she has any security issues and problems."* They convinced my father. Their supportive language energized me.

It was a rainy day in the summer of 2014. We were preparing our luggage and being ready to go to the appointed school. Early in the morning, some unknown people called on my number. I received it. *"I am Mr. Lunar, plus two coordinators of your appointed school. I heard that you are appointed in our school in hinge transfer, and your full quota was Kalika Secondary school, Sailu. It would be best if you went to your full quota school. I called you for this purpose and information."* He might have informed me.

After that phone conversation, we informed the issue to Mr. Gyanendra, the chairperson of DEO. We requested him to post us in full-quota school. He again repeated the same statement, *"We cannot modify it. You need to follow the rules of DEO."* We had no alternatives. We started our journey towards *Thakuri gaun*. After walking around eleven hours' journey, we reached our destination. We met headteachers, teachers, and office assistants. Then the headteacher had informed us that some local people were interested in keeping us in their house. We agreed on it and left at the simple farmers' house.

After a week, I felt that people were simple, kind-hearted, and straightforward. We grew up in diverse geographical and socio-cultural environments. Therefore, we were linguistically and culturally different. My father supported me in every step. We went to school together. I had a fear of working in a new environment and collaborating with teachers, students, and gradients. However, when we reached school, I did not feel any hesitation. The male teachers were interested in talking with my father, and the female teacher was closed with me. My father played the role of a catalyst for adjusting me to that unknown and new culture and environment. He asked about my attendance. As I remember now, the headteacher might have replied, *"I will call a meeting and attend her."*

It was the day of 2014. It was my first class at Shree Baljyoti Higher Secondary School. I was a class teacher of class ten. I entered the classroom with an attendance register and marker. The classroom was full of students. I gave my introduction at first. Then students began to introduce themself in the process of class attendance but, I could not understand the language of many students. I requested to repeat slowly. They repeated two/three times. At that time, I understood more than earlier, but the problem was not entirely resolved. I came to know that they were

linguistically different than me. They looked innocent and straightforward. I did attendance of all students. Although one hundred and thirty-five students' names were registered in the record book, only eighty-two students were present. That made me curious. I asked the students and also observed their previous records to explore the cause and patterns of irregularity. I found that a large number of students were absent from the beginning of the session. A small boy on the first bench Jenish could have said, *"It is normal here, madam. Most of the students came to the final exam and passed the exam. They had full freedom to come to the school as per their time and interest."* I was in the process of excavating the main reason. I critically observed the classroom. I realized poor classroom management.

I went through my science course. Although there was a half of an academic year, only two lessons were completed. Again, I asked the reason for being late. They said that the teachers are fighting with each other for being a headteacher. They have less concern in teaching. There is no teacher, teaching, and exam in time. Some friends have got the old books of the previous batch, but many friends do not get them. The book might be distributed at the end of the academic year. I curiously listened and observed their voices and facial expression. I felt that they were reflecting their pain as I gave an immediate solution to it. The bell rang. I could not go through the lesson.

I went to the office. I shared the problems that I and the student faced in the classroom. I asked the reasons for students' irregularity and schools' actions for their regularity to the headteacher. For making the problem understandable, he simplified the issues by connecting with social context (Vygotsky, 1978). He might have explained, *"Students have lots of problems at home. They will come in their leisure time. How can we make it regular? We also do not have enough space to place them.*

If all students come, how can we manage the classroom and human resources? The students who are interested in learning are coming regularly. Thus, we could not give regularly coming irregular students. Likewise, we have provided old books to most of the students. The number of students this year is greater than the previous year so some students have not got the books. We are in the process of managing it. There is no proper facility of transportation that also make problems for distributing the books in time. This is a remote village school, so we could not compare and generalize with well-facilitated schools of urban. You came from an urban area, so your thinking and understanding about the learning problem are also right but, we have to understand the grounded reality of remote school and practice accordingly."

After listening to the voices of students and administrators, I knew the various reasons which in/directly influenced the science teaching-learning cultures. I also realized the need for transformational leaders in schools. In this context, I fully aligned with Hoy et al. (2013) who called transformational leaders for using idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration to change the school.

It was the day of August 2014. The plus two coordinators, Mr. Lunar, called me and the newly appointed lower secondary English teacher Sanju to his home. He said that the agenda is our attendance. Sanju and I went together. We entered the room where around fifteen people were already there. We greeted all and sat near the window. After a few minutes, the meeting was started. At first, we introduced each other. Then we entered into the main agenda. I came to know that the headteacher, some teachers, and local political leaders having similar ideologies were gathered. They clearly said about their teacher trade union and requested to be a member of it.

I was a novice teacher. I did not know the names, aims, objectives, and functions of a teacher trade union. Therefore, I replied, *"I have no more knowledge about it. Teaching is my first priority. I do not think we need to be a member of any union for teaching."* My new friend Sanju came from Terai reason. She also agreed with me and added, *"I will be decided after some days."* Then, the coordinator, Mr. Lunar said, *"If you join our union, it will be easy to attend you, and we can work together."* We simply replied, *"We are ready to work together, sir!"* Other local political leaders also suggested bonding some unions. After a brief discussion, we returned. The next day, the headteacher attended us, and I formally started my teaching profession.

Influence of Power and Politics in School Leadership and Management

It could be any day of 2014. The District Education Officer, Mr. Gyanendra, requested me to take the headteacher's responsibility for resolving the chronic headteacher problems of Shree Baljyoti Higher Secondary School. In the three months' teaching-learning period, I realized an internal debate between the teachers for being a headteacher. They were divided into two groups and had rejected one another. In that polluted milieu, balancing the two groups to run the school smoothly was a challenging task for me.

For that reason, I informed that I am not interested in being a headteacher. As I remember now, I could have replied, *"I am in the process of adjusting in a linguistically, culturally, and geographically diverse environment. How can I interact with teachers, students, society, and the District Education Office without knowing these aspects? So, it is better to give that responsibility to a more experienced teacher."* Then Mr. Gyanendra might have convinced me, *"There is no female higher*

secondary level headteacher in this district still now. So, it is an opportunity as well as a challenge for you. I am inclined to believe that you can do honestly."

Then I was ready to take that responsibility. For being a headteacher, I had to prepare the School Improvement Plan (SIP). I did not know the historical, physical, economic, and cultural background of the school. I requested the headteacher to provide these documents from the school record. But he was not ready to support me. Then I shared my problems with other teachers and neighboring headteachers. With the help of them, I developed SIP and submitted it to the DEO.

It was the day of December 2014. I was appointed as a headteacher. However, the active headteacher was not ready to attend to me for a month. I realized that it was too difficult to work in that critical situation. I informed the DEO that one teacher group was not ready to accept me because they could have claimed, *"You are in a Kaj*[28] *and trial period. How can we accept you?"* Their claim was also valid. While being a headteacher, it could be disturbed my science teaching-learning as well. So, I am happy in my present profession. If all teachers are ready to support me, I will take this responsibility. I am not interested in working on rejection. Then Mr. Gyanendra said, *"All people can work on the easy situation. However, a few people can have the brevity to face a challenging situation. So, you need to think that the DEO allowed me to show my abilities rather than taking them as a burden."* Then, I was invigorated by his motivational speech. Some other colleagues and parents also encouraged me to be a headteacher. Then again, I was mentally prepared for taking it. After a month, the headteacher handed over the administrative responsibility to me under the high pressure of DEO.

[28] Kaj – hinge transfer

It could be any day of winter 2014. I could not find the staffs' attendance register on my table. I called a staff meeting to facilitate the situation. However, a group of teachers joined in the same Teacher Trade Union boycott the meeting. The former headteacher said, "*How did many teachers did not attend in the official register, make groups, and failed our administration? We will take an act of revenge. I took that register at home. How did they receive their salary without legal attendance? If they receive it, we will knock the door of court in the corruption case."* I humbly request to forget the past's negative loop and support creating a progressive loop of present and future. It is an official property that is required for conducting regular administrative work like teachers' regularity and leave. Keeping the register at home is illegal to work. Firstly, you need to return it that will help to discuss in your concern and doubt. However, he was not ready to return it. There was no active School Management Committee (SMC) to make an official decision and take legal action on that issue. I felt anxiety. Many teachers might learn about my psychology. They said, *"It is difficult to work in debate. Do not feel haplessness. We are ready to support you."* They suggested creating a temporary register for managing the immediate situation. Finally, I created a new register and facilitated the situation.

There was a weak bond between teachers-teachers and teachers-administrator. I called several staff meetings to reduce that distance and improve the polluted environment of a school. Further, we had to formulate a new SMC for handling the sensitive school milieu by acting as a mediator. However, some teachers frequently rejected my agendas. Therefore, in that transitional phase, I was less able to unify the school family, formulate the SMC and address the chronic problems of the school.

When a science teacher became a headteacher in my school learning period, it hampered our science classes. As a result, many students' interest and engagement in

the science classes also decreased. When I became the headteacher, I experienced the same. I spent more time in administrative meetings, debates, and managerial parts that/directly influenced my science classes. Commonly, I was under stress. For instance, the DEO office supported building the two-story science building with four rooms in each storey. The former administrator had involved many local people in constructing the building without paying their wages in time. They claimed their wages at the office, classes, and even at home, which made me stressed.

The school could not activate the account due to the lack of a new SMC. The DEO said to submit the minute of SMC for activating the schools' accounts. However, we could not formulate the new SMC due to the lack of triangulation between the teacher, administrator, parents, and students. There was no alternative to go in voting. I also informed the grounded reality and requested to facilitate the situation to DEO. They repeatedly said the same thing that you should collaborate with teachers, parents, and political leaders and develop the SMC through full consent of all. The two school supervisors who worked in DEO knew the situation very well. They worked as headteachers (one of them) and teachers for an extended period in my school before being the school supervisors. One of them was a related field supervisor as well. He also had a responsibility to support the headteacher in the SMC formulating process. However, he did not visit the school and support formulating the SMC either through consent or voting. I felt that he was escaping from the problems.

The unsatisfied group of teachers went for delegation in DEO. Their logic was she was in *kaj* and trial period. How had she made headteacher? Therefore, why did we work under her administration? The DEO did not follow the rules line by line force us to agree on their illegal actions. Therefore, their single agenda was to return me from that school. Then the DEO decided to return me to Shree Kalika Secondary

School, Sailu, without me. The teachers who had felt like the winners began to display harassment through their language and actions at school. They captured the headteachers' chair, gave a written ultimatum, and locked the office. In other words, their decision had invigorated orienting the school environment towards more debate and violence. I formally wrote the letters to CDO and DEO by attaching their threatening letters for my social security and facilitating the worst situation. Many parents and teachers suggested leaving the school due to the high risk of social security.

Then I felt paralyzed. I wished to represent the school environment as a *silkworm inside the cocoon,* which indicates the inactive phase, relation between the school family *as a breaking glass* that illustrates the difficulty in rejoining easily and I felt like a *sitting on the burning coal* in my initial months. That means it was too tricky timing for me. Before being a headteacher, I envisaged that I would create an empathetic relationship between teachers, students, society, enhance the quality of education by creating an appropriate learning milieu, and so on. In that problematic situation, I was a failure to implement my plan in the actual field.

I went to the DEO office. I met Mr. Gyanendra. I greeted him. He could have replied to my greeting and said, *"We have decided to return to you in Shree Kalika Higher Secondary School, where we had appointed you with a full quote at the beginning. Some teachers came delegation, gave political pressure, and you also could not manage the school. Therefore, we could not continue as a headteacher and teachers in that school. I do not know who you are? You should go to Shree Kalika Secondary School."*

Although Mr. Gyandendra had appointed me in the *kaj* without my interest and gave me the headteacher's responsibility in my trial period without following the

rules, he did not realize his weakness and commanded me. I might have thought, *"Who has given him an authority for doing the things as per his interest and establishing me as a failure headteacher because he is a policy implementer as well as a facilitator."* I realized anarchy embedded in our educational practice. Although there was not easy to fight against the powerful institution DEO, I decided to act for my justice. Then I did my attendance in DEO for around one month.

The DEO could not facilitate the SMC formulation process, so the two groups of teachers formed two separate SMC and submitted them to the DEO for legitimacy. In this context, I experienced the same as Pherali (2013) mentioned that representation on the SMCs (particularly holding the chair position) of SMCs became political entities for the political parties. Hence, they try to maintain the power through SMCs to gain a respectable social status. So, there was a more conflicting environment at school. To address the chronic problem, Mr. Gyanendra organized the meeting of distinct level and local level political parties and teacher trade unions to find the solution in the package. The meeting divided the president of SMC and Teacher Parents Association (TPA) as well as the members to different political parties. Further, they limited my boundary to a secondary level headteacher at Shree Baljyoti Higher Secondary School and guaranteed Mr. Lunar, who was the part-time teacher, as a plus two coordinators.

I experienced several challenges as a headteacher of a community school. There was a greater influence of power and politics on becoming a headteacher, formation of SMC, and their actions that disturbed to conduct the regular activities of school smoothly. Regarding the role of SMC in my school, I am with Groves (2021), who argues that the Local School Boards (like SMCs in our context) are becoming boiling pots of rage, political battlegrounds, and complete with personal attacks that

shadow the several issues of schools like recruiting teachers, improving teaching-learning environments, increasing school facilities and helping students in their teaching-learning in the American context. I faced similar problems in my working period.

It was the day of 2015. The DEO gave me a letter to return to my previous school to continue my previous role. Even though the decision was still more political and beyond the educational policy, for minimizing the violence in school, acknowledging the voices of local people, DEO, political parties, and teachers, and unifying all fragmented parts of the school, I agreed on it. Then I returned to school. It was easy to conduct the administrative and academic activities than earlier, even though the relations between teacher-teacher and teacher-administrator were not explicitly improved.

It could be any day of 2015. In the process of official work, I was going to the district headquarter of Jarang. Mr. Ganesh had a small coffee shop near the school called me. *"Madam! Most of the teachers are fighting in the office."* As I remember now he informed me in a frightening sound. He was a guardian of students, and he observed most of the schools' activities for an extended period. Therefore, I requested to facilitate the situation. He might have said, *"Do not worry! We will manage here."*

For understanding the actual situation, I called the acting headteacher and other teachers. They did not receive the call. After two hours, they informed me that they were at the police station and registered the case. I requested to resolve this through negotiation. The next day, I returned to school. When I reached school, I met the lower secondary level teacher, Mrs. Nami madam, and two non-teaching staff s Mr. Dan and Mr. Lalu. They explained the actual event and informed that all teachers were going to the district headquarter in the process of justice. The incident was

unfortunate. The police and CDO, and District Police Office, Jarang, took four male teachers and two female teachers for the investigation. They kept four male teachers in prison for some days, which influenced all the teaching-learning activities for around two weeks. This incident made me thoughtful about how could I feel if I was a male administrator?

Figure 18: 'Party Politics in School' Source: 'Self-created'

Finally, both victim and victimized teachers were ready to excuse each other and escape from the prison. Regarding the influence of power and politics in school leadership and management, I am with Dangol et al. (2013), who reveals that the political parties and their sister organizations commonly use the school for their benefits like assessing resources, promoting nepotism/favoritism, displaying and balancing political power of in schools. This incident was the turning point in my administrative journey. After that event, they committed to collaborating by getting their past ego and applying their commitment in their professional life. I was happy to experience the collaborative learning environment of the school. I also realized my weaknesses and forgot all unhelpful past incidents. It supported reducing the distance between the teacher-teacher, teacher-administrator, teachers-administrator-learners,

and teachers-administrator-parents-learners, and running the school smoothly, bringing back hope again. Although several roles, duties, and rights of DEO are mentioned by the educational policies for improving the academic qualities of schools, they are also less able to implement in the real field. When I was appointed as a teacher and headteacher, I experienced the dualistic role of DEO as well. Therefore, the related agencies also need to be responsible for developing the school as a peaceful learning zone and enhancing the educational qualities.

SLC Examination for Cut-off Point/Learning

It could be any day of 2015. Mrs. Renisha was the superintendent of the School Leaving Certificate (SLC) examination that was held in our school. We lived together in the examination period. Mrs. Renisha, madam, and I planned for conducting the Examination peacefully and systematically. The DEO recommended around six hundred students in the center. It was a school in a remote village. There was no proper infrastructure. Therefore, we collaborated with other neighboring schools, Community Study Centre and managed the desk-bench, carpet, and required human resources. We could not manage the desk bench for all students yet. Then we managed carpet for them.

The next day was the first day of the Examination. We counted the number of total examination papers and kept them in the drawer safely because we heard that there was a culture of cheating in the Jarang district. Even teacher also acts as a mediator for supplying the examination paper and cheating to students. We noticed all students coming before half an hour on the first day. We had a plan to motivate the students to do better without any hesitation and improve the illegal examination culture.

On the first day of the SLC examination, Mrs. Renisha and I went to the school one and half an hour earlier. Then we observed the school milieu, collaborated with other teaching and non-teaching staff. As we noticed yesterday, the bell was rung before half an hour. We went to the ground for informing the rules of Examination and invigorating the students. However, few students came to the assembly. I communicate with some parents to seek the reason. They might have said, *"There is a cheating culture in SLC. So, they possibly come late for escaping from the checking."*

Before five minutes, around two hundred students came in a group. Due to the time limit and overcrowded situation, the checking staff could not check their bodies properly. While observing their body language and entering style from the gate, I felt that they were coming to observe the fair festivals. I did not see any seriousness. In my understanding, they were free from anxiety. The SLC examination began at 7:00 AM. As a superintendent of the Examination Centre, at first, Mrs. Renisha went to the classroom supervision. As a headteacher, conducting the Examination smoothly was my responsibility as well. Then I also went to the field observation. I entered the different classes randomly. I found that most of the students were cheating. Although I was entered the class, they continued cheating without any fear. I had collected their cheats and burnt them. I observed the internal and external situations. I perceived that most of the invigilators, parents, headteachers, and students intended to cheat.

The DEO resource person, Mr. Nayan, came for supervision. He was standing outside the second building, which was a little height place, and observing the school environment. Meanwhile, a group of people entered the examination Centre by crossing the wall of the school compound. They pushed Mr. Nayan and entered the examination hall. Fortunately, he did not fall from the height. As I remember now, he

might have said, *"Ooh! Who are they? How can we control the situation?"* I loudly directed the polices to control the examination milieu.

The situation came in control after half an hour. Likewise, Mrs. Renisha was also collecting the cheats from the examinee and burning them. She said, *"It is difficult to change the examination culture of Jarang district. As a local teacher, I knew that most teachers, parents, and students' intentions were passed in SLC. They need to change their beliefs system for changing this Examination."* We agreed with her opinion.

The next day, the local people came into office and claimed that you were strictly the key person conducting yesterday's Examination. I heard from many people. Although you were qualified, the DEO appointed your colleague as a superintendent and did not give you any role. They decided to return to Shree Kalika Higher Secondary School. Further, they did not support you in formulating a new SMC, opening the school's account, and appointing the new teachers in school. Why did you take a risk? If the exam was conducted excellently, what would you get? You are at high risk, so better to present softly.

Their voices recalled my painful journey as headteacher. I felt helpless from the DEO. They recently decided to return to Shree Kalika Higher Secondary School, Sailu. Therefore, many schoolteachers began to display harassment behavior for giving pressure to return there. I felt pressure from the one-sided decision of DEO. I realized that the local people gave me good suggestions. Then, from the next day, I stopped field visiting and continued my regular official duty.

Moreover, in the examination period, many teachers of our school went to the Shree Janaki Secondary School to facilitate the students. I heard that typically, mathematics, science, and English subject teachers at related schools went to the SLC

examination center for cheating their students. One of the guardians indirectly said that mathematics, English, and other subject teachers supported the students in their examinations. Thus, many guardians have the same expectation from you in your science subject. I was surprised by listening to his proposal and immediately disagreed.

Although learning is also crucial for solving the learners' real-world problems, I experienced that the SLC examination greatly focused on cut-off points rather than learning. Therefore, I realized that the students, teachers, and parents must understand the assessment beyond the cut-off point. For transforming their dogmatic beliefs actions, I acknowledged the idea of Panta (2015, p. 181), who focused on "assessment for nurturing creativity." In doing so, we could incorporate this notion by revisiting our curriculum while designing and implementing the phase. In my understanding, *one-size-fits-all* pedagogy (Luitel, 2013), curriculum, and assessment are inadequate for addressing the need of students and society in the diverse learning environment.

Teacher Selection Examination for Being a Teacher or/Responsible Teacher

It could be any day in 2015. We had conducted the Examination of secondary level English teachers. There were four candidates. Among them, three candidates have participated in the Examination, which was held near the DEO of Jarang district. Resource person Mr. Devi and I were in the examination hall. At the last hour of examination time, Mr. Avaya, who was also a candidate, entered the exam hall without permission. He began to tear the paper of the examinee. Mr. Devi and I requested Mr. Avaya to stop his illegal action. However, he was not ready to listen to our humble request and tore the papers of all examinees.

We wrote *a muchulka*[29] of that incident, and the Examination was postponed. Due to several causes like internal debate, lack of proper support of DEO, we could not fulfill six teachers for a long time. We conducted that Examination after a prolonged exercise. Likewise, I also felt disgraceful when the secondary level candidates who applied for being a secondary level English teacher tore the papers of other examinees and published postpone notice on the DEO notice board and strongly raised the voices for punishing the candidate who had gone against the rule of Examination. At that moment, I remembered my students and realized them as failure headteachers.

The next day, the chairperson of SMC informed me that we had to conduct the English teacher selection examination the next day. All the examinees had an agreement to accept Mr. Avaya as a single candidate. There are no challenges for selecting the teacher. Therefore, you have to publish a notice for the going forward process. I was not ready to agree with his opinion. As I remember now, I could have said, *"Other three examinees advocated fair Examination until yesterday? How did they accept the examination rule breaker as a single competitor? How could I conduct the Examination for making an illegal person a teacher? A teacher with having the qualities of a good teacher is the present need of a school."* I immediately called other candidates to listen to their voices. Then they informed that they lived together and discussed that issue. The subject export had reassured to address them in the following vacancy and decided Mr. Avaya as a teacher for that school. I might have replied, *"You were advocating for the fair Examination until yesterday. Why do you change your voices? If you quit the Examination, I will re-advertise."*

[29]*Muchulka* - crime scene report

I had greater pressure to conduct the Examination from the SMC chairperson, and I also convinced him to follow the rules, and I strongly raised my voice. Why do we perform the Examination for selecting a punishable person as a teacher by following the grand design of subject export and others?

Then I submitted the crime scene report *and informed the candidates' response* to DEO for the investigation. I expressed my opinion like DEO has to punish or reward the candidate who went against the rule of Examination? How do we select a teacher who did not have basic qualities for being a teacher? How can we solve the problem of school by gathering illegal/criminal-minded people as a teacher? However, DEO did not act against him. They might have claimed, *"Mr. Avaya is a single candidate. We can easily examine without debate. There is no social security; why do you take a risk? It is better to continue the process."*

I realized that it is challenging to implement the rules at a basic level without proper support and motivation from the uppermost institutions, committees, and persons. I became emotional. I felt alone and hopeless. I had no alternatives other than selecting him as a teacher. Thus, I requested the chairperson of SMC to call Mr. Avaya to realize his mistake with a solid commitment to being responsible towards the school family in the following days. The SMC chairperson also agreed with me. He called Mr. Avaya to realize his wrong actions. Finally, he came with us and realized his weaknesses and committed to being a responsible teacher, and we conducted the Examination. Dangol et al., (2013) suggested revisiting schools' educational laws and policies because the political conflict victimizes schools. Although educational laws, policies, proper supervision, and monitoring also have a crucial role in counteracting the political conflict of school, being a responsible teacher is more important than just being a teacher in our professional life that can

support guiding their actions through their selves as well. Perhaps, it could support creating an empathetic learning milieu and transforming towards Habermas's (1972) emancipation interest.

Negotiation, Collaboration, and Critical Reflection: Foundations for Creating Empathetic Milieu

It could be any day in 2015. The resource person, Mr. Devi, organized the meeting for creating the empathetic learning milieu at school. To counteract the violence and stress embodied in school, he acted as a mediator. We all teachers, coordinators, headteachers realized that the ego, politics, and power-sharing were the leading causes of creating violence and stress, which in/directly influenced all the school's activities. For illustration, we could not formulate the SMC and TPA; appoint two secondary level English and social study teachers in *rahat*[30] quota and four high school level mathematics, English, population, and health education teachers in *anudan*[31] quota; open school account and pay the salary of teachers and wage of workers; continue the construction of science building. In other words, the school learning milieu was in critical condition.

We made a written agreement for collaboration by accepting our weaknesses. Then we focused on managing the learning milieu of school. We addressed the various problems of school that I mentioned in the above illustration. In a short period, people began to give positive responses towards our activities. Moreover, in a staff meeting, most of the teachers began to take part and bring constructive agenda for improving the learners' creativity and schools' learning milieu. I also acknowledge their productive plan and feedback. Then we discussed and decided from the staff meeting. Whenever we felt the plan was complicated, we discussed it in SMC and

[30] Rahat quota – relief quota
[31] Anudan – contract basis

took an appropriate decision. The teachers were ready to take the responsibility of different departments of school like spot, cultural, and discipline. We conducted co-curricular activities like dance, quiz, debate, and writing competitions. At that time, I perceived the hidden intelligence of learners. I realized how the stressful learning milieu compressed the learners' multiple intelligence and creativity tacitly. In this regard, Khanal (2018) also explained that the school principal leadership influences the teachers' behaviors, attitudes, and perceptions, so he/she plays an important role in making the school successful. I came to know the same lesson from my lived experience as a headteacher of a remote community school.

In the transitional period, people had negative thinking towards the school. For clarity, I had called several meetings of parents and political parties to address the chronic problems of school in that transitional phase. They strongly raised their voices like teachers did politics, selected their relatives in the job selection process, and did groupism for their beneficence; taught their children in institutional schools and damaged the future of the children of a poor community in the meeting. In other words, they said that the teachers were not honestly doing their professional responsibility. They suggested changing our narrower beliefs by forgetting the personal ego and benefit and thinking about how we can address the voices of the masses for institutional benefit. However, the progressive activities of school began to change the beliefs of local people. To reflect on the positive shift in my school, I now briefly discuss a typical activity related to reproductive health.

As an administrator, I collaborated with reproductive health education-related organizations. They greatly focused on puberty age girls' reproductive health and also included some boys in their programs. They supported the reproductive health-related materials, first aid box, and scholarship to the school. They gave me a role to assist

the learners. Therefore, the school managed a room for puberty girls who suffered from severe pain in their menstruation period and problems of bleeding in learning time could use first aids, sanitary pads, and take a rest.

Moreover, we also managed first aids for all students, so other students contacted me inside/outside the classroom and shared their problems. Jang and Elfenbein (2019) prevailed that physiological and psychological symptoms around the menstrual phase may contribute to the most significant risk of severe mental health outcomes like suicides, suicide attempts, and psychiatric admissions. The puberty age girls of our school could easily share their problems with other teachers and me. I was delighted to assist them. The reproductive health education-related organizations members responded that they also felt it easy to collaborate with us in a peaceful learning milieu. However, in my past learning journey, I could not express the pain and problems that I had faced in the menstrual period, even with my colleagues, which sometimes gave me emotional stress (see chapter III, p. 45). I was less conscious of reproductive health. I tried to hide it. Therefore, I felt that we had to understand and support the girls in their menstrual phase that could help to counteract the hegemony inside the classroom.

From this critical incident, I learned that negotiation, collaboration, and critical reflections are the foundations for creating an empathetic learning milieu at school. We can visualize our more substantial and weaker poles, realize our weaknesses, and invigorate transform our dogmatic beliefs. As a result, it can support creating an empathetic science learning milieu inside the classroom as well. Hoy et al., (2013, pp 229) also argued that “conflict can be successfully managed by competing, collaborating, accommodating, compromising, or avoiding depending on the situation.” From my struggling journey of Shree Baljyoti Higher Secondary

school, I learned the lesson that each member of the school family needs to reflect on their actions critically, and listen to the voices of larger masses by forgetting their personal ego, debate, power, politics that support for creating an empathetic learning milieu inside/outside the classroom and counteracting the hegemonic pedagogical culture of science and other subjects.

Science Pedagogical Culture: Linguistically and Culturally Diverse Students

It could be any day of 2014. Most of my administrative time was spent managing the internal debate. Therefore, we could not be able to build the science building on time. I still realize that we could not grasp an opportunity of managing a science laboratory. I connected science content with the local context and participated in project works, classroom discussions, and presentations. For instance, when I taught the topic 'Flowering Plants,' I initially divided the students into eight groups. I gave twenty minutes to list the names of locally available flowering pants and present them in the classroom. All students took part in group discussions. I observed their activity by moving around the classroom. Each group listed several names and presented them.

I could not listen to the name of various flowering plants that they had listed. I asked the learners to explain their characteristics and habitats and portray their pictures on their paper for knowing the plants. Even though they did according to my instruction, I could not understand the many plants. I came to know that their local names were different than my growing community. I suggested collecting the different parts of flowering plants from their surroundings. The next day, they demonstrated their collection. I know the local names of many flowering plants. Further, there was an enriching collaboration between teacher and students and students and students for elaborating their characteristics. I experienced that science

learning is a binary process. We can learn and learn well from both teachers as well as learners. While teaching the topic flowering plants, I learned the local names of many flowering plants like *pirya*[32]*, galmat*[33]*, parlauro*[34]*, and kaddu*[35], which greatly supported me in adjusting to the linguistically and culturally different society. In my understanding, we can connect the science content with learners' context and culture by incorporating students/teacher binary process-based pedagogical culture in a science classroom. It could support creating a good relationship with teachers and students for managing the linguistically and culturally diverse science classroom.

I participated in their cultural and religious programs like a fair festival, *Teej, Krishna Ashtami*[36] for knowing their language and culture. They shared their cultures through dialogues, songs, cultural dance, music, and folk songs. The local people were pleased when I visited their house; dialogued with them; ate their food like roti and *sisnu*[37]*;* and sang, danced, and observed their cultures. Moreover, my student Jyoti who studied in grade ten, lived with me. I learned their language and culture with her at home. Many young girls were happy to sing and dance with me. In this manner, I was able to adapt to their culture, which in/directly supports creating empathetic relations with learners. In this regard, Gay (2000) also advocated understanding the students' prior experiences, community settings, cultural backgrounds, as well as ethnic identities for cultural responsiveness teaching because it is a contextual and situational aspects.

I delivered most of the abstract theoretical and conceptual ideas of science, like preparing gases, electroplating, mitosis, and meiosis cell division through the

[32] Priya- local name chili in English
[33] Galmat- local name taro plant
[34] Parlauro- local name stinging nettle in scientific
[35] Kaddu – local name pumpkin in English
[36] Teej Krishna Ashtami – festival
[37] Sisnu – stinging nettle

lecturer method. I focused on solving the previous exam questions and model questions. At that time, I thought that the students should achieve high scores in the final exam. However, I had studied that the low cost and no cost material and audio/visual aids help simplify the abstract idea of science. I was less able to apply these teaching materials in my actual classroom practice. In my learning time, As I remember now, I might have commonly thought, *"How can I obtain a high score rather than how can I apply the scientific knowledge and skills in my real life?"*

In this context, I am very much akin to the ideas of Holbrook (2003), who argued that students need to view the relevance of science learning as it applies to them personally and socially. In doing so, I could use some improvised materials as an alternative to actual materials and connect with the everyday lives of learners and remote villagers, making my teaching-learning livelier. For example, we can use outer parts of eggs or chalk as an alternative to marble chiefs; lemon juice as an alternative to dilute hydrochloride acid; bottles and pipes for making Wolf bottle, gas jars, and delivery tubes, and demonstrate the preparation of carbon dioxide by connecting with their social context. It could support viewing the relevance of science learning through the lenses of students. According to Mensah (2015), the improvised instructional materials are helpful in science teaching, typically in rural areas where the limited resources for doing hands-on activities by using standardized materials. But, I was less conscious of incorporating this aspect in my real practice.

Dogmatic Beliefs of School Administrators: Practical as a Time-consuming Matter

It was the day of May 2016. The headteacher, Mr. Manu informed me that I have to participate in the workshop on 'Science Teaching Equipment-Fabrication and Experimentation,' which was organized by the Nepal Academy of Science and Technology (NAST) in collaboration with DEO of Shreethana from the Shree Dibyashakti Higher Secondary School. Around twenty-five, secondary level science teachers participated in the workshop held between May 16-18. The activities were related to the secondary level science teaching topic of 'Electricity and Magnetism. We engaged in science teaching equipment-fabrication and experimentation activities like designing and demonstrating electric motor, electric bell, battery (for converting alternating current into direct current); parallel and series combination of loads. We realized that the workshop was fruitful, so committed to applying it in our everyday professional practice and share it with neighboring schools' teachers who could not get an opportunity to participate in the workshop.

Before participating in the workshop, I mainly focused on important conceptual and theoretical ideas of electricity and magnetism, which repeatedly came into the previous Examination. The students were busy noting down the highly structured answers. I did a few experiments and demonstrations in this lesson by relating to the learners' daily lives. In my learning journey, I carefully observed some demonstrations related to electricity and magnetism demonstrated by my secondary-level science teacher. However, I could not connect the different concepts, theories of electricity and magnetism with my real life. I perceived all these activities from the examination point of view. I rarely thought about how I could apply these ideas in my daily life? There was no electricity facility in my village in my learning time, which

might be the reason for being difficult to understand and generalize in my everyday life.

The workshop significantly contributed to changing my teaching culture. I applied the materials that I had designed for the seminar to my actual classroom teaching. For example, I used a battery in electroplating, electrolysis, an electric motor, an electric bell, and a household circuit to explain its working mechanism. The students were explicitly motivated to design and demonstrate their creativity. They used the low-cost and no-cost materials of their surroundings and developed the science teaching materials. From this lived experience, I realized that if we were less conscious to connect the experimentation and demonstration-based activities with our real-world problems, we could not go beyond the scientific information gathering process and foster the learners' creativity.

I remembered a critical incident that was related to science practical work. There was a science laboratory in the secondary level education building at school, which was behind the office room. The basic level students had to walk around seven hundred meters from their classroom building to reach the science laboratory. For providing the concept of various forms of energy and the energy conversion process to class eight students, I managed the required materials in the laboratory during my leisure time. The number of students was around fifty. I divided the students into ten groups and discussed laboratory work and precautions. Then, we went to the laboratory building for the experiment. The lab was small. There was no lab assistant. So, I kept them in a row outside the laboratory and demonstrated it according to their turn. At the same time, Mr. Head came to the lab and asked me about our activities in the class and outside the class. As I remember the conversation took place accordingly.

Mr. Head: *Madam, what are you doing this? Students are making noise and moving outside.*

I: *Sorry, Sir, I have been demonstrating the experiment of an electric bell. Our lab is small, and due to safety measures, I could not allow all students simultaneously. So, I made ten groups, kept the student in a row outside the lab, and demonstrated the experiment accordingly. While demonstrating the conversion of electrical energy into sound energy, the students were excited and observed curiously that caused a little bit of noise.*

Mr. Head: *I think taking students from one building to another building for their practical work is time-consuming. It is better to focus on the theoretical portion and finish the course as soon as possible. Then we can revise the important content and be well prepared for the annual Examination. If you have time, then you can also do some practical activities. Most of the teachers have finished their course within four/five months of the academic year and started to prepare the students for the annual Examination.*

I: We can give crystal clear concepts through practical activities and enhance the learners' creativity. These activities un/knowingly support achieving higher scores in the Examination. I do not think I need to complete my courses in five/six months as other teachers had done and competed with them. I will conduct my classes as prescribed by the curriculum.

Mr. Head: Yes, you think you might be good, and I am just aware of you. Some students also complained that you mostly used the English language for elaborating the science concepts. Most of the students were from Gurung, Tamang, and Uperkoti casts. Typically, the Gurung and Tamang students had their mother tongue. They feel

difficult to understand and express even in the Nepali language. Thus, be conscious of these aspects.

I: Ooh! Of course! I used English terminology in my classes. We could not complete translating some science terminology in Nepali and questions were also asked without translating in Nepali. It possibly supports the students who continue science subjects in their higher education. In my understanding, the students are also used to these aspects. Thus, I parallelly used both languages. I do not realize they are feeling discomfort for understanding the content. I will rethink my practice. Thank you for your constructive feedback.

Mr. Head: Okay, Madam, you can continue your class.

From my lived experiences, just completing the formal recommended courses of science teacher education and continuing the science teaching profession is inadequate for addressing the emergent socio-cultural context. McFadd et al. (2014) argued that the Teacher Induction Network assists the novice secondary science teacher in developing soft skills as a reflective practitioner. Thus, I realized the need for induction training for novice science teachers for their professional development. So, it positively influences teacher collaboration, communication, and reflection skills development. They could get an opportunity to learn about contemporary society, culture, recent trends, and challenges in science education from the lived experiences of More Knowledgeable Others (MKO). In the above incident, Mr. Head considered the science practical a *'time-consuming matter'* rather than flourished the learners' creativity for meaningful learning. In this context, Koirala (2019) explained that science teachers need to integrate practical activities in their professional practice for effective science learning. In my understanding, teacher induction training could

invigorate novice science teachers to counteract the dogmatic beliefs and action and enrich transformative science learning.

I remembered another incident in my school-level science teaching-learning process. It could be any day of 2016. I encouraged my class eight students to draw the excellent label diagram of various science-related pictures on the white prefab classroom wall. The students could easily draw and erase the images as per their interests. The less engaged learners in my theoretical classes were also actively involved in sketching the pictures. I learned the lesson from their collaboration and creativity in their leisure time. I experienced that we could create an empathetic science learning milieu through this activity. Therefore, I was extending these activities in classes six and seven. The students were happy to engage in that activities. I realized the artistic activities have an inner capacity to connect the teacher, student, and content in the same space and shift towards authentic, inclusive, and meaningful learning. However, I could not continue these activities for a long time. I heard that some teachers strongly critiqued my activities during their teaching period. One day Mr. Nayan, the assistant headteacher, shared his views with me. He might have said, *"You have been encouraging the students for portraying the science pictures on the wall of a classroom which might be good. It is a newly constructed building after the earthquake of 2015, and the drawings could make the outer looks of school old and dirty. My suggestion is better to draw the pictures on their paper."*

While drawing the pictures, I did not view through this vantage point. I had full confidence that I had taken positive action. I questioned myself, why do people critique my creative activities and try to band me? At that time, I could not positively take his suggestions. After he complained, I gave a bottle of spirit to the students and suggested removing their creative work from the wall and stopping to portray the

science pictures on the classroom wall. Regarding the cognitive process of learning, I am with Buchanan and Hyde (2008), who explained the complementary aspects of the cognitive process of learning are thinking, feeling, and reflecting/intuiting. I also tried to incorporate these aspects into the process of science learning. However, I faced challenges while integrating them into my actual practice. Typically, the dogmatic beliefs held by the administrators' demotivated me to engage the students in the active learning process and foster their creativity.

Dogmatic Beliefs of University Administrator: Adapting Defensive Science Pedagogical Culture

On the day of twenty-five May 2016, I was appointed as a science teacher educator in a Riverview Campus of Kathmandu valley. I was excited and went to the recommended campus for my professional responsibility. When I got there, the situation was different. The campus chief was absent that day. The assistant campus chief called him for his suggestion about my attendance. He said to wait for him 2/3 days. After two days, Mr. Chief came into the campus. I greeted him and gave my appointment letter to him. However, he was not ready to receive my letter, based on the reconstruction of my memory, the conversation would have been as follows.

Mr. Chief: *I have pressure from other teacher educators. I need to collaborate with other colleagues to decide on this subject, so you should wait a few days*.

I: *Sir! If I am your requirement, you can include me as a member of this campus. I am ready to take on my responsibilities. Otherwise, you can return me. As a young citizen, I am ready to serve anywhere in my country*.

I greeted him every day and hurried to listen to his response, but he was not ready to talk with me. After a week, I humbly requested him to give his final decision. But he said, "*I have a good relation with high-status friends like the vice-chancellor,*

rector, registrar, and professor. They also could not directly talk with me. Do not bother me again! It is wastage of my time." As a chairperson, he had tremendous responsibility and accountability towards an academic institution. However, I did not find it in his professional practice. I was hopeless and demotivated by his non-ethical language and behavior.

After a month, he received my appointment letter and told me to attend in next day, which brought back hope again. In next day, as I remember now, he could have replied, *"Your letter is unsafe with me, so keep your letter with you."* I requested that he register the letter and filing in the official record file. Then he might have added. *"I studied about your family background. My colleagues reported that your family has a different political ideology than us that makes me difficult."* He threw the letter in my lab and went outside from his office room. At that time, I felt that it was not the appointment letter of teacher educator; instead, it was a letter of a typical political party that was concerned with my political background, not my academic abilities. The campus chief was like a chairperson of some political parties who had a full right to include and exclude his members. The educational institution was like a political office, where the people having the same ideology are welcome. I was demotivated by experiencing the non-ethical practice. I informed my problems to The Office of the Registrar. However, they did not give any concern about my issues. From my lived experience, I learned that it is difficult to adjust to the teaching profession in our context without political power.

I went to the campus every day and stood outside the campus chief's room for his response. When he would come into the campus, I would greet him. He would not respond and would enter his office room. One day he telephoned Mr. Planer and asked, *"Today is the last day of the legitimate period (thirty-five days) for attendance*

her according to the rule of TU Service Commission, so what can I do?" After their conversation, he came outside and said, *"There are not enough human resources for teaching physics, zoology, and botany. Therefore, you should write an application with the commitment of teaching these subjects for your attendance."* My specialized subject was chemistry education. How can I write the letter without expertise in that subject? I was puzzled. Immediately, I informed my problems to the related office and academic persons. As I remember now, they could have suggested, *"You do not have time to think more. The commitment letter has no legal validation, so you should agree to your primary settlement."* After consulting with more knowledgeable others, I perceived that I had no other alternatives to escape his meaningless proposal, and I agreed. The unhelpful behavior of the campus chief had generated negativity in me. So, I did not have any excitement and satisfaction while beginning my higher-level teaching profession. I was demotivated and dis-empowered by experiencing unwanted political influence. I could not envisage being a good teacher educator. Although it seems normal and simple, I think it may have a significant role in promoting disengaged learning. The teacher facing such a challenging journey could not actively participate in the teaching-learning process because they feel aloof and helpless.

The Science Education Department of Riverview Campus had not included me in their teaching schedule until ten months. Therefore, I did not know who were my students and staff. I did not give any responsibility in that transitional period. I just came for attendance and returned home, which was worthless for my professional development. I did that action just to secure my job. I could not interact with other colleagues, although we are in the same institution with having the same aim of providing quality education to the learners. As a novice science teacher educator, I

felt like an *aloof prayer* in the same line of the same temple to attain God but unable to collaborate with other unknown players.

Before being a science teacher educator, I worked for three years in school. In that time, I spent around twelve hours in my science teaching-learning activities. After my schools' duty, I also engaged in my class preparation and other academic activities. I experienced that the teaching culture was different than school education. Most of the teacher educators came according to their working schedules. They taught their lesson and came back without interacting with others. I lost my valuable time without engaging in teaching-learning.

After passing the unproductive and boring transitional phase, the Science Education Department included my name in their schedule for teaching methods of teaching science and chemistry education at the Bachelor's level. It was difficult to cope in the new environment as a novice teacher educator. In my initial classes, I recalled my past science learning journey. How did a science teacher educator teach me in my higher-level education? I followed the same learning culture where the teacher greatly emphasized instrumental knowing rather than meaningful learning. The cultural reproduction-based professional practice guided me. I maintained my teaching diary and documented the content by studying some textbooks. While conducting my regular classes, I stood near the lecture stand every day and delivered the prescribed content knowledge. I wrote equations, difficult words, and molecular structures and drew the whiteboard's pictures and tables. I could not move around the classroom and interact with my learners. I emphasized consuming disciplinary knowledge. I was less able to create a collaborative learning milieu. When I was a secondary level science teacher, I had faced a challenging situation while engaging my students in the active teaching-learning process.

Some teacher educators said that we had to maintain the distance with students to control the class milieu. I learned the lesson from my past and from more experienced teacher educators. Therefore, I extensively focused on applying teacher-centric teaching pedagogy by maintaining proper distance with learners in my initial years. I tried to display goodness by hiding my weakness to establish myself as a good teacher educator. There was not enough support, care, and motivation from campus administration so that I applied a defensive teaching strategy for my safe landing in the unknown culture. There is a more extraordinary politicization in our higher education system, which is less helpful for our professional development. The teacher facing political biases could not openly participate in the active teaching-learning process because they feel aloof and helpless. As a novice science teacher educator, I have been experiencing political interference in my professional life, which disempowers me for creating an interactive learning milieu. People of academia strive for political ideology and neglect their shared goal of providing quality education due to the party politics in education. It has done more harm to our Nepalese education (Dhungana, 2012). For displaying my science teaching culture, I would like to share my teaching culture at the beginning of my university profession.

It could be the day of April 2017. Whenever I interned into the Bachelor in Education second-year chemistry classroom, the classroom was pin-drop silent. I stayed in front of the class and wrote 'Thermodynamics Basic Concept' on the whiteboard. I started to go through several terminologies of thermodynamics like a closed system, an open system, an isolated system, equilibrium, and non-equilibrium. I was focused on noting down the essential points. Further, I also drew pictures of closed systems, open systems, and isolated systems. The students were busy copying it. Meanwhile, one of the active students, Yamu raised a question, *"How ice in contact*

with water is a heterogeneous system?" I could have replied, *"It is a simple question. Please, sometimes think before asking the teacher."* I gave them a few minutes to reflect on their prior knowledge. Then some of the students answered that they were in a different phase. I acknowledged them for giving the correct answer. Although some students participated in the question-answer process, most were passive. I was less conscious of making my classroom more interactive. I finished the topic without paying attention to the students' lived experience, understanding, and different abilities and interests. The students can understand and construct the chemistry knowledge through the critical self-reflection on their own culture that supports developing collaboration skills, higher-order thinking skills, and socio-cultural awareness (Rahamawati, 2017). However, I focused on the knowledge consumption process rather than listening to the learners' lived stories and experiences, encouraging the learners to ask questions, collaborate to connect their cultures. I used the images of teaching as a mundane *and unglamorous process'* and learning as *'straight rows'* for reflecting my science teaching and learning culture. Similarly, I realized that education as a '*vocation'* supported the commodification of learning and educational institutions as centers of production that concerned maximizing output (Brookfield, 2015) education at the university level.

I was also responsible for creating a student-centered learning environment for growing the learners' abilities and seeking the problems in my profession. In doing so, we could design the science *curriculum as an epistemic device* that focuses on provoking interaction for understanding (Bartell et al., 2015), and reflect our teaching activities and change the teaching strategies (Mahlios et al., 2010). Further, I agree with Martin's (2005) who represents teaching-learning as *'learning circles'* where the concept of teaching as *'reflective decision making'* aims at a

plausible and attainable reality, and learning as *'growing'* which implies that the changes occur in a positive direction. Therefore, I need to ask myself, am I prepared to transform in assisting my students in transforming? It was because self-reflection and relationships are essential in the process of emancipation, which helps to change society (Taylor, 2008).

Recapitulating the Theoretical Praxis

I started this chapter by reflecting on the dogmatic beliefs of people towards the teaching profession and my family's role. I am learning that family is a catalyst for counteracting the dogmatic beliefs and motivating me to become a science teacher. I tried to demystify my beliefs for creating an empathetic science learning milieu through some critical incidents I experienced as a science teacher in the remote district and rural district; headteacher in the remote district; and science teacher educator in an urban district of Nepal. I perceived the invisible disempowering forces like power and politics (from the perspectives of national politics rather than consciousness), influenced school leadership and management selection, teacher recruitment, posting, examination, regular administrative activities, infrastructure development, and teaching-learning activities. The unhealthy exercise of power on becoming a teacher could not create an empathetic learning milieu of school, so the teacher recruitment examination also needs to be conducted without the influence of power, politics, and other illegal benefits for selecting a good quality teacher from the many candidates. It possibly supported making the teachers more responsible in their profession.

When I taught science subjects in remote districts, I faced the challenges of managing a larger mass of linguistically and culturally diverse students in an overcrowded classroom. However, I learned several cultural knowledge and

languages while integrating with learners and society. I realized the binary relation of student/ teacher, so the science teacher also focused on actively participating the learners in the knowledge construction process by acting as an optimal scaffolder that supports understanding the science contents in a meaningful manner. Meanwhile, the science teacher can also adjust to the culturally and linguistically diverse culture by learning about their cultures. Moreover, I experienced a lack of laboratory access in the remote school. I felt we could use the improvised materials in such a context and connect the science teaching-learning with learners' cultures. From my administrative experience at a small school, I learned that the negotiation, collaboration, and critical reflection on our dogmatic beliefs and actions support transforming us from the pathetic to empathetic science learning milieu.

I perceived the domination of power, politics in higher education as well. The dominance of administrators at the university level was less supportive for creating empathetic relations with other disciplinary and trans-disciplinarian teacher educators, students. As a novice science teacher educator, I could not share my problems with the administrator and other co-workers and zoom in and zoom out the humanistic lenses during the process of science teaching-learning in that pathetic learning milieu. I focused on analytical knowing dominated defensive science teaching culture for my safe landing in a new teaching environment that forced my learners to consume the scientific information without being critical. So, I used the images of teaching as a 'mundane and unglamorous process' and learning as 'straight rows' for reflecting my science teaching-learning culture. From my lived experiences, I have realized that the politicization (unnecessary influence of national politics) in school and higher education/directly contributed to initiating a pathetic science learning milieu.

The one-size-fits-all-dominated science curriculum and assessment system are less able to generate my intrinsic motivation for shifting towards praxis-oriented science education by incorporating the transformative pedagogy. The cut-off point-oriented examination was less helpful for nurturing creativity and developing empathetic relations with students and other teacher educators. So, in my understanding, we could include the real-life themes in the science curriculum by understanding the learners' interest and contemporaneous society, assessing the developmental aspects of learners in the progress of science learning, and reducing the ground over the exercise of power and politics (from the perspective of national politics rather consciousness) in academia for shifting from pathetic to empathetic science learning milieu. Therefore, my research's two theoretical stances (emancipatory interest and TAS) helped me demystify the hegemony caused by the rigor structures, taken-for-granted assumptions, dogmatic beliefs, values, and actions attempted to give alternative ways for developing the transforming learning environment.

CHAPTER V

CRAFTING MY STEAM EDUCATIONAL JOURNEY: REFLECTING MY KNOWING, DOING, AND BEING

In this research chapter, I have narrated my lived experiences in response to the third research question: How have I been experiencing an inclusive science teaching culture? While doing so, I have discussed the transformative teaching and learning culture that I experienced in my MPhil in STEAM education in which I attempted to portray how my STEAM journey facilitated me to be a transformative-minded science teacher educator and enrich inclusive science educational culture by counteracting my hegemonic beliefs and actions. While portraying my experiences of STEAM educational learning concerning my science professional culture, I have narrated some transformative knowing, being, and doing cultures that I engaged in my MPhil learning journey and my professional practice at different periods. Also, I have consciously articulated the deeply grounded hegemonic pedagogical culture I experienced in my initial STEAM educational learning journey.

I have discussed these chapters in seven narratives: STEAM Education as/for Transformative Learning; STEAM-based Design Thinking Project for Science Learning; Artist (visual and animation)-Teacher Collaboration Project for Science Learning; Covid-19 Pandemic: Challenges and Opportunities for Teaching and Learning; My Educational Research Perspectives: Notion of Useful Research for My Professional Context; Research-Based Teaching and Learning as/for Professional Development; and Curriculum Images: Conceptualizing the Notion/Meaning of Curriculum for critically reflecting my cultural knowing, being and doing.

STEAM Education as/for Transformative Learning

It was the day of April, 2020. Due to covid-19, the government announced the lockdown in the country and made the policies to control the endemic for spreading in society. Thus, we had to maintain social distance, stay at home, and honestly follow the rules for protecting ourselves and others from covid-19 infection. Although the face-to-face mode of teaching-learning and assessment (some portion) prescribed by the curriculum, we could not be able to participate in that process in such a pandemic situation. After around one month of face-to-face teaching-learning, my learning institution also began to teach and assess our learning progress through online mode. The STEAM educational learning journey explicitly emphasized enhancing our creativity and transforming our professional practice by engaging in critical reflective, collaborative classroom activities and a continuous assessment to assess learning progress. However, I also experienced the hegemony in that process. I would like to critically reflect on my strengths and weaknesses in my STEAM educational learning journey.

In my previous formal schooling (school level to masters' level), I studied a minimum of five subjects in the day shift with 45- 50 minutes of teaching time for each subject. Commonly, teaching pedagogy was the lecture method. But, the curriculum prescribed three credit hours for each subject in STEAM education and the teaching time was in the evening. I mean, the learning milieu was new for me. The course facilitators assigned us different topics, research-based articles related to the curriculum for individual presentation, and group collaboration and presentation before presenting their views on those topics. They observed the learners' presentations and gave immediate feedback. Then the presenters continued their presentation by connecting the learners' preexisting knowledge, curiosity, and

alternative conceptions. Compared with STEAM education, the teaching-learning milieu was less interactive in compulsory subjects. The number of students was tripled than major subjects. May be other subjects couldn’t engage them. Some STEAM colleagues also expressed dissatisfaction with that teaching culture and requested a separate STEAM group to make the teaching-learning more interactive. However, the administrator was not ready to listen to learners' voices in the face-to-face mode of teaching-learning time. Due to the Covid-19 pandemic, we had to shift towards an online mode of teaching-learning. The online teaching-learning was less effective in a larger group. So, most of us raised our voices again for dividing the group. Fortunately, at that time, the administrator made two groups. Then I felt the teaching-learning was more effective in a smaller group than a larger group.

Although the STEAM course facilitators emphasized creating a collaborative learning space in the online mode of STEAM education, I had faced many challenges, typically in a first-semester learning journey. I spent more than fifteen hours online reading the preferred research articles, designing slides, searching extra reading materials for an assignment, studying regular classes, and teaching my students online. In doing so, I faced lots of technical problems that made me more stressed. For instance, it could be the day of December 2020. The critical reflective practice course facilitator was assigned to skim the book of reflective practice and note down the key ideas in a google doc in ten minutes. Unfortunately, the electricity was cut off in my residential area. I immediately joined from mobile data and downloaded the books, and began searching the suggested chapter. I spend around five minutes finding my chapter. How could I skim the chapters in the remaining five minutes? I felt stressed and began scanning the chapter. However, I was less able to understand the key focus of the book chapter while skimming at first. Before presenting the key concepts that

we skimmed from the book, the course facilitator gave a ten-minute health break which brought back hope. I was also able to note down the fundamental ideas of my chapter that reduced my anxiety. I presented my slide, and the course facilitator might have asked me, *"You have presented the key ideas of the chapter more clearly. Did you read the full chapter or just skim it?"* I had faced many problems and was under full stress, so I could not go through the chapter. I was happy to listen to the positive comments of the facilitator. Before my STEAM educational learning journey, I did not engage lots of time by using Information and Communications Technology (ICT) for doing academic activities. I was frustrated when I could not correctly know the function of various software like Microsoft Team, Zoom, and Google Meet.

In the initial three months, I felt difficult to adjust to the new teaching-learning and assessment system because I was less familiar with research articles-based assessments, which mainly focused on understanding the fundamental ideas of the paper, reflecting the lived experience by connecting with our profession and fostering the learners' creativity instead just labeling as success or failure that I used to in my previous teaching and learning process. My previous science learning journey (see chapter III) emphasized memorizing the content to achieve a high score in an annual examination rather than engaging the learners to reflect on their lived experiences by studying books, articles, and other learning resources. I mainly committed to rote-recall the content in examination preparation time without understanding the meaning by connecting with my lived experience and sociocultural context. After hard work, I was able to copy the content. Therefore, in my final examination, I answered the questions by delivering the ideas of others that I memorized earlier. Although I felt pretty difficult in memorizing stage, I could easily attempt the questions in the examination without deeper thinking. We could deserve a good position without

incorporating our creativity in the examination. These might be the possible reasons for having anxiety about adjusting to the new learning milieu. I experienced more stress while doing the assignments in the last two months of the first semester. Sometimes I thought, I could not complete the prescribed courses in time. I shared my problems with colleagues and course facilitators. They energized me for doing the assignments. Finally, I completed my first semester in punctual time, bringing hope again.

Anderson and Krathwohl (2001) place "creating" at the highest level of the cognitive domain in the revised Bloom's taxonomy of educational objectives that support developing higher-order thinking. Students' preexisting learning experiences are also important in these processes. So, I realized that science education needs to acknowledge the learners' creativity.

Although I felt anxiety in the first-semester learning journey, it enhanced my soft skills like collaboration, critical thinking, creativity, communication, and hard skills like using different teaching-learning-related software that made my learning journey easier. I learned that we have to manage enough time to reduce anxiety in the end-semester examination time. Thus, I consciously worked my time in the second and third semesters. Consequently, I did all assignments and experienced less anxiety in the end semester examination time. The course facilitators involved us in several collaborative activities using various online platforms like Modular Object-Oriented Dynamic Learning Environment (MOODLE), Jam board, Google Docs, Google slides, and a few more. They allowed us to share our feelings, beliefs, values, assumptions, experiences, and understanding individually and in a group to assess our learning progress. Pant (2015) also advocated that "the evaluation system as grooming of students rather than certifying the failure/success" (p. 178).

I perceived my STEAM educational journey as an intermixing of trans-disciplinary networking, critical self-reflection, creativity, respect, cooperation, contextualization, empathy, compassion, and joy. In our non-formal meeting, my colleagues also shared these aspects. Therefore, I agreed with Chemi (2014), who emphasized the artfulness learning milieu for creating embodied, more accessible, fun, personal, and motivating learning that could assist to connect the cognitive and affective domain. Therefore, as a science teacher educator, I realized that we can foster STEAM education in science education for counteracting the domination of unhelpful compartmentalization in knowledge, skills and ideology. It might help make socially responsible science education. Now, I would like to reflect on our non-formal discussion related to science education.

It could be any day of 2020. At the beginning of my STEAM educational learning journey, my colleague Debin criticized me while I was introduced as a teacher educator of science education (impure). He negatively interpreted the teaching profession of science teacher educator to others, and he was proud of being the science (pure) teacher. In my professional learning journey, I faced criticism from other educated people that humiliated and demotivated me. In my understanding, science education (impure or pure) itself is neither good nor bad. The important thing is could we design and implement the curriculum for addressing the learners' real-world problems? Could we think about how I improve what I am doing (Whitehead, 2008)?

Likewise, in teaching-learning, another colleague Jhon who was from a science(pure) background, shared his perceptions in science (impure) education before and after the STEAM educational learning journey. Before engaging in STEAM education, he held similar beliefs as Debin, but he transformed his beliefs

and actions. He realized the need for transformative content and pedagogy and assessment for meaningful learning science learning. Such sharing also invigorated me for being a transformative science teacher educator by shifting my disempowering teacher-centric teaching culture.

In this context, I agreed with Pritchard (2009), who emphasized the learners' engagement while learning. In doing so, a clear focus and goals with considering the pupils' preexisting knowledge, the level of difficulty, sociocultural context, and aim to move children's learning across the zone of proximal development are the guidelines that can apply in planning the lessons. In my understanding, such inclusive (im/pure) nature-based science (see chapter III, p. 36) lessons could invigorate the teacher for stimulating dialogue and nurturing its momentum inside the classroom.

I have been using transformative pedagogy to shift my hegemonic science teaching culture in my current professional practice. Now, I would like to display some transformative activities that the course facilitator of teaching and learning subject engaged. We all trans-disciplinary STEAM learners connected trans-disciplinary ideas by designing and implementing some STEAM projects as/ for our professional development. I would like to share some project work/report in my STEAM educational learning journey.

STEAM-based Design Thinking Project for Science Learning

As a STEAM learner, I could use the trans-disciplinary STEAM approach while teaching chemistry education to shift my authoritarian beliefs and actions. The arts in STEAM education have a crucial role in transforming our practice. It creates an opportunity for the learners to reflect on their lived experiences, feelings, beliefs, values, assumptions and connect the content with learners' everyday life. For sustainable development to be successful, we could enrich trans-disciplinary STEAM

education, which is also the worldwide need of the education system (Taylor, 2018). Therefore, I have designed and implemented a trans-disciplinary STEAM approach-based designing thinking project-*"Let's Make Our Favourite Soap at Home!"*

Designing the Project

As a transformative-minded STEAM learner, I realized the need for the STEAM approach for transforming chemistry teaching culture. I designed the trans-disciplinary STEAM-based designing thinking (DT) project -*"Let's Make Our Favourite Soap at Home"* for transforming my chemistry teaching culture. The project's learning outcomes were to construct a meaningful understanding of the conceptual, theoretical, and practical knowledge and skill of soap to foster the learners' entrepreneurial skills. In doing so, I listed the required materials and elaborated the activities that the learners will be doing in the empathizing, defining, ideating, prototyping, and testing DT (Culen & Gasparini, 2019). Likewise, I also developed the rubrics (see appendix-1) for assessing the learners' developmental aspects like knowledge, soft skills (such as collaboration, critical thinking, communication, and creativity), and hard skills (handling the laboratory apparatus). It helped to assess the learners' progress in-action and on-action. The course facilitator encouraged us to develop plans, receive feedback from transdisciplinary colleagues and implement the program in real professional practice. Then I collaborated with my trans-disciplinary STEAM colleagues and refined my project based on their feedback. They suggested rehearsing the plan before lunching in the actual classroom. Therefore, I managed all the required apparatus, chemicals, and video recorder. I deeply engaged in project work and critically reflected on my actions. I also recorded the session that helped to refine and implement the project in the actual classroom. Moreover, I envisaged the possible implications like curriculum as a mandala,

pedagogy as/for the public good, and assessment as learning after implementing the project that could help to reduce the gap between theory and practice.

Implementing the Project

In this process, I disseminated STEAM-based DT projects to my learners. In doing so, I shared my lived experiences about soap in my teaching and learning journey. I explained some basic ideas of STEAM education and conducted the soap-making project as follows.

Empathize

At first, they conducted an in-depth interview exploring their preexisting learning experiences and feelings related to soap. Moreover, I observed their engagement in designing soap-related pictures, charts, and PowerPoint presentations. For illustration, they easily defined what soap and saponification process, where we can use soap, and also have the skill to test the cleaning action of soap based on their surface tension. However, they felt that they were beyond the actual soap-making activity and flourishing their entrepreneurial skills. In that time, I also realized that if we had taught chemistry by designing the STEAM project, we could have made meaningful learning. Furthermore, I was more interested in assessing their deep understanding of soap; therefore, I engaged them to demonstrate the cleaning action of soap by using the soap that I had made in the piloting process. I asked how, why, and related questions and critically observed their responses.

Figure 19: ‘Learners' engagement in the empathizing process’ Source: ‘Self’

Define

After understanding their lived experience and feeling, I encouraged them to define the problems related to soap. Initially, they felt difficult and became silent for a moment. Again, I motivated them to engage in the class discussion without feeling shy, fearful and pressured because we all are in the process of learning to learn. Then they felt accessible to some extent and tried to define the problems. They said that we memorize the conceptual and theoretical idea of soap without sense-making. Our practical work also primarily focused on 'cookbook' knowledge consumption rather than solving our real-world problems. Hence, there is a need for meaningful learning that develops our entrepreneurial skills. As a constructivist teacher, I supported them in defining the problems.

Ideate

In my understanding, the idea of 'think-pair-share' can play a significant role in seeking possible solutions. Hence, I invigorated them to participate in group work for concertizing the abstract concepts they realized in the soap-making project. They deeply engaged in a group and introduced a holistic trans-disciplinary STEAM approach to solving their real-world problems. Learning is an iterative and slow process (Taber, 2015); these are the possible solutions for meaningful learning. Here, in the iterative process, we introduce a new concept by understanding the learners' preexisting concept that helps to reduce the possible alternative conception in science education. Likewise, the learners' prolonged engagement can consolidate the learning. As a result, the teaching will be meaningful.

Prototyping

In this step, all participants were engaged in the collaborative activity for designing the quality soap with attractive outlooks so the consumers could be easily

attracted and become regular consumers. Hence, we can get more profit that can motivate the producer to produce the soap on a larger scale. To make their prototype more functional, I suggested observing my pilot testing video. Furthermore, I also shared my lived experiences while designing various colours, sizes, and shape soaps. They carefully listened to my narratives and observed that video. Then they realized the importance of locally available medicinal plants (like *tite pati*[38]), fruits (like mulberry), and some kitchen chemicals (such as turmeric powder, tea powder, etc.) in the soap-making process.

They made the extract varieties using them and designed the types of soaps with various colors, shapes, and sizes. From my soap-making experience and my lab assistants' support, we engaged them to compress the semi-solid-state raw soap to set the soap molecules in a compressive manner; therefore, the remaining part of soap can be in a solid-state while being used for a cleaning purpose. Similarly, I also critically observed their activity and motivated them to participate in collaboration, individual contribution, and commitment. The student teachers in the present can become science teachers in the future, and hence, they need overwhelming support for fostering their teaching skills. Therefore, I had provided optimal support and feedback in their activity. In this regard, Taber (2015) argues that we need to act as optimal scaffolders to connect the cognitive and affective domains in teaching-learning as constructivist teachers.

Test

This is necessary for refining, improving, and discriminating the project work. I suggested my learners test the cleaning action of the soap that I had prepared by following the same procedure in the piloting phase. I did that testing activity because

[38] Tite pati – artemisia vulgaris

the saponification process can take a minimum of one day. Then I motivated them to share their feelings. They were more excited while using that soap and positively responded to its efficiency.

Likewise, I also asked questions to assess their knowledge, skills, and outcomes. For instance, I asked them, "Why did you add lye in water rather than water in lye?" And I critically observed their facial expression and response. They looked at one another and thought sometimes. Most of the participants were unable to answer my question. After some time, one participant said that it helps to protect us from a possible accident. I elaborated on his answer and thanked him for his contribution.

Figure 20: 'Learners' engagement in soap testing process' Source: 'Self'

Due to the pandemic situation of covid-19, my participants were unable to test their soap. However, they observed their soap shape, color in the virtual meeting. Moreover, I shared the working efficiency of their soap by washing my hands. At the end of the project, I encouraged them to reflect on their learning outcomes by designing a concept map and presenting it in a classroom. In doing so, they can integrate the various concepts, theories, and practical skills that they learned from the project, draw several concept maps, pictures, and calculate the soap price and volume.

They integrated several compartmental ideas of chemistry, physics, biology, and mathematics in their concept map and presentation. Moreover, they also incorporated the design idea of engineering by designing a variety of soaps and

enhancing communication skills and creativity by using simple and modern technology. Likewise, they primarily focused on eco-spiritual concepts such as biodegradable soap formation for sustainable development.

Assessing the Learning Progress

In this DT-based project work, I assessed my participants' developmental aspects through the continuous assessment system. I divided learning outcomes into several criteria: active engagement, hard skills and soft skills development process, integrated knowledge construction, and presentation skills. In this project work, two of my participants secured outstanding results, one participant got excellent, and one got a good result in this project work.

Figure 21: 'The soap price calculation and concept map designing process' Source: 'Self'

Envisioning for Transformative Science Learning

After deeply engaging in this project work, I am learning to learn the various transformative curricular, pedagogical, and assessment-related ideas that we could apply in our science teacher education. For transforming the traditional science teaching culture, I have envisioned the possible implications of the project as follows.

Curriculum as Mandala

The mandala represents wholeness and completion (Fremantle, 2003). I developed this soap-making project for authentic, inclusive, and meaningful learning by integrating trans-disciplinary STEAM

components. For making clear, I incorporate the various concepts, theories of science in the process of designing and implementing the project for fostering the learners' entrepreneurial skills. Likewise, I used videos and montage of technology for communicating the idea of homemade soap; applied engineering and mathematical ideas in the process 3D soap designing and labeling its appropriate prices; and also incorporated the humanistic lens of arts for designing the various shapes, colors, flavors soap for attracting the public's attention as well as enhancing the learners' creativity. "The whole sphere expressing the vivid reality of life" (Trungpa & Rinpoche, 2010, p. 263). Likewise, an inclusive reasoning model is beneficial for generating a holistic understanding of ourselves and our connectedness (Taylor, 2014). Therefore, we can develop our curriculum as a mandala for making a holistically meaningful understanding rather than in a small chunk.

Figure 22: 'Mandala' Source:https://upload.wikimedia.org/wikipedia/commons/thumb/d/da/Chenrezig_Sand_Mandala.jpg/1280px-Chenrezig_Sand_Mandala.jpg

Pedagogy as/for Public Good

We can use the transforming STEAM pedagogy to address a larger mass's need by engaging in a critically reflective process to solve real-world problems. From Spady's demonstration mountain, we can easily observe that complex role performance and life-role functioning can be possible in a transformational zone. Thus, in my understanding, the STEAM components integrated soap-making project

can reach our learners' in that zone. And we can create multiple futures by applying transformative STEAM pedagogy.

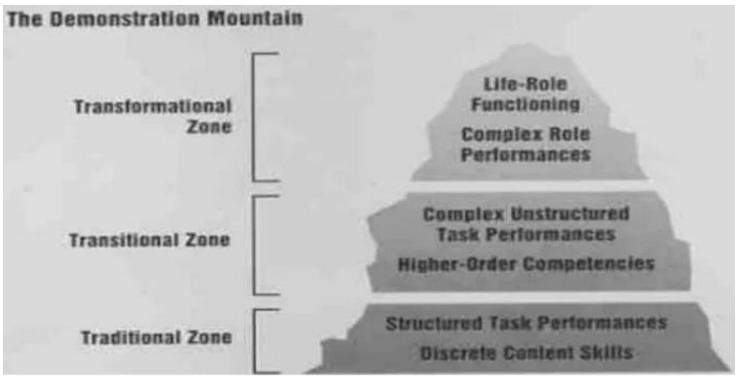

Figure 23: 'Demonstration Mountain' (Spady, 1994).

Assessment as/for Learning

In this project, I assessed my learner's developmental aspect in learning to learn the process by designing some typical criteria such as critically observing their engagement, hard skills, soft skills developing strategy, concept map designing, and presenting skills. I had recorded the project implementing session and critically assessed their engagement during and after the completion of the project. Hence, through this project work, I came to realize that we can determine the learners' progress in the learning process, and a more structured paper-pencil test is insufficient for assessing the learners' deep understanding or sense-making process.

In summary, the course facilitator of teaching and learning subjects and my trans-disciplinary colleagues supported me in the project designing phase. They gave feedback for doing things better. I addressed their comments and improved my project plan; in the implementing phase, I listened to the learners' lived experiences, preexisting knowledge, and also provided enough time for their prolonged engagement for fostering the learners' developmental aspects and consolidating the learning outcomes; in assessing phase, I critically observed the learners' collaboration, presentation and asked the questions for assessing their deeper understanding; and

envisioning phase, I envisaged curriculum as a mandala, pedagogy as/ for public good and assessment as/for learning for meaningful science teaching and learning. Then I realized that for life-role functioning (Spady,1994) practice in science teacher education, we could design the DT-based STEAM project that helps to integrate the cognitive, affective, and psychomotor domains of learning. Likewise, I have designed another "Artist-teacher Collaboration" project for transforming the traditional teacher-centric science teaching culture. Here, I have mentioned the details of the project.

Artist (visual and animation)-Teacher Collaboration Project for Science Learning

I have realized that the role of art is essential for creating interconnectedness and making the invisible visible (Ibera & Sommerstead, 2019). Thus, I have designed the Artist-Teacher Collaboration Project to teach the topic *Structure of the Atom and Electrovalent Bond Formation Process*. The project's objectives are to demonstrate the structure of the atom; explain electrovalent chemical bonds; apply the duplet and octet rule in the electrovalent bond formation process; to perform an electrovalent bonding process outside the classroom. The required materials for implementing the projects (see in Appendix-2).

I have learned that an artful teacher needs to prioritize in-depth thinking and reflection while designing educational projects or programs. The aesthetic learning process emphasizes these aspects. We can change our learning journey from linear to longer, more challenging, and obscure (Chemi, 2014). Thus, to achieve the above objectives, I will maintain the quality of the artful classroom by collaborating with animators and visual artists and designing the animation and film.

The learners will also actively participate in the animation and film designing process that helps to understand the conceptual and theoretical knowledge of the

atomic structure and electrovalent bond. These artistic ways will play a significant role in connecting my science classroom's cognitive and affective domains. According to Chemi (2014), an artful classroom helps to integrate the cognitive and emotional aspects and emphasizes mindfulness. The learners can dare to experiment, learn and deal with complexity because arts support generates an emotionally safe environment. The teacher can act as a facilitator and successfully implement the curriculum. Therefore, I will also emphasize sharpness and clarity on creating an artful science classroom milieu. I believe that we could develop holistic thinkers who can solve real-world problems and support to achieve the objectives of the curriculum from the perspectives of an artful classroom. I envisaged the possible activities for implementing the project in my real science classroom, which were as follows:

Activity Details

Initially, I will collaborate with an animator artist and elaborate the teaching-learning activities to achieve the lesson's objectives. After enough discussion, the animator will design the animation. In that process, he will participate the learners for elaborating the related activities. By doing so, he can record the different voices of students. Furthermore, my students will observe his animation designing activities. Meanwhile, I will also carefully monitor the animation design work and give feedback for properly representing key ideas of content that can help overcome the possible alternative conceptions. At last, the students will observe the final animation and engage in discussion and reflection for making clarity.

To enhance the learners' creativity, I will collaborate with a visual artist. Then I will provide the animation and script to a visual artist. While writing the story, I will be consciously incorporate the key concerns of my objectives. Then we will deeply engage in that story and modify it as per our needs. I am inclined to believe that visual

artists will motivate my students to perform according to the story. Consequently, we will be enriching artfulness in my science classroom. The story for the visual artist will be as follows from my side:

There was a beautiful school in one of the remote villages of Nepal. There were around six hundred students in the school. The student loved to play different games in their schools' leisure time. One day in their science period, the teacher invigorates the learners to perform the activities according to an animated video they had already engaged in the previous class. In doing so, they went outside their classroom and collected different colored followers for designing various colored and size circles. Then they engaged in designing the atomic structure. In creating the circles, the student caught each other's hands and poured the colored soils and flowers by taking the references of their circular shape. Then the eleven girls wearing blue color uniforms put their bags at the inner core of the circle to represent the protons (11), and again, each of them brought a stone from their surroundings and put it at the center of the circle. The science teacher also helped them and added a stone to represent the number of neutrons (12). After that, at the first circle of the core(nucleus), two girls were sitting by catching their hands strongly and revolving around the core. Then again, in the second circle from the core, eight girls were kept by tightly catching their hands and moving around the core. Moreover, in the outermost circle, only one girl was sited. She did not see any friends in her circle so she was very sad and feeling alone. Other friends who were sitting inside her circle were singing and dancing in 'deuda[39]*' songs. Likewise, the boy who was wearing a blue uniform also designed the circle the same as the girls. However, their number*

[39] Deuda song – cultural songs from far eastern region on Nepal.

was greater than the girls' number. Due to the greater number of the boys, seven boys sited in the outermost circle and revolved around the nucleus.

The inner friends claimed that we were more powerful than the outer circle because we were protected from the outermost friends. Our total number (8) is also greater than the outermost friends' number (7). They also suggested them for being powerful by adding a new friend to their circle. Then outer most fellows began to look for a new friend. Meanwhile, they saw their friend Jenny alone in the nearest circle. They humbly requested Jenny to join their circle, and Jenny accepted their request by thinking that if I joined their group, I could sing and dance with them. The boys were successful in bringing Jenny due to their unity with having a larger number.

The girls' group was delighted to see Jenny joining singing and dancing at the outermost circle of the boys' group. They were more positive (+) with Jenny's movement, although their outermost circle became empty. However, the boys started to tease the girls' group by showing their empty outer circle. They (boys) developed negative (-) thinking towards the girls' group due to their larger number with having full outermost circle.

The teacher was critically observing their activity by sitting on the ground. He/she listened to their debate and came towards them and said, "You both are great because you learn to make different circles, sodium and chlorine atoms. Now, you reduce your positive and negative thinking and leave together". After listening to their teachers' appreciation, they realize their strengths and weaknesses and are closer. Consequently, they were able to form a more stable sodium chloride molecule (NaCl). Then the class ended.

Assessment Plan

I will incorporate the formative assessment system rather than a summative one because it allows learners to improve their activity by engaging in self-reflection. The learners' developmental aspects are the key concern; instead, crossing the cutoff point in the exam. In this project, I will assess my learner's developmental aspects by using rubrics. Typically, I will assess my students' achievement based on their animation and visual art engagement. I have developed the various criteria for assessing their learning progress which I have mentioned in my rubrics. Moreover, I will record the project implementing the session and critically observe their engagement. I will encourage them to create poems, narratives, etc. to reflect the theoretical and conceptual knowledge and deeper understanding. I will invigorate them for presenting their reflective writing without any hesitation. I will critically observe their entire activities and thoughtful presentation for assessing their learning achievement and provide feedback. I believe that I can determine my learners' cognitive and emotional development through this assessment strategy. For each of the given criteria, I have divided it into five different scoring criteria from outstanding (5) to the poor (1). As doing so, I will follow the assessment rubrics (see appendix-3).

Covid-19 Pandemic: Challenges and Opportunities for Teaching and Learning

I experienced the Covid-19 pandemic as a challenge and an opportunity for science teaching, learning, and evaluation. The annual examination of the bachelors' fourth year to the first year is generally conducted from March/April to September/October in a normal situation. But, the final examination of science education and other subjects of education faculty was postponed for more than eight months due to Covid-19. My institution did not seem to incorporate alternative ways for assessing the learning progress. The preferred examination rules of our institution,

or rigor nature of the curriculum, or others were the possible reasons behind happening. Thus, the paper-pencil test-dominated examination conducted in the pandemic without honesty followed health protocols. As an invigilator, I felt that most students participated in the examination under stress. Some students were ill, so they could not attempt their tests. They suffered from fever, cough, and sneezing, which were the possible symptoms of Covid-19 as well. Many teaching and non-teaching staff rejected being an invigilator, but the administrators requested/or forced (sometimes) to facilitate the examination. Our professional duty was to do that duty in such a fearful examination milieu. From that lived experience of paper-pencil test-dominated evaluating cultures, I realized that focusing on labeling the students' performances as complete or not is insufficient for nurturing and assessing the learners' developmental aspects like collaboration, creativity, critical reflection, and dialogue, presentation, and other skills.

My organization did not conduct our regular classes online. So, it was not easy to manage the legal official platform for online courses for a few months in the lockdown period. However, after around six months, it suggested conducting our regular classes by using different ICT tools like zoom, google meet, and so on as per our access and comfortable. I began my classes by using these ICT tools. Initially, I faced many challenges like creating links and slides, connecting, managing, and collaborating with students, giving assignments, and assessing their learning progress while conducting the online mode of science classes. My organization provided a short training period to all teacher educators. From the lived experiences of Dahal et al. (2020), we could incorporate the recent methodologies, ICT tools, and techniques in online classes (typically, in Covid-19 pandemic context) for enhancing the learning experiences of the learners and trainees. However, I felt difficult to apply those skills

in actual practice due to the inadequate knowledge of ICT tools and proper management of legally preferred institutional platforms.

Further, there was the problem of absenteeism in the online mode of science learning. We informed the administrators to listen to the voices of students. Then they called every student to motivate the students in online education by understanding their problems. Due to Covid-19, most of the students returned to their home town. Many students were informed that there was no proper access to the internet and ICT devices like laptops and mobile phones for connecting in online classes. It was not easy to address their problems. We conducted our regular classes with a few students. As a result, many students requested to repeat the lessons taught online, which generated another problem. Then the administrator managed the issues by collaborating with students.

The Covid-19 also created an opportunity to develop my communication skills using ICT tools. Recently, I could use different software like Teams, Google meets, zoom, and create various collaborative spaces for learning like MOODLE, collaborative library, etc. It enhanced my confidence level and motivated me to connect the cognitive and the affective domain of learning by integrating arts in my science classroom. Further, I studied STEAM education online due to the Covid-19 pandemic. I felt anxiety in my initial learning journey due to the lack of familiarity with ICT tools. But, the online mode STEAM classes greatly supported me in conducting my online science classes and managing my time for both teaching and learning. The course facilitators created various collaborative spaces and encouraged us to actively participate in the class activities, STEAM-based project designing and implementing. I engaged in such a learning milieu in STEAM education that invigorated me to be active in the classroom and incorporate those skills in

professional practice. I realized that the Covid-19 pandemic also became an opportunity because I could continue my MPhil course and profession parallelly.

After normal conditions, we are running our classes in face-to-face mode. My students have a diverse response to the online and face-to-face methods of science learning. Commonly, those students who did not regularly join in the online classes enjoyed face-to-face mode, and some students who joined periodically on the online way have mixed experiences. They said, *"We enjoy and feel comfortable to understand the science concepts on those virtual classes where the teacher educators created collaborative space, designed art-based slides, provided enrich related materials, and actively engaged the students in science teaching-learning. And feel the burden and stress those teacher educators who less conscious in these aspects."* Therefore, I realized that incorporating the ICT in science teaching-learning is inadequate to attract the learners' attention. For authentic, inclusive, and meaningful learning, we have to be conscious apply the ICT tools by assessing the learners' need, access, and motivation towards science teaching-learning. In other words, we need to be critically reflective practitioners for making plausible and fruitful online science classes.

After STEAM education, I realized that I need to change my one-size-fits-all notion guided science pedagogical culture. According to Christie et al. (2015), in teaching, we need to change the invalid assumptions and the behavior based on that assumption for doing the best in a rapidly changing world. In doing so, we can encourage the learners to assess, challenge critically, and change their assumptions. Therefore, I begin to engage my students to reflect on their lived experiences, values, beliefs, feelings, assumptions; encourage them to raise questions; use transformative pedagogy like storytelling, critical reflection, collaborative management for reducing

the gap between theory and practice (Shrestha et al., 2020). Class notebooks, assignments, and grades in Microsoft Team increase their active participation in learning and assess their learning progress. After completing science lessons, I encourage my students to use different artistic logic and genres like stories, poems, metaphors, pictures, and so on to reflect their understanding.

I also collaborated with trans-disciplinary colleagues and actively participated in the training and webinars to resolve our professional problems like research and teaching-learning. STEAM education has a complementary role in shifting me towards the inclusive science pedagogical culture. It could in/directly transform our professional culture of knowing, doing, and being. Therefore, I perceived that the Covid-19 pandemic creates challenges and opportunities to change my professional culture.

I agreed with the ideas of Cheong (2000), who emphasized triplication (individualized, localized, and globalized) science teaching. The teacher needs to act as a facilitator or mentor for learners' self-learning and self-actualization in the individualized science teaching. Likewise, a mutual sharing of experiences, professional practice, and inspiring are essential in the localized and globalized science teaching where the teachers could get the opportunities for their professional development, sustain a new professional culture facilitates the learners' science learning, and maximize the teachers' teaching effect in the local and global networked science teaching. In this process, the teachers could be exposed through cross-cultural sharing, web-based teaching, video-conferencing, and a few more. I also felt that we could think globally and act locally by being aware of individual needs for shifting the hegemonic to the inclusive science pedagogical culture.

My Educational Research Perspectives: Notion of Useful Research for My Professional Context

My present MPhil journey supports shifting my perspective of educational research. I have realized that every academic person should be well familiar with research work which helps to understand and overcome the problems faced by the teacher educator in their professional life. Likewise, researchers can passionately engage and run the research work in their academic field if they have a clear concept in several aspects of good research. Thus, the discourse on research paradigms gave me better insight, clarity, and confidence for designing a well-organized research proposal. Not only that, such a great idea has directly supported me in guiding the student in their master's degree thesis. I am inclined to believe that educational research-based activities will help to change my traditional teacher-dominant teaching-learning practice and transform towards the STEAM-based transformative learning direction, which is the present need of our science education, so I have changed my perspectives about educational research.

As a STEAM learner, I learned several philosophical, theoretical, and methodological aspects of research by engaging in various national research-based articles, books, webinars, discussions. I was able to develop the transformative activist stance (TAS) based philosophy for shifting my positivistic ontology to unified (i.e., indivisible through non-homogeneous) transformative ontology of collaborative praxis. It advocates that the dialectics and movement of social practices embodied in human acting constantly change reality (Stesenko, 2017).

Based on TAS philosophy, I have created my philosophy of teaching and learning. For me, transforming my traditional beliefs, cultures, values, and assumptions by critically knowing the situations and doing my everyday profession

passionately by playing the role of a *social activist* is my professional philosophy. For that reason, engaging learners actively by managing the indivisible non-homogeneous learning environment, promoting the learner for authentic learning, creating dialogic space to generate critical thinking, encouraging the learner to collaborate with a contribution, conducting my teaching-learning with a clear vision, and contribute to the design the *curriculum as social reconstruction* (Schubert, 1986) notion-based science curriculum are my possible roles in the following days. It has enabled me to change my disciplinary egocentric (Connor et al., 2015) science teaching-learning culture and move towards an inclusive (Luitel, 2013) science teaching culture. Therefore, in my understanding, shifting science education towards transformative learning is the best notion of useful research in my professional context.

Research-Based Teaching and Learning as/for Professional Development

As a science teacher educator, I realized that I needed to extend my academic skills to transform my teacher-centric professional practice, so I purposefully joined MPhil in STEAM education. Before being exposed to research discourse, I could not engage in the research field. I had lots of confusion about the basic concept of research paradigms. I thought that designing a well-organized research proposal and conducting the research correctly was difficult and beyond my access. Due to inadequate knowledge, skills, and research experiences, I was shrinkage in routinely based classroom practice.

My initial journey was full of struggles. I was less able to grasp the fundamental ideas of several transformative research articles. We are all trans-disciplinary co-learners deeply engaged in group collaboration, making it relatively easier to understand the key concepts and connect with my science profession. Thus, I

perceived the research as/for professional development (Luitel, 2019). Now, I would like to share an event for displaying the role of power and hegemony in my professional life.

It was the day of April 20, 2020. I planned for deeply engaging in my MPhil study by taking study leave. I humbly requested the administrator (teacher educator as well) for study leave. He might have said, *"All teacher educators have completed the MPhil/Ph.D. a degree just for their worthless promotion. Their research knowledge, skills should contribute to changing their professional practice. If the university gives the study leave, then the experience score of educators should be cut off, which gives justice to the educators who are dutiful in their profession.*

Similarly, it will hamper the students' teaching-learning process; whenever you are on study leave. Most of the teacher educators accept their leave directly from the central office. If you have access to power, you can do it. Otherwise, it is impossible from my side. I am unable to provide the acceptance letter for your leave". He returned my application letter. I did not imagine such a response from the administrator. I became voiceless.

In my understanding, as a good administrator, being conscious of the students' learning, their future, and making them aware of theiiir professional responsibility is his duty. Whenever we observed this event objectively, we could not visualize the role of power and hegemony, which seems normal and natural. We could raise the questions like did he behave equally to all teacher educators, and why has the university made the provisions of study leave for MPhil/Philosophy of Doctor (Ph.D.) scholars? For uncovering and challenging power dynamics that frame the decisions and actions. It helps to challenge the hegemonic assumptions (Brookfield, 2015)

whenever we view the event from different facets. Only then can we detect the event is free from power and hegemony.

We could extend our research ideas, skills, and experiences by sincerely engaging in the research field. To support the MPhil/Ph.D. scholars' learning, the administrator could address their study leave application by obeying the rules rather than exercising power. It probably gives justice to all scholars who are beyond power. In my understanding, as an administrator, regulating the equal, justifiably, undiscriminating rules is essential for shifting towards the transformative being, knowing, and doing (Stensenko, 2018).

The teacher educators who had completed the post-graduate could have significantly contributed to the research field and enhanced the quality of university education. However, they were less conscious of applying their research skills in professional life. In my view, our MPhil/Ph.D. academic degree could transform our identities by critically reflecting on the problems inside our culture. Utilizing the certificate for promotion could not support realizing our hegemonic culture and re-conceptualizing our identities. While critically reflecting on this incident, I came to know that the administrator acts as a competitor, controller rather than a collaborator, facilitator. Such a disempowering belief and culture could be less helpful for enriching the transformative learning in science teacher education. And another possible reason for showing such kind of response by the administrator might be the reason that he had experienced a disciplinary egocentric learning milieu in his learning period, which in/directly guided his beliefs and actions. Gramsci (1971) also argued that cultural hegemony guides the people's way of thinking and action by their interest.

The STEAM has a greater capacity to develop design thinking, collaboration, creative computing, and innovation while keeping the level of reflection and critical thinking connected with humanist inquiry (Lewis, 2015). In my STEAM educational journey, I have realized that research is a means to transform oneself and others. Without proper research work, our educational journey will be incomplete because teaching-learning and research skills are like two sides of a coin; thus, to improve science education, all the teacher educators should be essential to deeply engage in the research work. If we research our professional field, we can identify the real problem that will help to transform our practice with changing situations.

Curriculum Images: Conceptualizing the Notion/Meaning of Curriculum

In my STEAM curricular learning journey, I have developed a conceptual and critical reflective understanding of curriculum images by profoundly engaging in Schubert's curriculum images like curriculum as subject matter, discrete tasks and activities, intended learning outcomes, cultural reproduction, experiences, social reconstruction, currere (Schubert, 1986). We all trans-disciplinary colleagues who primarily engaged in teaching science education, mathematics education, engineering, and ICT in higher education drew the actual images and preferred images that emphasized Schubert's traditional images and progressive curriculum images, respectively. Furthermore, we perceived the metaphorical curriculum images as more effective for understanding the deeper meaning of the curriculum. Before learning these concepts of curriculum, I emphasized the definition approach of the curriculum instead metaphorical approach. Although I studied curriculum from secondary level to masters' degree level and have been teaching the unit 'Curriculum and Textbook' in the method of teaching science subject of third bachelor year, I was less able to

understand the notion of curriculum and develop a clear concept for myself and learners by connecting with everyday life.

After learning the metaphorical concept of curriculum, I applied Schubert's curriculum images in my classroom while teaching the concept of curriculum. My students tried to figure out the recent bachelor-level science curriculum from their lived experiences and imagined the appropriate images of the science curriculum for making socially responsible science education. Then we critically observed the actual and preferred images. We knew that the real images of the science curriculum are highly related to Schubert's (1986) traditional curriculum images like *curriculum as intended learning outcomes* that focus on ends (product) rather than means (process). It follows the well-structured specified objectives, content, instructional techniques, and evaluation process. All materials, plans, and arrangements are set for achieving the specific learning outcomes. Although it analyzes the context and philosophical factors in determining, designing, and realizing the intents of curriculum, it neglects the various unintended (hidden) outcomes essential in daily life. These curriculum images primarily focus on the cognitive domain. Thus, for assessing the students learning progress, students need to demonstrate their objective and competence-based performance in a particular time and place. In other words, it neglects the developmental aspects of learners.

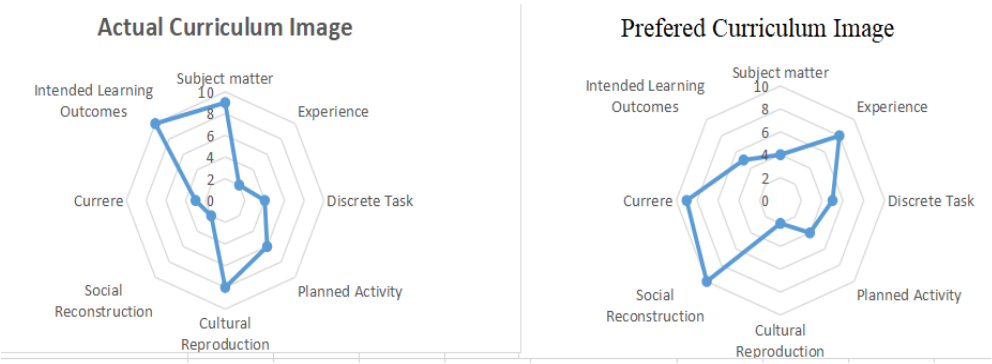

Figure 24: 'Actual and preferred curriculum images'

Most of the students preferred Schubert's (1986) progressive curriculum images like *curriculum as social reconstruction in my actual classroom teaching process.* This image of the curriculum holds the social agenda because education aims to improve the social order that means schooling for the betterment of the society where every social member realizes social justice. As human beings, we never remain beyond the community, so our schooling should be socially responsible. If the schools serve an agenda of knowledge and values, we can improve society and cultural institutions, beliefs, activities and develop good citizens. The students actively participated in the curriculum designing and implementing process. Likewise, the teachers need to act as perpetuate problem solvers (Larivee, 2000) and create a socially responsible science teaching milieu. For illustration, the teacher could motivate the learners to engage in collaboration, dialogue actively, and reflective journal writing for assessing the learners' knowledge, understanding and creativity; we could use the continuous assessment rubrics, open-book questions (the learner can use the library, internet for searching the related materials like books, research articles, and videos). I engaged in such kind of assessment process in my STEAM learning. In the end-semester assessment process, the course facilitator assigned us to design the open book questions for assessing our understanding and creativity. It developed my question designing skill, and I also felt ownership while answering that questions.

Finally, I collected my students' responses on metaphorical thinking for conceptualizing the notion/meaning of curriculum. They reflected that they felt it easier to understand a broader concept of the curriculum while engaging in Schubert's traditional and progressive curriculum images. Therefore, I realized from the lived experiences of science teaching and learning that metaphorical-based professional

practice could help change the literalism-based understanding. Schubert's progressive *curriculum image- curriculum as social reconstruction* is more powerful for shifting our traditional practice towards transformative learning.

I learned to design the science curriculum by incorporating Schubert's (1986) transformative curriculum image- *'curriculum as social reconstruction' for* emancipation. It could promote autonomous, responsible action, which is the fundamental genuine interest of an individual. It supports interest critically examines the disempowering elements such as coercion, distortion for freedom, justice, and equality (Habermas,1972). Autonomy and responsibility are the foundation of emancipation that helps liberate the teacher and learners from dogmatic and unfree existence, so the curriculum focused on critical perspectives such as self-reflection, critical inquiry-based activities that underpin awareness of false consciousness, counter the cultural hegemony (Grundy, 1987). Thus, I am inclined to believe that the curriculum as social reconstruction fully contributes to empowering the learners as critical and imaginative thinkers.

Recapitulating the Theoretical Praxis

In this chapter, I presented how STEAM education assists in minimizing the gap between theory and praxis of my science professional practice. I reflected on the knowing, doing, and being cultures of the STEAM learning journey and its influence on my professional practice for incorporating inclusive pedagogical culture. In the beginning, I tried to demystify the deeply-rooted curricular, pedagogical, and assessment system related dis-empowering forces in my STEAM educational learning journey that I experienced at the very beginning of STEAM education learning journey. Then, I focused on how I experienced and engaged in inclusive pedagogical cultures for displaying transformative knowing, doing, and being. I mentioned the

STEAM-based design thinking project report that I had designed and implemented in my professional practice in the learning journey of STEAM education. I also listed the possible implication of projects are like a curriculum as a mandala that greatly focused on self-consciousness for developing holistic thinkers, pedagogy as /for the public good that could address the need and interest of larger mass by connecting with their natural world, and assessment as/for learning that could enhance and assess the developmental aspects of learners. The project supported developing the conceptual, theoretical understanding of science contents and entrepreneurial skills and evaluated their learning progress using continuous assessment rubrics. Likewise, I included another artist (visual and animation)-teacher collaboration project) that I designed in my STEAM educational learning journey. I tried to write the script by incorporating the idea of science (typically chemistry) and focused on collaborating with visual and animation artists in that project work. I realized the need for trans-disciplinary artist-teacher collaboration to make artful classrooms that could connect cognitive and emotional aspects.

After engaging in the transformative journey of STEAM education, I felt that I needed to act as a change agent. In doing so, I realized that incorporating the notion of Stesenko's (2017) transformative activist stance that emphasized unified transformative ontology, so it probably supports shifting my positivistic ontology guided professional practice towards the transformative knowing, being, and doing culture. I came to know that research is a means to transform oneself and others. We could visualize the deeply-seated hegemony, other problems and envisage the possible ways through research. I also felt that research-based teaching and learning are necessary/for our professional development. Shifting science education towards transformative learning is the best notion of useful research in my professional

context. Thus, I tried to incorporate these transformative notions for improving and transforming my science profession.

I experienced the Covid-19 pandemic situation as a challenge as well as an opportunity. Most of my professional institution examination was postponed for more than eight months. Due to the examination rule of institutions, or rigor nature of the curriculum, or other possible reasons, my institution could not change the paper-pencil dominant examination. Thus, incorporate such nature of examination in the pandemic situation without honesty following the health protocols. So, most invigilators and students were under stress while participating in the examination.

I also faced challenges conducting science (typically, chemistry) classes online due to the lack of proper knowledge, skills, and access to connectivity. Many students did not have good access to the internet and ICT devices to connect in online classes. So, there was the problem of absenteeism in the online mode of science learning. However, the Covid-19 pandemic also created an opportunity to continue my professional and MPhil in STEAM educational learning journey through online mode by improving my communication skills.

I also realized the need to shift towards Schubert's (1986) progressive curriculum image '*curriculum as social reconstruction'* (social agenda for social order and justice) for counteracting the ends-oriented science curricular practice after engaging in different Schubert's curriculum images in my STEAM educational learning journey. While designing and implementing the science curriculum based on this image, it could be easy to counteract the dogmatic beliefs and actions embedded in our science teaching-learning by shifting towards the transformative pedagogical praxis. Thus, I realized that for being aware of such the hegemonic structures, emancipatory interest (Habermas, 1972) based theoretical stance greatly assist me,

and another TAS (Stesenko, 2017) related theoretical referent which greatly advocates the individual transformation supported to understand and transform my practice towards the transformative learning direction for meaningful science learning. So, in this chapter, I attempted my knowing, being, and doing in STEAM learning and my science professional practice from the different vantage point– which could be a foreground for demystifying my inclusive as well as dis-empowering hegemonic pedagogical culture parallelly, and possible ways for transforming me towards the inclusive science professional practice.

CHAPTER VI

KEY INSIGHT FROM MY LIVED EXPERIENCES: ENVISIONING AN INCLUSIVE SCIENCE TEACHER EDUCATION

While narrating some critical incidents related to my life world and academic world, I perceived that I grew up in an enriched transformative cultural life world. However, before STEAM education, I was less conscious of connecting the academic world with the life world for meaningful science teaching-learning. Generally, I delivered the science contents without connecting with learners' life world. I critically reflected on my hegemonic beliefs and actions in my STEAM learning journey. Also, I realized that transforming my analytical knowing dominated science teaching culture towards the critical knowledge culture for transformative learning. So, after STEAM education, I realized that we could apply several transformative pedagogies embedded in our cultural life-world while teaching science teacher education to foster inclusive science education. Later on, I started to transform my dogmatic beliefs and actions.

At this stage of the research journey, I have focused on attempting the last research question: In what ways can I envisage an inclusive science teacher education? In envisioning an inclusive science education, I started the chapters by briefly explaining how transformative learning transforms our isolated identity into a deeper and fuller identity? How do my grandfathers' transformative beliefs and actions support enriching, transformative science teaching-learning culture? In what ways can we incorporate the Hindu trinity (Lord Brahma, Lord Vishnu, and Lord Shiva) metaphorically for counteracting the hegemonic science teaching-learning culture and envisioning inclusive science education? While doing so, I have envisaged

transformative visions, missions, and values of my organization after ten years in this research journey. In my understanding, it could be the possible ways of flourishing transformative cultures.

In the process of addressing these research questions, I have divided these chapters into nine narratives: My Grandfather's Transformative Beliefs and Actions: Transform Our Isolated Identity to a Fuller and Deeper Identity; Lord Brahma Principle: Creating and Practicing Good Visions, Mission and Values; Lord Vishnu Principle: Preserving Core Values and Practices for Sustaining and Keeping the Culture Alive; Lord Shiva Principle: Eliminating or Reducing Bad Organizational Practices; Vision of My Organization: Nurturing Inclusive Science Education; Missions of My Organization; Key Values of My organization; Benefits and Beneficiaries from My Organization; and Success Indicators of My Organization.

As a STEAM learner and science teacher-educator, I have realized the lack of transformative learning in science teacher education. Transformative learning entails a profound structural shift in the learner's core premises of thoughts, feelings, and behaviors (Goodman, 2002). It should strengthen the individual self and the collective souls for resisting oppression and domination, challenge the continual reproduction and re-colonial relation in the academy, and support the learners to deal with an extensive influence of empirical structures of knowledge production. The self is a complex, integrated being with multiple layers of meaning; spiritual education supports connecting the self to the world and self to others by teaching sacredness, respect, and compassion. All knowledge is contingent, so we need to be conscious of our social and political contexts while teaching (Sefa Dei, 2002) to incorporate inclusive pedagogical culture in science education. Initially, I would like to narrate my grandfather's transformative beliefs and actions where I perceived several

transformative learning cultures for envisioning an inclusive science teacher education.

My Grandfather's Transformative Beliefs and Actions: Transform Our Isolated Identity to a Fuller and Deeper Identity

I saw various religious activities from my childhood. Especially, my grandfather is devoted to God. Every day early in the morning, my mother cleaned his praying place with cow-dung and put deer's skin and *kushasan*[40]. He would take a bath, wear a holy dress and sit above that place, and chanted the *Gita* and other prayers before he had his usual meal. We usually collected all the required materials to worship God. He would face a mirror to God and then look at his face around and put *Shrikhand Chandan*[41] in his navel, chest, vocal cord, ears, forehead, and head at the end of his praying time. He would make his meal by himself. In his cooking time, no one would touch him and his kitchen area. He would not speak and left his cooking place until he had a meal. When he needed to go away for home, he would carry all the necessary foods and clothes in his bag.

When he was eighty-five years, he cooked his food by himself. It indicated that he was self-dependent for fulfilling his basic need at old age as well. He collected varieties of religious materials and books from the different holly-place of Nepal and India, and shared them to other friends. Many religious people would come to meet him. They would chant *bhajan, chudka*[42] and enjoy. My grandfather would read several religious books. He would ask about his curiosity, absurdity, and ambiguity when he met More Knowledgeable Others (MKO). They would discuss and share their understanding for addressing his problems. In other words, they would try to solve the issues through enriching dialogue, discussion, and collaboration.

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[40] Kushasan – holly mat
[41] Shrikhand Chandan - santalaceae
[42] Bhajan Chudka – Nepali folk cultural songs and dance

He would share his lived experiences, religious stories and also asked creative questions for assessing our intelligence. Therefore, my colleagues and I would enthusiastically listen to his stories and try to answer his questions. Furthermore, he commonly visited every house of local people and talked with them. He critically observed their activities and gave suggestions for doing better. Metaphorically, he acted as a scaffolder for improving their actions. He shared various fruits and vegetables with all villagers. Villagers also shared new fruits and vegetables that they grew in their garden. There was reciprocity between the local people and my grandfather.

Most of the villagers would inform my grandfather when they suffered from diseases. Some patients would come to our house. Many times, my grandfather would go to meet the patients. He would check his/her pulse rate, eyes, skin, and would ask about their disease history, their food. Then he would give various Ayurvedic medicine that he made by collecting the locally available medicinal plants. He would also treat by saying the *mantra*[43]. He would give suggestions and sympathy to the patient and other family members. Most of the patients recovered from his treatment. Therefore, they greatly believed in my grandfather's treating technology. My grandfather suggested collecting the various medicinal plants and sharing his medicine-making techniques with others. They also followed him and used various medicinal plants like *kammari laharo, thirjo, gurjo, harchul, gaikhure*[44]*, etc*. Most of the small children to older people respected him. I realized that his beliefs and actions focused on creating an empathetic relation with other people.

Moreover, my grandfather observed the livestock and agricultural farms of local people and gave motivations for increasing productivity. He also made and

[43] Mantra – a word or sound repeated to did concentration in meditation

[44]*kammari laharo, thirjo, gurjo, harchul, gaikhure – Nepalis local medicinal plants.*

shared local medicine with the farmers for controlling plants and animal diseases. He followed ayurvedic books to seek solutions when he saw the new symptoms in plants and animals' diseases. The local people learned his valuable suggestions and *aayurvedic* treatment technology in such a collaborative, cooperative, and creative learning milieu and easily applied them in their everyday life for solving their real-world problems. As I remember now, he could have said,

"If we do *the wrong action and thinking, then God will punish us like downgrading us from a human being to other lower animals such as pig, dog, donkey. He carefully notices our activities. So, we have to do right karma (action) for attaining the God."*

At that time, there were many queries in my mind, like how can we see God? Where does God live? From the narratives of my grandfather, I felt that he was the source of inspiration to our family and society. He focused on collaboration, cooperation, self-reflection for self-awareness. He acted as a collaborator, scaffolder, motivator, and social activist for the betterment of society. In this regard, Dhungana et al. (2021) also emphasized fostering the professional agency to integrate curriculum and professional development programs, practicing student-centered pedagogy, and taking on leadership positions through the cross-disciplinary collaboration for professional autonomy. Thus, I aligned with cross-disciplinary like ICT-science teacher collaboration and cross-professional collaboration like artist-teacher collaboration for counteracting the hegemonic pedagogical culture.

In the above narrative, my grandfather was able to form a network for learning and discuss their views, problems, and progress with each other. The MKO supported solving his learning problems. He utilized his knowledge and skills to understand the contemporary social issues of local people and encouraged applying locally available

materials and technology to resolve their problems. I grew up in such an environment. So, I un/knowingly learned these values and cultures to some extent from my grandfather. While critically reflecting on my lived world, I perceived that I grew up in enriched cultures. However, my academic world could not dig out my lived world and connect science education with my everyday life. As a science teacher, headteacher, and teacher educator, I realized that we were less able to create a transformative learning milieu in science teacher education. I am inclined to believe that we could also apply my grandfather's transformative beliefs and actions while teaching science education to counteract the hegemonic pedagogical culture. Further, it could support fostering inclusive science education in Nepal.

In this regard, Shrestha, et al. (2020) explained that the transformative pedagogy supports raising questions about our practices by establishing a dialectical relationship between teachers and students, which helps for individual and social transformation. It can engage both teachers and students in critical reflective practice and bridging between theory and practice. Therefore, I also realized to incorporate transformative pedagogy in science teacher education for spiritual learning that can expand our isolated identity to a fuller and deeper identity - "me" to "us" and "all of us" for our growth and development (Wilber, 2007).

Each individual has different learning abilities, so the learners cannot learn and succeed on the same day and the same ways. The learners can develop their multidimensional ability through cross-disciplinary collaboration, dialogue, and a cooperative learning environment. We need to study the empirical trends, understand the educational culture and interpretation, and critically reflect the present practice for addressing the multiple voices of learners and transforming the learners into holistic thinkers and actors.

In my STEAM educational learning journey, we discussed an outcome-based education (OBE) and curriculum integration approach. I was impressed by these ideas, so I realized incorporating them in science teacher education to envision an inclusive science education. Now, I briefly discuss the key notions of OBE and curriculum integration approach and try to connect with my professional context as follows.

According to Spady and Marshall (1991), there are three types of OBE. They are: Traditional (structured task performances/ discreate content skills), transitional (complex unstructured task performances/higher-order competencies) and transformational (complex role performance/life-role functioning). For defining outcome-based education (OBE), Brandt (1992/1993) discussed four principles. Firstly, the clarity of focus principle focuses on clearly mentioning the possible demonstrable actions in the process of all curriculum design, all instructional delivery, all assessment design for successfully attaining at the real end; secondly, expanded opportunity principle highlights to expand the ways and several times for increasing a chance to learn and demonstrate by the pupils at a very high level; thirdly, high expectations principle wants all pupils able to do important things well at the end rather expect bell curve standards, expectations, and results; and finally, design down principle acknowledges to proceed the curriculum design backward from the culminating outcomes. Therefore, OBE is about preparing students for life rather than college or employment.

While critically reflecting my lived experiences in this autoethnographic inquiry, I came to know that our higher-level science teacher education aligned with Spady and Marshall's (1991) traditional OBE greatly, transitional OBE to some extent, and neglected the transformational OBE that acknowledges the success-based

philosophy and outcome-based practice that follows the cross-curricular approach in the process of curriculum designing, implementing and assessing the outcomes. Moreover, it is future-oriented and visionary that emphasizes culminating demonstration (high-level demonstrable performance). Here, the demonstration represents the precise details of the broad complex concept and their interrelation. So, the scope of outcomes can range from a relatively small segment of learning like lessons and units to large areas of learning like entire subject areas and a whole program of study. The learners can demonstrate their learning outcomes in the learning place to real-life because it connects simple cognitive or psychomotor skills to complex, higher-order synthesis and application. Moreover, it advocates expending time and support for learning success because the learners get a chance to learn and demonstrate their ability to become life-long learners.

Likewise, Beane's (1995) separate subject approach includes selective content that emphasizes theoretical knowledge and neglects the real-life themes. But, the curriculum integration approach focuses on the self-concerns and problems raised by the other culture. The learners can deepen their understanding of themselves and cultures by sincerely engaging in the meaning-making process. It also acknowledges the disciplinary knowledge for making the more responsible curriculum. Thus, in the process of curriculum integration, inquiring the rhythms and patterns of learners' minds rather than in the subject-specialists for seeking the real-life themes or centers of learning experiences and planning the interactive activities. In such a curriculum, the teacher could work as generalists and content specialists by engaging the learners on interactive themes and developing thematic knowledge. As a result, learners could solve real-world problems by using their knowledge. To deepen and broaden our understanding of ourselves and our world, consider the *curriculum as the mastery of*

fragmented information within the limited boundaries of subject areas. Therefore, we need to focus on curriculum integration that centers the *curriculum on life itself* and *learning as the continuous integration of new knowledge and experience* for actively constructing the meanings rather than the passive adopting the others' meaning.

Figure 25: 'Brahman'

Source: https://thehindugods.org/wp-content/uploads/2017/04/om-consciousness.jpg

I agree with Beane's (1995) curriculum integration approach and Spady and Marshall's (1991) transformational outcome-based education (OBE) for envisioning an inclusive science education that could support developing my students as creative-imaginative thinkers and lifelong learners. In my understanding, transformational OBE follows the design down approach, the cross-disciplinary collaboration, dialogue, and cooperative learning environment for developing the high-level performance of learners and creating multiple futures. It could support counteracting the deeply-seated hegemonic beliefs by engaging in transformative knowing, being, and doing. In doing so, I realized the relevance of Lord Brahma, Lord Bishnu, and Lord Shiva's principles. The Hindu trinity Lord Brahma, Lord Vishnu, and Lord Shiva

denote the power of creation, maintenance, and destruction manifested in the world, and they are interconnected with each other. For eliminating or counteracting the less relevant organizational culture, preserving the transformative values and practice, and envisioning visions, missions, and values for enriching inclusive science education, metaphorically, I have incorporated the notions of Hindu trinity as follows.

Lord Brahma Principle: Creating and Practicing Transformative Visions, Mission and Values

We could apply the Lord Brahma principle that focuses on acting as a creator for creating and practicing transformative visions, missions, and values. Creation is the role of Lord Brahma. "Creation requires creativity, and creativity requires knowledge and wisdom" (Low & Muniapan, 2011, p. 495). In the context of teaching-learning, for reorganizing the preexisting unclear elements or parts into a pattern or structure create follows three cognitive processes: generating, in which the students engage to generate possible solutions by understanding the task; planning, in which the students examine the possibilities and devises a workable plan; and producing, in which the students make a new product by successfully implementing the plan (Anderson & Krathwohl, 2001). The learners could understand the fragmented knowledge into a pattern or structure and act *as holistic thinkers and creators.* Ensuring an inclusive and equitable quality education for all by 2030 (United Nations [U.N.]. 2015) is the premise of Sustainable Development Goal 4. Preparing the job-oriented citizen for the gig-economy is insufficient for sustainable development. But, our present Western science education narrowly emphasizes the goal of sustainable development (Luitel, 2019). The Western World View of science focuses on the construction of propositional, analytical scientific knowledge. It is a robust scientific worldview.

Figure 26: 'Brahma'

Source: 'Who is Brahma? | The God of Creation | How was the universe created? | Why Brahma is not worshiped? | - YouTube'

In contrast, the Non-Western World View of science emphasizes cultural and ecological aspects (Taylor, 2006) that enhance the local knowledge, cultural beliefs, values, ecology. In this context, I acknowledge Bhabha's (1994) ideas of creating a 'third space' for connecting the Western and non-Western World View of reasoning in science education to address the heterogeneity and call for inclusive science education. The postmodern art-based logic and general are the tools for sense-making and sources for imagination that could connect scientific knowledge, skills, and ideology with human feelings, thinking, values, beliefs, cultures, and activities. Therefore, I felt the relevance of Lord Brahma's principle for creating and practicing transformative visions, missions, and values for an inclusive science education that could support enhancing the quality of science teacher education and develop socially responsible learners.

While engaging in the text generation and meaning-making in the previous chapters, I realized that we have to preserve the transformative core values and practices for counteracting the hegemonic pedagogical culture of science teacher education that could sustain and keep the culture alive. We have to manage the necessary resources like physical infrastructure and human resources in doing so.

Thus, I would like to explain the Lord Vishnu principle in envisioning inclusive science education for nurturing the new values and practices in science teacher education.

Lord Vishnu Principle: Preserving Core Values and Practices for Sustaining and Keeping the Culture Alive

In science teacher education, we could incorporate the Lord Vishnu principle for preserving and maintaining core values and practices for sustaining and keeping the culture alive. "Lord Vishnu's role is to protect humans and to restore order to the world" by acting as a preserver (Low & Muniapan, 2011, p. 495). We need to preserve the more appropriate core values and practices of science education for the growth and progress of science teacher education. We could dig out these values and traditions through *reflection on action, reflection in action,* and *reflection for action* (van Manen, 1991).

Figure 27: 'Dashavatara of Lord Vishnu'

Source: https://www.ritiriwaz.com/wp-content/uploads/2019/04/Dasavatar-.jpg

In this research inquiry, to counter the hegemonic pedagogical culture in my professional practice, I have critically reflected on my autobiographic narratives related to science teaching and learning to address the first, second, and third research questions. I realized that we need to design and implement education in emergencies sensitized transformative notion-based curriculum, pedagogy, and assessment system

to help connect the learners' life world and the academic world by creating an empathetic learning milieu. In such a learning environment, we could enrich the communication between students and teachers as well as students and students for inclusive participation in the science classroom; **c**ontextualize learning to solve the learners' real-world problems; trans-disciplinary artist-teacher collaboration for making artful classroom that could support for connecting cognitive and emotional aspects.

There is a binary relation between students and teachers for active learning in the process of scientific knowledge construction. The teacher could act as an optimal scaffolder by critically reflecting the learners' beliefs, assumptions, values, context, experiences, and feelings that support understanding the science content in a meaningful manner. I faced the challenge of managing more linguistically and culturally diverse students in the congested classroom. Therefore, I realized the need for cultural-self-knowing in science education for counteracting the deeply-seated unjust hegemonic culture that seems normal and natural. It could help transform self and others and support adjusting to the culturally and linguistically diverse classroom milieu.

My family motivated me to be a science teacher by counteracting the dogmatic beliefs of people toward the teaching profession. So, from my lived experience, a family has been a catalyst for developing intrinsic motivation towards the science teaching profession. As a headteacher, I faced lots of challenges in my initial journey. However, I was able to conduct the regular school activity smoothly after negotiation, collaboration, and critical reflection on our dogmatic beliefs and actions. It supported minimizing the conflict between the co-workers and escaping from the win-and-lose situation in school by forgetting egos. I also experienced that for making the teachers

more responsible in their profession, the teacher recruitment examination is also required to conduct without the influence of unnecessary power, politics, and other illegal benefits.

Likewise, the Covid-19 pandemic situation also created an opportunity to develop communication skills using ICT tools. We used different software like Teams, Google meets, zoom and created various collaborative spaces for learning like MOODLE, collaborative library, and so on. Further, the online mode of MPhil classes in STEAM education supported me in managing my time for learning and teaching. Therefore, I realized the value of ICT in science teacher education for enhancing our communication skills and academic qualification.

After actively participating in the transformative journey of MPhil in STEAM education, I felt that I needed to act as a change agent. In doing so, I realized that incorporating the notion of Stetsenko's (2017) transformative activist stance (TAS) that emphasized unified transformative ontology, so it probably supports shifting my positivistic ontology guided professional science practice towards the transformative knowing, being, and doing culture. Further, I came to know that research is a means to transform oneself and others. We could visualize the deeply-seated hegemony, other problems and envisage the possible ways through research. I also felt that research-based teaching and learning is necessary as/for transformative professional development. In my understanding, for shifting science education towards transformative learning, we could apply the key notions of TAS and act as an agency. I have tried to incorporate this notion in my research and professional practice for improving and transforming my hegemonic beliefs and actions. Therefore, I felt that we could preserve these transformative core values and practices to sustain and keep the culture alive by following the Lord Vishnu principle.

While critically reflecting on my autobiographic narrative in the previous chapters, I am learning that some disempowering forces also contributed to continuing the hegemonic pedagogical culture in science teacher education. I believe that we have to eliminate or counteract bad organizational practices for enriching inclusive science education. In doing so, I metaphorically used the Lord Shiva principle as follows.

Lord Shiva Principle: Eliminating or Counteracting Less Relevance Organizational Practices

The Lord Shiva principle helps eliminate or reduce bad organizational practices (Low & Muniapan, 2011). While addressing the research questions in the previous chapters by critically reflecting on my learning, teaching, and administrative journey as a student, science teacher, headteacher, and science teacher educator, I perceived some less relevant cultures embedded in our professional practice. I realized to eliminate or counteract those cultures as per our need of 21st century for enriching inclusive science education.

Figure 28: 'Lord Shiva'

Source: https://images.saymediacontent.com/.image/

I experienced *a one-size-fits-all-dominated curriculum, pedagogy, and assessment system grounded in* science education. The decontextualized ends-oriented

rigor nature of science contents, pedagogy, and assessment of formal schooling neglects the learners enrich cultures for connecting science education with learners' everyday life. The invisible disempowering forces like power and politics influenced the school leadership and management selection, teacher recruitment, posting, examination, regular administrative activities, infrastructure development, and teaching-learning activities. I perceived an unhealthy exercise of power on becoming a teacher, cut off point oriented examination, uncritical science pedagogical culture emphasized on knowledge consumption rather than construction, domination of power, politics in school to higher education, also realized that we need to eliminate or counteract these less helpful cultures embedded in science education for nurturing the creativity and developing the empathetic relation with students and other teacher educators. Likewise, corporal punishment in teaching-learning was less helpful for creating a caring environment in school. Although the children faced such a demotivated learning in school, the parents were less conscious of their children's problems and the teaching-learning culture of the school. Moreover, there was no proper connection between learners' academic world and life-world while teaching science.

I perceived several dogmatic beliefs of teachers, learners, and society towards the science teaching profession, mensuration, defect in vision, and unhelpful dualism between impure and pure science education negatively influenced the science learning and fostered an unjust science learning milieu. The science teacher educators' prospective science learning and teaching cultures also contributed to structured task performance and developing my hegemonic beliefs.

In my teaching-learning journey, I also experienced the lack of proper management of textbooks and laboratories in the remote school, which also made science learning

problems. To address the issue of laboratory management problems, we could connect the science teaching-learning with learners' cultures and use improvised materials that could help solve the learners' real-world problems.

As a secondary level science teacher, headteacher, and science teacher educator, I perceived that the politicization in education initiates a pathetic learning milieu. I used the images of *teaching as a mundane and unglamorous process* and *learning as straight rows* for reflecting my science teaching-learning culture. I commonly focused on knowledge consumption rather than construction. The domination of administrators at the university level was less supportive of creating empathetic relations with other disciplinary and trans-disciplinary teacher educators and students. As a novice science teacher educator, I used analytical knowing dominated defensive science teaching culture for my safe landing in a new teaching environment.

I experienced the Covid-19 pandemic situation as a challenge as well as an opportunity. Most of the examination of my professional institution was postponed for more than eight months. Due to the examination rule of institutions, or rigor nature of the curriculum, or other possible reasons, my institution could not change the paper-pencil dominant examination. Thus, incorporate such nature of examination in the pandemic situation without honestly following the health protocols. So, most of the invigilators and students were under stress while participating in the examination.

Moreover, there was the problem of absenteeism in the online mode of science learning. Many students did not have a good assessment of the internet and ICT devices like laptops and mobile phones to connect in online classes. We also felt difficulties conducting the science classes online due to the lack of familiarity with ICT tools. In this learning milieu, the learners did not have intrinsic motivation

towards formal schooling. In my understanding, continuing these cultures without revisiting our curriculum, pedagogy, and assessment may weaken the organization. So, we could develop the transformative visions, missions, and values and manage the resources for designing and implementing education in emergency sensitized transformative notion-based science curriculum, pedagogy, and assessment for running our science education programs smoothly in the possible tricky timing as well. Likewise, we could manage the induction training for novice science teachers to develop their professional skills from the MKO. Therefore, I felt that we could be eliminating or counteracting bad organizational practices (typically, in science education) by incorporating the Lord Shiva principle.

Now, I would like to envisage my organization's visions, missions, values, benefits and beneficiaries, and success indicators after ten years of shifting towards inclusive science education. In doing so, I was also conscious of Lord Brahma, Lord Vishnu, and Lord Shiva's principles.

The Vision of My Organization: Nurturing Inclusive Science Education

To enrich the transformational outcome-based science teacher education for counteracting the hegemonic pedagogical culture and nurturing inclusive science education will be a vision of my organization for the next decade. From this research inquiry, I also realized that we could incorporate Lord Brahma, Lord Vishnu, and Lord Shiva Principles for developing transformative visions, missions, and values; preserving the core values and practices; eliminating or counteracting the bad organizational practices of science education for sustaining and keeping the culture alive; and developing students as creative-imaginative thinkers. I believe that it could support enhancing the quality of science by creating multiple futures that will be conscious and responsible towards society.

The Mission of My Organization

The science teacher educators could engage in professional development activities like research, journal article writing, conferences, workshops, webinar, seminars, etc. It could support excavating the dis/empowering forces in science education and developing the local, global and international network for sharing new innovative ideas, practices, and problems by creating an empathetic learning milieu. So, I agree with Luitel and Taylor (2019), who explained that research as/for transformative professional development enables the practitioner-researchers for taking educational action like designing and implementing curriculum; explore the cultural and contextual solutions of real-world problems, and being a lifelong learner by acting as a critically reflective practitioner.

We could design and implement a science curriculum based on Beane's (1995) curriculum integration approach and Spady and Marshall's (1991) transformational OBE. Moreover, we could also incorporate the key notions of emergency education to foster an inclusive science educational culture. Furthermore, some rights will be delegated to the science teacher educator to introduce local contextual emergent ideas in the curriculum. While designing the science curriculum sensitized with education in emergency and transformative notions, it could be easy to implement this curriculum in possible difficult timing like conflict, pandemic, disasters, and so on. Metaphorically, I would like to represent the future science *curriculum as social reconstruction* that emphasizes the social agenda for social order and justice (Schubert, 1986), human feelings, and social context for developing socially responsible and conscious citizens.

In the process of implementing this curriculum, the science teacher educator could apply transformative pedagogy. In doing so, they could collaborate with inter

and trans-disciplinary professionals like science teacher-science teacher, science teacher- ICT teacher, artists- science teacher; design and implement the STEAM project, maker space, science museum, and online library; conduct science exhibition for disseminating their learning outcomes to others, engage the learners in research-based articles that possibly develop their hard skills and soft skills.

After conducting a STEAM-based design thinking project in my STEAM educational learning journey, I realized the need for *curriculum as a mandala* that greatly focused on self-consciousness for developing holistic thinkers, *pedagogy as /for the public good* that could address the need and interest of larger masses by connecting with their natural world, and *assessment as/for learning* that could assess the developmental aspects of learners. It could shift our dogmatic examination beliefs as achieving the cut-off point to examination as/for learning. Moreover, the trans-disciplinary STEAM approach could support the development of the conceptual, theoretical understanding of science content and entrepreneurial skill. We may act as critically reflective practitioners for being autonomous and responsible science teachers. As a result, we could shift towards the inclusive science educational culture and counteract the hegemony by transforming self as well as others' (learners) world view.

Key Values of My Organization

Implementing the above visions and missions that greater focus on transformative learning through transformational OBE and research work in my organization could enrich different values like inter and trans-disciplinary, intellectual, sociocultural, vocational, utilitarian, aesthetic, moral, and ethical values science education. I felt that the ethical dimensions of development are required in science education for developing political imagination, relativism of knowledge,

commitment, and visions (Stetsenko, 2017). In this regard, Taylor et al. (2013) also acknowledged the idea of integrating disciplinary knowledge, skills, values education, and citizenship education in the curriculum and pedagogy.

From some critical incidents that I experienced in my science learning, teaching, and administrative journey, our science education is less able to incorporate an aesthetic, intuitive, spiritual premises-based Eastern and indigenous wisdom tradition that could enrich moral and ethical values required for sustainable development by connecting human and nature (Chakrabarti, 2004; Cheon, 2018). Therefore, I realized to include these values in our present educational culture for fostering inclusive science educational culture in my organization.

Benefits and Beneficiaries from My Organization

My organization is related to science teacher education. Whenever the stakeholders and practitioners are aware of transformative science learning, we could counteract the hegemonic structures, taken-for-granted assumptions, dogmatic beliefs, values, and actions by incorporating the transformative visions, missions, values, and activities (see chapter VI and VII) in our everyday practice. While doing so, the larger mass of people like teacher educators, student teachers, curriculum developers, policymakers, society will be the beneficiaries. Science teachers and teacher educators could act as an agent for transforming the learners, society, and nations. Metaphorically, they could act as a *social activist.* Likewise, it could assist the practitioner science researchers to integrate the transformative notions in their research for their professional development. Likewise, policymakers and curriculum developers might feel comfortable for achieving the goal of quality education by re-conceptualizing the purpose of education with changing times. Society might be benefited from the socially responsible tripolized (individualized, localized, and

globalized) notions guided science teaching cultures that could assist the learners in solving their real-world problems.

Success Indicators of My Organization

For enhancing the quality of science education, we could enrich inclusive science education by incorporating the education in an emergency sensitized, transformative notions-based science curriculum, pedagogy, and assessment system. It could help transform the current disciplinary egocentric science educational structures and practices where we could act as an autonomous and responsible agentic being. If my organization practically shifts the present meaning of learning as an adaptation to learning as achieving (Rae & Carswell, 2000), it will also indicate success. It possibly supports sustainable development, flourishing the humanistic, eco-spiritual perspectives in science education. Therefore, I am inclined to believe that these aspects could represent the success indicators of my organization.

Recapitulating the Theoretical Praxis

I began this chapter by portraying my grandfather's transformative beliefs and actions for displaying my enrich transformative cultural lifeworld. Then, I metaphorically used the Hindu trinity (i.e., Lord Brahma, Lord Vishnu, and Lord Shiva principles) in the process of envisioning transformative visions, missions, and values for nurturing the inclusive science educational culture; maintaining, preserving, and practicing core values and practices for sustaining and keeping the culture alive; and destructing or minimizing few relevant practices manifested in my organization (Typically, science teacher education program). While doing so, I applied emancipatory interest (Habermas, 1972) and transformative activist stance (Stetsenko, 2017) as a referent that helped to unfold the key insights from my lived experiences for enriching transformative knowing, being, and doing cultures in science teaching

and learning. I am inclined to believe that, it could assist to transform the hegemonic organizational structures, believes, and actions of myself and others by nurturing the inclusive and empathetic science learning milieu.

CHAPTER VII

FINAL REFLECTION OF MY JOURNEY: LOOKING BACK AND MOVING AHEAD

This chapter is a synopsis of how I unfolded my lived experiences of teaching and learning as a student, teacher, headteacher, and teacher educator in the process of sensing the problems in my professional practice and envisioning an inclusive science education for fostering transformative learning. In chapter I, I discussed my research problems and theoretical positioning. Likewise, I explicitly focused on research methodology in chapter II, whereas in chapter III-VI, I deeply engaged in four research questions to address my research purpose. I tried to consolidate my narratives with scholarly interpretations by applying critical lenses in meaning-making. Moreover, I attempted to portray this chapter as an overview of this research inquiry by looking back and moving ahead of my journey. However, I explicitly emphasized chapter III-VI to demystify the key learning outcomes of my research journey, present standpoint, and future direction.

Recapturing My Research Purpose and Questions

I used the idea of retrospective reflection, anticipatory reflection, and prospective reflection (van Manen, 1991) and set the background of the study. Then, I tried to unpack the research context, issues, and significance of this research in the problem statement process. I learned that the pedagogical problems embedded in the science teaching-learning process. Therefore, my study aimed to counteract the hegemonic pedagogical culture in science teacher education, thereby envisioning an inclusive science education. For making the problems more researchable and address the research purpose, I developed four emergent research questions as follows:

1. How have I experienced hegemonic pedagogical culture in the science learning journey?

2. What beliefs did I hold for creating an empathetic science learning milieu?

3. How have I been experiencing an inclusive science teaching culture?

4. In what ways could I envisage an inclusive science education?

I reviewed the key themes: Hegemonic pedagogy, beliefs, empathetic relation, and inclusive science education of research questions for understanding the primary concern of my research. So, I realized that thematic review made my research journey clearer.

Reflecting My Theoretical Referents

In this research inquiry, I used Habermas's (1972) emancipatory interest and Stetsenko's transformative activist stance (2017) as referents for pondering the hegemonic cultures embodied in my science teaching and learning for envisioning an inclusive science teacher education. In doing so, I attempted to unfold the taken-for-granted beliefs critically, values, cultures, and actions various dimensions of hegemonic cultures I experienced in my academic lifeworlds by asking myself like did my retrospective and anticipatory science teaching-learning milieu support me for enriching inclusive science education, am I prepared to facilitate transformative science learning and so on. I felt that critical reflection is the foundation for uncovering and challenging hegemonic assumptions that direct our teaching-learning action (Brookfield, 2017). I held the collaborative and unified transformative ontology. So, my research inquiry focused on continuous dialogue and participation, relatedness and interconnectedness, and the coming together of learners and their world in the science classroom.

Habermas's (1972) emancipatory interest focused on critical knowledge to pursue autonomous and responsible actions. So, I incorporated this theoretical lens to address my research questions. I tried to critically reflect the hegemonic structures, beliefs, values, assumptions, experiences, and actions during my science teaching and learning process to counter the hegemonic structure (like curriculum, pedagogy, assessment) and make me aware of the false consciousness. While doing so, I portrayed some critical incidents that I experienced as a student, science teacher, headteacher, and science teacher educator to excavate the hegemonic pedagogical culture and create an empathetic learning milieu and inclusive science teaching-learning culture. Similarly, TAS significantly highlights transformative knowing, being, and doing for acting as a social activist. Therefore, I applied this theoretical lens to seek my transformative lived experiences in my academic worlds and lifeworlds and develop my organization's visions, missions, and values for the next decade. Furthermore, it helped me to reflect on my transformation in my research journey.

Multi-paradigmatic Research Design and Autoethnography

I aligned with the multi-paradigmatic research design like criticism, postmodernism, interpretivism, and integralism (Taylor, 2014) to demystify my lived experiences. I have incorporated autoethnography as a research method to dig out my social, cultural, and political beliefs, values, experiences, and actions in the process of science teaching and learning. I was conscious in writing as inquiry (Richardson, 2000) and healing for visualizing the deeply grounded dogmatic beliefs and actions and bringing back hope who are in hopelessness by envisioning more relevant visions, missions, and values of my organization that could enrich inclusive science education in an empathetic science learning milieu. Therefore, I extensively focused on resisting,

healing, and envisioning the criticism paradigm in meaning-making. In this chapter, I also tried to connect my past, present, and future actions to act as a *social activist* or *change agent.* I am inclined to believe that it could contribute to developing pedagogical thoughtfulness to novice science teachers, teacher educators, practitioner-researchers, and other readers by feeling likeliness and lifelike. So, we could counteract the dogmatic beliefs and actions embedded in science teacher education and transform our science teaching culture.

I applied autoethnography as my research methodology for critically narrating my autobiography related to socio-cultural, historical, and political aspects. While doing so, I made conversations with my family, colleagues, co-workers, and students. Further, I studied research-based articles, curriculum, books, and policies. It helped me articulate my formal and non-formal science teaching and learning-related lifeworlds and envision an inclusive science education to counteract the hegemonic structures, beliefs, and actions of my organization and me. Reed-Danahay (2009, p. 32) claimed that autoethnographic writing "confronts the tension between insider and outsider perspectives, between social practice and social constraint". I also became conscious of the perspectives of my research journey. My lived narrative represented the typical socio-cultural contexts of science teaching and learning. In my understanding, it could have less generalizable power because I constructed the meaning in such a narrow boundary. I believe that the research could generate pedagogical thoughtfulness to my reader for transforming their hegemonic beliefs and actions. In doing so, they could transfer my research finding by understanding the research context and agenda. In this regard, Poerwandari (2021, p. 310) also argued that autoethnography helps to "develop, understanding, and knowledge through the construction of substantive theories about a particular issue."

Responses to My Research Questions

I attempted to dig out the diverse ways of hegemony from the beginning of my formal schooling to present the science learning and teaching journey by portraying some critical incidents I experienced as a student, science teacher, headteacher, and science teacher educator. While critically reflecting on my lived experiences, I perceived that the civil war of Nepal disturbed the internal chemistry of my family and school. Typically, the school became the battleground. However, I did not feel the education in an emergency (like conflicting, pandemic situation) sensitized; my lifeworlds and the academic world connected contextualized science curriculum, pedagogy, and assessment in my school and higher education learning journey. Further, I realized an uncritical science pedagogical culture that focused on knowledge consumption rather than construction; cut-off point oriented examination, which was less helpful for nurturing creativity and developing empathetic relations with students and other teacher educators; and structured task performance dominated prospective science learning and teaching milieu that neglects the complex task performance (or life-role functioning). So, I would like to represent a *one-size-fits-all* science curriculum, pedagogy, and assessment system metaphorically.

The research journey was eye-opening for me. I learned that my past cultural reproduction-oriented science learning journey also un/knowingly contributed to developing my hegemonic beliefs, values, and actions. Further, an unhelpful dualism between impure and pure science education; lack of inclusive participation in the science classroom; politicization at school level to higher education like the unnecessary influence of political power and access in leadership and management, teacher recruitment, posting, examination, regular administrative activities, infrastructure development, and teaching-learning activities; dogmatic beliefs of

teachers, learners, and society towards the science teaching profession, mensuration, defect in vision; the corporal punishment; lack of empathetic learning milieu in the school and caring environment in the family-like less consciousness of my parent in our need, interest, problems, and learning were the possible forces that were less able to develop intrinsic motivation and empathetic science learning milieu.

The dominance of administrators in higher education was less supportive for creating empathetic relations with other disciplinary and trans-disciplinarian teacher educators, and students. As a novice science teacher educator, I could not share my problems with the administrator and other co-workers and zoom in and zoom out the humanistic lenses during the process of science teaching-learning in that pathetic learning milieu. Thus, I felt politicization (i.e., the disproportionate influence of national politics and power rather than from the perspective of consciousness) in education initiates a pathetic learning milieu that negatively influenced science learning and fostered an unjust science learning milieu. I commonly focused on knowledge consumption rather than construction. I would like to use the images of teaching as a *'mundane and unglamorous process'* and learning as *'straight rows'* for reflecting on my past science teaching-learning culture.

I realized the need for cultural-self-knowing in science education to transform self and others. While doing so, we could critically reflect on our classroom cultures, family cultures, and enrich communication between student-teacher and students-students that possibly support inclusive participation in the science classroom, counteracting the disempowering forces embedded in science teaching-learning and shift towards sustainable development by developing socially conscious and aware science learners. So, I realized that we need to transform towards cultural reconstruction.

I tried to demystify my beliefs for creating an empathetic science learning milieu through reflecting on some critical incidents that I experienced as a secondary level science teacher in the remote district and rural district; headteacher in the remote district; and science teacher educator in an urban district of Nepal. The unhealthy exercise of power and politics (i.e., from the perspective of domination of national politics) on becoming a teacher could not create an empathetic learning milieu of school. So, the teacher recruitment examination also needs to be conducted without the influence of power, politics, and other illegal benefits for selecting a good quality teacher from the many candidates. It possibly supports making the teachers more responsible in their profession.

When I taught science subjects in remote districts, I faced the challenges of managing larger masses of linguistically and culturally diverse students in an overcrowded classroom. The science teacher might also adjust to the culturally and linguistically diverse culture by learning about their culture through enriching dialogue and interaction with learners and society, acting as an optimal scaffolder for engaging the learners in the knowledge construction process. In my research process, I am learning that we could connect the science teaching-learning with learners' cultures and construct the improvised materials as an alternative to standard laboratory materials. Further, we could smoothly conduct the regular activity of school through negotiation, collaboration, and critical reflection of the conflict by forgetting egos. It could support understanding and reduce the win-and-lose situation by minimizing or illuminating the taken-for-granted assumptions, dogmatic beliefs, values, and actions. I have faced many ups and downs in my professional journey. However, my family gave me an intrinsic motivation to cope in my professional life's

challenging and vulnerable situation by counteracting people's dogmatic beliefs. So, I felt *family as a catalyst* to becoming a science teacher.

In the process of my professional development, I joined MPhil in STEAM education at Gamma University. After around a month, we shifted from face-to-face mode to online mode due to the Covid-19 pandemic. At the very beginning, I strove to cope with the online method of STEAM classes due to the lack of proper connectivity facility, knowledge, skills, and intrinsic motivation for actively engaging in the teaching-learning and assessment-related activity. My course facilitators attempted to understand my problems in formal and non-formal conversation. They provided intrinsic motivation by acting as an optimal scaffolder.

I slowly began to enjoy online classes, managing my time and completing the preferred activities and assignments in punctual time by actively participating in the transformative knowing, doing, and being like designing and implementing STEAM-based design thinking project, artist-teacher collaboration project, and so on. I also used the rubrics for assessing their learning progress. Through these transformative activities, I also envisaged the *curriculum as a mandala* that extensively focused on self-consciousness for developing holistic thinkers. The emancipatory interest-based theoretical stance of my research inquiry also focused on self-reflection for emancipation that promotes autonomous, responsible action (Grundy, 1987). Likewise, the *pedagogy as /for the public good* that could assist in addressing the need and interest of larger mass by artfully connecting with their cognitive and emotional aspects and *assessment as/for learning* (see chapter V) that could assess the developmental factors of learners and consolidate their learning.

The online mode of MPhil STEAM classes greatly supported me in conducting my regular online mode science classes and managing my time for

teaching and learning in the Covid-19 pandemic. However, due to the lack of proper connectivity, access, competency in using ICT tools, rigor nature of curriculum, pedagogy, and assessment system, my students and I faced lots of challenges like participating in the paper-pencil test dominated board examination with delay, joining on online classes without problems and so on. It probably makes it easy to incorporate transformative pedagogy in our everyday professional practice.

After normal conditions, I have been conducting my classes in face-to-face mode. My students have a diverse response on online and face-to-face modes of science learning. Many students who had not regularly joined the online classes due to the connectivity problems loved the face-to-face mode of science classes. Some students who had regularly participated in my online science classes gave positive responses. Therefore, I am learning that just conducting science classes online is inadequate to address real-world problems. For making plausible and fruitful science learning, we could revisit the rigor structures like policies, curriculum, pedagogy, assessment system dominated in science education. Thus, I realized the need of designing and implementing the science curriculum based on Schubert's (1986) progressive curriculum image-*curriculum as social reconstruction* (social agenda for social order and justice) for counteracting the domination of Schubert's curriculum image- *curriculum as the intended outcome* (focuses on ends rather than means) in present science curriculum for developing the socially responsible science education. Taylor and William-Chambel (1993) also argued that the emancipatory interest-based curriculum emphasizes creating a complete reciprocity-based teaching-learning environment. In my understanding, *curriculum as social reconstruction* image of Schubert also advocates for developing such kind of science learning milieus for emancipation.

From the transformative journey of STEAM education, I came to know that we need to change our hegemonic structures and my individual self for improving and shifting my science teaching-leaning towards transformative learning and developing me as an agentic being. In doing so, I realized to incorporate the notion of Stetsenko's (2017) transformative activist stance that emphasized unified transformative ontology (see chapter I) for shifting my positivistic ontology guided professional science practice towards the transformative knowing, being, and doing cultures. Furthermore, I also realized that research-based teaching and learning are necessary as/for our professional development.

It could transform myself and others by visualizing the deeply-seated hegemony, other problems and envisioning the possible ways through research. So, for me, shifting science education towards transformative learning is the best notion of helpful research. Thus, I have incorporated Habermas's (1972) emancipatory interest and Stetsenko's (2017) TAS as a referent for viewing the hegemonic cultures grounded in my teaching and learning journey from different angles and enriching inclusive science education. I feel that such transformative notions-based research assists in bringing back my hope from hopelessness.

I tried to unfold the key insights that I perceived from my academic worlds (as a science teacher, headteacher, and science teacher educator) and lifeworlds by keeping the issues of science teaching and learning at the center and envisaged transformative cultures of my organization after a decade. While doing so, I portrayed my grandfather's transformative beliefs and actions like collaboration with MKO and people of the society, cooperation, scaffolding, self-reflection, contextualization, and so on by excavating my enrich inclusive cultural lifeworlds. Thus, I realized that we

could connect science teaching-learning with our cultural lifeworlds for enriching transformative learning.

I used the Hindu trinity - Lord Brahma, Lord Vishnu, and Lord Shiva as the metaphors for nurturing the inclusive science educational culture; maintaining, preserving, and practicing core values and practices for sustaining and keeping the culture alive; and destructing or minimizing the fewer relevance practices manifested in my organization (typically, science teacher education program) respectively. My transformative visions, missions, and values were guided by these Lord Brahma, Lord Vishnu, and Lord Shiva principles (see chapter VI). I am inclined to believe that such a transformative knowing, being, and doing in science teacher education could enhance the quality of science education by fostering inclusive science education and preparing socially responsible citizens by enriching an empathetic science learning milieu. According to Habermas (1972), the task of critical-oriented sciences incorporates emancipatory interest. Self-reflection and relationships have a crucial role in emancipation that helps to change society (Taylor, 2008). I also felt that we need to be critical reflective practitioners for shifting from analytical knowing-dominated science teaching culture to critical knowing guided science teaching culture for counteracting the hegemonic beliefs and actions embedded in science teaching and learning.

Reflection in Action: Demystify My Present Position

As an autoethnographar, I try to demystify my present standpoint. I deeply engaged in the research work for around a year in my research journey. I critically reflected on some critical incidents I experienced in my learning, teaching, and administrative journey by acting as a critical reflective practitioner. The principal purpose of this research was to counteract the hegemonic pedagogical culture, thereby

envisioning an inclusive science teacher education. This purpose in/directly connected with me as well as my organizational culture for improving and transforming my hegemonic pedagogical culture.

Although it is difficult to display the drastic change in my professional culture, I realize the positive influence of my STEAM education and transformative notions guided research in my science teaching-learning cultures, beliefs, values, assumptions, and actions. It makes me aware of becoming a transformative-minded science teacher educator for preparing them socially responsible citizens. Thus, I have been emphasizing transformative knowing, being for shifting my taken-for-granted assumptions, dogmatic beliefs, values, and actions. For instance, I focus on enriching inquiry-based learning, teacher-teacher (inter and transdisciplinary), teacher-students and student-student collaboration, scaffolding, communication, creativity (like designing 3D models, charts, improvised materials, STEAM-based projects), critical reflection, participating in research-based workshops, STEAM approach integrated webinars and so on.

I am inclined to believe that the good combination of minds-on, hearts-on, and hands-on in my science pedagogical cultures might help to counteract the domination of compartmentalization in science knowledge, skills, and ideology embedded in my professional practice. Further, I realized to be conscious of individual, local and global perspectives for transforming my knowledge consumption dominated professional approach to knowledge construction guided science teaching culture for an authentic, inclusive and meaningful learning. It could help to develop the higher-order thinking skills of my learners. So, I have been trying to act as a *change agent/or social activist* for preparing socially responsible citizens.

Reflection for Action: Demystify My Future Way

In my transformative journey of MPhil in STEAM education, I am learning that transformative learning is necessary for science education for authentic, inclusive, and meaningful learning. It could develop 21st-century skills like collaboration, critical thinking, communication, and creativity. In doing so, we could incorporate the trans-disciplinary STEAM approach in the process of designing and implementing a science curriculum. Moreover, from this research inquiry, I also perceived that we need to be conscious in education in emergency sensitized science education for continuing the teaching-learning with assuring social justice in tricky timing like a pandemic, political conflict, disaster, etc. I will continue the transformative research work and teaching-learning activities in science education to extend my knowledge and skills.

While critically reflecting on my lifeworlds, I realized that I grew up in an enriched cultural setting, having various transformative practices. However, as a learner, science teacher, headteacher, and science teacher educator, I realized that my science learning and teaching was less conscious of connecting the academic worlds with enriching cultural lifeworlds. In this context, I will be focusing on the quality of education. Thus, I will make a shift towards inclusive science educational practice. I will be counteracting my cultural reproduction-dominated disempowering beliefs and actions for enriching cultural reconstruction in science teacher education. I will focus on enriching communication in my science classroom by creating an empathetic learning milieu for emancipation. Therefore, I also felt that transformative research and teaching-learning are more relevant in our science academia for developing higher-order thinking. So, I will conduct transformative notions-based research and encourage my masters' degree students to incorporate this notion in their thesis. I

believe that it could help me become a lifelong learner by excavating the deeply grounded hegemonic cultures in our science teaching and learning.

Conclusion

I have incorporated the transformative theoretical lenses to zoom in and zoom out the historical, socio-cultural, and political aspects of my science teaching, learning, and administrative journey for pondering the deep-seated hegemonic pedagogical cultures due to the in/direct influence of my taken-for-granted assumptions, dogmatic beliefs, and values as well as rigor structures like policy, curriculum, pedagogy, assessment, administrator and institution. The knowledge-constitutive interest theory (typically, emancipatory interest) of Habermas (1972) acknowledges constructing the knowledge as being together because knowledge instead exists somehow separate from the people. Similarly, Transformative Activist Stance (Stetsenko, 2017) also focuses to counteract compartmentalization by restructuring a broad dialectical view in human development. So, in my understanding, both theoretical stances of my research inquiry advocate interconnectedness, inclusiveness, and critical self-reflection for transformation. As a researcher and research participant, I attempt to connect my past, present, and future knowing, being, and doing cultures of science teaching and learning by actively engaging in reflection on action, reflection in action, and reflection for action.

My STEAM educational journey greatly supported changing my epistemology and ontology of science teaching-learning. For me, science teaching and learning as a *circular process*. Thus, I try to be a critically reflective practitioner in my research and present science teaching-learning for transforming myself and my organizational cultures. I slowly feel the change in my professional practice. To develop socially responsible citizens and create multiple futures, I also realize

developing and implementing emergency sensitized curriculum, pedagogy, and assessment to counter the domination of *one-size-fits-all cultures and enrich* inclusive science education for emancipation. In doing so, we could incorporate the curriculum integration approach (like STEAM approach) and transformational OBE notions in my organization's visions, missions, and values that might incorporate the real-life themes in the science curriculum and help to create an empathetic science learning milieu.

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APPENDIX-1

A. **Topic: -** Let's Make Our Favorite Soap at Home!

B. **Learning Outcomes: -** To develop entrepreneur skills of learners by engaging in conceptual, theoretical, and practical soap-making activities.

C. **Duration: -** 3 days

D. **Materials Required: -** 200ml water, 500ml olive oil, 100gm coconut oil, stick blender, heat, mixing bowls, spoons, molds, glasses, mask, gloves, newspaper, weighing machine, litmus paper

E. **Additional materials: -** Colors, medicinal plants, fruits, flowers (locally available), pictures, related videos.

F. **Design Thinking Based Activities**

1. Empathizing

- The learners realize their soap-related problems such as molecular structure, soap preparation, cleaning action.
- Deep interviewing and gathering information.

2. Defining

Understanding the learners' needs and defining the basic concept such as definition, saponification, cleaning action, basic nature, advantage and disadvantage of soap for developing the entrepreneur skills.

3. Ideate

- Students will be divided into different groups for engaging them in brainstorming activities (related video and photo montage) that can extend their understanding of soap.

- They can incorporate the STEAM approach while developing the possible solutions and ideas for fostering the learners' entrepreneurial skills.
- The teacher can provide feedback**.**

4. Prototyping

- Promote to connect the new ideas with prior ideas while engaging in soap-making activities (related video); test an acidic or basic nature of soap; and design various shapes, sizes, and flavor soaps artistically by using local medicinal plants and colors.
- Label an appropriate price of soaps.
- Focus on the "think-pair-share" approach that motivates the learners to critically reflect on their solutions.
- Sketch up the final way for fostering their entrepreneur skills by designing soap.

5. Testing.

- The last two sessions of the unit will be devoted to testing, refinement, and presentation.
- At first, give an opportunity for students to recognize if they need to refine their projects.
- At the end of each day, a teacher will ask students to share with other colleagues how have refined their projects and reflect on what they want to do moving forward.
- The final session will be a presentation of student work to other students.

A. Assessment Process

We can incorporate a continuous assessment system for assessing the learners' developmental aspects. As doing so,

- The learners need to construct a concept map by reflecting on their soap project.
- The teacher can critically observe their active engagement, collaboration, creativity, and communication skills and ask how, why, who related questions for assessing their conceptual and ethical understanding.

F. **STEAM Components**

- **Science-** Incorporate various concepts, theories in the process of designing and implementing the project for fostering the learners' entrepreneurial skills.
- **Technology-** Communicating the idea of homemade soap by using video and montage.
- **Engineering and mathematics-** 3D designing process and labeling an appropriate price of soaps.
- **Arts-** Designing various shapes, colors, flavors for attracting the public's attention, and enhancing the learners' creativity.

G. Future Project

To expand the soap making project in community level by focusing on entrepreneur skills and sustainable development aspects.

APPENDIX-2

Assessment Rubric

Criteria	**Outstanding (5)**	**Excellent (4)**	**Average (3)**	**Good (2)**	**Poor (1)**
I. Content Knowledge II. Learner's Performance in Animation III. Learners' Performance in Visual Arts IV. Learner's Competency in Technology. V. Learners' Active Engagement in Discussion VI. Teacher-Student Collaborative Skills. VII. Learners-Animation Artist Collaboration. VIII. Learners-Visual Artist Collaboration IX. Learners-Learners Collaboration. X. Critical Questioning					

Skills XI. Creativity XII. Following Precautions XIII. Learners' Final Reflection by Creating Poem and Narratives. XIV. Presentation Skill					

APPENDIX-3

Materials Required:

For Representing Various Shells (like K, L, M…) - Locally available colorful substances like colored soil or/ flowers or/ ropes or/ ribbon.

Neutron- Stones

Proton- Bags of students

Electrons- Boys-17 in blue color uniform and girls-11 in red color uniform but for showing negative charge around the nucleus of Chlorine and Sodium atoms.

Technical equipment- Audio, video recorder and other animation and visual arts related materials for this project; and cultural song like *deuda.*