BECOMING A STEAM-BASED SCIENCE EDUCATOR: INTERSECTING SCIENCE TEACHER IDENTITY AND EXISTING PEDAGOGICAL PRACTICE IN NEPAL

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AN ABSTRACT

of the dissertation of *Dilu Ram Parajuli* for the degree of *Master of Philosophy* in *STEAM Education*, presented at on January 27, 2023 entitled *Becoming a STEAM-Based Science Educator: Intersecting Science Teacher Identity and Existing Pedagogical Practice in Nepal.*

APPROVED BY

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Dissertation Supervisor	Dissertation Supervisor

Personal experiences and practices shape and nurture teacher beliefs about science classrooms. It has been demonstrated that their understanding of their actions depends heavily on the experience of identification. It has impacted their instructional strategies and provides a solid foundation for their learning endeavor (Kelchtermans, 2005). Science teachers frequently face their professional identities in multiple ways of action in the classroom. Thus, this study illustrations my identity construction process to intersect present Nepali pedagogical activities and the identity of science teachers. However, science teachers face many challenges in their careers and changing identities.

This study is a critical autoethnographic research based on the self-inquiry process. Hence, I generated initial research questions based on my critical reflection upon different contexts, i.e. primary, secondary, and higher levels' science learning/teaching scenario (*as a learner*), experience in science classroom practices/ crease (*as a science teacher*), and engagement with STEAM education course (*as a STEAM learner*) as well as my professional experiences working at a Nepali university as a science educator. The overall study of research is a reflective journey between 2001 and 2020 because I choose this timeline to express my multiple perceptions in science teaching and learning. Through a critical autobiographical inquiry of my lived experiences of disengaged science education, three emergent research questions form the basis for this study; (1) In what ways does my practice of reflection (my self-examination, self-reflection, and learning process) affect my own

professional identities? (2) How did I prepare myself as a STEAM teacher/ educator and progress in my M.Phil. journey? (3) Why did I transform from a conventional science educator to a STEAM educator through a critical reflective lens?

In this study, I used a picture of science teacher identity construction, like Beauchamp and Thomas (2006) thought, to examine the teachers' identity development concerning my classroom roles and responsibilities, the way I feel about and describe myself as a professional identity, and my beliefs and classroom practices. It is a critical autoethnographic (CAE) design, I try to explore my (I am as a participant) world, lived experiences, feelings, and my perspective/narration through reflective writing. Then multiple genres are developed probing by these thoughts, values, prejudices, perceptions, views, feelings, and perspectives. Thus, this critical autoethnographic inquiry aimed at capturing my lived experiences of my identity and practice through envisioning of transformative vision of STEAM education. It is a multi-paradigmatic research design space and employs interpretivism, criticism, and postmodernism, as a 'tripod of my inquiry.' And, it is mostly guided by constructivism, critical, and transformative theory.

Moreover, in this study, I include four main sections in the form of chapters. First is my (as a student) perception of the notion of a science teacher professional. My identity is explored in addition to the view of the community of practice towards the traditional school structure with a critical comparison with job regarding societal values. The following section illustrates my changing identity as a STEAM-based educator to respond to the research question of how I prepared myself as a STEAM teacher/ educator and progressed in my M.Phil. journey. The final section incorporates the synopsis, transformation, and praxis. It also presents why I transformed into a STEAM- educator through a critical autobiographical lens and reflection of my experiences. The overall reflection of this journey, future direction, and implications of this study are presented in the epilogue as a poem. Three research questions of my study and reflective themes are connected in multiple ways in different chapters so combinationation of four chapters (IV, V, VI, and VII) envisioning leads my transformation.

…… January 27, 2023

Dilu Ram Parajuli

Degree Candidate

This dissertation entitled *Becoming a STEAM-Based Science Educator: Intersecting Science Teacher Identity and Existing Pedagogical Practice in Nepal* presened by *Dilu Ram Parajuli* on January 27, 2023

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

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DECLARATION

I hereby certify that I worked solely on this dissertation on my own. It is being submitted for the degree of Master of Philosophy in STEAM Education. It has not been submitted elsewhere for another degree.

…..…… January 27, 2023

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DEDICATION

This dissertation is dedicated:

To my father and mother
The people who gave up their time and resources to ensure that I received a top-notch education, inspired a lifelong love of learning in me.
“For one who has conquered the mind, the mind is best friends; but for one who has failed to do so, the mind will remain the greatest enemy.”
-Bhagavad Gita (6.6)

Explore, critique, conquer , and change on own existing deep-rooted beliefs (mind); it will lead to transformation.

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Dilu Ram Parajuli
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ABBREVIATIONS

4C's	Collaboration, Communication, Critical thinking, and Creativity
BEd	Bachelor's in Education
CAE	Critical Autoethnography
EDSP	Ethical Dilemma Story Pedagogy
ICT	Information and Communication Technology
KUSOED	Kathmandu University School of Education
MPhil	Master of Philosophy
MDS	Multi-paradigmatic Design Space
MEd	Master's in Education
NASA	National Assessment of Student Achievement
NCF	National Curriculum Framework
PhD	Doctor of Philosophy
PSC	Public Service Commission
SEE	Secondary Education Examination
SLC	School Leaving Certificate
STEAM	Science, Technology, Engineering, Arts, and Mathematics
STEM	Science, Technology, Engineering, and Mathematics
TAS	Transformative Activist Stance
TIMSS	Trends in International Mathematics and Science Study
TPD	Teacher Professional Development
UNESCO	United Nations Educational, Scientific and Cultural Organization

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PROLOGUE
BEFORE OPENING THE DOOR TO WRITING

"Self-inquiry is the process and the goal also. 'I am' is the goal and the final reality. To hold to it with effort is self-inquiry. When spontaneous and natural, it is realization". -Ramana Maharshi

Before introducing the study, I want to explain why I intend to be open and honest with my reader. Even before I studied at Kathmandu University, I attended various formal schools and another university; despite years of formal public schooling and a university degree, there was something in my brain about writing. Simply it was copying of book content, poem, story, etc. I was not comfortable with it. Even as a science student, I understood writing as a copy of a symbol and a book's content. Although I was familiar with the course material's components, I did not understand the importance of writing in different sense. When I joined Kathmandu University, my professor always used the sentence " *writing is an inquiry*". It motivated me a lot to connect writing with research as part of the inquiry.

Similarly, If I were being completely honest with my reader, I would still struggle to identify the specific components of research writing. When I joined the STEAM education program at M.Phil. Level, I enjoyed reading and found myself shaping my writing style. Being a reader of my writing ideas, some of my friends motivated me, and it became a heap of fusion of my pedagogical activities and experiences. However, my writing style is controversial among my former educators and other university colleagues. Sometimes it disturbed me, but I continued writing as a part of the module's assignment and other purposes. I believed that when I wrote dense prose was in some way intellectualized task for me. It turned out to be quite the opposite. In some cases, I felt anxiety and frustration resulting from my writing style and the professor's comments. Finally, due to the support of my professors, I wondered whether it was worth expressing my thoughts and ideas through writing. Consequently, now I express a heap of my lived experience as a form of critical autoethnographic research.

My research work focused on enabling the reader to act as a silent witness in my personal transformation as I envision STEAM-based science teacher/ educator

education within daily practices and reflection during my M.Phil. course. It is a highly individualized account of how self-reflection helped me define my identity as a STEAM-based educator by revealing the process of self-transformation that is required for change. And how the teacher/educator's reflection (my self-examination, self-reflection, and learning process) affect my professional identity (identity construction and change of practices). Despite having many different and complex meanings, including those relating to identity. It has grown to be some significant issues such as people's internal systems of nationalism, group membership, and taking own positions (Schwartz, 2001; Schildkraut, 2007; Brown, 2000; Tajfel & Turner, 1986; Bamberg, 2006; Benwell & Stoke, 2006). The scholarly interest in identity is increasing day by day (Vignoles *et. al*., 2011). Hence, I also chose this issue for my inquiry to add a brick to change science teacher identity in Nepal.

While envisioning the term '*identity*', it addressed concerns the fundamental inquiry of 'who am I?' or 'who are you?' This type of inquiry might involve self-beliefs drawn from in-depth self-reflection (I am Nepali, a Hindu, a police, an officer, a teacher, a university lecturer, a science teacher, a math teacher, married, a mother, an artist, etc). It seems as a personal question (who I am?). However it might also be a reply to a question posed by someone else or some other group (e.g.," who are you?"). The personal and the social are intertwined in this situation because this domain essentially involves a more social perspective. These two dimensions may also have plural meanings, such as "who are we?" or "who are you?" In this instance, the personal and the social are intertwined. Like these arguments, the science/ teacher identity construction and changing scenarios affect the pedagogical process and society. Thus, my work was oriented toward this agenda. I think my readers also would enjoy this work.

I believe that it explains the theoretical perspective that underpins the self-exploration of my (Science teacher/ educator) construct and change (science teacher to STEAM-based educator) professional identities. Firstly, my (as a student) perception of the notion of science teacher's professional identity and then the perception of the community of practice towards the traditional school structure with critical perspectives are explored. Thirdly, how I prepared myself as a STEAM-based teacher/ educator and progressed in my M.Phil. journey and my experiences of transforming into a STEAM- educator are explained through a critical autobiographical lens. These experiences were constructed through teachers' own

knowledge and beliefs, communities of practice, professional development, individual position, and identity.

My professor mentioned about the expressive, meditative, and therapeutic benefits (Rubin 2013), of autoethnography and critical pedagogy (Freire, 1970) which always evoked me to conduct this research. Furthermore, writing this inquiry also involves contributing to a conversation, I had to remind myself. I should not, therefore, be writing this study for my experience and engagement alone. Even though the research may have been inspired by a personal experience, I am committed to advancing knowledge by identifying, pointing out, and describing one possible approach to comprehending and resolving my identity as a science teacher to a STEAM-based science teacher. And it is a small academic initiation as a movement to change the traditional perception of science teacher identity.

Moreover, in my STEAM journey, a wider perspective and deeper understanding of the nature and complexities of social research were made possible for me as I critically engaged with educational research by considering the nature of exploration and the problems they brought up. I was able to comprehend my self-practice and I started to build myself as a researcher through the way of critically analyzing my own professional identity and that of others, as well as the effects of systematic change. Through my interactions with my colleagues, professors, and the research itself, I have engaged in a journey that has cultivated new ways of thinking. I hope that through my study, science teachers would recognize the value and continuing growth of their professional development and identity construction through critical reflection.

My inquiry attempts to demonstrate the potential of science teachers can affect how other teachers perceive their own identities and strengthen the case for re-professionalizing science education. Like Day's argument, science teaching also orders to a significant individual contribution (Day *et al.,* 2006), and it was found that the identities of science teachers were related to both their professional and personal goals and values (Day, 2002; Ball, 2003; Day *et al.*, 2006). Similarly, it is a great deal of personal investment on my part, it was possible for emotional events to change my identities, attitudes, and beliefs (Sachs, 2001; Ball, 2003; Day *et al.*, 2006). Hence, looked at how teacher identity might be impacted by reform and discovered that it was challenging to maintain both my personal and professional identities. The impact of a personal experience, internal organization, and external

policy on teacher identity has been observed. My experience is similar to that of Ball's view. He highlighted the conflict between professional and personal identities (Ball, 2003).

I believed that my style of writing needed to adapt to different academicians, audiences, purposes, and contexts, so, I started looking for authors who exuded sincerity, frankness, and clarity about the transformative research work I sought. Luitel's study (2009) inspired me to pursue my writing. However, it was not sufficient to merely read and copy my writing style. I had to, too corroborate through research and lived experiences in multiple art forms.

In my opinion, this study is like a blueprint. There is an implied responsibility to explain to the reader how I became a STEAM-based educator and changed my identity. Consolidation and praxis will have the chance to apply and modify the findings from my study to their own real-world situations. And it would create a new discourse on science learning and science teacher identities. Much like a blueprint, as I keep thinking, reflecting, theorizing, and writing about my practice as a science teacher, educator, and researcher, it promotes future science teacher educators who ask themselves, "Who am I? And what is my identity and how can I change?" I offer my different periods of stories of self-inquiry. These stories point to its use of my critical autoethnography and how it helped me change my identity from a science teacher to a STEAM-based educator. Before the STEAM journey, I saw my identity (science teacher) as a positional identity. However, when I joined MPhil, it becomes conflicting with my previous thoughts.

Through critical autoethnography (CAE) I discussed the concepts that clarified my understanding of how science teacher's identity is multifaceted, layered ever-changing, and influenced by those around me. In this inquiry, I employ critical autoethnography (CAE) as a method to explore my identity and my process of self-discovery. Finally, in addition to those, I have stated a few facts with the goal of making my work as accessible as possible.

CHAPTER I
INTRODUCTION AND INITIATION OF THE RESEARCH AGENDA

This is the first chapter of my study. This chapter includes mainly three sections; they are contextual background, activation of my research agenda, and arrangement of the study. The first section includes my background, science learning scenario, engaged learning, STEAM approach, teachers' identity, and science teachers' identity and pedagogical practice. The second section especially captures the major aspect of my research, including statements of the problems, the purpose of this research, research questions, the significance (contribution) and the delimitation of the study. And the third section illustrates the overall arrangement of the inquiry together with chapter themes.

Contextual Background

The study of science subject is a compulsory requirement for all students in Nepal's schools. But most peoples' perception of science is a *hard subject*, it is related to socially value-related jobs. Large numbers of students were not achieving excellent results in this subject in School Education Examination (SEE). In this condition, I think our science was critically suffering from various problems, A majority of science teachers and students consider science a difficult, dull, and boring subject. So, there are many barriers arising in science learning besides being effective, interesting, engaging, and real-life problems based science learning.

In most parts of our country, traditional pedagogical systems are adopted in teaching and learning activities in educational institutions (where I grew up and was involved). On the other hand, our curriculum is highly structured with the aid of chalk, markers, and a blackboard/whiteboard, teachers help students understand a concept and the assessment system is just score-based quality. The mostly adopted teaching approach shows every important thing regarding the topic is written on the blackboard/whiteboard and students make important notes from the book and other sources and including regarding topics and learn by heart to secure a high grade in the documentation. Students review their notes after the lecture and attempt to memorize them. Passing the test is the main goal of this type of traditional instruction. Teaching-learning activities are not fully participatory. Our practice is less inclusive in the classroom but highly diversified. In such a condition, our existing pedagogical

practice in science cannot advocate equitable access, full participation and approval, and respect for diversity.

In our classroom environment, there are usually more than thirty children and one teacher participate in teaching-learning activities. This classroom has teacher supremacy, he or she explains content from the book and takes more time to repeat for memorizing. It is simply impossible to give each student one-on-one attention or instruction from one teacher, which may be required but not applied in our condition. So, our existing system is behaviorism dominated teacher-centered practice. This practice is unable to provide equal opportunity to all students. I also faced this condition, and it is the same now.

Incredibly, more students, as measured by the National Assessment of Student Achievement [NASA] (2013), were only able to solve less of the practical problems (15%), i. e. 5.0% in science. The science achievement levels of students in three development regions (Eastern Development Region (32%), Far-Western Development Region (32%), Mid-Western Development Region (34%)) are also significantly lower than those of the Kathmandu Valley (56%). It shows the practicability of science learning in our school context.

Furthermore, in the case of science subject, the outcome demonstrates that the students are proficient in identifying the right response as well as in concepts that are very basic, like selecting facts and numbers and writing definitions. In terms of logic, problem-solving, establishing the truth of the statement, and creating the figures, they are much weaker. Many a time, the open-ended questions received no effort from the students, which resulted in a low score (NASA, 2013). It means our result shows that the Science learning scenario focused on the ‘definitional approach’, which provides the categorized and readymade definition with strict rote learning. And a high score secured by student also focused on parroting rather than being engaged in learning. In this case, it shows that science learning was highly disengaged.

Poudel (2017) claims that when comparing the mathematics and science achievement scores with the results of an international assessment, it becomes clear that both subjects' achievements fall short of the global average. Comparatively, the potential for learning of students has been adversely impacted by Nepalese schools. Thus, we need to promote higher cognitive ability and improve reading ability, balance instructional activities, and manage diversities including linguistic, cultural,

socio-economic, and gender by developing an inclusive and child-friendly (school and classroom) environment, reorganizing and revising teacher preparation and teacher development strategies. NASA, (2013) result analysis and Poudel's (2017) arguments also show that our classroom scenario exists in disengaged learning. Hence, this study also explores and reveals my activities in less active classroom practice.

My Understanding and Experiences in Science Learning

At the beginning of my school life, a large number of dilemmas developed in my mind due to the teachers' remarks such as 'He has no concept of science,' He is dull, He has no brain, etc." in science classroom during the period of teaching-learning activities and it stamped bad images in my mind. Such blame of the science teacher highly hurt me and some questions arose in my mind, i.e. why did the teacher always say this? Do we (I) have no concept? What is the concept? Is rote learning capacity a concept? Why is Science a hard subject?, etc. In detail, I have mentioned this in chapter IV.

Those questions struck my mind day by day. Similarly, in the study of intermediates and Bachelor's levels, the teachers used this term 'try to understand the concept,' and 'develop concept,' but nobody says 'How to develop it?'. So, this term 'concept' bothered me and it hiddenly sucked me every time. When I joined my MPhil in STEAM education, my professor created an open discussion about critical reflection as a learning approach. Then I tried to familiarize myself with this term and started opening the door to continuously search for the answers to my previous questions. After that time, I studied relevant literature on critical reflection, critical pedagogy, transformative learning, the STEAM approach, etc. Critically, they created my curiosity about existing pedagogical practices and I tried to understand their meaning, theoretical background, use, effectiveness, and interrelationship. In the starting days, I thought it to be a simple process and it gradually increased my deep understanding. I decided to write my autoethnography incorporating my critical reflection. Then I thought it could deal with active learning, STEAM-based thought, and transformational learning. Consequently, I started to critique our existing pedagogical practices.

In the present time, various methods were developed to facilitate science learning. The value of advancing science education has been a main topic of research in this field and it is based on pedagogical methods, pedagogical activities for the next generation, future approaches, and sustainable development. These thoughts show that

the pedagogical paradigm is shifting in science education with different teaching/learning methods such as lecture method, hands-on activities method, problem-solving method, cooperative method, collaborative method, project- based learning method, peer-led team learning, flipped learning, teaching science through STEM, STEAM approach, etc.

Beyond this, the traditional concept (which is rooted in my context) is used to only develop the concept of learner and design with interlinking to the concept. But now I believed that it can be used in different ways, such as designs of activities (collaboration), open-ended activities that allow students to construct their ideas, fostering design thinking, dialogue creating, sharing (communication), writing a story, and many more (artistic literature). Similarly, different kinds of transformative learning-based approaches (EDSP, arts-based learning, STEAM-based) were first introduced to schools in Australia over a decade ago (Settelmaier, 2009).

The condition of our practice is seen as classical only, it does not focus on creativity rather than rote learning, and it can evoke lower-order thinking of Bloom's taxonomy only (remembering, understanding and applying) rather than higher-order thinking (analyzing, evaluating, and creating) (Anderson & Krathwohl, 2001), critical thinking, and critical reflection. In transformative science learning, the reflection process is focused rather than on deductive reasoning or moral judgment (Taylor & Taylor, 2018), and the side STEAM pedagogy is based on the philosophy of transformative learning, which can interconnect different ways of coming to know i.e., cultural-self knowing (self-realization), relational knowing, critical knowing, visionary and ethical knowing and knowing in action (Taylor, 2015).

When I joined M.Phil. in STEAM education, I got an opportunity to review my learning background and I feel that the existing practice of science learning is limited to us (me) in the recalling of a certain topic and it motivates us (me) to secure high scores. During the engagement with this course, I gradually changed my perception and included multi-disciplinary thought (diverse ideas and relating several ideas, activities, actions, practical activities, etc.) in a science learning scenario. Furthermore, the existing science learning process encourages learners to the development of knowledge, skill, and creativity but it does not talk about the learners' engagement to enhance their classroom activities through critical reflection /critical self-awareness, and emotional and affective aspects.

My context is a mirror of many diversities in caste, religion, culture, and others basis. Our classroom scenario is seen as multicultural, multilingual, and multiethnic. In this context, science-related knowledge, skill, and ability are scattered in our diverse society, but existing practices make fewer learners engage in science learning. It is important to successfully engage in learning science for sustainability. The transformative pedagogical perspective focuses on engaged learning, active participation, self-reflection, critical thinking, social learning, emotional learning, and real problem-solving. Hence, as a novice researcher, I tried to relate critical reflection in the science classroom practice and science teacher identity.

Engaged Learning and Science Classroom Activities

Engaged learning is a modern concept of active learning, where students engage with active participation in their learning process. It focuses on teach less, and learn more to engage students in order to prepare them for better life. The term 'engaged learning' is associated with active and meaningful learning grounded in constructivist orientations. It aims to influence our students' affective and cognitive domains and engaged both. In such kind of learning, learners actively participate in thinking and learning activities and then create new ideas from their experience and meaning-making through interactions with peers and teachers.

Furthermore, the word “engagement” has been interpreted in a different way but defining what student engagement really means is difficult. However, it has been interpreted as enjoyment and interest, as well as a driving force of science learning and a potential strategy for doing so in the future (Godec et al. 2018) and it has been applied to students' active engagement and level of engagement in science-related activities. In the contextual background of the study, I already mentioned that in the situation, we adopted teaching more content-based and teacher-centered pedagogy, which neglected engaged learning.

Both teachers and students have always found it difficult to facilitate the engaged learning process (taught and learned) in science education. On other hand, it may seem difficult for students to comprehend scientific inquiry, content, and processed skills because they require a construction process that is time-consuming, complex, and looping rather than straight forward (Hadzigeorgiou & Schulz,2019). As a result, it has been difficult to get students interested in science learning. Critically, how to engage learners in science learning in our context has always been a challenging and pressing issue.

It is not an effort of the learners' minds; however, it is an understanding of real-life problems and context. Lave and Wenger (1991) claim that the related idea of situated cognition can be used to explain engaged or meaningful learning, it is a participatory interaction of situations i.e. Learning often happens in a social environment, community, and context and not just in an individual mind. An analysis of this perspective depicts that our pedagogical approaches are driven through disengaged learning but this study critiques disengaged learning beyond creating active participation, interaction and collaboration, dialogic situation, appropriation, and socialization (Maturana & Verala, 1987).

The main goal of engaged learning is making learning experiences authentic beyond the mechanistic worldview of science learning. Furthermore, engaging learning is related to authentic activities which empower self-regulated learning and inspires to reflectively. Even though it is a complex one but engages based on students' interests and different factors like personal identity, maturity, the goal of learning science, and students' awareness, etc. (Hadzigeorgiou & Schulz, 2019).

In conclusion, for the authentic engagement of the students in science learning, it must convey both the potential for this content to promote the use of classroom learning in "free-choice" settings and an understanding of its worth in terms of its contribution to the enrichment of life experiences (Pugh, 2011; Pugh et al., 2017). Hadzigeorgiou, (2016) argues it is important to acknowledge that this is a pedagogical possibility; consequently, a learning experience with these qualities might be deemed ideal, which it is in various ways.

Teaching/Learning Science through STEAM Approach

STEAM (science, technology, engineering, arts, and mathematics) education is a multidisciplinary educational thought and the the STEAM approach is engaging in experimental learning practices, the STEAM approach encourages dialogue and critical thought to find solutions to issues in the real world rather than make-believe ones and to adopt teamwork techniques for creative projects (Hamdan, 2020). It is an approach that is developed after the integration of arts in STEM. Initially, it was introduced by Georgette Yakman (Singh, 2021).

According to STEAM Community (2018), it has mainly focused on preparing future innovators for the real world in the twenty-first century. In the STEAM approach, 'art' is kept at the center point because an opportunity for unrestricted, free innovation is provided by art-based activities, which is a crucial

prerequisite for studying interdisciplinary subjects such as science, technology, engineering, and mathematics(STEM) (Keane & Keane, 2016). There are different ways of reforming science education, indeed, the STEAM approach is seen as a recent pedagogical thought. Several studies show that the STEAM approach has been used in reforming science education within its' different components, such as teacher professional development programs and in the curriculum development process (Hamdan, 2020; DeJarnette, 2018; Herro et al., 2018; Keane & Keane 2016). It is an approach that is based on transformative science learning scenarios.

To encourage the learner's productive engagement in topics and issues related to science learning and academic fields that are closely related, the concept of STEAM education has been put forth to mathematics and science curricula (Stroud & Baines, 2019). The STEAM approach focuses on the interconnection of different ways of (coming to) knowing i.e., cultural-self knowing (self-realization), relational knowing, critical knowing, visionary and ethical knowing, and knowing in action (Taylor, 2015). The analysis of the term "interconnection" has kept significant meaning in the learning process, which may be fulfilled by artistic work. It means that art helps to link divergent ideas and thinking levels in science learning.
To challenging the conventional approaches of rote memorization and passive learning, it helps students better understand [T] [t] theories and internalize learning styles and ideas. When we create the proper learner engagement situation in the classroom, it develops twenty-first-century skills (4C's – collaboration, communication, critical thinking, and creativity).

Moreover, in the present time, we could design some technology-based artistic works to encourage self-evaluation and aiding in self-mastery as a result (MacNeil, 2007), self-regulation, and self-efficacy (Chularut & DeBacker, 2004). When we integrate multi-dimensional learning efficacy, it might be used as a transformative approach. While learners are engaged with this approach, they can open their multiple ways of thinking and connect their experiences to solve their real-life problems. STEAM is an integrated and interdisciplinary approach it motivates students to reflect critically and broadly on issues in the real world (Panta et al., 2020).

In my inquiry, I believe that the STEAM approach in science classrooms compared with transformative approach and it leads to changing my own identity. Because the STEAM approach is seen as a *holistic, interconnected, creative, design thinking promoting, and arts-based self-evaluative* approach through the lenses of

transformative learning and exploring the learner engagement with it. It may benefit students in a number of ways, including by allowing them to better understand their own thought processes, helping them to create more effective learning strategies, and encouraging reflective thought, particularly in peer- and in-group learning situations (Hodson,1998).

Teacher's Identity

Identity describes how people behave. Both an internal and external phenomenon has been used to describe it. Cote and Levine (2014) argued that it can be explained in many different ways. According to the sociological perspective, identity is a result of external social, political, economic, and other forces, whereas from the psychological perspective, it is the self's internal , individual, and willful potentials. Similarly, language and experience are crucial components in the creation of identity, which is connected to social interactions (Mead, 1934) and over time, it builds up (Colley 1902 cited in Day *et al*., 2006). It seems that identity is concerned with social influences (society) personality (mind), interpersonal skill (self), and social structure (society) (Mead, 1934). Hence, Identity is not individual work, it is created as a result of the self's interaction with the social environment, and both individual and social context play a role (Arvaja, 2016).

In my study, teacher/ science teacher identity took as a perspective of professional identity. It consists of a number of qualities that are externally assigned and are used to distinguish one group from another. Schneider and Sachs (2017) and Sachs (2001) argue that it offers a group of common characteristics, values, and other factors and allow for the separation of groups. And, teachers' professional identities are rich and complex, just like those of other professions (Wenger 1998).

Evans (2011) identified three elements of teacher professionalism are behavioral professionalism, attitudinal professionalism, and intellectual professionalism. The first is related to what teachers do, the second is related to their drive and job satisfaction, and the third is related to their expertise and comprehension. The combination of these three components constructs the science/teacher's identity. Furthermore, it refers to one's sense of *self*, which affects how one presents themselves and behaves in a teaching environment (Avraamidou, 2014). But the development process of a teacher's identity is intricate, and different life experiences have a direct impact on how that identity develops supplimentary (Kier & Lee, 2017; Hancock & Gallard, 2004).

In the review of teacher identity, literature is not exclusively found. They show different thoughts as retrospective and prospective identities (Bernstein 1996 as cited in Sachs, 2001), entrepreneurial identity and activist identity (Beane & Apple 1995), positional identity (Holland et al., 1998), and discursive identity (Brown, 2004; Gee, 2000). Retrospective identities are used as sources for historical narratives that serve as models and standards for the present and the future. As an alternative, prospective identities are essentially future-focused (Bernstein, 1996). He contends that prospective identities alter the foundations of social recognition and connection.

Similarly, entrepreneurial identities have elements of individualism, competition, control, and regulation, whereas activist identities that emerge from democratic discourses have emancipatory goals that are crystal clear ((Beane & Apple 1995). And, positional identity is ‘‘a sense of relative social position’’ (Holland et al., 1998, p. 132) within particular contexts. They argue that it appears as the regular, concrete, and ground-level relationships between social interaction and structures in the real world, and connection of power, deference, entitlement, social affiliation. In another hand, the sociocultural and linguistic components that a person interacts with and is known for in any given context influence the discursive identity (Brown, 2004; Gee, 2000).

When considering one's professional identity, Wenger (1998) identified five dimensions of identity. In addition to addressing the social, cultural, and political facets of identity construction, these five dimensions of identity represent a revised understanding of the professional identity of science teachers. He argues that identity and practice are profoundly intertwined.In teacher identity development, Beijaard and Meijer (2017) argue that it is an ongoing process of reinterpreting who one believes oneself to be and what one wants to become.

Similarly, it also develops in a variety of contexts, including society, culture, politics, and history; like Rodgers and Scott's (2008) model and constructed by sociocultural contexts and personal narratives (Manrique et al., 2015). Therefore, the identity of a teacher is always shaped by a variety of factors, including our position, how we see ourselves and others, and how people relate to one another. It implies that construction of identity is flexible and dynamic; it is built and then rebuilt over time as a consequent of interactions with different context and people.

Science Teacher Identity

Gee (2000) mentions that the teacher identity can be conceptualized and described in various ways and it is an valuable construct in educational research. Like his argument, science teacher's identity is also a useful workout in our educational research because it focused on the fundamental to someone's belief, values, and status of a science teacher (Carlone & Johnson, 2007; Helms, 1998; Kier & Lee, 2017). It is a combination of the personal dimension of identity (Appleton & Kindt, 2002; Shanahan, 2009) and the social dimension of identity (Avraamidou, 2014; Carrier et al., 2017).

Personal interests and traits such as beliefs, and conscious or unconscious choices in active engagement with science are related to the personal dimension of identity (Appleton & Kindt, 2002; Avraamidou, 2014; Helms, 1998; Shanahan, 2009). Additionally, the social component of identity is shaped and negotiated through contextual interactions (Avraamidou, 2014; Carrier et al., 2017). Hence, it appears that one's self identiy contains multiple aspects such as bad, good, better, best, traditional, reformative, and transformative teacher or educator. It depends on their values about teaching methods, what matters to them, and their level of self-efficacy and confidence. Also, their ability to teach science (on a personal level), and their interaction with other people in the context of those values are shaped the science teacher's identity. Like this argument, in this study, my concern is also related to how I reshape my personal and social dimension of identity as part of the wider culture of a school, and interaction with administrators, students, teachers, parents, and society. However, the identity of a science teacher cannot be seen as a rest thing in an era of rapid change in the science teaching-learning process. According to Kondo (1990), "it is negotiated, open, shifting, ambiguous, the result of culturally available meanings and the open-ended power-laden enactment of those meanings in everyday situations" (p. 24).

In the case of science teachers, identity is influenced by their own experiences both the internal and external context of the classroom, as well as the teacher's beliefs and values. Hence, the professional identity of science teachers is not simple in our context. It would be equivocating on the meaning of identity that has been put forth by the educational system, organizational structure and individual beliefs, and these will fluctuate depending on the needs and circumstances of the individual and the

context. While reviewing our system, science teachers' identities can be seen by levels, such as primary, lower secondary, and secondary science teachers.

In conclusion, in my study, the science teacher's identity is very much closer to positional identity and discursive identity. Which are influenced by the language and sociocultural factors that a person interacts with—are closely related. Science teachers bring their identities as people who are continually negotiated, socially positioned, limited by their gender, race, and ethnicity, and morally anchored to their teaching and professional development (Bianchini et al., 2000). It means that this study is concerned with position-based identity, which operationally depends on relative positionings of the science teachers occupy in multiple ways (appointment position, subject, more valuable job), and allows individuals to acquire knowledge of science subject matter and pedagogical skill using unique ways. Finally, in our context of science teacher professionalism, their identities are not "just a matter internal to that practice but also a matter of our position and the position of our communities within broader social structures" (Wenger, 1998, p. 148).

Science Teacher Identity and Pedagogical Practice

Sociocultural, institutional, and pedagogical factors must be a consideration when studying the development of science teachers' identities. The different works of literature talk about the development of teacher identity through classroom activities, identity construction through critical pedagogical actions (Bartolomé, 2004; Menard-Warwick, 2008; Talmy, 2010; Zacharias, 2010), and teachers' knowledge of pedagogy (Motlhaka, 2015; Saengboon, 2013). Through this, their identities are fostered by the science teacher, and this has both positively and negatively influenced how they teach. Addtionally, Kaya and Dikilitaş (2019) argue that teacher identity is formed through perspectives from the behaviorist, cognitivist, and socio-constructivist schools of thought. It means that the science teacher transitioned from a behaviorist to a socio-constructivist identity, it follows that the science classroom activities are crucial to the construction of own's personal identity. It is also constructed by addressing learners' needs by self-regulating thoughts about pedagogical practices (Golombek & Klager, 2015).

The fundamental ideas that one has regarding teaching and being a teacher serve as the foundation for his/her identity as a science teacher. Derived from the experience in both personal and professional contexts, it is constantly evolving and changing (Grier & Johnston, 2009). Hence, a particular pedagogical practice or

implementing a new instructional model implied in a science classroom affects science teachers' identities. Furthermore, the science teacher's identity and their identity development are influenced by a particular context (school environment and classroom practices) and community of profesionals (Freedman & Applement, 2008; Basu et al., 2009). Also, science teachers' identities construct with their beliefs, values, and practices that are influenced by their participation, dedication, and behavior in the both internal and external settings of the classroom (Cohen, 2008).

Additionally, Eick and Reed (2002), Rex and Nelson (2004), and Proweller and Mitchener (2004) assert that teacher/educator's identity is influenced by their past experiences, which in turn influences their pedagogical decisions. Thus, this study also illustrates my past experiences, which shaped my identities in different periods and they affected by my experiences of pedagogical practices. My evolving science teacher's identity is related to my classroom roles and responsibilities and particular student-centered teaching/learning methods as well as classroom behaviors.

Moreover the pedagogical shift, cross-cultural awareness, difficulties, objectives, and expectations all have an effect on science teachers' identities. Werbińska (2017) claims that it is closely related to classroom activities and learning environments; some teachers even reveal their own identities along with job promotions. In sum, in our (my) context, science teacher identity is constructed by factors such as exam-result-based, self-positioning and promotion, political power, ethics and income, caring-for-other (students), pedagogical practice, and making a difference. However, the first three (exam-result-based, self-positioning and promotion, political power, ethics, and income) are dominating factors.

Critically, the condition of science teacher identity represents the social justice and values of teachers and educators. Through the critical pedagogy perspective identity shows power relations in every aspect of science teachers for example to the curriculum development process, policymakers, and the ability in order to provide social justice and equity in schools. It needs to transform both teachers and students into '*a change agents'*; however, in our existing condition, it calls science teachers' identities toward the pedagogical perspective, content knowledge, students' result (pass or fail condition, income sources, and so-called experts' recommended techniques are ineffective. It cannot effectively advocates the present needs of science teacher identity and bridge the gap between pedagogical theory and practice. Thus, I

take *two holes* (identity of science teacher and existing pedagogical practice) of science learning as my research agenda.

Enunciation of My Research Agenda

This study presents my lived experiences of the professional and learning worlds by connecting them to pedagogical practice and teacher identity. It stems from my lived experiences and hidden stories representing the science classroom practice, school culture, and socio-educational contexts. This inquiry consists of my lived experience, stories from my academic journey, professional engagement, and transformation in my action to empower engaged learning in science classrooms through the STEAM approach as well as to increase voice for reshaping science teachers' identity in Nepal.

This study illustrates how I change my beliefs about science teacher identity by becoming a new STEAM-based science teacher/ educator in terms of intersecting existing beliefs on identity and pedagogical practices in Nepal. I reviewed this context through critical lenses and shared its potential to have an impact on the professional status, identity, and practice of science teachers. The study had two main agenda: Firstly, it is to critique the existing disengaged learning scenarios in the science teaching and learning process. Secondly, I consider the extent to which science teachers' professional identity could have an impact on the process of engaging and how my experiences of pedagogical practices affect the construct of my identity, reshaping and transforming together.

Through the restructuring of the curriculum by the National Curriculum Framework (NCF) 2076 (2019 A.D.), the implementation of the science curriculum was intended to result in a new method of teaching and learning science.
More learner-centered and hands-on activity-based instruction was to be provided to students, and teachers were urged. Theoretically, NCF mentions that reforming pedagogical practices in science learning was developed based on real-life problems and it connects with the globalization of values of learners' interests and ideas (NCF, 2019). Practically, It seems like there has been slow and sporadic progress made toward achieving these and other objectives.

On the other hand, implementing the NCF-recommended teaching strategies is needs to be done better by science teachers. Moreover, students may have been given less time to engage in active learning and activity-based learning because it was suspected that mental and physical activities are still restricted. Like Prophet and

Rowell (1993) argue the dissemination of content (transmission of content) continues to occupy a substantial amount of time and effort in science teachers. Contrary to what the NCF supports, the current teaching approach is consistent with the transmission-based approach of learning and teaching such as;

In January- February 2020, I visited the three schools of the Kathmandu district as an external and internal supervisor of teaching practice students i.e., student-teacher (Bachelor's level Science Education). At that time, I was engaged in the field/ school (three times in 45 days duration) and directly observed the science classroom activities of these four schools (both student-teacher and professional teacher). During the observation time, I found that a large number of learners were not interested and not focused on science learning. Then, in one school, I discussed this with student-teachers, a professional science teacher, and class ten students about this problem on the spot. They realized science learning activities could be more interesting and learners could be more engaged in learning activities. After the discussion, I also agree with their view. Furthermore, this problem was seen at other schools (same as the other four schools of Parbat district as well, which I visited after that observation during my personal duty) and I also felt this problem in my school life ((Chapter-IV) and same now.

In contrast, science, education and science pedagogical methods have changed as a consequence of a shift in perceptions regarding the nature of science as well as learning theories and philosophical perspectives, and it becomes integrated with different fields of knowledge. It has consistently offered pedagogical and subject matter knowledge, which is thought to aid science teachers in performing their duties successfully. It mainly focused on the theoretical underpinnings of the teaching and learning skills-building process. Additionally, it taught the student how to teach, learn, and evaluate information at various times. For them to actively participate in and interact with the science classroom and the community of science teachers, little practice is typically given,to identify possible alternative skills and misconceptions, and learner engagement about science teaching.

While I put on the NCF direction, student-teacher and professional teacher's practice, science education's assumption, and my lived experiences in the same vessel, I feel there are many 'wholes' in science pedagogical practices. Hence, I started to critique this context. Consequently, the problem was generated. However, it possesses a wide range of sophisticated beliefs about science learning topics

including viewpoints concerning students and instructional techniques (Berliner, 1991; Borg, 1998, 2003; Burns, 1992; Shavelson & Stern, 1981).

On the other hand, the identity of science teacher is also a good construct in our science education research because, through the lenses of multiple perspectives it is essential for someone's belief system to include values and beliefs about science teaching and

learning, as this will affect how they are positioned as science teachers. Moreover science teacher identity, and integration of pedagogical practice and knowledge field are widespread controversies among educators. However, interest in the inquiry regarding teacher identity is growing day by day.

The teacher identity is a fusion of the two extremes (visible and invisible) domains of science teachers/educators' jobs and personal lives. The first visible aspect consists of the work that teachers do, such as, classroom activity, assessment and evaluation, learning material design, and overall pedagogical actions. On the other hand, the invisible aspect is related to more introspective phenomena like cognitive and affective sides (beliefs, expectations, or emotions). Thus, it may be more fruitful to link the exploration of pedagogical practices and science teacher identity and these two viewpoints could be combined. To do this, my study focused on science teachers' knowledge and beliefs interacting with their pedagogical performance to construct their own professional identities. Such beliefs are influenced by a teacher's past experience, classroom procedures, and sense of self (Borg, 2003).

According to Gormally (2016), teachers' beliefs about teaching and learning have an impact on how they develop their identities and by reflecting on their classroom practice. The classroom practice and their (critical) reflection on their practice facilitate their continued growth and contribute to reshaping their identity. Although through autoethnographic inquiry, this study has embraced a great deal of critical reflection of my lived experiences of science learning and teaching, which helps to reshape my identity. Hence, it acts as a silent witness and critique of my past actions and experiences.

As a novice researcher, I have a great interest on this topic and critical reflection on my experience of many years (2001 -2020) in science learning (as a student) and science teaching (as a science teacher or educator) in school and higher education associating with science pedagogical practice and my identity as science

teacher led me to pursue my this inquiry. I have taken the time period from 2001 to 2020 as I have done this research based on my experience from primary level to MPhil engagement period.

Purpose of the Study

My study's purpose is to give an opportunity to act as a silent witness in my own transformation process as I envision a STEAM-based science teacher/ educator. It is based on my daily practices and reflection on my MPhil course. Additionally, this autoethnographic work aims to give a highly personalized account of the role that self-reflection played in
helping me define my identity as a STEAM-based science educator through self-examination and to demonstrate the self-transformation process.

As I became aware of the importance of STEAM education or STEAM-based science teacher education that exists, and more conscious of how unseen factors (inner passion as well as self-reflection) translated into practices within my classroom practices, thoughts, and identity. It is important for others started to pay focus to my own changes in personality, thought processes, and emotions, as well as how these changes affected my professional life. Thus, in this study, I want to open up a space for science teachers to realize their potential as STEAM-based science teachers or educators through the use of my voices. However, these (my voices) are focused on science classroom practices and science teacher identity.

Similarly, This study reveals my story from an inner personal viewpoint which is a collection of my experiences, dilemmas, challenges, and finally my triumphs in the deep-rooted beliefs system. I think it will be given a voice in order for those who may be in comparable circumstances to comprehend their experiences better. Furthermore, this critical inquiry is to compel the reader to consider their own narratives and lived experiences regarding the effectiveness of reflection and introspection in analyzing and altering my (own) practices.

Additionally, here I elucidated how my changing identity, how I change my identity from a science teacher or educator to a STEAM-based science educator after engaging in the reflective practice-based transdisciplinary course (STEAM - education). I was able to mature and shift from a positivist to a post-positivist (interpretivism, criticalism, and post-modernism) worldview by looking at myself critically through this autobiographical lens. It means another aim of this study is to make a milestone for qualitative research in the science education area, especially as a

transformative work. Autoethnography offers a wide range of flexibility to work within a holistic framework using a multiparadigmatic design space (MDS) (Luitel, 2009, 2012) in Nepali science education.

Similarly, this study inseminates reflective practice as a research method in science teachers/educators to lead transformative learning. Like Remler's (2000) argument, in order to improve student learning, reflective teaching entails a conscious investigation into or reevaluation of instructional practices, beliefs, decisions, or issues. As Dewey (1933) argues that teachers must act as reflective practitioners who reflect on their practices and use reflective teaching to evaluate and enhance them (as cited in Rodgers, 2002). Hence, I do it as a science teacher/ educator. I expressed my reflective opinions of different modes (student, teacher, teacher educator, and practitioner). Finally, in my opinion, the main objective of this study is to rethink about improvement of science teaching strategies and empower science teachers' identity through a potent method.

Research Question(s)

The main inquiry question is: how can I change my identity by becoming a STEAM educator in different stages of my educational journey? With the aid of this inquiry, I invite my readers to perform their self-evaluation and reflection to glimpse at the science instructors who are waiting for their thoughts or who are actually there, but are hidden or forgotten. Thus, these ensuing questions further serve to guide my study.

(1) In what ways does my practice of reflection (my self-examination, self-reflection, and learning process) affect my professional identity?

(2) How did I prepare myself as a STEAM teacher educator and progress in my M.Phil. journey?

(3) Why did I transform from a conventional science educator to a STEAM educator through a critical reflective lens?

Contribution of This Inquiry to My vision

A science teacher’s identity construction process is seen as a complex action. If I am right, this study will add to the body of knowledge and research on science (teacher) education in a various ways. Firstly, my study clarifies the procedure of how professional science teachers change their own existing beliefs and then construct professional identities or reshape his/her identity gradually. Secondly, the study may

add to intersect science teacher identity and critique existing pedagogical thoughts and practices about a teacher community's influence on forming an own professional identity. The next is investigating the connection between science teachers' beliefs, contextual conditions, classroom activities and science teachers' identity may additionally contribute to practice- related knowledge already in existence in the area of teachers' practice to reform present education status.

The findings and transformative thoughts as well as praxis potentially helpful in developing the critical reflection for science teachers regarding organisation of carrer's and the identity exploration. To be more precise, this mode of inquiry process might help to introduce changes in the science education course at the university level. Moreover, it could also spark policymakers to argue about the usefulness of professional development for science teachers as well as identity construction.

Finally, it little inseminates critical autoethnography in science education for engaging in a science teacher community of practice (teacher) actively. This could strengthen the construction of professional teachers' identities even more and develop through social values, teachers' pedagogical beliefs, and classroom experience. Hence, it seems significant in multiple perspectives, such as preexisting beliefs system, pedagogical thoughts (Kier & Lee, 2017), classroom and laboratory experiences (Settlage et al., 2009; Siry & Lara, 2012), informal contexts (Avraamidou, 2014; Katz et al., 2011) etc. and the formation of dynamic identity of science teacher identity.

Delimitation: I am a World of Science Teacher

I have discussed a few of the obvious boundaries of my work before moving on to the next section. First, it's crucial to offer my reader ways to interact with and assess this study, taking into account the use of a critical autoethnographic method in my study. By using my personal experience as the research site, in order to analyze or make a statement about social and cultural practices, it engages the reader through a different way of aesthetic and artistic literacy (Jones et al., 2016). It is my lived experiences like other autoethnographic research and determining what is "good" or "bad" in our context and applying a contextual standard of judgment. Furthermore, this study creates the individuals' world, reconstruction of memories of my journey; hence it is not a single sense, message, or reading, every reader found an interpretation; that is influenced by their

own unique experiences, meaning or subjectivities in the context (Roth, 2005). Thus, it has the main criteria is to evaluate my study should be applied contextually (Sparkes et al., 2002). However, it unfolds qualities of coherence, the thickness of experience, interpretive insight, applicability, persuasiveness, aesthetic appeal and texture of the evocative cum critical argument.

This inquiry is an in-depth probing of my academic and professional experiences. Thus, in readers' view, it might be seen as unethical writing like Delamont's (2009) arguement that autoethnographic studies are self-laminated and experience-driven rather than analytical, and unethical to produce. However, as a researcher I took the responsibility to make it real world reflection. This study appears to be of speculative nature. My primary goal in conducting this self-inquiry was to draw attention to the complexity of the science teacher's identity and critical reflection on existing pedagogical practice. In critical lenses, it appears that my desire to learn more about how I came to be a STEAM-based science teacher or educator and how I (re)constructed that identity originated from my fascination with alternative ways of knowing, acting, and being.

Organisation of the Dissertation

Acknowledging of this writing I want to use an academic-artistic form for my dissertation, which can be both academic and artistic in nature, it suggests the formation of the science teacher identity as a constructive process and co-constructed one through practice in the classroom, historical and socio-culturally. The primary body of this study was developed based on three research questions And the first three chapters I, II, and III are developed on the sparking of my research work in terms of contextual background, activation of research agenda, critical autoethnography, and its philosophical vantage point. Hence, the first chapter (I) illustrates my background, science learning scenario, engaged learning, STEAM approach, teachers' identity, and science teachers' identity and pedagogical practice.

Chapter II illustrates the philosophical perspectives of my study in terms of ontology, epistemology, and axiology, and research paradigm. I introduced the topic in chapter III by outlining how I came to conduct critical autoethnographic research. This chapter covered the suitability, selection, and justification of my research methodology, as well as my positionality with respect to the study. It gives an overview of my critical autoethnographic journey as a research method. Finally, it

seems a compile of the methodological, theoretical outline of this study with quality ensuring process and ethical considerations.

Chapter IV presents my opinion based on my school life especially focused on science classroom activities and science teacher identity. It is the first part of my first research question which states the self-examination and self-reflection about my learning process, which affected my professional identities (identity construction and change of practices). It tries to represent the picture of our science learning scenarios which is growing in the Nepali education system. Most of the parts of this chapter are concerned with science learning activities that occurred at the school level with critical reflection.

Chapter V reveals an authentic picture of the science teacher's professional identity at my school. It gave a description of my interactions with other like teachers, school administration, and students in the secondary school and an account of my place of work and even the teachers' perspectives. This chapter presents the major stories and my reflection on the school's environment (location), size, composition, control, and management system, among other things, which have had an impact on my instructional practices as a lens of science teacher identity construction. It provides a critical analysis of how I constructed my initial perspective about the science teacher's identity and the factors that pushed me for the reconstruction of my identity.

Chapter VI is the center of this study, which incorporates my experiences of the 18-month journey, which highly impressed me to transform. It shows my core engagement in the STEAM journey. It is divided into three major sections. First is related to dilemma and acceptance, second is envisioning, and third is how I gradually unfolded my identity. Moreover, it reveals the role of critical reflection, and how it guided my inquiry.

Chapter VII summarizes the research findings and draws conclusions regarding synopsis, transformation, and praxis. It provides a self-evaluation of the effectiveness of the personal reflection on the knowledge acquired during the process. It is a combination of transformative stages responsible for reshaping my identity and my efforts to bridge the theory-practice divide after learning this course (praxis). Similarly, it is a consequence of creating alternative arguments on the educational professional community, who are interested to challenge and transform of their own

belief systems about science teacher identity, existing educational research as well as pedagogical practices through STEAM approaches.

Also, it illustrates my contribution to enhancing transformative learning and changing pedagogical belief systems to personal transformation. Besides it, the prologue opens the door to the writing of this inquiry and the epilogue closes it. In the many sections, pictures/ photos, stories, and poems are included to enrich discussion and nurture postmodern sensibilities.

CHAPTER II
PHILOSOPHICAL JOURNEY OF MY RESEARCH

In this section, I have talked about my study's philosophical worldviews. It shows the ways of my thinking to accomplish this study. It is based on Critical Autoethnographic (CAE) design (Chapter III). Therefore, this chapter illustrates the philosophical perspectives (i.e. ontology, epistemology, and axiology) and paradigmatic space of this study based on my methodological, meaning-making process, and overall action.

Ontology

Ontology alludes to a theory of reality that deals with the nature of the study, interpretation of existence, and relation with reality (Saunders et al., 2009). In this study, my ontology as a relational ontology i.e., idea (reality) development is a relational process that connects individuals and their world and a transformational activist stance. Human agency and human development are seen as relational, in which they collaboratively and purposefully transform their world, and change their world through collaborative, transformative practice, human subjectivity, and interactivity (Stetsenko, 2017). Yet, the ontological commitments of my research include taking morally responsible and value-laden actions.

In this study, my core belief about ontology is teachers as change agents. They can purposefully interconnect ideas or experiences with processes of being, knowing, and doing as well. Then, collaboratively and purposefully, they can transform their world i.e., human existence, beliefs, identity, development, and teaching-learning practices. In this study, I critique science teacher identity and existing pedagogical practice corresponding with classroom crease, which is guided by interpretivism, criticalism, and postmodernism worldviews. Thus, the ontological stance of this study and researcher incorporates multiple forms of realities. While the science teacher engages with the community of practice and his own socio-cultural context (s), he creates his perceptions i.e., multiple-meaning through their previous knowledge, beliefs, value, and practice. Consequently, the ontology assumption of this research is the construction of multiple meanings/reality and relative truth i.e., subjective reality.

Epistemology

Epistemology is another worldview of philosophy that deals with how people construct knowledge. and how an individual acquires and develops knowledge. It shows the forms of the justification of human knowledge (Hofer & Pintrich, 1997). It represents the very foundation of knowledge construction, including its natural forms, methods of acquisition, and methods of sharing it with other people (Cohen et al., 2016). In critical autoethnographic inquiry, the underlying epistemological presumptions it accept that knowledge is ambiguous and that knowledge creation is a self-active process, and the "I", as the subject of the inquiry. Similarly, the epistemological stance of this study is that the meaning-making process constructs knowledge through active engagement with classroom practice, interconnection with different ideas as well the response in the society, collaboration with the community , self-reflection, dialogue, and critical thinking.

Axiology

This section of philosophy refers to the theory of value, i.e. axiology. While using the concept in the science classroom, science teacher has existing beliefs/values about the meaning of learning strategy, meaning-making process, ethic and moral behavior which represent their action /interaction, value, cultural norms, and social justice respectively (Mertens, 2007). Value is the collective term for ethics, morals, and aesthetics. In the case of a qualitative study, mainly two cases arise i.e., value-free and value-laden. In the analysis of all nature and engagement of this study, it will be value-laden as this study is based on subjective reality and focused on moral values i.e., free from the researcher's beliefs and readers would develop their own values from their engagement, beliefs, context, and reflections.

Moreover, philosophically, critical autoethnography is grounded in a postmodern tradition that embraces a dialectic of shifting understandings, where "objectivity is impossible" and "multiple or shared realities exist" (Kelly, 2005, p.66). Similarly, it exemplifies the idea that individuals have a right to choose how they will develop, recognizes the demand for locals or contexts, analyzed their/ own solutions, and would argue about power and control for sustainability. This study may be the creation of personal spaces in educational activities whereby some factors that political, social, economic, and familial contexts influence academic activities. It can be reshaped meaning-making process and self-identity of readers and researchers, thus, an axiological aspect of this study is value-laded.

Research Paradigm

As a researcher, I want to notify that, this study is mainly guided by a multi-paradigmatic research design (Taylor et al., 2012; Luitel, 2019). In the case of my study, more then the single paradigm is required to conduct my research study. Hence, it is directed by integrating more than one research paradigm, i.e. interpretivism, criticalism, and postmodernism paradigms as a 'research tripod'. Additionally, a paradigm is a comprehensive set of interconnected practices and ideas that specify the ontology, epistemology, and methodology of inquiry (Kivunja & Kuyini, 2017). It is a "philosophical way of thinking," which represents a culture of researchers' shared beliefs, values, and presumptions about the purpose and methods of research (Kuhn, 1970; TerreBlanche & Durrheim, 1999). Like the above mentioned views, in this research, I used the term 'paradigm' to describe a my (researcher's) perspectives (Mackenzie & Knipe, 2006) it denoted a way of looking at things, a way of thinking, a school of thought, or a group of shared beliefs that influence how research data is understood and how it is interpreted, as well as a general pattern or outlook on how my study is conducted. In my research, I explore my works through the lenses of interpretivism, criticalism, and postmodernism.

Interpretivism

Interpretivism is an important paradigm, which has evolved in social and educational research fields as an anthropological and sociological turn. Its roots can be found in the fact that methods are employed to comprehend information pertaining to social context and human experiences (Hammersley, 2013), and deepen understanding of the phenomenon and complexity (Creswell, 2007). Additionally, the understanding of subjective realm of human experience is seen as the main goal of this paradigm (Guba & Lincoln, 1989) with the socially constructed reality (Bogdan & Biklen, 1998). It focused on the relativist ontology in which a single context may have multiple explanations, realities, and relations rather than absolute truth or single reality. Finally, It is predicated on a naturalist methodology, relativist ontology, subjectivist epistemology, and balanced axiology.

In the same way, this paradigm deals with multiple interpretations of human's relationships, personal experiences, and context or phenomena or culture. Interpretive researchers ought to work to comprehend the various lenses through which people perceive and experience the world in various settings and contexts (Hammersley, 2013). It is is anthropological and hermeneutical turn in the research field and an anti-

positivistic view, which mainly focuses on seeing participants' views through their eyes and interpreting them deeply as a conical shape. Furthermore, it highlighted discussion with the diversifying views of phenomena, and researchers try to deeply understand them in a social context. The implication of this paradigm seems in order to be based on the data gathered during the research process theory is developed after research, not before it (Strauss & Corbin, 1990). In this study, I probed into my lived experiences, beliefs, principles, biases, conceptions, opinions, and perspectives, then generated the meaning (Wellington & Szczerbinski, 2007).

My study is based on Critical Autoethnographic (CAE) design. I have tried to explore my *(I am as a participant*) world, lived experiences, feelings and perspectives/narration through reflective writing. Then, multiple genres are developed by probing these beliefs, principles, values, conceptions, opinions, and perspectives.

In this study, the generated information includes narrative tale/ writing, lived experiences and photos, pictures, poems, stories, memos, etc. Due to the nature of data/ information, my 'meaning-making' process is inductive, and I employed the process of translating, sense-making, relating, recognizing, empathizing and valuing to understand a phenomenon and finally, meaning-making. Hence, interpretivism guided the overall process of my study.

Similarly, interpretive research is focused on the meaning-making process and it seeks to comprehend the context and actual experiences of participants (Luitel, 2009). In a similar vein, as a researcher, I tried to understand the situation and lived experience of the participant (*myself*) while critically reflecting science classroom practice and science teacher identity. Furthermore, interpretivism facilitated me to explore and understand the context relating to the multiple vantages of critical reflection. To sum up, I think it helped me to probe and understand my real-life experiences through critical views and to develop profound understandings of the context (lived experiences) emergent and reflective practices, and meaning-making.

Criticalism

In the final decade of the nineteenth century, politics and social ideologies had an impact on knowledge and social reality, consequently, the criticalism was developed. Its main aim is to empower individuals and societies and advocate issues of power and agency related to oppressed people's power. This is also known as the 'transformative paradigm' (Riyami, 2015). This paradigm presupposes a dialogic methodology, an axiology that respects cultural norms, transactional epistemology (in

which the researcher interacts with the participants), and an ontology of historical realism, especially regarding oppression (Kivunja & Kiyumi, 2017).

This paradigm emphasizes the Transformational Activist Stance (TAS) which focuses on the social construction of reality; it is determined through the media, power, agency, institutions, and society for good change. Such paradigm-based research focuses on social, economic, political, and cultural contexts for empowering and reform that can potentially alter participants' lives (Hammersely, 2013; Creswell, 2007). This paradigm creates a relationship among disciplines of contemporary social issues such as socio-political, cultural, economic and global visions (Kellner, 1993). It explores contemporary issues of present social contexts and gross power disparity, which affects social justice and systemic inequality (Taylor & Medina, 2013). In my research, this paradigm directs me to create equity, equality and power balance in teacher-centered science classroom practice, science teacher identity and multiple aspects (Taylor, 2008).

The overall actions of this study were guided by interpretivism and criticalism paradigms to explore the trends of meaning arising from the information presented in my language narration. In my study, I envisioned this paradigm as advocacy of injustice in science classroom and science teacher identity to support a better chance of equitable and inclusive science learning and promote empowering democratic and participatory pedagogies by critiquing existing classroom practices and reshape teachers' identity.

The study deals with the relativity of things and is enhanced with the subjective analysis of the phenomena or context. In addition, it focuses on the respect for cultural customs, issues of power, oppression, and trust among teachers' identities. Also, it is the high reliance on praxis and endeavor to expose alliances of politics, identity, morality, and ethics of teachers. Moreover, this study also advocates science teacher identity and classroom power balance. Hence, this research moved through an interpretive paradigm as well as critical interpretation of the social surrounding on the ground.

Postmodernism

Similarly, postmodernism focuses on the arts-based inquiry approach which considers humans as artistic beings. It emphasizes that arts represent the self. It articulates powerful new logic and genres to comprehend the complex world through stories of our experiences, narratives, and poetic, dramatic, non-linguistic, metaphors

(Taylor, Taylor & Luitel, 2012). This postmodern paradigm also guides my study to promote thinking and expression and make my research art-based. I focused on art-based inquiry as multiple ways of creativity (story, poem, song, pictures, photos, poster etc.) and critical reflection. Additionally, meaning-making, knowledge construction, and reporting of this research also include some artistic expressions, for example, the epilogue in poems and metaphorical arts in chapter IV, V, VI, and VII. Thus, this research is also guided by postmodernism. I believe this paradigm deals with 'multiple ways of knowing' (Guba & Lincoln, 2005). As a result, this study was nearer to some beliefs of the postmodern paradigm.

CODA: Reflecting on the Overall Chapter

This study was based on critical autoethnography (CAE). While some autoethnographers, like Boylorn and Orbe (2014) and Madison (2011), have explicitly and consciously referred to their works as 'critical autoethnography,' not all have done so. Nevertheless, It is able to easily accept criticisms of societal injustice and the positionality of identities. To be inclusive in my work of critical autoethnography, I have selected a critical perspective to explore both explicitly and implicitly in Science Education Practices. CAE is democratic and enabling self as an inquiry; it is equitable in that it recognizes the equality of people's worth; liberating in that it frees people from oppressive, crippling circumstances; and life-enhancing in that it allows people to realize their full potential as individuals (Stringer, 1996).

Moreover, my study establishes a self-critical perspective in communities of practices (science teacher); and involves people in theorizing about my practices and making it possible for those who are oppressed to participate in social change by giving them the motivation they need to do so encourages everyone involved to grow in their abilities (McTaggart, 1991; McTaggart, 1997). Similarly, it seeks to improve science teachers' situation and solve their existing problems in science learning and raise awareness about power (identity) dynamics. Hence, this study is guided by these three paradigms. In conclusion, value-laden axiology, relativist ontology, and constructivist epistemology are the three guiding philosophical worldviews of this study, and it is a workforce of the multi-paradigmatic research design space, i.e. interpretivism, criticalism and postmodernism.

CHAPTER III
COMING TO ADAPT CRITICAL AUTOETHNOGRAPHY

This chapter presents how I am coming to critical autoethnography (CAE) as methodology, the process of story cum lived experiences generation and overall meaning-making through multiple and artistic logics and genres. Furthermore, this chapter illustrates the philosophical underpinnings of my study. It includes two main sections; the first section reviews the research methodology about CAE and also its text generation process, ensuring in the quality of researching and ethical consideration. The second section addresses the theoretical underpinning of this study related with an emphasis on its connection with methodological pursuits.

Unexpected Journey: Go! Stop!! Go!!!

Due to the lockdown of pandemic situation, schools and universities in Nepal have been temporarily closed. My M.Phil. journey in 2020 was challanging and happy. It was also highly affected by the COVID-19 closures of schools and universities in Nepal. It impacted schools' face-to-face education as well as my this research work. In the initial days of my research work, I developed a proposal to develop and implement a STEAM approach in science education through Participatory Action Research (PAR). As a consequence of the lockdown situation, this plan was stopped. It creates some challenges in my research and raises researchable questions inside me; is current field only can act as an area of research. At that time, I remember my professors' voices as '*writing as inquiry, self-inquiry, evocative –autoethnography, critical autoethnography'* etc. which provided green signal in my research work.

In addition, through my course in MPhil program, critical reflection has become an everyday practice encouraged by all instructors, which is quite a new path for me. I appreciate this practice and being an introvert, my reflections became the easiest ways for me to internalize the consequences of my various status and identities. Then, I utilized my reflection as a set of passion connecting with the autoethnographic work (Duncan 2004; Ellis 2004; Wall 2006) to display my lived experiences about my struggle in science classroom practices and the sociocultural identity of a science teacher.

As a science teacher or teacher educator, I am impressed by Bullough and Gitlin's (2001) argument that in order to help you actively explore your private or implicit theories, teacher education should start with who the beginning teacher is, or rather, whom you envision yourself to be as a teacher. Then, I believe it is crucial for me to investigate "myself as inquiry" to comprehend more clearly how my lived experience and my present beliefs and practice as a science teacher educator relate to one another. Then I decided to trace my education/academic lived experience (Bullough & Gitlin, 2001) and critique uncovered taken-for-granted beliefs (Brookfield, 1995) in the instructional process in science that guided my practice. Also, this practice gradually reshapes the science teacher identity in my society.

After my engagement with the STEAM education course in KUSOED, it has been seen as a milestone for critical and autoethnographic writing in my life. The emotions, thoughts and intentions of others have also piqued my interest regarding how they create meaning through lived experiences and how they construct identity. My interests could be followed there, and I could fully engross myself in autoethnographic research. However, I feel very difficult because my Master's degree thesis writing was guided by positivism and pure scientific cum quantitative research. I realized that autoethnography can fulfill me as it combined my interests in research through acting as oneself and assuming different roles, subjectivity and emotion.

Additionally, it is oriented toward social justice for a science teacher is paying it forward to my work as critical self-inquiry through writing as inquiry and evocation, storytelling and personal narrative. Then, it started within an academic environment through postmodern, poststructuralist, and critical perspectives by contesting issues of self-beliefs, practices, voice, and identity. Hence, coming to this critical autoethnography, my journey is accelerated by multi situations of Go! STOP!!, and GO!!! I have already mentioned my initial work was growing with PAR *as -GO!* Then the pandemic situation and my core belief in the positivistic paradigm created obstacles in my journey *as -STOP!!,* and my MPhil engagement, interest, and professors' inspiration *as –GO!!!*

Truly, as a consequence of the unexpected journey, I have explored my beliefs, pedagogical practices, identity and their interrelationships (Hamilton, 1998) to have a deeper understanding with critical reflection. Finally, it directed my research towards critical autoethnography as a methodology but now it is an inspirational

research design that leads me to personal transformation and reconstruction of identity.

Theoretical Underpinnings of the Study

In the study, the theoretical review gives a platform to the researcher to discuss the entire matter of research on philosophical premises. Every researcher reviewed their own study-related theory to link with the research problem(s) and the main assumption of theory applied for proper guidelines. In this research study, I am guided by constructivism and critical theory as major underpinnings.

Constructivism: Interaction, Construction, and Multiple Realities

Generally, this autoethnography-based research is a step of my identity construction process and critique to existing pedagogical beliefs constructed by our academic culture and structure. Thematically, it focused on two aspects; first is intersecting science teacher identity and second critical reflection upon disengaged science learning. Additionally, this study is based on constructivist theories of learning, which place more emphasis on the active learner than the active teacher. While we mobilize learners actively in science classroom, the students' perception towards science teacher also change. In the intersecting of existing science pedagogical practices, this study focuses on critiquing traditional practices beyond its interactive, collaborative, and learner-engagement activities.

Similarly, in the perspective of science teacher identity, identity is constructed by different aspects. They are science teachers' activities (personal construction), the value provided by others and social interactions. Moreover, this study focused on the critique of existing pedagogical practices (learner at the center and active) and social construction of science teacher identity with continued interaction with society. Thus from a theoretical perspective, it is closer to constructivist views.

A social constructivist perspective on identity is predicated on the idea that we construct reality and give it meaning through interaction (Jackson & Hogg, 2010). And, by interacting with culturally significant individuals (like parents, teachers, doctors, etc.), institutions (like governments and schools), and socio-cultural values, we learn about society. The approach presents knowledge as acquired, constrained, and fallible, and as such, partial, significant, and occasionally problematic. Similarly, social identity is acquired and constructed in society and developed by professional involvement as well as contribution.

Theoretically as well as practically, different kinds of constructivist perspectives were developed by the contribution of Piaget, Ausubel, Vygotsky, Bruner, Jeorge A. Kelly, and Ernst Von Glasserfield such as Trivial, Radical, Personal and Social constructivism (Pandey & Bharathi, 2020; Hardy & Taylor, 1997). The common core knowledge construction process is an active learning process, not passive (Major & Mangope, 2012), which means human knowledge and learning is not passively taken in from the environment; rather, it is actively constructed by the learner i.e., "*knowledge is made but not given*". Like this, in my study, I believe that *identity is also actively constructed*. Thus, this study is guided by the theme of constructivism theory which provides theoretical background and a way for my study.

Moreover, this theory rejects absolutist epistemology according to Hein (2007), constructivism is the theory that each learner creates their own knowledge collecting individually and socially, i.e. context-based knowledge constructs meaning- as he or she learns. And it concentrates on how people build or construct their new knowledge through interaction with others. Similarly, the identity is multifaceted, plural (Cummins, 2011), and "dynamic rather than stable, a constantly evolving phenomenon" (Beauchamp & Thomas, 2009, p. 177), which is influenced by numerous internal and external factors of individual and context (Yazan, 2018; Fairley, 2020). Like these themes, my research study also assumed that teaching-learning process and identity construction process are relativistic works developed and reshaped by interaction with their already known concepts, beliefs, ideas, events, and activities and change with actions.

In this research, my meaning-making process is driven by thoughts that are related to my identity construction. Teachers' identities are seen as constructs level of position and values within a social scenario, with a focus on social influence (Heisey, 2011). Gee's (as cited in Farnsworth, 2010) identity is a concept that is enacted through different modes of thinking, behaving, and interacting. It means that science teacher identity also evolves gradually, is context-specific, and changes as it moves from one context to another (Hall et al., 2013). Both culture and effective teaching practices play a very important role in constructing science teacher identity. Consequently, the constructivism theory (individual and social constructivism) is a theoretical orientation of my study.

Critical Theory: Empowerment and Transformation

Mainly, the critical theory exposes sociological inconsistencies, injustice, and debate and takes action to social development. It is a transformative endeavor that challenges oppression and encounters hegemony and deep power relation. The above-mentioned assumption of critical theory directs my research study through emancipation as self-consciousness, self -realization in my autoethnographic work, and always motivates me for critical thinking/ reflecting on my lived experiences as well as the injustice of science pedagogical practice and science teacher identity.

Age, gender, and educational practices, as well as sociocultural, economic, and institutional dynamics, are some of the variables that affect teacher identity shaping and how teachers present themselves in the classroom (Duff & Uchida, 1997; Danielewicz, 2001; Olsen, 2008; Li, 2022). The critical theory deals with these factors. Thus, it helps me deal with an oppressed pedagogical context (gender, caste, cultural diversity, imported (euro-centric) science curriculum) and science teacher identity. Similarly, it talks about 'healing' of science learning, the finding of this study might heal the present academic gap 'wound'. Similarly, critical theory evokes me to cure my voice, restore my belief in terms of inclusive and empowering science learning. Like this, my inquiry was guided by creative and critical engagement using narratives and dialogue to tackle complex issues.

Moreover, critical theory and transformative learning are close to this study. My next concern is the transformation in science learning and science teacher identity through critical autoethnographic inquiry. O'Sullivan et al. (2002) argued that transformational learning involves going through a significant and structural shift in the underlying assumptions guiding personal thoughts, affection, and actions. It is a change in consciousness that
fundamentally transforms how we interact with the outside world and does so in a different ways. As a novice STEAM researcher, I tried to connect my lived experiences to develop transformative learning thinking.

Similarly, in this study, I focused critically on student engagement activities to offer an opportunity for learners, which leads to equity in the classroom. On another side, I advocate science teacher identity in society. Finally, this study focused on advocating learner's demand, classroom diversity, engaged learning, and valuable science teacher identity. Thus, another theoretical underpinning of this study is critical

theory. Therefore, I believe that my study is strongly guided by constructivism and critical theory to fulfill the intent of the research question.

Critical Autoethnography (CAE) as My Methodology

Autoethnography is qualitative and interdisciplinary method of inquiry that is becoming more popular and well-linked in the social sciences (educational field also) and it focused on research centers on the self as a site of inquiry (Marx et al. , 2017). Wall (2006) also argues that using the researcher's experiences as a starting point to understand social phenomena, autoethnography is a new research strategy and methodology, it refers to the type of lived inquiry. However, in many cases, it seems as a contentious style of qualitative research (Delamont, 2009). Etymologically, it seems that a combination of three different words: *Auto, Ethno, and Graphy*, in which the term auto, ethno, and graphy represent self, culture, and research process or science respectively.

It denotes the textual depiction of one's own particular experiences within their own specific social, political, economic, and cultural contexts (Luitel, 2003) enabling the researcher to reflect on and identify personal experiences with structurally rooted educational policies and practices. It also encourages the excavation of deeply ingrained cultural memories (Taylor, 2013). Spry (2001) argues that a self-narrative should critique how one is situated in relation to others in a social, political, economic, and cultural context.

It means that this methodology promotes gaining a deeper understanding of society and the self. Moreover, it focused on growing appreciation for personal lived experience, story, literature, aesthetics, emotions, and the body, as well as the emerging significance of social and political identities (Adams et al., 2017). While deeply reviewing my research questions, they demanded this methodology because they tried to explore meaning-making in my personal lived experience *(auto)* my core beliefs, practices, and identities in school cum society culture (*ethno)* (Adams & Herrmnn, 2020). Hence, I selected this as my research methodology.

In addition, autoethnography is not a single methodology. Under this inquiry, a variety of methodological approaches are developed. They are descriptive, analytic (Anderson, 2006), emotional and evocative (Bochner & Ellis, 2016; Luitel, 2003), solo and collaborative (Chang, 2013), and critical (Boylorn & Orbe, 2016). Out of them, critical autoetnography has sought to explore and encourage underrepresented voices in a way that allows the lived experiences of those who are socio-politically

marginalized to enter academic discourse. Thus, it appears as a critical perspective itself. As Boylorn and Orbe (2016) and Madison (2011), the critiques of injustice in societal construction and the position of identity can be easily embraced by critical autoethnography (CAE).

In contrast the above arguments of CAE, this study tried to intersect the existing identity of science teachers and pedagogical practices in our science classroom; which examines the role that privilege and power play in social and personal lives and how they are both reproduced and resisted. Hence, in the wide range of autoethnographic inquiry, I have selected critical autoethnography (CAE) to address my study but not as against other types. In my perspective, it embraces critical perspectives both explicitly and implicitly to lead powerfully illustrate and (re)construction of science teacher identity in education.

Especially, CAE is a relatively recent form of the genre that describes three aspects of critical theory: "to understand the lived experiences of real people in context, to examine social conditions and uncover oppressive power arrangements, and to fuse theory and action to challenge processes of domination" (Boylorn & Orbe,2014, p. 20). And, it considers individual experience and cultural criticism that can advance our understanding of social injustice and power. Reed-Danahay (2017) assures a critical ethnographic perspective is to
comprehend social dynamics. I adopt CAE as my methodology because in this study I try to comprehend sociocultural phenomena as seen through critical lenses and gather my lived experiences and analyze and interpret them collectively. As a participant in this research, I generated my distinct and independent voices, and then they interrogated my social phenomenon to create a unique synergy and harmony of science teacher identity.

Adams (2017), mentions that CAE identifies power and privilege's outward manifestations in routine behaviors and makes unanticipated relations between individual and cultural experiences. It provides an opportunity to alter harmful attitudes and behaviors, enhance living conditions, support resistance and transformation, and figure out better ways to get along (*ibid*). Similarly, it is an innovative strategy for carrying out research in vulnerable, marginalized communities through the combination of autoethnography, ethnography, and critical pedagogy (Tilley-Lubbs, 2016). Thus, I make meaning about CAE as a modern, cutting-edge interdisciplinary, ambiguous genre-making process that adapts to fit academic

backgrounds, interests, and critical philosophy. I use it for illuminating marginalization, privilege, and power in educational contexts (especially science education) concerning the areas of the science teaching-learning process, and teachers' identity. It also connects to my other formal and informal (socio-cultural) settings.

In my perspective, I try to inseminate an integral perspective in science education because science teaching is more than the just transmission of a body of knowledge; it is also a process that produces dynamic development and plays a crucial role in the formation of identities. Science education and science teacher identity is developing on multiple paradigms and they are characterized by sub-communities like pedagogical practices, the teacher's role,the teacher's beliefs and the values of society.

Integrally, this study tried to connect social facts, social definition, and social behavior with science teacher identity. The incorporation of the truth of this study (ontology and epistemology) is integral. The context used to conduct this study is with its distinctive features, other paradigms and theories beyond positivism. Hence, in essence, it is an effort to align the perspectives of science teacher identity, classroom practices, and science learning scenarios. Finally, this study represents CAE, including science pedagogical and social-political values to be able to integrate with the transformative pedagogy.

Self- the Research Site of My Study

I have already mentioned that autoethnography it refers to a type of qualitative research study in which the researcher draws on personal experiences for the basis of their study. This methodology the self is positioned as the primary factor to be considered when examining all social phenomena. Also, it is a connection between self and society. As a result, it seems as a sophisticated and flexible methodology for comprehending the socio-cultural context. Pillay et al. (2016) argue that in autoethnography, the self is always in focal point and considered in relation to others (i.e., stakeholders) in socio-cultural and historical settings that promote the experience of combined expression.

Similarly, this type of research methodology explores significant social context-dependent personal issues while seeking an interpretation of phenomena in challenging situations. It means that autoethnographic research embraces topics such as own practices, personal experiences, different forms of self-expression,

individual profiles, illness and injury, or family life (Wall, 2016). However, , in these forms kept self- inquiry in center then provide a sociological contribution. Although it is written in a different way, it still aims to explain and meticulously analyze (graphy) of individual experience (auto) regarding with comprehend cultural experience (ethno) (Ellis et. al. 2011).

Moreover, , the texts developed in autoethnography are usually written in the form of self-perspective (first-person) and contains dialogue stories, and emotional content in the author's attempt to become aware of how social structure and beliefs, history, cultural events have influenced and constructed our own understanding (Bochner & Ellis, 2002). Like as mentioned thoughts, my study is also concerned with my practices, personal experiences, and different forms of self-expression connecting with my social-cultural context. And I illustrate how I change my identity (science teacher identity) in different forms. Hence, all narratives of this study are developed in *myself* at the center.

Putting Lived experience into Words: Data of My Research

Before presenting the autoethnographic texts as data for this study, I would inform my reader about the method used to create these texts. I feel that it is important to very important to understand this study. The texts were generated through my lived experience in multiple situations.These situations are represented in the chapter-wise form. As a researcher, I have included my twenty years of experience as a form of text. They have been developed based on what I am as a learner and as a teacher in my school as well as in higher education contexts. Mainly, the text (data) of my study was generated by a declining level of student interest in science classes, a rise in test-taking motivation, school climate and culture, the identity of the science teacher, and a shift in my own perspective.

On the other hand, the data of autoethnographic research exist in a variety of forms; they have stories, emotional and evocative text (Ellis, 2004), analytical text (Anderson, 2006), poetic (Richardson, 1992), performative (Jones et al., 2016; Spry, 2016), and more. In this study, I put my lived experiences into words and then it is combined them with multiple forms. They are stories, poems, folksong, posters, charts, photos, etc. The table below represents my overall journey and the sources of stories (texts).

Table 1

Summary of Text Generation

Chapter (s)	Chapter-Driven Research Question(s)	Timeline of Lived experience	Critical Reflectivity upon Main Idea
Chapter IV The Unraveling: The Existing Pedagogical Practice as a Banyan Tree	In what ways does my practice of reflection (my self-examination, self-reflection, and learning process) affect my professional identities?	From school education to Master's Degree	-My preconceived conceptual Frame towards pedagogical activities in science learning. -Mirroring of my classroom Activities (2001 – 2005). – The Dim of My Hope (2010). -Consistency (2012) -In the Ring of Technical Interest
Chapter V Becoming a Science Teacher: Experience in the Classroom Context	In what ways does my practice of reflection (my self-examination, self-reflection, and learning process) affect my professional identities?	My experiences as a science teacher at secondary level (2014 to 2016).	-The Beginning Science Teacher/ Educator. -Initial Interaction in the School (August, 2014). The National Science Day on Ashoj 1 (18 September, 2015) Upset from Staff's Meeting (12 October, 2015). With/within Communities of Practice.

Chapter VI STEAM- Travels: Dilemma, Accept and Envision	How did I prepare myself as a STEAM – based science teacher/ educator and progress in my M.Phil. journey? And, Why did I transform from a conventional science educator to a STEAM –based science educator through a critical reflective lens?	During my M.Phil. journey in STEAM education (2018 – 2020)	-Station I Dilemma: standing on multidisciplinary and multi-paradigmatic tract (February 2019 – August 2019). -Station II Multiple Perspectives in Learning and Identity: Constructivist, Socio-cultural, and Transformative (August 2019-February 2020) - Station III STEAM Approach: Integration of Arts in Science Pedagogy (February 2020-August 2020)

The table illustrates the text generation process of my research. Indeed, many poster photos also act as data for this study.

Meaning-Making Process in My Research

Such research has the special objective of aiding the meaning-making process. How significance is assigned to various personal contexts, objects, people, and life events greatly influences the complexity of meaning in people's lives. Common and unique meanings are two subcategories of meaning that are created, in accordance with Erikson (1963). Common meaning means ‘group of people meaning’ and unique meaning is ‘individual member meaning’ of the group. For example, in my research method autoethnography (especially in CAE), the meaning- making

process mainly creates unique meaning (personal meaning) but it is connected to socio-cultural practices. Hence, this study is also having a real classroom practice, and they may have a unique meaning to different people and contexts.

Moreover, paradigmatically, this study belongs to MDS, where meaning is constructed by interpretive and critical assumption, and the construction of the meaning is influenced by different factors, such as context, researcher, and readers' beliefs, etc. In this process, as a novice autoethnographic researcher, I tried to create meaning based on critical reflection on my lived experiences and it kept an individual's values. Then it connects to society as power and privilege thought. However, it is more oriented toward the context of science education and science teachers' identity.

On the other hand, it was viewes as a collection of 'mysterious metamorphosis' (Merriam, 1998), where the researcher would retreat with the personal experience, applied
their analytical skills and emerged at a later time with conclusions that they deal with the problems and community practice. Additionally, it is a highly intuitive activity with critical proclivity. Consequently, in this research, my meaning-making (genre formation) process has oriented to the power of transformative learning and which can be turned into the community's problems and actions. In the meaning- making process, I used narrative logic and genres to connect my actions and my life world (Luitel & Dahal, 2020).

In this way, I also focused on translating my lived experiences to the 'multiple common genre' relating appropriate community of practice. Also, it connects with my research questions. In conclusion, my meaning-making process is driven through hermeneutics to understand contextual meaning. It provides a method of analysis that suggests a way of comprehending the meaning or attempting to make sense of texual
information and relate with my own world (my situation). Besides textual data, I have used non-linguistic genres (pictures, paintings, creative models, etc.) to show how knowledge claims are embodied, multi-vocal, and nonlinear ways (Luitel & Taylor, 2019).

Trustworthiness of My Research

As a novice autoethnographic research practitioner, I have tried to explore my living experiences in an unbiased manner to establish a sound relationship with the

research context. Like other types of qualitative research, in this study, I have paid attention to the four keys, verisimilitude, transferability, pedagogical thoughtfulness, and critical reflexivity as well as the concept of fairness.

As I thought about the issues with quality in my research, I referred to the influential terms namely apparency, verisimilitude, and transferability (Clandinin & Connelly, 2000) for answers. To develop the trustworthiness of my research, it appears pertinent to develop verisimilitude. Verisimilitude is the quality of appearing to be real or true. Similarly, it is described as "a criterion for a good literary study, in which the writing seems 'real' and 'alive,' transporting the reader directly into the world of the study" (Creswell, 2007, p. 250).

In my study, for maintaining verisimilitude, I generated consistent information by digging up in-depth and cross-checking with the other action (community of practices mentioned in chapter IV) and reflective thinking. Like Eisner's (1997) argument, it is our telling stories about context and another aspect as well as people , it's possible for people to
learn about both their lives and our own when we do the same. In the informal talking, I let some teachers read these stories; they got excited and said "*exactly like my story".* After that, I felt proud that my work maintains one aspect of trustworthiness.

The next criterion 'transferability' of my research, has been ensured by applying it to different contexts and 'thick description'. In this action, I probed into my context and to collect information in detail, useing the different modes of inquiry, for it, I generated and included narrative (text) with the support picture, dialogue, contextual seen settings, etc. (see in chapters IV, V, and VI).

In addition, to ensure the quality of my work, I connect it with pedagogical thoughtfulness; it provides educators at all levels with a fresh and motivated interpretation of the notion of pedagogy that looks for the concept's
foundations in actual classroom practice (Van Manen, 2016). It also appears to be the connection between pedagogy and politics, the nature of educational experience, the practical applications of pedagogical knowledge, and the experiential examination of the connection between pedagogical reflection and action (ibid). The chapters (IV, V, VI, VII) of this study are developed based on the critical reflection of my pedagogical actions (where I grew up and implemented myself). These actions reflected most of our science classroom practices, consequently, I believe that this study is trying to maintain pedagogical thoughtfulness. Furthermore, I become aware of the genres of

my study which guide my beliefs and practices closer to Luitel's (2009) argument about pedagogical thoughtfulness.

Likely, to maintain critical reflexivity, I used critical reflective practice in my research. It especially focuses on subjective perceptions of reality as a foundation for considering the consequences of my assumptions, values, and actions on others with critical thinking (Cunliffe, 2004). He argues that such practice is crucial to the management of education because it enables us to comprehend how we relate to one another to construct our meanings and identities and how we can create more cooperative and adaptable organizational management styles. The meaning- making process of this study is guided by critical reflectivity. In the main chapters (IV, V, VI, and VII), I developed different themes reflecting on the data.

Furthermore, this study is strengthened by praxis. As a researcher, I tried to add some pedagogical bricks in the gap between theory and practice criteria through reflection and action (see Chapter VII). Also, it is seen as a coherent form through the process of continuous interaction and integration between reflection and action. I have already discussed my study is guided by critical reflection. Hence, in writing, I used the action-reflection cycle in the meaning-making process. Finally, I ensured the trustworthiness of the study by applying cross-checking perspectives and testing through practical application, and compatibility with moral values within the community of practice.

Ethical Consideration of My Study

The matter of ethical consideration occurs at every point in the research process (Creswell, 2015). In the present time, the research study is highly sensitive to the moral character and ethics of the researcher. In this writing, as a researcher (I) occupy a central position in the autoethnography rather than presenting others' experiences. I write about myself, and my experiences in science education practice and my science teacher identity. Hence, it is also related to different contexts where I grew up academically and non-academically.

In my research writing, I am accountable to practices, cultures, and spheres of influence in communities. However, in critical dancing in my own school environment, the socio-cultural context is quite challenging. According to Ellis (2007), there are two well-known ethical dimensions: situated ethics and procedural ethics and called relational ethics one of the three. To maintain the procedural ethics in this study, I developed the narratives from real or live; they are not imaginary with

pseudo–name. And situated ethics is maintained through the use of unbiased contextual scenarios. In such kind of research, another ethical dimension is the ethic of the self.

As a researcher, I have authentically described and investigated my experiences. Furthermore, I maintained informed consent while adding photos, models, and others to this study. This process is oriented towards reformation/ transformation. Hence, the writing of this study follows no harm, risk or disadvantage towards the educational situation/ school context and adverse science teacher identity in their social, ethical, cultural, emotional, and other aspects. Finally, from my side, I have taken great care to ensure the reliability and honesty of my work. However, it presents legitimate and ongoing ethical challenges related to self and context.

CODA: Wrapping –up of the Methodology

This is my autoethnographic genre of research writing that uses my personal experiences as a starting point for analysis or interpretation in science classroom practices and connects to self-identity, emotions, economic status, cultural rules, and values as well as socio-political issues. Envisioning this methodology, it is not fiction writing. It seems as an integral part of research and as a primary method of inquiry. While engaged with this chapter writing, I feel that it is an evocative, active and reflexive action. In such inquiry, the researcher acts as a center of research, 'self as a research site' and meaning- making process is critical self-reflexivity. It is generated from my ground, my lived experiences to illuminate many layers of our emotional as well as socio-cultural praxis.

Here, I highlighted the theoretical underpinnings of my study and outlined my research design choices. The point of this chapter is to tell my readers exactly how I designed my research as CAE and to justify my choices**.** It demonstrates an understanding of my methodological action and theoretical underpinning. In conclusion, I accept this method as a transformative journey that starts with exploration of myself (as a researcher or teacher or educator) to connect my socio-cultural context. However, to research of 'Self', as participant as well as researcher is a complex phenomenon. To illustrate the transformation of self/others, I feel that autoethnographic research is a good choice for transformation (Luitel, 2012; Taylor, 2014).

CHAPTER-IV
THE UNRAVELING: THE EXISTING PEDAGOGICAL PRACTICE AS A BANYAN TREE

In this chapter, I reflect on my experience based on my school life primarily centered on science classroom activities and science teacher identity. It is the first part of my dissertation that states the self-examination and self-reflection about my learning process which affected my professional identities and practice modification via the research in what ways does my practice of reflection (my self-examination, self-reflection, and learning process) affect my own professional identities. This chapter represents the picture of our science learning scenarios. It examined my journey regarding the Nepalese educational system. Most of the part of this chapter is concerned with science learning activities that occurred at the school level. It is specially focused on critically reflecting on pedagogical practices, science teachers' activities and identity.

My Preconceived Conceptual Frame

I started my formal educational journey in 1996 A.D. When I was studying at the school level, our country was suffering from the 'Civil-war' (conflict between the government and the Maoist party). Many classes were disturbed due to fear of war and strikes. Furthermore, parents felt insecure about their children in school. Thus, there are many students were absent from the classroom. I belonged to the group of talented students in the classroom of that time ranking system of evaluation.

At that time, the subject '*Mero Serophero' (Mero Serophero; it means my surrounding)* was included in our course at the basic primary level (class one to three). It is mostly related to the content of science. Similarly, in classes four and five, this subject was continued as the name '*Hamro Vatavarana'* (*Hamro Vatavarana; it means our environment*), and upper than that level as a science subject. During the study of '*Mero Serophero' and* '*Hamro Vatavaran',* I felt very happy because most of the contents included in this book were related to our surroundings/context. Furthermore, most of the lesson/ related concepts were arranged with suitable figures and interesting language (like the story, conversation, and many more) and teacher provided a flexible learning environment. Thus, I enjoyed the study of this subject at the primary level.

After completing class five, I joined class six. Then the nature of Science subject was changed and it included different contents. They are related to Physics, Chemistry, Biology, Environment, Geology, and Astronomy. At starting days of the lower secondary level, the previous image *Science- as- an- easy- subject* remained constant, but this image was destroyed gradually while increasing the level of formal education, and finally, it changed to *science-as-a-difficult-subject*. Additionally, in the group discussion, I found that my friends also felt this problem. When I was working as a secondary science teacher, my students also shared and agreed with this perspective, and it seems constant at present. In many cases, our science learning is suffering from science anxiety (Mallow, 1981).

Similarly, in the study of intermediates and Bachelor's degree levels, both teachers/ colleagues frequently used the term *science-as-a-difficult-subject.* This term always bothered me and it sucked every time. When I joined Master's degree in science/ chemistry education, during the study of 'Methods of Science Teaching', I internalized science is not a difficult subject; however, it is made *artificially-difficult-subject* critically. It is driven through expert prescription-based learning scenarios beyond learner's interest (Luitel, 2009). Consequently, under this topic, I explored my preconceived conceptual frame towards two aspects of my reflective journey at my school life. The first is pedagogical activities and a good teacher and the second is science teacher identity.

My Preconceived Conceptual Frame towards Pedagogical Activities in Science Learning

"Read, Read, Read, …
Homework, Homework, Homework…
Note, Note, Note…….
Rote, Rote, Rote…….
Pass, Pass, Pass……"

These terms are five prominent echoes of my inventive classroom and specially used by my science teacher. I believed that the 'Enforcer' was a quality shared by all successful teachers, and instilling the "Controller with fear" in students would be the answer to every issue a teacher would ever face. I was therefore prepared when I first became a teacher. I was sure that one quality I needed to teach science effectively was to instill a fear of authority in my students. However,

now, I realize that my impression was completely off because teaching/ learning activities are much more than controling and passing the exam.

When I grew up in school life, traditional pedagogical systems (teacher-centered approach, chalk and talk, exam oriented, etc.) were adopted in teaching and learning activities. Critically, our curriculum is highly structured and teacher's activities are dominated by 'chalk and talk approach' and the assessment system is just focused on a score- based quality. Every important concept regarding the topic was written on the whiteboard (blackboard) and students make a note and rotting it strongly to secure the high grade in the document. Students revise their notes and attempt to memorize them and they believed passing the test is the main goal of education and existing teaching style**.**

The World Shapes My Pedagogical Perception in the Beginning

The following scene represents my science classroom scenario in school life and develops the base of my learning practices in the beginning. They made a strong conceptual frame in me about the teacher and learning activities.

2001 - 2005 – Mirroring of My Classroom Activities

Here, I mentioned three small parts of my classroom activities. These three parts of the story (Day1, Day 2, and Day 3) are the major teaching-learning activities of my science teacher. Guiding through these actions, I draw a specific image of the science teacher. From class six to ten, I was guided through these activities and spent more time with voices "Read, Homework, Note, Rote, and Pass……"

Day -1: Read! Read! Read!!!

Mr. Bigyankumar was a science teacher at my school. He was 17 years experienced science teacher and taught science from the beginning of his professional life. It is a retorting story of my teachers. One day Mr. Bigyankumar enters the classroom holding a stick and science book in his hand. Like previous days, he started the lesson in the same way; first of all, he wrote the topic on the blackboard and then looked at the book and read a lesson and explained it frequently.

Hari was a genuine student of class. He sat on the first bench and Bikram sat on the last bench and he was not interested in science learning. He wrapped the paper and threw towards the girls. The classroom was noisy with unwanted voices but Mr. Bigyankumar taught continuously. He finished the lesson cell-division after 45 minutes. While pre-determined time was finished (bell rang) and Mr. Bigyankumar provided the homework. Some students copied questions, while others did not write it.

Then, he strongly ordered me to prepare notes. Finally, he went out of the classroom and then walked towards the toilet. Most of the students ran outside in groups when the teacher returned to the office. Another teacher entered the classroom and he ordered me to read, i.e. Read! Read!! Read!!!

Day-2: Homework! Homework! Homework!!!

In a similar way, Mr. Bigyankumar came in the classroom and asked me about homework and notebook but did not check it. Then, he started a new lesson in a similar way (like day-1).

Day-3: Note! Rote!.. and Pass

"Hello.. hello..good morning and welcome!! We're so glad you're here. Because of today, we set up very important questions for your examination, and we have tried to solve some of them to receive a grade of "Excellent" on the school report card." The day-3 was very important for students because our science teacher (Bigyankumar) checked our notebook and asked questions, and we needed to give answers. Otherwise, we had to be ready to face punishment. Due to the fear of punishment, many students were absent from the class.

I have never more loved and accepted these activities because my real- world learning was different than it. And all through my time in school life, I have joined into different schools, and contact with a lot of students. At that time, I was unable to know that I would eventually learn up my real- world science, however I never forget my initial impressions about the school life. Now, these live experiences are used as a part of data in my study.

My Real World and My Learning World

In the majority of Nepali public schools, including the one where I was raised, the pedagogical practice of science is historically dominated by a teacher-centered approach. Students cannot perform their creative works in the classroom alone. Looking back at the immersion of my school life, I was still feeling overburdened. Due to the uniqueness of each classroom culture and teacher, teaching science content and real-world application at the same time is a real challenge (Johnson & Swain, 1997; Walker & Tedick, 2000). Many researchers support this argument regarding

Figure 1

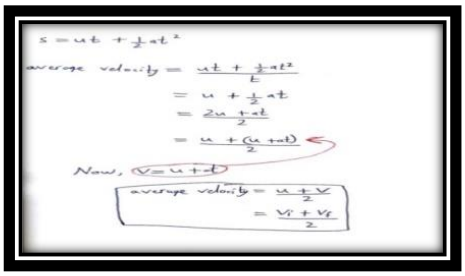
My Real World of Science Learning

some factors such as to addressing variety of socio-political issues (Cummins, 2000), ethno-science, divergent and critical thinking, (Bialystock, 2001; Cenoz & Genesee, 1998; Hakuta, 1986), and daily-life problem-solving skills. Hence, understanding the micro-contextual challenges of the classroom is important for teaching, but my class did not reflect it. We are (I and my colleagues) faced with it in school life.

I used rote methods for much of my study time. My old brother asked me and my friends – *Do you know the term speed*?" We said that "*Yes, we know*". Then, he asked us "*who can calculate the speed of this moving tire*?" Nobody was talking. None of them calculated the speed of it. And, similarly, he asked us a question about speed which was included in our science book's exercise; we solved it within a minute. This means that we all learnt speed without better understanding, and it did not link with our daily life i.e., my real world of learning. If I was to apply so-called pedagogical thinking to the speed of cars only, we would have to know that speed and its formula would be applicable to all moving objects, etc. However, it did not happen, like as speed content, so many concepts of science, mathematical operations of speed and velocity etc., were learned by rote.

Figure 2

My Classroom World of Science Learning at School Level



After completing School Leaving Certificate (SLC)[1], I joined college level [Proficiency Certificate Level (PCL)[2] level] for the study of science subject. Most of the learning activities were the same in college level classroom (theoretical part) and laboratory work was together. From the pedagogical perspective, learning activities of theoretical portions were the same in the school. But at the college-level, sometimes we/ I got an opportunity in laboratory engagement. That engagement is mentioned in the next section, *'In the Ring of Technical Interest.'* At the college level, my lecturer used a catchy sentence about

Figure 3

My Real World of Chemistry Learning

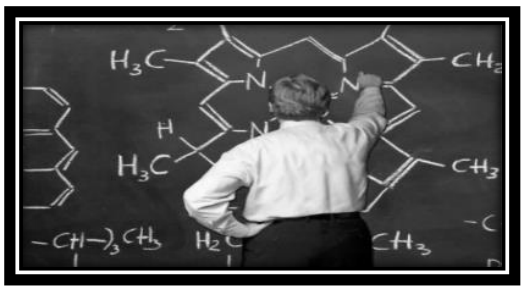
1 SLC was known as Grade 10 final examination.

2 PCL is equivalent to Grade 12 final examination (+2 Course)

science learning i.e., *"Science is not an understandable subject, it is a subject to be learnt by heart."* When I/we faced difficulties in different disciplines of science (Physics, Chemistry, Biology….) learning, I/we asked related questions with my teacher, s(he) repeated this sentence again and again. It seems like a slogan or mantra of science students and a tool for the teacher to student control or defense.

Figure 4

My Classroom World of Chemistry Learning at Collage Level



Moreover, time, place, college, teacher, curriculum, and level were changed. However, activities remained the same. Consequently, in both levels (school and college) teaching-learning activities, I made an important understanding of science teacher "*teacher as a good student controller and content explainer*" and the heart of teaching learning activity is "*Note Rote and Pass" i.e., Capsulism.*

2010 – The Dim of My Hope

In the Bachelor's degree, I studied science education. The curriculum of this level was slightly different than the previous level. It was an integration content of different science disciplines (Physics, Chemistry, Biology, and Environment) and pedagogy. During the engagement of the pedagogical portion, I started to change my perception towards a teacher and pedagogical activities. And, at that time, I thought the role of a science teacher in school might change. However, it remained in the same condition.

Figure 5

Representation of Student Role in the Traditional Pedagogical Practice

After five/six years later in my school life (after the completion of my Bachelor's degrees), I found the same role of a science teacher (Prakash and Rajesh), as a part of the Sarita, Gita, and Ram's stories. All of them are students of class X and they are preparing for the SLC examination. On their activities, I saw my school's life picture because through them, I recognized the same classroom activities of science "Note, Rote, and Pass" like my own school life. It is a story of that time (after five/six years later of my school life). One day I went Sarita's (first

student of grade X based on ranking) home. Her father (who is school level science teacher but not her teacher) called Sarita. Then he requested to prepare a cup of tea. She responded to this request and finally, she discarded it. In the small part of their conversation, I found the reflection of our teaching-learning system. For example;

Father: Sarita, what are you doing?

Sarita: I am preparing a notebook for my science subject.

Father: Oh, good! Can you give me a cup of tea, please?

Sarita: No!No! No!!! (She was angry with her father) and she said that tomorrow was Friday.)

Father: Silent… (She was talking alone, introvertly)

After this event, I was interested in talking with Sarita about her Friday's action. Then, finally, I asked her. Sarita, why are you shouting tomorrow is Friday? Tomorrow is Friday….

Sarita told me that *"Tomorrow is Friday; our science teacher (Prakash) will check our notebook and ask questions, we will give answers word by word. Otherwise, he charges stick instead of wrong answer (one stick per word)." Thus…..*

Again, I asked why he was preparing a notebook and memorizing it. She responded quickly and said *"to pass the exam securing high grade." ….. Have you any goals? In science learning, I asked and she responded "No, just, I want to save my prestige by securing a high score."*

Similarly, Gita and Ram's experiences are similar to Sarita's story. They (Gita and Ram) are students of urban areas compared with Sarita's and my location. Both of them are best friends at school. They studied in a private school, and in the informal talking; Ram shared his distress with Gita. Like *"I did not sleep yesterday night…, the whole day I read science notebook….., and I have a headache because the science teacher will ask for the whole notebook tomorrow."* And Gita also agreed and said *"I am also in the same condition."*

At that time my sense of duty stems from my changing beliefs which are developed in the B.Ed. level. My teacher (who taught the teaching method in science) inspired me about the teaching-learning of science and said that we had to change our perception of science learning. I also agreed with this changing perspective. That perspective was mainly guided by the learning by doing worldview. Against it, our classroom practice was mainly guided by the pure behavioristic worldview. It has focused on the structured lesson plan, trial and error method, and sense of rewards and

punishment. And, finally, I hoped that our school learning scenario might be changed. After changing time, I hoped that our school learning scenario may be changed, however in the part of Sarita, Gita, and Ram's stories, I saw the death of my hope.

It is also supported by my observation. In my Bachelor's third year, we had to be involved in teaching practice (practicum). At that time, I got in the same condition in classroom practice. These experiences and stories are revealed that traditional learning scenario hunted my new germinating beliefs and hope. At that time, through the use of my energy, talents, passion, time and beliefs I hoped to help learners to reach their goal. However, our structural system does not support my changing perception.

2012 – Consistency

When I was studying Master's degree in science education, I got an opportunity to meet a school science teacher (Darwin). He was a young science teacher and completed his Master's degree in Physics (M.Sc. Physics) just one year ago. Moreover, he was proud of his classroom management system and explained his own classroom activities *"…..Nobody talks in my class……..students are not breathing in my class……..silence! very… very silent!!!……. I fully controlled my class……students are fearful of me, they do homework completely and rote learn……our head teacher gives an example to other teachers 'Darwin sir's class is very best'….."*

After this meeting, I realized the new generation of teachers also adopted the same kind of activities in science learning. They had to influence their students through the controlling method. Furthermore, the stakeholders also supported such kinds of action to be a good teacher. At that point, I was worried because it led to the 'death of my hope'. Finally, I began to challenge the existing beliefs.

In the Ring of Technical Interest

In the reflection on my laboratory engagement, in many school classrooms and collage laboratories, I felt that there was little or no opportunity for practical activity. If there is a practical activity, it is just a program of planned activities to fulfill intended learning objectives. High schools frequently lack the necessary equipment and no instruction is provided to teachers on how to design lab experiences that make use of basic equipment. The fact that most experiments are restricted to the confirmation of established principles through step by step (monolayer structure) is more serious shortcoming of this style. My context also similar with Ünal and

Özdemir (2013) argument it emphasizes the discovery of objectively knowable facts or the validation of accepted laws and principles. It seems separate from its structural and socio-cultural contexts. Also some listed actions of a discipline-oriented curriculum whose success in the classroom situation should be judged by how well students have achieved the program or unit goals.

Often, our practical courses offered by most science departments (Physics, Chemistry, Biology etc.) also do not take care of teachers' skills (McDermott et al., 2000) and student's needs. In many places, including my science lab, reviewing the lab work is done as a drill without involving the students in inquiry. Additionally, my common laboratory experiences do not seem to have much of an impact on more intricate aspects of scientific reasoning (Klopfer, 1990, as cited in White, 1996). Critically, in my context I successfully complete a practical course by using manual book's steps without having to deal conceptual issues or comprehend scientific method, and real life problems.

Moreover, it provides a small window of opportunity to begin with their observations and walk through the thought process that went into developing these principles with very structural steps of stakeholders. Moreover, the major activities of my laboratory work were controlling prescribed variables. Step-by-step instructions from the teacher and practical manual book are provided, but there is not supposed to be any discussion about variable control in the lab. The final result is then presented as a declarative and inert piece of knowledge, almost verbatim that is guided or even dictated by the teacher. Thus, comparatively in my opinion, it seems that the bundle of technical interest- driven actions. Hence, it should be noted that my laboratory is a ring of '*technical interest'* (Habermas, 1972).

> *Mostly, my laboratory engagement was carried out as ritual work. It focused on steps of procedures or practical manual book. It is rarely provided opportunities for framing scientifically testable questions and engaging in investigations and inquiry in search of my questions. A prescribed number of experiments are carried out mechanically. Class is crowded, and teachers were overburdened. My friends and I performed experiments randomly and noted down the observations without critically thinking 'why they are using a particular apparatus, a particular method and in some cases, we are not even aware of the objective of the experiment.' On another side, the assessment of*

laboratory work is another major concern of science education. Whether it is a just process of internal or external examination and a tool for inflated marks.

The structure of science also seems substantive and syntactical (Dugganet al., 1996). Facts, ideas, rules, theories, and principles comprised the substantive component of conceptual understanding. The syntactical structure, however, also incorporated the concepts of evidence and the procedural understanding acquired through skills. The practice growth in our lab does not fulfill the syntactical structure of science learning. It is lacking from the *ready-made*-steps *(capsule)* preparation of science teachers (Melear, 1999). In contrast to my laboratory context, it was similar to Grundy (1987)'s words, the technical cognitive interest guides "empirical-analytic science is an interest in control and the technical exploitability of knowledge" (p. 12). Moreover, the technical human interest views learning and thinking as reciving information and redistributing it in a completely controlled environment. It gives rise to a particular form of action i.e., technical rule-based instrumental action of empirical knowledge.

From the critical perspective, it seems that overall activities are guided by the positivist worldview; therefore, my laboratory ring was very close to *technical interest.* Because of when I look back my laboratory activities (practical work in lab of my context), they do not encourage my initiative, creativity, and imagination. It mainly restricted me to the experiments that could only deductively confirm "*existing knowledge and already tested variables i.e. truths*," as these are exemplified by the practical manual book or from the instructors themselves. Furthermore, the different laboratory activities as they are presented in the practical manual book and away from the actual engagement and opportunities. During experimentation time my friends and I were asked with teacher some argumentative questions ; he replies quickly '*Do not make noise and do fast*'. It demonstrates the actual scenarios of our laboratory practices and it leads towards less practical or communicative interest and the emancipatory human interest (Habermas, 1972).

My Preconceived Conceptual Frame towards Science Teacher Identity

When referring to a collection of qualities that are used to distinguish among various groups, the term 'professional identity' is often used. It offers a set of shared qualities, ideals, and so forth that makes it possible to distinguish one group from another (Sachs, 2010). In the comparative views, it seems to be an exclusive ideal

rather than an inclusive one. Rather than being radical, it has a conservative outlook. Like other professions, teachers' professional identities also created in a large and intricate collection of professional relationships (Wenger, 1998).

In the context of teacher professionalism, Evans (2011) described three components; they are behavioral professionalism, attitudinal professionalism, and intellectual professionalism. The combination of these three components constructs the teacher's identity. It is also suitable for my school condition; however, it seems that the behavioral component of professionalism receives the majority of attention in professional standards.

Pertaining to the teacher identity, different thoughts are developed as retrospective and prospective identities (Bernstein (1996), entrepreneurial identity and activist identity (Beane & Apple 1995), positional identity (Holland et al., 1998), and discursive identity (Brown, 2004; Gee, 2000). In the contrast my preconceived notion is that practitioners are viewed as having specialized knowledge bases that are unique to them and their field of practice as the heart of teachers' professionalism (Day, 1999; Sachs, 2001). Moreover, it has been related to a specific subject (Math, Science, English, Social, Nepali, etc.), professional level (primary, lower secondary, and secondary) and institutional standards are expected of them.

At this time, I clearly perceive that science teachers inhabit level wise different identities such as primary level, lower secondary science teacher, and secondary science teacher. Similarly, another identity as a teaching subject-based specific identity connecting with subject name such as a math teacher, science teacher, English teacher and so on. Moreover, in my school life, I made a permanent professional identity critically. It is static and unproductive.

Comparatively, it is similar to positional identity because one's position in relation to other socially identifiable individuals, as well as one's sense of belonging and entitlement, are changing and define it (Holland et al., 1998). Also, I relate a identity to their relationship with the subject matter and individual's context (Helms, 1998). It means that positional identity is strongly stamped. It is also related to which subject teacher earns more money through tuition that constructs social identity.

Pondering in the Context

In my lived experience journey, Bigyankumar, Prakash, Rajesh, and Darwin are the representatives of science teachers of different periods. It has been organized

in a chronological order i.e., very traditional (Bigyankumar: 2001-2005), traditional (Prakash and Rajesh: 2010), modern (Darwin: 2012). In the analysis of stories, there are some commonalities between them in the instructional practices. Time period, place (schools' area), characters [teacher (Bigyankumar, Prakash, Rajesh, and Darwin) and student (I, Sarita, Ram, and Gita] experience change but directly or indirectly all are suffering from the *"Note, Rote, and Pass"* disease and perception towards good teacher was a teacher as *'controller with fear'*. Science teacher's activities demonstrate that a good teacher is a good controller in classroom management. Also, s(he) teaches that *scientific-knowledge-based-contents* and leads us or students to '*how to pass'* examination beyond the connectivity of natural reality and the social need for connectivity, where the main pedagogy was guided through repetition and rehearsal of content for the promotion of academic success (Morton, 2011).

Critically, such kinds of pedagogical activities are far from the learner's interest and demands. It just emphasizes integration of contents with recall, and finally, it reflects on the document as a score. It means teachers' actions are oriented towards the monologic epistemological hierarchy and how teachers accomplish their goals. It means how a teacher can pass a large numbers of students in own subject. It is also mediated by the institutions in which they work and their practices are geared to highly structured forms beyond social justice, inclusive perspective, and multiplicity/plurality.

I think most of the science teachers (like Mr. Bigyankumar, Prakash, Rajesh, and Darwin) adopt a traditional method for science learning. They do not follow any learning principle and their adoptive method was less effective during the analysis of events. Mostly they followed repetition way to memorize only. Moreover, this classroom scenario was seen less than the objectivistic belief. As objectivist contend that a set of impartial and trustworthy facts, guidelines, and theories already exist or will do so in the future, our educational practices have primarily focused on memorization.

Similarly, our (I, Sarita, Gita, and Ram) learning actions were operating from primarily traditional objectivist worldview. Which is compiling of the majority of the information is composed of facts, formulas, terminology, rules, and theories. And it turns into of utmost importance to effectively transmit this body of knowledge. The teacher-centered instructional activities, teachers, textbooks, and notebooks,

authoritative work, informative action, etc. at the focal of the teaching-learning process.

On the other hand, the students' (me, Sarita, Gita, and Ram) responsibility is to correctly understand, replicate and focused on “Note, Rote, and Pass” it was seen as a framework of the science subject. Also they would be expected to "right answers" and support them for assignments and exams. Finally, such kind of practice derails our creative thinking. Additionally, the teacher must have a strong degree of control of control over what and how students learn, choosing which materials should be covered and in what order the learning activities, and the evaluation procedures. It means students are ruled by our teacher with control and fear.

In my perspective, they have slightly deviated towards the behavioristic approach because the behaviorism is based on a positivistic approach of science learning. According to this perspective the only that can be addressed is the relationship between sensory stimuli and the particular corresponding response (Webb, 2007). and it act as a foundation for theoretical justifications, predictions, and testing (Rotfeld, 2007). If we compare the adopting learning activities with Rotfeld's perspective, it seems to be theoretical explanations. It drives learners far from active participation and interaction as well as a multicultural perspective (Rummel, 2008).

This pedagogical practice is seen as a form of transmissive lecture method. It means learning from listening (traditional lecture method). This lecture also depends on only one copy of a book (textbook). Teachers themselves are a part of an even older oral tradition of education, where information is passed from teacher to student orally. For "accepted" knowledge to be successfully transmitted in these situations, accuracy and authority (the ability to control access to knowledge are essential. As a result, it is crucial to recall information accurately, practice recalling it, and make references to reliable sources when validating the information transmitted. And the person who is successful in promoting memory and repetition, s(he) is a great teacher. Also, with a great deal of my learning experiences, the teaching-learning activities of science show that ‘*learning is note/book parroting’*. Similarly, the teacher's role seems to *promote rotting* and a great teacher is ‘*the best controller with fear’*.

In the above contexts (context I, II, and III), among the longtime duration, just changing the characters to the science classroom, but the learning activities and teacher role is seen in the same condition without changing outcomes. The most

important reason is that students study similarly (Note, Rote, and Pass) beyond the different learning environments or contexts. This was focused entirely in the rest of the text book. Similarly, the students learning in a classroom was fully driven by the teacher (teacher centered classroom). Our classroom activities showed that some people actively seek out knowledge while others merely received it. Even if teachers are kind or entertaining, when they have complete control over the classroom, students come to accept authoritarianism.

In our context, theoretically different kinds of pedagogical practices are coming into discourse, but the widely accepted instructional model was founded on the unstated presumption that students can successfully transfer intact knowledge from the teacher to them. Our classroom practices focused on MSC (moveless, soundless, and creativeless) and learners become very passive. For example, *"…..Nobody is talking in my class…….students are not breathing in my class…….silence! very… very silent!!!……. I fully controlled….."*

Similarly, a teacher guide offers guidelines and a textbook offers helpful information on '*how to teach pupils*' and primarily supports teacher-centered or teacher-dominated approaches (Garrett, 2008). Additionally, the teacher concentrated on the science textbook's content rather than the students' learning styles when using the evaluation system (examination). If learners are involved in laboratory activities, they appear to be very "structured" experiments in which they must mechanically carry out the suggested or listed experiments while adhering to a set of detailed instructions. Critically, students are not given any chances to discuss and interaction on the entire experiments or specific portions of them, or to consider how and why they adopt particular methods. It means that our teaching- learning activities are growing as pedagogical activities as *capsulism* and laboratory activities as *technical interest*.

In contrast to philosophical perspective, the use of strategies that improve students' behavior is the main focus of my classroom management in the behavioral model because it focused on the fully stimulus-control strategy (Brophy, 1999). And according to this model, the learning activities are consistent with traditional or transmission-style teaching. In the shifting of instructional practice, teacher identity also changes but my context is deeply rooted to the traditional perspective of teacher identity. It does not change and it seems like the *positional, permanent and temporary tenure*.

The classroom scenario shows that our practice focuses on the passive learner and silent classroom, which does not adopt the active learner perspective in learning because it has deviated from the different learner-centered pedagogical perspectives (constructivism, experiential learning, and critical pedagogy), and finally, it is unable to connect education and learning with experience as well as real-world problems. It means our practices do not advocate these major recent learning perspectives such as '*constructivist'* (knowledge is constructed by the learner, we all grow up and live with the society, and our sense-making process is affected by our cultural activities such as '*Constructivist'* (Vygotsky, 1978), *Experiential learning* (Dewey, 1954), '*Critical pedagogy'* (Freire, 1993), '*Socio-cultural representation of learning'* (Luitel, 2009), and connection of science learning activities with engaged learning, empowerment diversities, and justice in science education (Taylor, 2013).

Development of Dead Classroom and Capsulism Perspective

In my classroom, during the teaching- learning activity, communication among the learner is nonexistent and it did not provide opportunities to express their/our ideas. Furthermore, students are rarely involved in argumentative discussions because the learning environment does not value their original ideas in classroom activities. These are not engage students; teacher transmits knowledge actively but students roles seem as passive knowledge receiver. On the contrary, it was guided by structured steps and applied multiple ways of tools to control the classroom for *very silence.* For example, *"…..Nobody is talking in my class……..students are not breathing in my class……..silence! very… very silent!!!…….. I fully controlled….."*

Most of the strategy and pedagogical activities are exclusively prearranged for me. Additionally, this context did not provide any opportunities for me to negotiate construct meaning from the activities that are mechanically loaded over learner, or have a clear understanding of them. Moreover, memorized information that is disconnected from accurate conceptualization and real understanding was emphasized in science classroom learning activities.

When the instruction is done in the manner of a traditional classroom it is guided by reading textbook and taking notes procedure. If we take notes or just read the textbook, we can move much more quickly and with far fewer behavioral issues. Learner are used to it and they were well trained for the most part to face examination, but there I cannot share my interest and it did not have an engagement

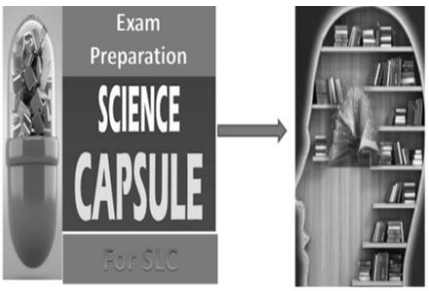
opportunity; consequently, it was just seen as dead there. So the silence of the classroom represents a '*Dead classroom*' in the metaphorical form.

In my school life, me and my friends believed that the preparation of packaged of notes by my science teachers meant that they cared about their students. It was the source of course content and appreciates the comfort, security, and assurance. Most of the teachers used note- making and note- taking process. I am also used to good packaged notes and they are all very useful for me to pass the examination. My note memorizing capacity was compared with brilliance. However, it acknowledges that memorizing notes for an exam is just a memory test and is neither educational nor developmental; it is simply a memory test. Furthermore, best teacher quality was connected with his note providing capacity i.e., development of "*note capsule*." And a learner said that "*s(he) is the best teacher because s(he) can still get the best notes and it is easy to learn*."

The word "capsule" is derived from the Latin diminutive, "capsula" from "capsa", *a box,* and "capere" meaning *to hold* (McArdle, 2007). A capsule is frequently thought of as a tiny packet that, thanks to its membrane, can be ingiseted by a person without them having to chew it or taste it. Like this meaning of the "capsule", I compared pre- prepared small notebook, textbook, solution book, etc. are metaphorically represented as 'capsules', which are easily absorbed by students to easily pass the examination and secure high grades. It has contents sealed;, therefore, there is no active involvement of students. However, it leads to treatment "to pass the exam". The note capsule is packaged by another science teacher and probably prescribed to students. They demand different doses to swallow in order to secure a high score in the examination.

Figure 6

Representation of Pedagogical Capsule and Capsulism Process



Similarly, in my college life (PCL-level), another belief is widespread that we can pass without attending class by simply getting the notes and memorizing them. One of my friends (Nabin), who acknowledges that until his honors second year, he had never opened a book, claims that students not only believe they can get by on their notes, but also on last year's or the year before notes. He managed different notes collected from friends, library, and often photocopied notes. He says:

"*I think the note is very good, if you read it, no need to delve too much into it, I think it works well and helps to pass the exam easily*."

It means that at school level or college level I/we manage notes in a package and recall them and present them at the final examination, metaphorically, such kind of pedagogical activities represent *capsulism in education* (McArdle, 2007). My closest friend Nabin, asserts that he could easily pass first division (greater than 60 %) in exams can be aced by attending lectures once or twice a week and studying the notes. He suggests to me "*If you check your notes from the lecturer, you'll have everything you need to pass the exam*." Critically, the packaging notes (capsule) makes students lazy and disengage students in teaching- learning activity. It shows the passive role of the student, but we think that students would read independently only if they were marked on it as part of an assessment process. Also, we discussed better notes to achieve better marks in the final examination.

In our context, the science teaching also has other crucial components are the old is gold (collection of old questions organized based on the final exam in the chronological order), text book, and practice book. However, all are related to the content explanation mechanism and memorizes it. In science classes, textbook is crucial because the curriculum and what is taught and learned about science in the vast majority of science classrooms are determined by the it (Chiappetta et al., 2006). This perspective was also applicable to my school and college life.

Moreover, after completing important question collection (teacher's note), I gradually focused on old is gold's questions, textbook and practice book. I took science textbook (at school) and course book (at college) as important resources for me. My teachers also promote this concept because they provide detailed explanations of the topics taught. Most of the time, my /our teaching learning depended upon the textbook like Yager (1983), and Weiss et al., (2001) view; that is over 90 % of all science teachers use textbooks. Additionally, my learning world was shaped by textbooks and it was strongly influenced by the content, teacher's directions, and the orientation towards final exam questions. In a similar way, after completing the textbook, I was ready to take a new dose of marks capsule i.e., *practice book.* The practice book was seen as a collection of simple to complex sets of questions.

In my opinion, teacher note (important question collections notes), old is gold's solution, textbook, and practice book are arranged in simple to complex respectively as *different dose of capsule*. Consequently, I felt that my classroom

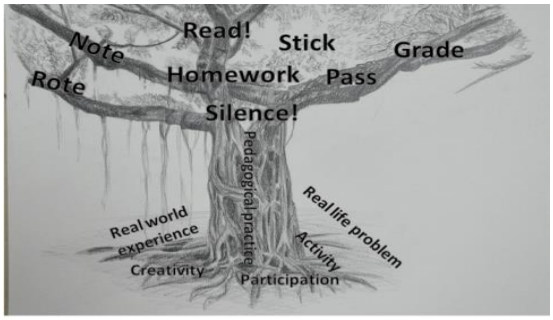
scenario was seen as a very passive *dead classroom and the* learning activity was seen as *capsulism.* It means that capsulism is easily taking the process of pedagogy. The capsulism practice is similar to banking pedagogy (Freire, 1993); it seems like a way of deposit process in cognition through memorization (Pant, 2019). Hence, in the overall process analysis, my classroom activities are oriented to fulfill different doses of the prescribed capsules. They are dose I: *notebook* (which is a collection of important selected questions for the final exam, dose II: *old is gold* (old questions collection and solution), *dose* III: A text book of Science subject, and dose IV: *Practice book sets*. In my critical reflexivity, science teacher identity depended on capsule formation, prescription , thereby promoting strongly absorption of a capsule, which leads to science teacher identity as subject matter knower.

CODA: Existing Pedagogical Practices as an 'Old Banyan Tree' and Science Teacher Identity under its Shadow

In my perspective, my science classroom represents the *'Dead classroom'* because where learners' activities and voices are negligible. And similarly, the learning process was *Capsulism i.e.,* capsule formation (*preparing a package)*, prescription, and absorption of capsule *rote rigorously*. In the envisioning of my different contexts (contexts I, II, and III of 2000 to 2012), I realized that our existing pedagogical practice is developed as an '*Old Banyan tree'* which is deeply rooted to the educational system and learner's creativity and activities are under the its dark shadow. Hence, critically, education and learning are not only to reproduce earlier concept facts, formulas, terminology, principles, and theories, thus, we also need to break the *'Dead classroom, Capsulism, and technical interest* scenario in science learning.

Figure 7

Metaphorical Representation of Existing Pedagogical Practice



Mainly, here I focused on my envisioning towards science teachers' activities. Similarly, different contexts represent less improvement in science learning activities and we do not have a good foundation of science education. Also the government opens the doors for learners and incresed opportunities. Learners need to pursue their study. However, it seems to complicate the quality of education offered. The role of

science teacher did not change drastically. Thus, science teacher identity was also growing under the shadow of this old pedagogical banyan tree. Because this situation constructs the science teacher identity, however, science teacher identity was also discovered that science teacher identity changes during the course of a career (Day et al., 2006).

Therefore, it was later discovered to be connected to both personal and professional inspirations as well as own values. Finally, in the reflective journey and contextual understanding of this chapter, I opened the door to my critical auto-ethnographic research work and motivated me to critique my context and transformation of my roles.

CHAPTER V
BECOMING A SCIENCE TEACHER: EXPERIENCE IN THE CLASSROOM CONTEXTS

This chapter's main objective is to accurately portray the professional identity of the science teacher in my school. The major narratives gave a description of my interactions with other teachers, school administration, and student in the secondary school and an explanation of my workplace, including what the teachers think. The descriptions, however, make it clear that my experience as a science teacher and my own upbringing unavoidably influenced portraits of that school's context where I was engaged approximately for three years.

Here, I include some major stories and my reflection upon upon those aspects of the school like the setting (location), size, make-up, supervision, and management system etc., as a lens of science teacher identity construction. They had a major role in constructing my initial perspective about the science teacher's identity. Moreover, such factors push me for the reconstruction of my identity as a science teacher/ educator. I addressed the first research question - in what ways does my practice of reflection (my self-examination, self-reflection, and learning process) affect my own professional identity?

I Want to Give Back to My Learning Community

Now, I am a lecturer at Tribhuvan University, Nepal, and an M.Phil. scholar of STEAM education. Before becoming a lecturer in the Department of Science and Environment Education, I was a secondary school science teacher in Nepal. I have a Master's degree in science (chemistry) education. I decided to become a science teacher because my teachers helped me envision a more promising future and I had seen my teachers' power, prestige and property (recognition in society, respect and collecting money through tuition class), which motivated me. My childhood life was hard for me growing up. My family background was economically poor and dragged into the agricultural ground. We lived in a rural area and had a small round house made from mud, wood, and stone. I felt that it was not more than a cave.

We (my brother and I) survived by selling chocolates, noodles, and other small junk food items in the classroom in the hidden form. From that time, I chose to be a science teacher because my two teachers (Math and Science teachers) had the

greatest influence on me. I recognized the effort these teachers put forth to earn our gratitude and financial support. Making connections to their lives helped and inspire me. From this context, I feel my ideology, "*I do something better with myself*." And I dedicate the rest of my life to making it a better place in the teaching field because of these teachers' greatest influence on me.

The Beginning Science Teacher/ Educator

I chose to teach as my career. I have tried out a few different paths (project, Public Service Commission, (PSC), etc. and after a brief stint teaching in a private school, I began my professional career. I worked as a science teacher for three years. Then I decided to mold "*my love of science subject and science teacher*" with my passion for working with adults. With an impression of first context i.e., *I want to give back to my learning community* and *my passion for working with adults;* my career objective had changed to become a teacher or educator, it was fostered by studying Master of Education degree in Chemistry Education. After completing my Master's degree, I became a Science teacher at a secondary school.

Furthermore, during that journey, I understood the different aspect of teacher's personal qualities requirement. These qualities include adaptability, creativity, responding to learners, provoking reform, leadership, and their implications. Also, it promotes self-evaluation regarding the explicit and implicit curriculum, learners and learning processes, the importance of cooperation, collaboration, and teamwork, and the influences of
significant events or incidents in learning (Woods, 1998; Tripp, 1993). Such factors helped me to grow my teacher identities; which also affect science teacher identity.

With science teacher, I was also taking responsibility of the extra-curricular activities (ECA) in-charge. My teaching is of a mixed design. In my activities involve being lecturing, *hands-on*, or a lesson that is followed by *posters, models,* etc. I'm not sure what terminology I would use to describe those, but it's a mix. I used different modes of knowledge to gain the information out to them. Moreover, I did some of laboratories and hands-on activities and tried to maximize science learning. In most classes, I taught it for a little over an hour through lecture-dominating approach, and sometimes even a whole day we do some hands-on-activities. I kept talking about it, and I tried to emphasize how learning is enhanced through these experiences and connection to the material.

I thought that my prior experience had adequately prepared me for my new

endeavor into recapitulation on science teachers' identities, and the problem related to the initially or consciously considered transition processes. Even though it displays abundantly clear how my assumptions affected my teaching in direct ways now, it was not clear when I first started teaching.

In my teaching activities, I am not just telling my students scientific facts, but I try to develop their scientific skills, and knowledge through hands on activities. I was establishing my status as a novice science teacher, my works also guided by predominant activities mainly in teacher- centered activities because that context leads to me. In that school, many teachers have their entry into the teaching profession without specific training (Berry, 2007). They also follow the traditional method (*learning from listening and Capsulism*) to develop as a school culture of learning. And it affects my science teacher's beliefs. Firstly, I describe the context which built the teacher identity in the school. However, I must admit that when I first started to examine my practice, I was conscious to presumptions I had made regarding the nature of learning activities and the role of the science teacher.

August, 2014: Initial Interaction in the School

The government of Nepal appointment to me, recommended by Teacher Service Commission (TSC) as a secondary level science teacher i.e., Secondary Teacher class-III (The Education Act, and its amendments, 2002). Then my professional teacher life started. At the beginning of this journey, my first contact with the school was through the Headteacher (Mr Sharma). He was a Nepali subject senior secondary level teacher .

Figure 8

My Initial Engagement In Science Classroom as a Science Teacher

He is from *Sankrit-subject-background* and he was 56 years old. Mr. Sharma, showed me around the school then he introduced me as a new science teacher. He was not comfortable to talk with me, at that time, I was just 23 years old and my *physical morphology* looked like a small sized man. He asked me you could control the adult local students with whom you worked. They are from multi-ethnic groups. And he says that "*students are bigger than you*". Although other two new teachers, who all had similar amounts of teaching experience like me, Mr.

sharma was happy to participate them but the youngest teacher in the science subject (in my case) he did not feel entirely at ease.

The science and mathematics teachers put a lot of time into their planning of notebook preparation and new techniques to make content easily memorable to students. Major activities included discussions of important questions (for examination), and drives the end of the year summative tests (*final exam*). Teachers spent the majority of the time to conduct many tests in the preparation student's grades for the final exam. Beyond this somehow as a science teacher, I was also employed to organize teaching materials and prepare experiments, I spent time in physics, chemistry, and biology related experimental setups. But, my school context does not accept those activities. I mentioned an example that represents the pedagogical thought in our practices.

> *"I was a secondary-level science teacher with a background in science (chemistry) education. I was trying to shift pedagogical practices from teacher-centered to student-centered activities accordingly, learners kept in the center and the learning by doing as the cardinal principle of science learning. Moreover, I was trying to focus on field-action, practical- based, or laboratory-based work. On conducting this phenomenon, a conventional teacher (primary level teacher class-I) said that "He is lazy to teach contents in the classroom, so he passes the time in the science laboratory or field (experimentation)." And he said "नयाँ जोगी धेरै खरानी घस्छ"*[3]*, "Thundering clouds seldom give rain," etc. And most of the teachers also support his argument."*

This context mirrored our pedagogical practices in science i.e., a large number of our teachers have a traditional concept towards science education and science teaching/ learning activities (i.e., science pedagogy).

In my perspective, it is necessary to change such kind of perceptions (learners are passive knowledge receivers, teacher and textbook are central to teaching/ learning activities, teacher is seen as the transmitter of knowledge or source of knowledge, school/classroom-based learning) of our school family towards science and science pedagogy. Furthermore, in the present time, it seems that science

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[3] The young science teacher shows unnecessary works.

education must be shifted towards; preparing future citizens of society and focusing on multidisciplinary, child-centered, and inquiry-based teaching (Orion, 2007) and provide opportunities for students to think independently of the teacher, creating, and resolving personal problematic experience (Taylor & Fraser, 1991).

Similarly, I never once pulled out the prepared structure that the school gave me to tell all teachers. However, they commented on my classroom practices, in case my head teacher inquired about my classroom activities, I kept a prepared response in my pocket,

but I kept it hidden from other teachers. Finally, I continued my action parallel traditional as well as hands-on activity based.

18th of September, 2015: The National Science Day on Ashoj 1

As a science teacher, I include and organize Science Exhibition in the co-curricular activities because I learned that such activities promote participatory and hands-on learning in Science. The program's objective is to give students a common setting in which to develop their original ideas and gain knowledge from one another's experiences. Similarly, the participating teams presented their original concepts and approaches to

common problems through creative activities, working and non-working models, exhibits, and projects. I think it was heartening students and through self-motivation, students were encouraged to conceptualize and begin their own scientific journeys.

As a part of co-curricular activities, a science exhibition was held by Shree Dhanmuda Secondary School, on the 18th of September, 2015 (1 Asoj, 2072 B.S.) for classes I to XII. I got an opportunity to lead this program as a science teacher. It was a single-day program that was organized on the special occasion of *National Science day*. Students from all the classes were to participate. This programe was inaugurated by the president of School management Committee. He also observed and asked to rate the student performance. It was held on the school's play ground and commenced at 11 A.M. and got over by 5 PM. All parents and stakeholders were invited. Most of them also visited school and commented very well.

Figure 9

The Small Part of Exhibition on National Science Day

The 9th and 10th graders participated in the exhibition as the organizer. They decorated and reorganized the exhibition area (School's ground). They constructed the materials by choosing their favorite topic and creating content to describe it. They also performed their artistic activities via developing models, colourful charts, posters, working models, and so on.

Figure 10

Steamer Developed by Grade 10th Student

Additionally, students gave a lovely and thorough explanation of their creations to all of the visitors (other students in the class, teachers, and guests). They were even questioned about the scientific ideas and theories that underpinned their project.Visual representations were chosen to illustrate various sustainable concepts. Be it the working of a steamer, toy cars, etc., They all displayed their best skills and talents, both mentally and verbally. The students received praise from all of the guests for their efforts and were commended for giving it their all. And they encouraged students to keep up the good work. The Exhibition got over at 5 PM. And the students were given a day off.

My last year teaching in school students started to create some learning materials, it was incredibly satisfying to me there were so many things that I could not even comprehend them all to assist in editing them. One student, Kamal developed a science exhibition material called *"Steamer"/* a boat, or locomotive powered by steam. All the students praised him and followed his material. He developed a locomotive boat powered by a small motor of a toy car and controlled by a toy car remote. And he said that "*it is short and simple*." The *Steamer"* became incredibly popular with the rest of exhibition and class. Unkhowingly, at that time, I used it as a STEAM -based approach, now I realize because students created different posters, models, and materials, along with writing science stories with full passion.

The *National science day (Asoj 1)* activities taught me that artistic work is an excellent tool in the engaged science teaching/ learning scenario. All of them requested me for the next competition. In my feeling, it is one of my proudest moments as a science teacher. I found that this structure made sense from both sides, first was my science teacher's identity beliefs and second was how children learn with specific direction and a great deal of child friendly activities. And, these activities

were building my identity as a 'good science teacher' in society after the exhibition time. At that time, I used art-based material as a part of the exhibition but I did not have any idea about a STEAM approach. However, students enjoyed these activities and material. Now (after joining M.Phil.), I feel it as a very important component of learning.

12 October 2015: Upset from Staff Meeting

On the last day of the month, my school organized a regular staff meeting, but this time school organized meeting before the Dashain vacation. I was also involved there. I felt it was my best platform to expose my work and share it with the practitioner community. I simply hoped that this platform would be the best ring for me. However, it goes the opposite. The conversations of the staff meeting always create a debate between traditional ideologies of learning vs. modern worldviews (constructivist worldview).

After a long time of discussion, I understood that some teachers at my school have deeply rooted traditional worldviews. I felt it as well. They created different modes in school I am reluctant to reveal any more information about the people on *hand in activities, lab work and science exhibition* and they did not help me in that situation and hurt and frustration were beyond my comprehension. However, three /four teachers supported my action, which made me a pillar. This piece of staff meeting shows the picture of our deep-rooted pedagogical practice, hesitation and difficulty of a new science teacher to change their identity.

MINUTES OF STAFF MEETING

SHREE DHANMUDA SECONDARY SCHOOL

Date of Meeting: 12 October, 2015

Venue: School Staff Room

No. of Present: 22

No. of Absent: 1

Time Started: 2:00 P.M.

Meeting starts at 2:00 P.M.

Headteacher (Mr. Sharma) starts the meeting.

Welcome to all in this meeting. Today we are gathered for the monthly staff meeting. It is similar to other last staff meetings. The School headteacher explained the school's current situation in relevance to organizing this staff meeting of the

reflection of last month's overall activities in the school. He listed several issues that were open to discussion as meeting agenda. However, the main agenda of this meeting were:

Agenda item no.1:- *What are our plans for the children of our school for final exam (SLC) preparation?*

Agenda item no.2:- *Lesson plan development and its strict implementation.*

Agenda item no.3:- *Disciplinary committee and treatment room.*

Agenda item no.4:- *Monthly test conduction*

Agenda item no.5:- *others*

Scene of Meeting

As the open discussion, all teachers show their views about the above agenda. Mr. Sharma noted that these views. In this meeting, Mr. Primary teacher of class-I said that "I am planning for a successful result, extra classes, coaching class, weekly test, etc." For continuous improvement, we need to motivate students to read important questions , rote notebooks and solve them many times. As a teacher, we should know the background history of (marks) all students so that we will know how we are going to handle them. We have a strong desire to serve our students' high marks. We want them to know how to improve themselves and realize their dreams and guide each of them to the opportunity to learn despite their differences (based on the score of monthly test). As a teacher, we have also improved ourselves to be more effective, i.e. prepare lesson plan, important question notes, level-wise sets, etc. and for us to render a quality education to them. In another agenda no. 2; most of the teachers focused on the lesson plan development in the dairy and it followed strictly. Similarly, for the implementation of agenda no 3; a new Discipline committee formed this year would control the students' activities that relate to the disciplinary part of students. Its work would be different from the other committee because it is more of a kind of suggestion-oriented supplementary role. For the agenda no.4; they advised it is not new for us, so it continued in a similar way to last month, but we need to include more complicated questions.

.. ……Tea or fruity and Biscuits……Break meeting for some time……..

After the break of meeting, the headteacher continued it and he stated the points listed by him. Then, he asked a teacher to write the decision of thatday's staff meeting minutes. He concluded that, for developing student quality (increasing pass

number), these decision points would be steps of further direction, the headteacher stressed upon the need to constitute different subcommittees for working on specific aspects as needed so as to ensure the optimal input from all teachers for the purpose. Then, Mr. secretary wrote these decisions:

Decision item no. 1: *It was decided that the increase in learner achievement, the Staff Members were requested to activate all resources, practiced the very important question, prepare a note and promote students to remember for exam purposes.*

Decision item no. 2: *For the enrichment the growth of the institution, we must prepare the lesson plan and follow it in the classroom. It is specially focused on the result- oriented action.*

Decision item no. 3: *A discipline committee to be set up to address the student discipline and control them. They believed that students' lack of concentration on academic activity was due to ineffective discipline. Each time there is a disciplinary issue, the committee will meet to report it and punish the offending students.*

Decision item no. 4: *To enable all students to get a chance to assess and evaluate the nature of work needed to be undertaken for each of the mentioned aspects as a monthly test. Also, provide feedback and repeat it continually.*

Closure: *After all the discussions and deliberations, the School headteacher inquired if there were further questions and acknowledged each member for their attendance and active participation. Mr. Primary Teacher Class-I typically said to me "Mr. new science teacher, now, you also left unwanted activities (i.e., hands-on activities, field-activities, and lab works) and focused on teaching and some teachers were laughing loudly. Headteacher also strongly supported him and he said that "Yes! Now new science teacher, you also focus on the note, important questions, 10-Sets, and Practice Book, please stop hand-on activity, lab work, etc. and focus on the result." The meeting ended at exactly 5:00 P.M. in the afternoon*.

THE-END

As a science teacher, I shared my perspective *"It is our task to deal with our children in a friendly way and in a motivating environment, giving them the opportunity to engage and we have to support them through hands-on activity and learning material to have an effective learning."* But my headteacher did not provide value for my opinion and he did not include it in the note list of decisions. My

headteacher advised me strongly, *"Yes! Now science teacher, you also focus on a note, important questions, 10-Sets, and Practice Book; please stop hand-on activity, lab work, etc."* Most of the participants laughed loudly. I looked at/ silently listened to those activities.

Many teachers are *laughing and chit-chatting* informally as I look around the staff room, taking it all in. I was aware of what was weighing on my mind. I was not ready to accept prepared hard structure i.e. *Capsule*. The two third number of teachers supported my headteacher's *capsulism activity*. I started to really see everything around me. For my work to have meaning I need to be in control of something throughout that day. And, I feel my final string of pedagogical strategies and personal identities were being cut during the meeting. I feel completely defeated after attending this staff meeting, which leaves me exhausted and frail. It tried to damage my bright professional dreams and my mind was fighting against it.

After staff meeting, I pondered all those activities I became aware of the identity I had fought for 'who I really was'. Forcefully, I had been trying to follow the traditional method in the same manner as all of the teachers around me; I felt highly guilt. They resisted me applying other activities in science teaching as my professional identity. In continuous observation, of them, I was unable to manage my own behavior as traditional works where I feel I am not appropriate in every aspect of school.

Everything had been rearranged as how the administrator (my headteacher) wanted it so that I could return to it with more ideas of how to make it better. All of my materials, passion, energy, and emotions were closed and could not be released. It tightened the chain on my hands and it held tape over my mouth. My voice had been silenced and activities were reduced to secure the best result in the final exam. Finally, it tried to limit my identity to positional identity only i.e., secondary science teacher class III. My activities were limited to four walls of the classroom and my pedagogical practice was limited to *capsulism*. Critically, in the engagement of prescribed activities "*I experience bowling, batting, and catching…… as the major pedagogical practice (game) of my classroom crease"* as a suitable metaphor. My context promoted me *"My students asked me questions (bowling), and I answered them immediately (bating), and they wrote (caught) answers in the notebook."* It creates an obligation to me to stand in *batsman-position*.

When I looked at all the allegation made against me at the staff meeting, I felt that I had betrayed my professional identity. Because of this, my professional identity has a specific role and making sense of the accountability and realities related to professional recognization with the challenge and reward (Gee, 2000; Settlage et al., 2009).

The staff meeting activities created a lot of uneasiness. In the profession, I saw that my dreams were turning towards despair. I could not accept it. After many days of internal strife, I was moved to say that I should not change my existence. As a consequence, I was highly motivated and moved forward with more force *"I do something".* I had to confront abuses, insults, threats (*Like my school headteacher said to me "I think about his performance appraisal; it is in my hands"*) and psychological torcher. There was also a performance appraisal number for promotion. Thus some of my friends would suggest to me to do whatever the headmaster said, why I had to teach for his happiness. But I did not listen to them and I started taking both activities together as pseudo-activities. While experiencing all these activities, I was trying to understand my identity as a science teacher in the school. Like the school environment and society, the mentality of the teachers is not so good about the teaching profession. That has been put below as a topic with/within communities of practice.

With/within Communities of Practice: My Friend's Perspective towards Science Teacher Identity

After I entered the school to teach, there is given training like Service Entry Training, and Teacher Professional Development Training. There were many participants. In training, we had many discussions which were related to education system, pedagogical practice, and improvement, and some were related to our identity. Sometimes, there were also comparisons between our jobs and those in other jobs (PSC, doctor, engineer and allegedly other valuable jobs).

Teaching is deemed to be difference from other profession because it is structured around a specific set of qualities and goods (Cribb, 2009). In different meetings, many of my friends also used to do different things beyond teaching as a representation of un-satisfaction with this profession. Out of them, Indira's words are stamped in my mind. I mentioned it here because it is a clear picture of professional thought and teacher identity in our society.

Indira, an experienced teacher with a master's degree in education, was in her tenth
year of teaching. According to her, she considered a career as a teacher to fulfill the basic need of life not in her interest. She spent more than ten years preparing for the public service commission (PSC) examination. She particularly committed to passing the exam. However, she did not pass that time. As a result of this situation, Indira was feeling sad and just considering the teaching job. She told me that after graduating, she has been preparing for section officer. She has an extremely positive attitude toward the PSC placement as a part of her dream. In her opinion, the positive attitude played a significant role in encouraging PSC's job rather than teaching when some friends have left this job.

She was not attracted to the teaching profession as a result of the negative impression which is guided by society's thoughts. At School, numerous opportunities for Indira to advance her career had been made available but she had not satisfied and told that "*Anyhow I must join section officer,"* I felt taken care of from the start and supported in my efforts to complete these tasks or pass the PSC exam; *My father and brother were very supportive of me doing this."* Indira actively looked for and went to several exams or opportunities at the PSC in order to continue to gain the best result. But, by the time I left, she had not passed the exam.

She provided an illustration in the first part of this quotation about own perception towards teaching job and she was interacting with people in constantly shifting contexts of the profession, additionally, it shows enthusiasm for the prospect of the next job (professional identity) but she had suggested to others, *"…Who lives by teaching; Instead of teaching, you also prepare for public service."* In the second part of the quotation, Indira showed that her family supported her for a new job.

In the casual conversation, Indira admitted that she had some very strong opinions about the teaching profession and the teacher identity, but she also acknowledged that these opinions were seen as just a time-passing interest. Additionally, some fact also provides some evidence to support her view about teacher identity; she claimed that some of her colleagues lacked such kind of understanding because they were engaged in the teaching profession *"I need to be careful because I don't want to be like my colleagues and think they are stupid."* Through this argument, she was comparing herself to other. She made it seem as though she considered herself to be '*more cleaver and smart'*. her voiced indirect

concerns that they have become teachers because they are idiots and they have no idea about carrier.

In my understanding, she criticized the school teacher and the higher educational institution's teacher identity. According to her, some people entered the teaching profession

for the incorrect motives, unemployment and a lack of interest. Also, she used to repeat this sentence many times: *I want to take risks, I do not stay here, I am going to prepare for the PSC examination because there is a quota for us (female)*. During a similar conversation, a friend of mine asked her "Why are you coming for TPD training? She answered easily, "*..... Because I do not even have to teach and three or four hundred allowances will be gained as income."* Some participants also agree with her argument. It demonstrated that she had no real interest in educating young children and thought about teacher identity in society. That is the reason why I say that this is the identity of a science teacher in society as most of the participants in the TPD training supported her argument. In the part of the conversation, I found her and my community of practice had a clear and strong view of what constitutes teacher's professional identity. Besides, the value of the teacher in our society was a recurring features in her in most conversations.

Figure 11

My Community of Practice in TPD Training

Critically, here, I present the thematic analysis that came after my experiences. The major theme seems to be the value of my (science teacher) identity in school. I reflect whether the teacher identity was accepted (high valued) or or rejected (low valued) in my society and the major envisioning was context leading to segrigation, and finally, the science teacher identity was growing in different modes. They include the science teacher identity in the society and science teacher identity within a school. Similarly, the value of science teacher in society is not valued (similar to other subject teacher); however, in school, it is more valuable than another subject. Although it is generally accepted that teaching is a profession, it doesnot has value with same respect as other professions like engineering, law, pilot and doctor (Armour & Makopoulou, 2012).

Due to the code of ethics, professional autonomy, and a specialized knowledge base teacher's identity is traditionally seen as being different from other types of profession (Day, 1999; Cribb & Ball, 2005). However, it can be further divided by level-wise identities in our context, such as a primary, lower secondary and secondary school teacher; a subject- or field-specific educator like English teacher, science teacher, math teacher and so on. In this context, my professional identity always resembles bureaucratic thought.

The Liminal Identity in School: My Identity as a Science Teacher

In my school journey, my initial sense of identity was shaped by my prior scientific experiences, which dominated how I saw science and how I taught it. My formal and informal positivistic science experiences suggest that it is an effective science teacher. In contrast, I found that a few positive experiences may not be sufficient to make a good science teacher and I need to rethink my initial beliefs about science, science teacher's identity and science teaching.

The science teacher's identity evolves within social, institutional, and socio-historical contexts and its construction process is complex and ongoing (Varelas et al., 2005). A continual process of self-formation and self-reformation within an institutional context, discursive settings, and natural elements is required to become a good science teacher. As a result, a science teacher's identity may change because of their ongoing interactions with students, ongoing relationship with peers, and yearly changes in their role (Settlage et al., 2009).

In this instance, the experience I had in my sixth through tenth grades appeared to have shaped my initial identity about the kind of science teacher I wanted to be and how I felt about science teaching in the future. The learning experiences and beliefs I encountered after enrolling in science education courses may have an impact on how I interact with and understand the new pedagogical practice in my classroom. In addition, after joining STEAM education, this course provides opportunities to reflect on my experiences and write autobiographies based on science learning early each semester. My professor helped me to reshape my initial values and beliefs, which helped me to design my instruction and my identity. When I entered the teaching profession as a secondary level science teacher, I found limited and apathetic perceptions towards science teacher's identity and it only focused on positional identity.

In my school environment, my professional identity (science teacher identity) relates to the issue of marginalization of profession compare with other sectors (PSC, Doctor, Engineer and other valuable job). And it ties closely with money (improved socioeconomic status) and a powerful mindset. I started to imagine a duality regarding the issue of the science teacher's identity being in another school inside the school. I feel that to make sense of the context and compare it with my own experiences i.e., *school within a school.* Similarly, teacher identity is a separate identity in the same level and all compared with different bureaucracy levels. On the way of this journey, I discussed this issue with some teachers to lead a sequence of perspectives. Some teachers described *another school within a school and different identities within same level* as a negative construct; whereas they suggested to me "*You are still young. Please prepare for public service, that is best for you, it is not suitable field for a talented person, etc."*

My Identity as a Reformative Science Teacher: The Fusion of Positive and Negative Events

I have already mentioned my opinions and convictions concerning science teacher's identity and science instruction stem from my educational experiences and my classroom crease. In my higher science education courses, I had a variety of experiences with science learning. In the initial days of my appointment, I felt excited to teach the science classes and recognized the use of modern methods such as learning by doing, hands-on activities, cooperative method, collaborative method, experimental method, etc., which I learned in my M.Ed. in chemistry (science) program.

When I joined school, existing science learning classes were run in traditional ways, such as lecturing, parroting, and *capsulism* (chapter-IV) and science learning highly impressed over anything else, memorization. However, other factors that impacted my interest in science teaching and science teacher identity were my attitude, enthusiasm toward my subject and learning activities in my M.Ed. in chemistry (science) program. I thus give up my mornings, lunches, and after-school hours to help students with all of my passion, constantly assisting them in their learning. Because I was concerned about my own learning strategies, I refused to abandon them when the school administration pressed me to.

On the other hand, the school administration looked at me with a negative disposition. They would feel that "he *is not a good science teacher; he makes students*

do a lot of unnecessary work without teaching", but I was struggling to continue. students to learn about concepts through hands on activities. Hence, for the reformative actions and identity, I
participated in a range of activities, such as collaboratively planning a science lesson, being organized, managing the classroom's resources, and effectively implementing the lesson. My pedagogical activities and administration thoughts are often run in a vulnerable and challenging situations and my actions lead to *act* and *react* to those contexts in real-time.

I had conflicting identities at the start of my initial year as a science teacher because I was not feel confortable in that position. In the classroom, I wished to serve as a facilitator but in the field that was not occurred I already shared my context and conflicting identities related to my roles and actions. I consider myself to be a facilitator who helps my students learns properly, so I believe that makes me a more reliable source in the classroom. But because of the way my school is run, I was forced to take on a more conventional role, where the instruction was more lecture-based.

Even though I wanted to acclimate and introduce them to my activity and my roles in the classroom, and learner are leader for their learning. Sometimes, I conducted an experiment to satisfy student's curiosity indeed it my identity as a less of facilitatory and more traditional person was actually observed in the fall of my first year. It means a highly positional identity (Holland et al., 1998) and a less activist identity (Beane & Apple, 1995). Along with that, I began to present a potent and multifaceted lens that was rooted in the culture of the school, the identity of the science teacher, and life experiences (Flores & Day, 2006).

CODA: How did I Find Myself in a Traditional School Setting?

Living in a traditional school setting, I was constantly torn between two potentially incompatible "role-specific" teaching ethics: the first is nurturing students 'doing the rightthing' and the second is serving or meeting institutional policy and goal 'doing the job' (Cribb, 2009). And the balance between ' economies of performance' and 'ecologies of practice' added to this conflict (Stronach et al., 2002). Moreover, when the national and local policies and practices supported by the core values of science teacher identity. Sometimes a more general sense of moral obligation and/or public service coincided with a commitment to interests in particular curriculum subjects, teachers were generally satisfied. Critically, however, when

the policies are oppossed to these fundamental beliefs, I found myself frustrated and discouraged. As a result, all of these situations and experiences had an impact on how I developed and implemented a new identity, and it is crucial to alter how science teachers view identity. Instead of using a one-size-fits-all strategy, it was decided on ways to increase the value of professionalism of all science teachers.

In the engagement of the school environment, I feel that science teacher identity is not individual work both personal and contextual factors contribute to the transformation of my professional identity through the interaction of the self and the social context (Arvaja, 2016). Taking into account Gee's (2000) assertion that the growth of teacher identity is a flexible process, and science teachers' backgrounds influence both their motivation to enter the teaching profession and their sense of self, so teacher identity must take this into account. I felt this is useful to me also. Thus, multiple studies on teacher identity may provide a more comprehensive viewpoint that enables teacher educators to construct and develop science teachers' identities in constructive way.

Moreover, the four dimensions (think, know, act, and feel like a teacher) (Feiman-Nemser, 2008) were motivate to me to reshape, which were directly related to my thought and feelings, my environment and social interactions, and my professional self. Finally, I left my school science teacher job and went back to my university career. I felt that the bird that had gone to cut down the old Banyan tree but returned with a beak of small piece or leaf. In a school context, the old banyan tree (Chapter-IV) is standing. Even though I changed my identity a reformative science teacher rather than traditional; at my farewell ceremony, some people (teachers, parents, and stakeholders) said that "*a teacher who was trying to improve the school, he also left this school."* I felt a bit of justice in my work at that time. Hence, a school within a school and different identities with the same level created tension within me and acted as a major obstacle to reforming my identity as a reformative science teacher. However, I continued my journey.

In this setting, I was changing my identity through process of becoming that I was undergoing in this situation involved ongoing identity-related negotiations, disagreements and exploration. It is a process that develops as a result of social-historical interactions (Schutz et al., 2018). In addition, I find it difficult to understand my place in the classroom and at school, which increases my likelihood of leaving the profession.

In contrast, a science teacher who is more successful in recognizing and modifying their own identity as a teacher might be more willing to stick with it. Also, due to its emphasis on how a person positions themselves within the teaching profession and the identity of a science teacher is given a lot of attention (Beijaard et al., 2004). It further affects how one makes decisions about how to teach science and the ways in which teachers should behave (Kier & Lee, 2017). And it occurs as discipline-oriented and connected to professional self-image (Enyedy et al., 2006).

And finally, within my school context of the classroom crease, I was developing my professional identity, including I understand my responsibility as a science instructor. And I identified as a reform-oriented science teacher as part of my professional identity regarding teachers' beliefs, classroom activities, pedagogical practices, and adhering to the goals and reforms being made in the field of science education.

CHAPTER VI
STEAM TRAVELS: DILEMMA, ACCEPTANCE, AND ENVISIONING

In this chapter, I organize my experiences of the 18-month journey, which highly impressed me to transform. It was started in February 2019. The following reflections are based on my experience as an M.Phil. student (STEAM education) in the School of Education at Kathmandu University, from February 2019 to August 2020. It helped me change my pedagogical perspective, practice, and my identity. This chapter shows my core engagement in the STEAM journey. It is divided into three major sections. First is related to dilemma and acceptance, second is envisioning, and third is how I gradually change my identity. These reflections were written as a response to the various courses I took throughout the program's three semesters. I then give a quick background on each reflection and an auto-ethnographic inquiry of it. The second and third research questions of my study served as a guide for how to organize and present these reflections, which are based on the theme of my experiences.

In the first section, I include four contexts of my learning journey under the topic as a form of STEAM travel stations. They are; Station I, Station II, Station III, and Station IV. They illustrate how they prepared me for a reflective journey and convinced me to transform my identity. Similarly, the second section represents my changing thought, and the third is concerned with how I changed my identity. Consequently, this chapter was developed as the center of my second and third research question. They are: how did I prepare myself as a STEAM teacher/ educator and progress in my M.Phil. journey? And why did I transform from a conventional science educator to a STEAM educator through a critical reflective lens?

Station I

Dilemma: Standing on Multidisciplinary and Multi-paradigmatic Tract

February 2019 –August 2019

I was a little nervous in class. I was at a new university and I participated in an M.Phil. STEAM course, which was totally new to me. Everything was so unfamiliar. My professor inspires us to write a reflection on our past educational journey. But it was out of my hope because I joined this university to study STEAM content. My main reason for signing up for the course was that it would be beneficial for my

future career. In the initial days, I felt a shadow on my dreams and future in this subject. That is why, the class was dedicated to multidisciplinary students such as Science, Technology, Engineering, Arts, and Math. And pedagogical activities are always concerned to:

" …..STEAM…….STEAM……..STEAM…..integration of arts……"

"…….Reflection……reflection ….critical reflection….write your reflection….."

"……..Interpretivism, criticalism, postmodernism, or multiparadigm……"

But, I was not convinced of that thought. However, However, to some class of the first semester, which I attended, I responded with a brief reflection. Beyond convincing my thought, I mentioned my reflection as a dilemma. Then I experienced a dilemma full journey in pedagogical thought and struggled for my career and professional identity.

Experience in the Station-I to Station-II

During the journey of station-I, I got an opportunity to review different kinds of literature related to multidisciplinary thought (STEAM education) and research paradigm. While I started this journey from station-I; I collected and learned a lot of different experiences. Here, I focused on how I passed through the dilemma full journey in my initial days of this course.

First, I mention the multidisciplinary thought which convinced me to transform my STEAM journey. For the fulfillment of 20th century demands, a more mature youth with the high-tech skills required for the growing STEM job market were the driving forces behind the development of STEM education. The STEAM initiative gives students more than just technological know-how. The fusion of STEM and the arts yields a special skill set that can enhance these transitional achivements. Divergent thinking is the capacity to simultaneously break down a complex issues using convergent thinking and then apply the corresponding solution to the real world. Making personal meaning and being motivated by oneself are made possible by incorporating the arts into STEM curricula (Land, 2013).

However, a compelling learning philosophy that guides the development of STEAM teaching and learning methods intended to give students the transdisciplinary skills they need to take part as future citizens in discussions, decisions, and practices related to sustainable development (Taylor & Taylor, 2018). STEAM learning happens at four different levels: 1) the accumulation of stocks of knowledge, 2) the creation of knowledge between people and organization, 3) the changing perception

of self as new knowledge, skill and one's ability to participate in a community of practice are assimilated, and 4) other people's changing perceptions of a learner as those new capabilities are leveraged within the context of a network (Radziwill et al., 2015). STEAM learning is a philosophy of transformative learning as five interconnected ways of knowings (Taylor, 2015). This changing phenomena is shown in people in an ethical way, not an obligation, so in this condition, STEAM-education is required to be pupil-centered , de-centralized, conceptual, interdisciplinary, sustainable and ethical . Finally, STEAM-Education addresses transformative pedagogy in Nepali science teaching and learning process.

In many countries of the world, there are various projects developed to make science effective and useful. Examples are Science-Technology-Society (STS) from Canada and the US (Solomon & Aikenhead, 1994), Science and Technology in Society (SATIS) from the UK (Curry & Holman, 1986), or Scientific and Technological Literacy for All (STL) in the framework of the UNESCO project 2000+ (Holbrook,1998). Like those projects, our country also needs one science education- related strong guideline project to develop the science as own our science., in such a case with STEAM-education journey or after the completion of STEAM, it is necessary to address different aspects in the context of our science education.

Secondly, in this journey, I have gradually built up my deep understanding of research paradigms. By paradigm, we mean a community of researchers' shared beliefs, values, and presumptions about the purpose and methods of research (Kuhn, 1970). It illustrates a system of interrelated practices and thinking that specify the ontology, epistemology, and methodology dimensions along which the nature of inquiry (TerreBlanche & Durrheim, 1999) and promotes to naturally reflect the worldview we hold about the one we live in and the one we want to live in (Lather, 1986). Along with this journey in the field of educational research, the term 'paradigm' kept me in the maze. But my professor encouraged me to describe a researcher's 'worldview', which denotes a way ofdistinct inquiry, a way of thinking, a school of thought, or a group of beliefs that influence how research data are understood or interpreted and a pattern or broad approach or perspective taken towards a method of a study (Mackenzie & Knipe, 2006).

Eventually, then my opinion gradually developed towards 'paradigm' is a fundamental set of assumptions or worldviews that directs research activities or an investigation and it is important in research to provide pattern, framework, and system

of academic and scientific beliefs, values, and presumptions as well as interpretation of result. My study was concerned with interpretivism, criticalism and post modernism paradigms and Multiparadigmatic Design Space (MDS) (Luitel, 2009, 2012). So, now one concern was raised here how you would immerse in these paradigms. The understanding of multidisciplinary thought and post positivistic thoughts were tools for me to break the dilemma. It focuses on a relativist ontology in which a single phenomenon might have several explanations, realities and relation rather than absolute truth or single reality. Finally, I impressed by its main assumptions such as *relativist ontology, subjectivist epistemology, naturalist methodology* and *balanced axiology.*

Moreover, this paradigm deals with multiple interpretations of humans' relationships, personal experiences and context or phenomena or culture. The interpretivism researchers ought to make an effort to comprehend the various lenses through which people view and experience the world in various settings and contexts (Hammersley, 2013). It is an anthropological and hermeneutical turn in the research field and anti-positivistic view, which mainly focuses on seeing participants' views through their eyes and interpret them deeply as conical shape.

This paradigm highlights discussion with the diversifying views of phenomena and researchers try to deeply understand them in a social context. Participants' beliefs, morals, prejudices, views, feelings, and perspectives can all be questioned by researchers (Wellington & Szczerbinski, 2007). Similarly, Luitel (2009) states that interpretive research is concerned with meaning making process of individuals and it seeks to understand participants' lived experiences and context. However, this thought facilitates me to engage in the research field and understand my perspectives relating to the multiple vantages of engagement in my field and identity. I think it helps me to probe my real-life experiences through my views.

The knowledge of criticalism is an another important achievement of this engagement, which leads to empower individuals and societies and advocate issues of power and agency related to oppressed peoples' power. This paradigm assumes a *ontology of historical realism, transactional epistemology, methodology that is dialogic,* an *axiology* that respects *cultural norms* (kivunja & kiyumi, 2017). It is also seen as a transformative paradigm (Riyami, 2015). This paradigm explores contemporary issues of present social contexts and "gross power imbalance" in society to contribute the system to reduce social inequalities and injustice (Taylor &

Medina, 2013). In educational field, this paradigm helps researchers to create equity and equality and power balance in teacher -centered science classroom practice (Taylor, 2008).

While I understand a little bit of this thought in this class, I started to think about equity and equality of science teacher identity compared to other professions. Then I think and use it as 'advocacy of injustice in science classroom' and promoting the empowerment of democratic and participatory pedagogies in existing classroom practices and also connect this thought with science teacher identity. While studying this, it focuses on the respect for cultural norms, the researcher's deliberate effectiveness in addressing issues of power, oppression, and trust among research participants, as well as their heavy reliance on praxis. It efforts to reveal intersections between politics, morality, and ethics. I came to the decision that I have to search for everything within myself.

Similarly, the next paradigm, 'postmodernism' focuses on the arts-based inquiry approach whose main belief is human as artistic beings. It emphasizes that the arts represent self. It articulates powerful new logics and genres to make sense of the complex world through stories of our experiences, narratives, poetic, dramatic, non-linguistic, metaphors (Taylor et al., 2012). This postmodern paradigm also guided me to promote thinking and expression as well as to make art based world. I believe that this paradigm deals with "multiple ways of knowing" (Guba & Lincoln, 2005) and artistic writing as an inquiry. In the initial days of this journey, I was confused looking around due to the dialogic conversation with my professor; like Krishna (my professor) and Arjun (me) conversation in the Bhagavad Gita. I was convinced to change my preexisting thoughts and get engaged in STEAM education passionately.

Acceptance: Time to Win Multidisciplinary and Multi-paradigm War

Critically, in this journey, I have hung on two sets of paradigms. It is *research paradigms wars* i.e., paradigm of positivistic worldview and paradigm of post positivistic worldview. Before the acceptance of multi-paradigm (Luitel, 2009), I have shown how both paradigmatic worldviews are at war with each other inside my thoughts. There is an immense danger of a paradigm that focuses on positivistic worldview because I am from the chemistry / science background student. It is explained by drawing attention to 'absolute truth'. After the engagement in this journey, I understand that it is a devastating threat to me (human), my culture, and other biological life. Therefore, I am convinced that positivistic thought is not only

sufficient for my identity construction process. Then, I started to rethink my pedagogical work and my identity, which pushed my journey toward the multi-paradigm and transformative activist identity in my profession. Similarly, I have been hanging on integrating different sets of subject as a subject. Finally, I was convinced that "*it is not a subject; it is a multidisciplinary approach (my professor's voice in class)*." Consequently, in my practice, I decided to choose the multidisciplinary approach (STEAM education) as a transformative learning perspective in my professional life i.e., in pedagogical practice and science teacher identity.

Station II

Multiple Perspectives in Learning and Identity: Constructivist, Socio-cultural, and Transformative

August 2019- February 2020

I have already mentioned in my school life I was growing with a kind of traditional pedagogical environment (chapter-IV). I was influenced by the 'definitional approach' at that time. Critically, in my mind, a wrong perspective was stamped i.e., the great teacher knows all contents and transmits spontaneously. Furthermore, initially, he talks about the definition, writes on the blackboard/ whiteboard, then students read and memorize it. After that, the teacher asks students questions. I/ we answered the questions and solved the problems, and then prepare a perfect notebook for the examination. The teacher becomes great if a large number of students pass in his subject. Honestly, I was also influenced by such kind of great teacher or this approach but in my subject, I believe if we conduct the practical / experiment in science lab, it makes better. My mindset was on the fully behavioristic pedagogical form. It focused on only observable, measurable, outward behavior worthy of scientific inquiry.

When I joined a Master's degree in chemistry education, I studied some philosophical background and learning theories. At that time, I got an opportunity to familiarize myself with constructivist philosophy (some constructivist and sociocultural perspectives) in learning science. Similarly, in the case of transformative perspective, I was just familiar with it at MPhil level.

There are different pedagogical approaches developed based on constructivism. The radical constructivist theory of Glasersfeld focuses on learner's construction that built two principles of constructivism (Popkewitz, 1998). First,

knowledge is not passively acquired; rather, it is actively created by the learner. Second, by giving our experiences of the world
meaning, cognition aims to organize them (Bodner et al., 2001). Additionally, social constructivism based approaches are focused on social interactions of learners that influence the process by which knowledge is constructed, thereby accepting
the idea that each person has their own knowledge but incorporated into social effects.

On my side, when I completed my Master's degree dissertation, I took a research issue related to constructivism. That study focused on the constructivist lesson approach in the science classroom. Then, I was highly convinced by this approach, and then I tried to create fair arguments continually about constructivism-based approach. Also, I was familiar with some other important aspects of constructivism; personal constructivism (Piaget, Bruner) contextual constructivism (Cobern, 1993), and social constructivism (Vygotsky, 1978) kept an important role in science learning. Additionally, When it comes to the formation and organization of students' ideas, contextual constructivism and Gergen's social constructivism place a strong attention on the influence of culture and worldview, while emphasizes the role of language in the acquisition of knowledge (Bodner et al., 2001).

The internal world of the student and the good notion of the subject matter as described by Cobern and Aikendhead (1997), are competing for conceptual "ecologies," a metaphor that conjures images of competing constructs, adaptation, and survival of the fittest. Compared to radical constructivism, this is a slightly more nuanced picture. It emphasizes the necessity of fully taking into account both the learner's context and the knowledge that needs to be learned. The term "ecology" or "context" represents the socio-cultural aspect of learning which leads to socio-cultural science learning (Pea, 1994).

It has become clear from studying sociocultural learning in my most recent course
that one of the most crucial steps in increasing my knowledge has been to explore and explain my ideas. After some thought, I realized how much my pedagogical development. Creating "texts" for others to respond to, whether in conversation or as a class presentation, and participating in ongoing dialogue, in my opinion, is how I was raised (Pea, 1994). In the context of Nepal, pedagogical approaches are guided by highly definitional approaches and it is highly structured. Also, it is a Western-

dominated curriculum rather than our socio-cultural representation (Luitel, 2009). Hence, now I am convinced of this argument and try to create space to change this. Finally, I realize that socio-cultural learning contributs a specific role in sustainable science learning and respects cultural diversity in science.

Moreover, the socio-cultural perspective focuses on the relationship between learners, between a learner and a facilitator, or between a learner and an environment experienced by them (Cobb, n.d.). I currently give it meaning, which disproves the idea that symbols and transmission can be used to transmit meaning to students. The opportunities for real-world experiences that matter are provided by this method of teaching, however (Fosnot, 2005). Due to the suported and sociocultural learning context in this approach, participants were also able to produce projects that went far beyond the previous scope of what we had anticipated (Vygotsky, 1978). Students also acquired knowledge from their collaborators
and the context while working on projects that were tailored to each student's vision.

Here, my next concern of this Station is transformative pedagogical practices (approach). It is an important achievement of my MPhil journey, which engages the students in critical reflection and changes the presuppositions underpinning individual's values and beliefs (Taylor & Taylor, 2019). It has been articulated in multiple ways to inscribe the need for 21st-century skills and developing students' transdisciplinary abilities and skills for participating in sustainable development as future citizens. It creates debates, decision-making, and practices. Moreover, STEAM-based learning approach is an example of such kind of approach. At present, I am building up my perspectives towards this approach, which leads to educational transformation focused on subjectivities, lived experiences, and real-world problem-solving to be addressed in the formal education or science curriculum.

In the science classroom, the STEAM-based learning approach focuses on student engagement in the context and then encourages reflection, views and critical thinking. In this approach, learners learn to re-conceptualize and change how their outer and inner worlds interact by using cognitive, emotional, social, spiritual, and moral value (ethics) development methods (Taylor, 2013). Furthermore, O'Sullivan et al. (2002) argued that transformational learning involves deep experience, structural shift in the basic premise of thought, feelings, and action. So, now I just understand the appropriateness of this approach. It seems more effective in achieving academic as well as a holistic performance of the students through collaboration, participation,

empowerment, accountability, confidentiality, and opportunity for subjects to present themselves in their voice. In the case of transformative learning approaches, I am a novice learner of transformative learning. I make sense that it works with the student's supportive atmosphere, and the teacher can encourage critical and creative thinking and the expression of a variety of views. It encourages transformation in different issues, social or classroom change, or problems by learner and teacher.

In envisioning transformative learning, it seems important to change the present learning scenario often reduced to parrot learning. Along the study journey, I changed my belief system through a psychological transformation and reflexivity. I would try to frequently involve a collection of questionable claims related to science teaching / learning and science teacher identity. In these accounts, the teacher's job is typically described as one of assisting students in their inquiries and explorations.

Additionally, the science teacher may be in charge of a variety of task and encourage students to reflect and real-life problem solving. Therefore, it is not whether or not students are building that is crucial, but rather the type or caliber of those socially and culturally situated constructions, along with the teacher's own identity. This learning perspective is rooted in Marxist and neo-Marxist critical theory and Freirean perspective, the transformative educational response to institutional and ideological hegemony is critical pedagogy (Dirkx, 1998).

Generally, the transformative approaches indicate to transform in person or society and it challenges the preexisting status of various fields (society, education, and many more), which puts an emphasis on public good (Mezirow, 2003). It sees the teacher's and the students' commitment to working together to develop knowledge. Therefore, I also learn from this course toward transformative science learning that it is crucial to gain knowledge from real-world experiences, where activities are based on individual ideas and visions in the real world. Reality construction process is a collaborative process of participants coming from diversive perspectives and interacting in different levels of development. This course is also teaching me about transformative science learning that in order to accelerate change, it is an important to learn from practice-based activity in the multi-contextual field.

Then, I considered constructivism, sociocultural, and critical and transformative approaches to have abandoned the topic of science learning. It also concentrated on moving away from ideas that seem to appeal to lone individuals and toward multiple contexts such as sociocultural, historical, relational-materialist

dynamic, situated, and dialectical (Polman, 2006). I have been tried to focus on Mezirow's perspective, the social dynamics and cultural matrices of cooperative practices as they continuously and historically develop over time (Mezirow, 2003). And I link it on my context, science education also placed a greater emphasis on human subjectivity, including the processes of thinking, knowing, feeling, and remembering as well as the formation of identity and commitments.

Therefore, I realized I have the opportunity to raise the current open level of discourse in mathematics and science education and adhering to sound pedagogical practices, I work to create for my students learning environments that are both intellectually stimulating and reflective. Additionally, while giving students the chance to create meaning from their experiences with the material, student-centered pedagogies help teachers give up some of their control and solution of real-life problems. As a result, my past experiences and present understanding of such pedagogical perspectives are significantly changing and leading to a transformative stance.

In this work, I elucidate my envisioning of these perspectives from our classroom engagement. Constructivist epistemological thoughts have had a significant impact on science education for many years, and there is ongoing discussion among some science education scholars about their value in creating effective science instruction. Similarly, some fundamental constructivist concepts have been widely adopted in science education and are now even frequently taken for granted and I am also impressed by this approach. However, in our context, learning activities are highly guided by structuralism and behavioristic worldview. Thus, in this study, I started to change my deep-rooted pedagogical belief and values.

Hence, this discourse is fruitful to me/us because it develops the sensation of transformation and rethinks the science pedagogical scenario of our existing practice. It has become clear that explaining and exploring my ideas has been one of the most crucial steps in building my pedagogical knowledge and reflecting, I realized how much of my own pedagogical development. Furthermore, pedagogical approaches are guided by highly definitional approaches and it is highly structured. Also, it is a Western-dominated curriculum rather than our socio-cultural norms and representation (Luitel, 2009). Hence, now I am convinced by this argument and try to create space to change this scenario. Consequently, I felt the need to change my

existing pedagogical approaches with respect to socio-cultural diversities/ perspectives, and transformative learning for the sustainability of science learning.

Similarly, I distinctly gain a way to contribute to ongoing discourse and creating "texts" for others to answer back to, whether in conversation or as a class presentation (Wertsch & Rupert, 1993). That might be significant for sustainable science learning and respect for cultural diversity in science. Students learn from context/ society and with their peers and can gain differentiated projects to meet the individual vision and so, it is important to contextualize pedagogical thought for sustainability.

Furthermore, in this journey, I realized it is necessary to change the Western-dominated-science curriculum which exists in our country but teacher identity is less valuable. It is ineffective because it does not fit our real problems. The issue, in the students' eyes, is a poor fit between their worldviews, the meanings of their language, and their preexisting beliefs and those of the subject (Popkewitz, 1998). Therefore, in science they are not more appropriate for non-Western cultures or our culture. Nevertheless, sociocultural pedagogies help to examine and respect their cultural appropriateness. Hence, I decided to pursue autoethnographic journey.

Additionally, as a science teacher, we need to operate as a community of practice and stimulate discussion within the broader professional community, envisioning in different ways, and has been the focus of some warmed discussion (Phillips, 2000). Sometimes, this idea has been equated with progressive or reformative actions, or with teaching by inquiry or discovery learning as a social reality. In my opinion, this is under the dark shadow in my context/ Nepali science education practice but it is relevant. As a result, I focus interacting in my own community of practice, cultural attitude, interest, motivation, self-concept, values, and moral values within the Nepali science education sector. Then, I probed this approach, which leads to educational transformation having focused on subjectivities, lived experiences, and real-world problem solving to be addressed in the curriculum of formal science education (Lotz-Sisitka et al., 2015).

As always, my professor kept providing the discourse about different learning approaches based on transformative learning and reflecting a particular vision, innovation and action. Then, I felt both vision and action are important to science education, pedagogical practices, and practitioners (Dirkx, 1998). In such a situation, this journey provides an opportunity to gain real practice of transformative learning,

so it is held to be the aims and ways of learning with good social work and problem-solving. Consequently, it was useful for the pedagogical practice of science learning and me.

On the other hand, between these stations (station II-station III) at every point, I learn about the knowledge integration across various perspectives is made possible by a transformative learning process. which concentrated on how perplexing dilemmas serve as the catalyst for new, integrated conceptual understanding (Taylor & Cranton, 2012). Similarly, it focused on the cross-disciplinary collaboration process which is useful to transformative science learning. Additionally, it provides answers to what is transformative learning approach and different ways that it is best fostered in formal learning environments (Littrell et al., 2010).

Before I reached the third station (station-III), I had learned a lot. Firstly, the social-cultural perspective provides a more nuanced understanding of learning than does the personal constructivist perspective, demonstrating how the same variables can support or undermine intended learning depending on the specific social context and cultural context in which a given learning scenario is enacted. Secondly, I change my belief systems as a psychological transformation and reflexivity. I would try to use frequently involve a collection of questionable claims and promote transformative learning. In such accounts, my role is typically characterized as that of facilitating students' investigations, explorations, and real-life problem-solving. Then, I realized to change professional community practices. It always stimulates me. As a science teacher/educator, I gain multiple ideas from this journey but I saw a critical issue in science education; it is very challenging. Finally, I would be committed to reflecting my outcomes in the science classroom/ science learning practices and my identity. Hence, experiences of station II to station III are important to me for real transformation.

Station III

STEAM Approach: Integration of Arts in Science Pedagogy

February 2020-August 2020

"Science is one of the liberal arts and should be taught as such." - AAAS (1990)

Currently, teaching/ learning activities are developing with challenging as well as complex actions due to the varieties of global problems and interests of the learners. Thus, educating students in order to meet their varied needs in terms of learning as global learners and challenge, yet a growing body of pedagogical thoughts

to build capacity for learning and motivation. In the last few years, there has been a rapidly growing interest in the connection between the arts and science learning. Thus, this journey provided an opportunity for me to integrate and analyze the interconnection between science learning and different forms of arts. And I realized that teaching/learning science without art is crippling.

A framework for both/and arts-based learning is the art integration and infusion framework. This refers to the incorporation of wholistic learning experiences embedded in learners' lived experiences to produce deep meaningful connection on cognitive and affective level in the multidiscipline (STEAM). Also, the arts-infused learning necessary for process and skill development in everyday life through different forms of art such poetry, story telling dance, drama, music, visual arts, performance arts, media arts, etc. Philosophically, it imagines that through the power of art, both individual and group agency will emerge because it employs a postmodernism perspective and transgressives the engagement of modernism (white, 2006).

Additionally, the arts offer children a natural and intrinsically motivating way to work and show that they have the ability to work "as if" they are famous artist. Like this, the arts-integrated pedagogy also provides imitative and collaborative activities for learners to learn in a playful manner, engaging both mind and body in as a rehearsal for the solution of real-life problems that advance development. Connery et al. (2010) state in their work in art integration learners actively create individual's knowledge about and the artistic environment in which they live similar to multiple literacies. The multi-literacies refer to the art, which also includes knowledge, skills, culture, processes, and dispositions (as cited in Cope & Kalantzis, 2009).

These characters of art or arts-based pedagogical activities are very relevant in science learning because in science/ mathematics/ STEAM learning I/we must be motivated learner to imitative and collective activities. Moreover, arts help to integrate the meaning of learners and context via artistic ways, symbols, and transmission. Also, it fosters opportunities for real-world learning experiences (Fosnot, 2005). Due to the supports and contextual learning environment of this approach, students were also able to produce self-activities that was much more extensive than pre-exists knowledge (Vygotsky, 1978).

Such an approach (arts-integrated approach/ STEAM approach) learners learned from context and with their peers but also from multiple realities that suited

each student's interests and goals. Hence, the arts-integrated pedagogy is the actual representation of context, culture, and individual interest of learners in the science/ mathematics/ STEAM education.

New London Group (1996) mentions that arts is multiple literacies like drawing and painting, model construction, gesture, performance and role play, etc. and they are symbolic modes of representation much broader than (verbal) language alone (as cited in Cope & Kalantzis, 2013). Besides it, visual and performing are the real action of the life which engage and empower learners to a deeper understanding, however, our science learning scenario is neglecting it. Consequently, inequities of arts discipline in science education permeate the educational landscape in our context.

Another important aspect of art is beauty and harmony, which empowers the common aesthetic needs or value in life. As human beings, the learner also has cultural, time/ historical, natural, etc., meaning relating to common biological and aesthetic, but in our science learning, such kinds of values of learners are in less priority. Dissanayake (2007), a cultural anthropologist, claims that this human aesthetic capacity is what gave rise to the beginnings of the arts. Repetition, dynamic variation, formalization, exaggeration, and
surprise are some of the ways that people react to aesthetic operations in experiences. These aesthetic processes combine biology, nature, and culture to make people both similar to one another and different from one another. They can be found in the natural world and in all forms of art throughout the cultural world.

The science learning also includes aesthetic operations beyond rote learning and structural laboratory work. As a STEAM -scholar, I am convinced that art-based pedagogy creates an effective, more creative, and artistic learning environment which is often engaged through collaboration with a more knowledgeble colleague, artist, educator, parent, or community arts organization. As a result, different forms of art can integrate with science pedagogy through drawing, art-based inquiry, writing (poem, story), practical works (performance arts), etc. we can integrate different kinds of arts into the pedagogy. They make learning more meaningful like through the use of performance art, students are able to study academic culture from the standpoint of their own cultural histories and personal memories (White, 2006). Also, arts-based pedagogy is a bridge between theory and praxis that forms a co-dependent engagement in the context and exemplifies postmodern theories in education.

Similarly, it gives students the chance to play with STEM and different arts supplies, such pedagogy allows teachers to develop their awareness of sensory information and recognize their developing sense of wonder, curiosity, and playfulness. In this context, the teacher as the guidance of an artist partner (learners) who empowers the habits of creative thinking of learners. In my opinion, we need to manage the science classroom/ laboratory as an art-lab and the teacher motivates the learner to develop multiple forms of arts and creativities. However, this appears to be the most challenging. Booth (2001) argues that when a teacher accepts the notion that all people are creative and change agents, transformation can start.

Moreover, the art-based pedagogy is positioned as a type of intervention used to combat a condition known as reification, which occurs when learners' culture, interests, behavior, and values adopt those of the mainstream. Additionally, it taps into the same modern sentiments that a 'self-actualization' commodity culture that encourages individuals to 'have it their way' and 'be all that they can be' has been capitalizing on. In conclusion, it concentrated on a critical engagement with personal experience and three key ideas: the spectacle, the dialogic encounter, and the civic engagement. Hence, different kinds of arts, such as performative arts, fine arts, visual arts, language arts, and liberal arts play a more important role in learning. In the context of science learning, White's (2006) argument, "*performance art is a form of pedagogy and pedagogy is a form of performance"* (p.115), is highly relevant because all of the science activities are performance art and it is highly experiential learning.

It integrates different arts (fine arts, performance art, visual art, music, painting, sculpture, etc.) in education which represents how postmodern paradigms in art and education are put into practice. It is not a particular theoretical text which enables students to learn the curricular and other activities/ creativity and it can be utilized for corporeal, psychological, and social learning of learners through arts. However, our existing pedagogical practices drive out of this tract. Thus, ensuring the academic practice from the perspective of their individual memories and cultural histories, it is important to science learning. With the engagement of STEAM education in MPhil, as a science teacher/ educator, I came to understand that there are various ways to incorporate the arts into science education, from methods that use straightforward illustrations of academic concepts to others that encourage metacognitive abilities. Like Silverstein and Layne (2010) opine art integration as a method of instruction whereby learners create and present understanding through

an artistic medium. Learners participate in a creative process that links one art form to other and satisfies changing goals of learning.

Finally, they (different forms arts) integrate science pedagogy through art-infused learning activities, teacher act as role of artist, classroom management focus in the multi-artistic science lab, learner as artiest, learning activities are performing arts, and fine arts, poem, story, drawing, etc. are the learning materials. Besides these actions, I empower to develop culturally responsive pedagogy and art integration in the curriculum.

Inside the Station-III

My third station was the world of colorful arts. When I got to that station, I felt happy there. I tried to connect that colorful world with my science teaching/learning world. In this station, I realized that science learning empowered through the arts is important as our learning environment should be changed towards practical arts-based learning. A variety of arts were being exhibited in different stages (stage *First, Second, Third, Fourth, and Fifth*). The first stage is related to performing arts, second is related to poem, third with storytelling, fourth with visual arts and fifth with language arts respectively. Enjoying these arts, the journey of six months was over. In this section, I am writing about how to combine science with art by combining those fun moments. Because after reaching of this station, I found my dreams which are lost in childhood. Here, I have reflected on the experiences of that station III; they are seen as important and impressive to me for changing my thought.

Experience in the First Stage: Integration of Performance Arts in Science Learning

In the first stage, performing arts- related activities were taking place. The main tasks are: I show some performance arts integration in science learning. For example, in the teaching-learning activities about the concept of ecosystem or food web, we can design the different perform-based arts in the initial stage, learners are divided into different groups; then divide different roles and motivate students for performing their role accordingly with design activities. Also, a student can reenact their movement through drama and object. Following this activity, *…..in pairs students perform an ecosystem game (habit, habitat, locomotion, chain, etc….),* finally engage and demonstrate their understanding of the concepts. As a reflection, they had to discuss experimental examples, applications, and the relevance of the scientific facts and concepts.

In science, learning to clarify the orbital motion and other different kinds of motions can be taught through dance where learners perform dance and they gained knowledge of axial movement in dance, which is any motion centered on the body axis while the body is fixed in place. Similarly, in the concept of the solar system also learned by performing arts such as *' sun-moon-planet-axial dance'* with corresponding song. However, the arts-based activities did provide students with increased lived experience. Before the implementation of the project, they provided some ideas of theater, visual art, song and dance instruction in the stage.

When I saw that '*axial movement in dance*', I felt performing arts (drama, dance, role play, etc.) are important in science learning. On the other hand, I discussed several papers about art-based pedagogy and integration of arts learning or pedagogy. Out of them, White (2006) reviewed a book 'performing pedagogy towards an arts of politics' of Charles R Garoian that highly touched me. He discussed the different ways of performance arts that integrate with pedagogy and how it acts as an important role in education.

Furthermore, Garoian focused on the relationship between performing arts and pedagogy (performance pedagogy), performance artists use memory and cultural history to question prevailing cultural presuppositions, create identities, and exercise of political agency (as cited in White, 2006). In addition to, the collective form of performance art projects that engage in radical forms of democracy and critical citizenship, they have a big impact on how students are thought in classroom and schools. I also agree that performance pedagogy is strongly associated with science learning to empower the cultural, contextual, and real-world-based learning of learners.

Similarly, performance art is distinct from other forms of art because it makes the best use of embodiment. By putting artists and visiters on the same place physically, intellectually, and socially, it offers the widest variety of sites for resistance and learning (ibid). Like this argument, in the case of science teaching/ learning, we need to develop multitalented learners and engage the learner in multiple ways. Thus, it is significant in science learning. Hence, in the overall analysis, while we integrate performance art in pedagogy, learners are aware of critical awareness of the subject of learning and empower meaningful learning through the appreciative learning culture.

Moreover, like the stage first performance, we can perform more performance art during teaching-learning process. Many practical experiments also learn through performing arts, such as gravity, force, work, energy, the law of floatation, etc. Hence, a large number of activities of science learning can design performance art-based activities. In order to ensure that inclusion was a top priority for all potential learners and disenfranchisement structural based learning and teacher-centered classroom, these activities were encouraged to take into consideration what barriers to learning could be present for any student. Also, it reduces learners' hegemony in different gender, language, background, disability, values, socio-economic status.

Experience in the Second Stage: Poetry in Science Learning

In the second stage, a student was reciting a poem about the solar system and other audience was clapping to hear his poetry. When I saw the science poems, I tried to connect various works of literature with them. According to Lawrence-Lightfoot and Davis (1997), poetry and science are closer and they argued that both fields are human endeavor and creativity. Similarly, Midgley et al. (2001) made the exact same point: as long as learned science content can be validly expressed either through poetry, which does so directly and concisely, or less directly through all of our thoughts and deeds, including scientific facts. In the context of science learning, poetry is important at the primary level for better experiential learning focusing on vision in our minds (congnitive) and heart (affective). Peacock (2008) advocated this argument, beginning with an encounter with the physical or reallife world, concentration, and heightened sensitivity through ideal fusion of poetry and science (as cited in Donald & Barker, 2016).

It increases the potential for careful, creative communication, and focused in-depth observation. Like the above arguments, I also agree with these perspectives; poetry is useful to science learning to develop learners' multiple aspects (cognitive, affective or emotional, psychomotor, creativity, etc.) For example, most of the students felt difficult to learn concepts about the solar system. However, the poem about the Solar system makes it easier to learn and motivate learner, which was mentioned in the figure. In this stage, I felt poem as important to science learning. And I tried to connect it with science teaching/learning activities I was highly impressed with learning activities.

Experience in the Third Stage: Storytelling and Science Learning

"Writing can be learnt, but storytelling is a gift"- Archar (2021)

There was a lot of fun storytelling; which reflected every day of my childhood. Like our traditional Gurukul and Harikatha styles of instruction and storytelling were used

extensively (Mercer, 1995). According to Mercer (1995), the storyteller (guru) would explain texts to the students, who primarily learned by memorization and this method was intended to give students access to knowledge. Even today, many subjects other than science and math are still taught using stories. Similar to this, stories can be thought of as a stimulus for additional learning and activity in addition to being used as a tool for teaching and learning. Stories, for instance, may inspire other forms of art, such as dance, theater, visual arts, design, scientific research or other endeavors.

Furthermore, Mallan (1991) argued argued that stories give students and teachers a way to engage in imaginative and creative learning, they can be used as teaching ideas. They provide a major route to understanding (Wells, 1986). Similarly, in science learning, learners are exposed to stories. It may develop positive attitudes towards learning because children readily accept stories from an early age feel happy to learn. After the envisioning of this stage, I think about the science stories and tried to relate them with our science content like *the birth of atom, heredity, history of earth*, etc.

Experience in the Fourth Stage: Integration of Music in Science Learning

Another world- accepted art is music and song. Students could experiment with a range of instruments to better understand music. If we incorporate music into science education, we would look at the actual mechanism by which the instrument produce sound, then connect the aesthetic to the representational of sound, and finally consider the aesthetic vision of performance (Roy et al., 2015).

Like this argument, I also agree that music creates motivation and a deep understanding of science learning. It also touches the learners' affection and emotions, which leads to actual learning. Furthermore, it enhances our creativity and interprets emotions, and each other as well as indigenous knowledge and ethnoscience. In science learning, I/we need to empower the learner to create and sing the song with music, which makes science learning interesting. For example,

A small part of Teej song about ecosystem

"Small as a pond or large as the sea,
living and non-living coexist peacefully.
BARILAI

living and non-living coexist peacefully.
Behind the biotic, abiotic factor
Light, , soil, air, and water.
Ecosystems (are) everywhere!"
BARILAI
"Ecosystems (are) everywhere!"
BARILAI
"Ecosystems (are) everywhere!"

Experience in the Fifth Stage: Role of Language Arts in Science Learning

The next important art in science learning is language art. There are several kinds of language arts found such as listening, talking, reading, writing, viewing, visually representing, etc. Mainly, they exist in oral, written, and visual modes, which means in learning, they facilitate in multimode. According to Miller (2009), recently the central role of language in science learning has been the subject of growing research and recognition on a global scale. Similarly, the introduction of reading and writing act as an important role in science literacy (Yore & Treagust, 2006). And, believe that if science instruction does not aid students in learning language or the arts, it loses its effectiveness (Yore et al., 2003; Wallace et al., 2004). Wallace et al., (2004) believe that all science students should develop reading and writing skill regularly in order to fully concentrate on their understanding of science. Consequently, I also believed that science learning more effective while students need to be fluent in scientific discourse, which includes reading, writing, and talking science through language arts.

The main goal of language arts is to be able to employ language proficiency in order to develop communication and deep understanding. In recent times, our main discourse has been concerned with 21st-century skills. Out of them, communication is a more important skill; without it, we cannot imagine better learning Thus, language arts are useful in all subjects. Therefore, for effective science learning instructor must combine instruction and provide opportunities for students to use all six forms of language art (listening, talking, reading, writing, viewing, and visually representing) in regular classroom activities. Language arts make science learning more interesting and lead to communicative skill because they shape our perceptions of society, justice, and acceptance in addition to serving as a means of communication.

At present, all subjects' learning is growing towards critical pedagogy which focuses on the enhancing role of language in learning. In science learning, it (language arts) places a strong emphasis on using language to communicate, solve issues, and persuade others to take a certain course of action. Also, it emphasizes the interactions among learners in the classroom, and the relationship between learner's context and language in the classroom, scientific concept, ethnic or cultural science, and society. Similarly, according to critical pedagogy theory that implies those queries ought to be raised by educators and learners as basic questions regarding knowledge, justice, and equity (Wink, 2010). Like this argument, to empower a dialogic environment in the science classroom, language arts act as an important role. Beyond it, science learning is not complete. I also emphasize language art in the science classroom through writing, reading, listening, questioning, etc.

Additionally, Freire and Macedo (1987) argue that argue that a social, cultural, political, and historical context influences the science content that teachers teach and the ways in which they deliver instruction in language arts. This shows the critical learning beyond the traditional concept of language arts i.e., traditional language arts covers almost all subjects and skills in an interesting and living way that keeps the learners' attention.

In sum up, language arts become a means for social action. In the case of science learning, I used different language arts to increase the inclusion of social and cultural diversity in my context. For example, write up your daily life science activities relation to the lesson (force, pressure, etc.), explain chemical reaction in paragraph, provide reading material about science and scientist history, create discussion about content, context, and applicability of science, etc. and motivate to listening skills, phonics or beginning reading skills, rhyming the words and its meaning, writing sentence structures or writing skills of learners, use of signs and symbols, reading comprehension, writing composition, sharing, speaking, etc. I also agree with Pearson et al.'s (2010) argument reading and writing exercises can be used to advance scientific inquiry rather than serving as a stand-in for it when science literacy is

viewed as a type of inquiry. Students simultaneously learn how to read and write science texts and to conduct science when literacy activities are inquiry-driven**.**

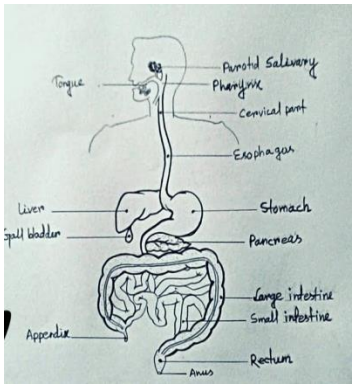
Experience on the Sixth Stage: Visual Arts and science learning

When I was getting close to end of this journey, my eyes reached the wall of the exhibition hall. There were a variety of things, including posters, drawing, painting, printmaking, photography, sculpture and pictures to help facilitate the learning of science. There are different kinds of visual arts, such as drawing, painting, printmaking, photography, computer-arts, sculpture etc., are used in science learning. They are often called the most important form of visual art. In my context, drawing and painting are the most applicable visual arts in science. Both of them became very important in science learning, where they were covered with scenes, content, and concept of everyday life as well as science learning outcomes.

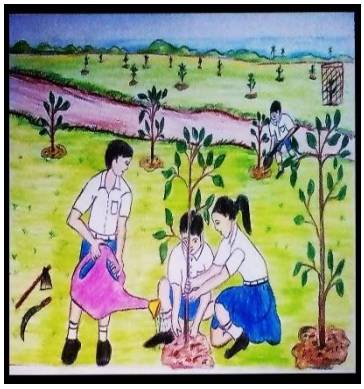
Similarly, to develop an effective learning tool, printmaking and photography are also useful to science learning. Furthermore, in the context of science learning, sculptures are useful to engage learners beyond the science lab because they are three-dimensional works of art that are made by sculpting various materials. The most common materials are wood, ceramics, steel, stone, plastic, etc. Also, it enhances the reuse of waste, recycled material and improvised material. Consequently, it seems very beneficial for school- level science learning.

Figure 12

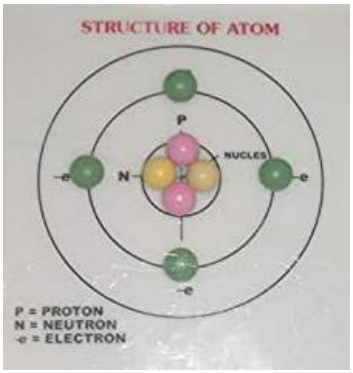
Integration of Visual Arts in Science Learning



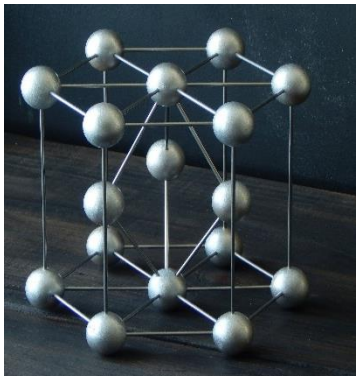
Drawing: Digestive System



Painting: Environmental Conservation



Model: Atomic Structure



Sculptures: Structure of unit crystal lattice

Sculptures: Structure of Benzene

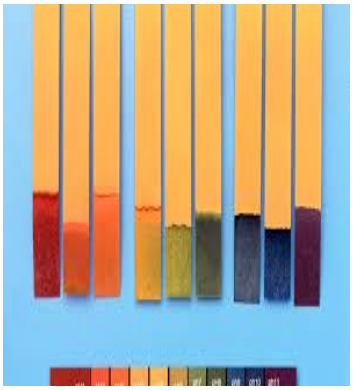


Photo: Litmus test photo

Meanwhile, in visiting of these stages, the proliferation STEAM seems to be what defines the twenty-first century, unlike any other time in human history. And it is happening learning is increasingly replacing human laborers in jobs that require repetitive, cognitive, and manual input. In my view, art-based pedagogy or arts-integrated pedagogical practices focus on the learners' analytical thinking, sophisticated communication skills, artistic innovation, and talk about socio-scientific issues. Thus, in science learning, the different art-based tasks promote learners' curiosity, dialogic situation, inquiry-based, and project-based learning. And finally, it leads learners as inventors. Furthermore, it cultivates the science learning as the creativity and an inquiry mindset that relate to sensations of productivity. Hence, I also used this practice in my professional and pedagogical life.

Coming Together: The Common Experience of All Three Stations

Another thing that I liked about this journey was critical reflection. We have used it at all stages of the journey. It impressed me. Hence, I reflected my this engagement towards critical reflectivity. Without it, my M.Phil. would have been in vain and I have taken this as another great thing I got from the KUSOED. Hence, as a metaphor, I use critical reflectivity as a golden gate of transformative learning which is explained below.

Critical Reflectivity: A Golden-gate of Transformative Pedagogy and Practice

According to Larrive (1999), critical reflection is generally the fusion of critical inquiry and self-reflection. It is defined as the distinctive quality of reflection practitioners. It entails an evaluation of one's own and employer's belief systems as well as consciously weighing the implications on morality and effects of one's own

actions. Teachers who are willing to view their practice through various "critical lenses" can thus "hunt" for sets of assumption. Critical reflection is critical reflection on oneself through critical reflexivity, much like Larrivees' case for the teacher educator (ibid).

Examining and encountering the teachers'/educators' deeply held beliefs, which are motivated by antecedent actual practice, is helpful in the teaching field. Although it differs from the term "Reflection" alone, it also aims to improve power dynamics that permit or support a particular set of practices, as well as conflict between disparate interests and groups that exist in prdagogical practices (Brookfield, 2017).

Alternatively, transformative learning can help to provide contemporary perspectives on the issues and solutions related to educational practice. A fundamental shift in education
has been argued to be necessary for sustainable development in human society, and learning can provide recent perspectives on sustainable development
(UNESCO 2017, as cited in Rieckmann, 2017). Mezirow (1995) contends that it leads to profound personal change, and that this change results from the dialectical interaction of a group of students who have various points of view.

For creating the proper dialectic engagement practitioner require to think critically. I think that in discussions about reforming science education,
the transformative learning theory has been underutilized but positivistic works dominate it. Furthermore this reform process is starting with critical reflection (CR) and challenging previously held beliefs and assumptions so it to be seems as ‘CR is gateway for transformative learning.’

I am a university science teacher educator in Nepal. During this journey of critical reflection, I was motivated to think about how we can change our pre-existing thought in science learning. By a product of my MPhil engagement, I tried to understand the self and other, who teaches science education. In this condition, first of all, I examined the understanding of my past practices, and experiences. Similarly, then started to think critically how I could grow my practice in science teaching and think carefully about it and critically evaluate my personal experiences as well as my professional praxis (Rahmawati & Taylor, 2015).

In this phenomenon, I build up one understanding of transformation, that is critical reflection is a precondition. We use it in each and every step of contextual

implication, so without critical reflection, we cannot change our perceptual understanding for further improvement. Thus, it may be an initial step for transformative learning which supports our argument. For the justification of *'critical reflection is a gateway of transformative learning* in science learning I take Rahmawati's experiences that "I came to realize that I needed to reflect critically on my past teaching experiences, not only to reveal and reconceptualize my vision of teaching, but also to empower my agency as a university teacher educator for transformation" (Rahmawati & Taylor, 2015, p. 41).

Reflexivity, which is the capacity to step back and consider individual's own thought process, values, prejudices, and regular action, is a basic requirement for challenging accepted paradigms, practices, and ways of operating (Laura, 2008). In a similar vein, the developing reflexivity is an essential element of science learning and is thought to be necessary for the agency's development. Similar to this, critical reflection encourages collaborative learning in a variety of social, historical, and material contexts in science classroom practices. It also empowers individuals to engage with interaction and a diversity of opinions. It means without CR, we cannot transform our science classroom practices into society and person's / practitioners' perceptions/ practices also stand at a 'static' point. On the basis of the above views, we can say critical reflection is *'a match stick for transformative learning'* and also the same as science pedagogical activities.

The three stages of critical reflection are: examination, struggle, and perceptual shift (Larrivee, 2000). Like Larrivee, I believe that these three stages of transformation must be pursued by every practitioner and researcher who wants to alter their educational practices. In this iterative process, critical reflection enables the initial stage of transformation by empowering the challenging of current practices. This idea is also widely used in the science professional learning community, so in my opinion, the first step toward transformative science learning is critical reflection.

On the other hand, transformative theory emphasizes the psychological aspects of collaborative teacher learning and the necessity of critical pedagogy to support practical efforts to enhance student learning—the means of education. And, critical reflection helped to create such environment that enhanced the sustainability and long-term effectiveness of science teacher / educator.

It is a way of thinking for teacher educators to acknowledge dilemmas brought on the exposure and challenging of the power dynamics that underlie our decisions

and actions must be an explicit focus of pedagogical implementation. Additionally, it makes an effort to refute hegemonic assumptions that we commonly hold about the classroom but that actually serve to undermine our interests. Therefore, critical reflection for the teacher or educator denotes the recurring critical reflexivity in one's own pedagogical activities that results. Setting goals using what has been to future action what was learned in the past, and thinking about the real-world practices are all aided by the reasoning process that results in a "meaning-making action" by teachers. In order to reveal the power relationships that are present in any group that tries to work reflectively, critical reflection was seen as illuminating power and hegemony and placed an emphasis on the justice in ongoing, intentional investigation (Rushton & Suter, 2012).

It displays multiple layers of reflection on another side, including "reflect-on-action," "reflect-in-action," and "reflect-for-action." An extension of "critical thinking" is critical reflection. And it considers our practices and beliefs and pushes us to take a step back and critically analyze our thinking. It is a process of reasoning used to interpret professional
experiences in order to advance one's own field.

By adding the dimension of a thorough examination of one's own values and beliefs, embodied assumptions, and expectations for students to conscious consideration, self-reflection goes beyond critical inquiry to give teachers the critical reflexivity they need to be effective teachers. Dewey claims that reflective thinking necessitates ongoing comparisons of beliefs, presumptions, and hypotheses with accepted practices. As a result, critical or reflective thinking appers to imply that the educator's primary focus is on cognitive problem solving. If critical reflection is to be developed, the teacher believes that self-reflection and critically challenging idealizations and limitations that one has placed upon oneself will have the greatest impact. With this conceptualization, the teacher portrays critical reflection as an issue of stance and dance in the classroom (Brookfield, 1995).

Moreover, critical reflection empowers the transformation and PLC efforts on the means of teaching and not its ends. Servage (2008) claims that it is a valuable and useful tool for teachers to study best practices, but it is only a partial representation of collaborative processes. It is simply change but not *transformation*. While enhancing instructional abilities would undoubtedly have a positive effect, a sole focus on these abilities does not encourage critical reflection. For CR, it is necessary to comprehend

PLCs and schools as intricate social and political structures. And she emphasized the critical reflection is not simply understand which is critical understanding of complex phenomenon. It shows the need for critical reflection for transformative learning practitioners (ibid).

During the study of this section, I build up a concept relationship between critical reflection and transformation for transformative potentiality and critical pedagogy relating to PLCs. It reshapes my mindset as committed to thinking rigorously and they are able to reflect critically upon both my actions and socio-cultural and policy (political) situations where my actions are oriented towards Brookfields' view that it is insufficient to consider critical reflection only in terms of teaching strategies (Brookfield, 2003). Critical reflection is the sense of critical pedagogy which is committed to interpreting and improving classroom practices to reflect the social order that promotes justice, equality, democracy, and human freedom in the society (Beista, 1998 as cited in Servage, 2008).

As an MPhil scholar, I am embarked on this journey of critical reflection by analyzing my prior behaviors and altering my prescribed viewpint and behavior. I led the group through four critical lenses, during the engaged time, including my autobiographies as both a learner and a teacher, viewing our work through the eyes of students (interpretive lenses), engaging with experienced- based discussing in our practices in 'critical conversations,' and connecting the academic literature i.e. focused on praxis.

The self-examination of my own educational and professional experience as a teacher/educator becomes conscious throughout every single field engagement as I travel along on my critical reflective journey. I believe it has an impact on how I teach, causing me to probe for a deep understanding of the viewpoints of my students. I address the assumptions underlying the learners' beliefs and behaviors while giving careful consideration to their "voice" in the learning environment as I engage in critical thought as a reflective practitioner. Following the development of the concept of critical reflection during the duration of this course, I made the decision to use critical reflection as a key element in the development and success of my practices.

Beginning this journey, I was led by a positivistic perspective, but as a novice critical reflective practitioner, I have since changed my mind. Brookfield (2004) argument touches my heart, and I believe, it is extremely pertinent to my practices

because, without reflection, teachers constantly run the risk of making bad decisions and poor judgments. Moreover it also plays a crucial role to construct knowledge through the conversion of experience (Kolb, 1984). The activities of instructional process requires constant and continuous observation, evaluation, and action through critical reflection. Consequently, I make meaning- without critical reflection we cannot change our existing beliefs and transformation, hence, it seems as golden gate or entry point of transformation.

Envisioning: Connection of Dispersed Thoughts to Reshape my Identity

I ended up with three semesters of M.Phil. for STEAM education. In these semesters, I had a strong commitment about STEAM education and its issues with big questions that revolve around a multidisciplinary approach. I need to comprehend how to connect all of these various ideas, whether there is any connection at all, which one should take precedence, whether there is a priority, and whether it is this or that. For now, I am attracted to these three issues: STEAM education, multi-disciplinary approach, multi-paradigmatic research and transformative learning. I finalize my thought on these terms. I finally acknowledged my initial science teacher identity as STEAM educator. However, the internalization took so long, I am still working on it. In the above part of this chapter, I mentioned different ideas (thoughts) in different stations (I, II, and III) and different stages of station-III.

My STEAM journey was committed to understanding and nurturing my different potentials on all sides like I am as human beings, inclusive education, innovative pedagogy, decision making, ethnicity (multicultural perspectives), etc. I acknowledge the deconstruction of hierarchal structuralism and systemic oppression of science education and commit myself to the knowledge and actions required to eliminate them from my institution, my work, and my daily life. Much of this section shows my perspective against historically biased thoughts about the existing practices and experiences of science education, my achievements in my M.Phil. journey as a collaboration with practitioners and colleagues in the side of science learning, science teacher identity, socio- cultural settings, and communities of practice, etc. As a researcher, I try to actively question people about my positionality in my profession, critically evalution my subjectivity, beliefs, methods and identities. Hence, I develop this section as a combination of my major envisioning, which leads me towards STEAM educator/ teacher/ practitioner.

First Envisagement: Beyond Modernism

The terms traditional, modern, postmodern and multi-paradigmatic are learned in this journey to to highlight particular conceptual structures. In our case science learning is mostly dominated by own prism itself represents a model of reason, rationality, cause and effect, and a belief that there are universals, and it dominates science education to a large extent, which always talks about the absolute truth and reality. In the initial days, I also strongly believed that modernism thought, in our educational society little attention has been given to the axiological reasoning because it has long represented an ontological and epistemological constellation. I debate myself over whether or not there are standard guiding human behavior, including like reason and justice, pitted modernism against postmodernism. And, finally I convinced with 'there is no objective truth, no *skyhook,* no *God's Eye* perspective (Rorty, 1989).

In our context, the classroom scenario shows a concept of banking education (Panta, 2019), where both oppressor and oppressed exist (Freire, 1972). A system of education that is *oppressive* kills innovation and critical thinking (Carroll, 1998 as cited in McArdl, 2011). It restricts students to whole learning and and to help them reach their full potential as people, emancipates them. During the discussion of many papers related to Freire's (1974) and Habermas's(1989) perspective, I got a chance to learn about Freire's *conscientization* and Habermas's fundamental human interests. While I kept both in a vessel, they made me think about science learning and led to breaking an unswerving belief. As an achievement of my each and every class, I gradually build ideas on science education for critical consciousness and the incredible motivation of my professor. This motivation stimulates me towards self-inquiry and critical reflection. Meanwhile, our students oppose a traditional or banking approach as well as a particular kind of critical pedagogy with internalised the dominant ideology (Buckingham, 1998 & Mejia, 2004). Also, the evaluation is made by the educator, not based on real life.

It means that with this study, I realized that science teachers also change their own perspective to lead twenty-first century learning being convinced by the thoughts of Freire (1998) about what it means to be and how to become a teacher/educator. He contends that we engage in a full experience when we live our lives with the authenticity that teaching requires of us in both our roles as learners and teachers "that is simultaneously directive, political, ideological, gnostic, pedagogical, aesthetic and

ethical" (p.31/32). Finally, after the study of Freire's thought, Habermas's (1987) perspectives on emancipatory thought and Taylor, and Luitel's (2012) views on multi-paradigmatic transformative. Research as/for teacher education crosses the border of my existing thoughts and attempt to negotiate liminal work to combine multi-paradigmatic lenses with science learning and I strongly stand on the '*Defender of modernism'.* Consequently, I try to connect students, teachers and socio-cultural perspective to critique and challenge the institutions that shape relationships currently dominating pedagogical practice (banking education).

Second Envisagement: Teaching as an Exploration

I have already laid down my initial thoughts and ideas in chapter-IV on teaching and learning activities. At that time, I thought a good teacher makes all the students pass the exam. And teaching is taken simply as telling and instructing. While I was engaged M.Ed. and M.Phil. levels, I gradually changed this thought and distinguished teaching from mere telling and instructing (Hidi et al., 2000). I take it is a negotiation of deeper knowledge and holistic skills. At the same time, I focused that teaching, as opposed to telling, is closer to the processes of research and creating art than it is to a structural technical process and
instructing kids to develop to their fullest potential (Murray, 2008).

In the engagement with STEAM education, I shifted the traditional paradigm of teaching to exploration. It means that I try to reject the prescription method. I apply some inquiry- based, some audio or video taping interaction, writing down as a form of inquiry, etc. Such works and my envisioning of M.Phil. journey pushes me to generate alternative ways of science teaching. I make meaning of the teaching ; *teaching as an exploration* of involvement of the whole person as opposed to just brain learning or 'black box' engagement (capsulism), which leads to the *whole-person learning*.

Third Envisagement: Science Learning and Culture – a link

Historically, the traditional science learning approach of our education sector was to resist such a link between science learning and culture. In fact, it was perceived that the euro-centric science curriculum was a single dominant science curriculum in Nepal beyond the common value system and shared cultural identity. Like Luitel & Taylor (2005) claimed that as a culture worker pursuing the creation of a mathematics curriculum that is culturally relevant for Nepal. This condition is

shown in science also. It means that, cultures have an impact on how education develops. Culture and people are inextricably linked because they both contribute to the formation of life.

As a result, science instruction will be designed to help students apply the knowledge they have gained in the classroom to real-world situations in society. Students will also learn how to understand how phenomena, cultures, and myths can be described scientifically. Here, I realize that students should learn about the contributions of science to the cultural phenomena that have developed in our society as part of science education.

Utilizing a local cultural element in the learning process is a surefire way to improve the quality of science education (Sudarmin et al., 2018) and create learning activity as an activity in transforming the science of community (cultural science) into scientific science and pure science. it means that the local belief in nature and culture are reflected in the science (Novitasari et al., 2017). In the different stations of STEAM travel (especially Station: II), I learned despite the fact that the diverse cultural hybridity, the majority of our culture do not connect with science education, serving unfairly the academic aspirations of a privilege group that are western-oriented like "living hybridity but talking scientism" (Adams et al., 2008). In the STEAM education journey, I appreciate this thought which helps me to change my identity.

Fourth Envisagement: School as Bureaucratic Paradigm and Pseudo-Embourgeoisement

In chapters IV and V, I illustrate my engagement in the Nepali school, where I was engaged and learnt. Critically the school and college of my context or education in Nepal have traditionally blended neatly with the bureaucratic paradigm of work which exists in the hierarchial *top to bottom' structure.* It perceived a clear distinction between conception and execution. Thus, it is ensured that the proportion of employees requires jobs.

The bureaucratic model of education is still prevalent, despite numerous nods in the direction of high-quality instruction and student autonomy. When it comes to the selection of texts, methods of assessment, and institutional management, teachers and students have little to no influence on the course content, pace, or grade of the learning process. In this connection, Hogget (1994) argues:

> *It seems to me that the new strategy of control [in the welfare state] is quite different from the previous bureaucratic one: rather than trying and controlling professionals by managers, you convert professionals into managers (i.e. by giving them budgets or by setting them adrift as quasi-autonomous business units) (Hoggett, 1994, p. 43).*

At that time, my work was affected by an increasingly dominant role of administrators which is becoming more complex to change science pedagogical practices and money-minded society threatens teacher's identity. The structures of our society have been evolving with the decline of the extended teacher identity comparing monthly income, which has little bit shown about the social difference.

Moreover, during my student life and professional life, I feel the emerging and contradictory curricular practice, professional identity and socioeconomic status. They are mainly oriented towards forms of policy and socio-economic context: the changing patterns of country's education, an alliance between curriculum developers and educationalists (experts), and administrators as well as existing process limit possibilities for the development of radical practice (James, 1995). Consequently, in my lenses, existing practice and school environment are seen as *bureaucratic paradigms and pseudo- embourgeoisement.* It is seen as just facilitation of *psedo-embourgoisement* – the shift to a professional society and cultural or local deskilling like Marshall's (1963) forecast that "the ticket obtained on leaving school or university is no longer for a life journey" (p.113).

Through this engagement, the idea of transformative education was ultimately what I learned is relevant for my context. Due to the dominance of other professional fields and society's perspective on teachers, the issues of science teacher identity became a lost cause for me and I struggled in the depth of the complex issues around my professional identity. It is created due to the domination of other professional field and society's lens towards a teacher. In this journey, I reflected on issues of existing pedagogical practices and science teacher identity in education.

During classroom engagement, I found it difficult to process and give meaning to my identity and experience using a holistic approach because I wanted to argue for STEAM educators. Due to support of my professors, I built my confidence. I was able to analyze these issues and change my identity as a STEAM –based teacher or educator at localized context. As a result, I started to reflect on my learning and experiences in an auto/ethnographical way in my educational practices, professional

identity and daily life.I challenge my presumptions and actions in this practice, then create more cooperative, responsive, and moral ways to carry out my practice in the context of the classroom setting. As a result, I combine reflection with 'critical thinking'. First and foremost, I emphasize reflecting critically in the focus on power and the ability to uncover, examine, and modify my deeply rooted beliefs (Mezirow 1991). After a long series of events I try to transform myself in the end .i.e. 'change my fundamental perspective'.

CODA: My Developing Identity as a STEAM-based Science Teacher/ Educator

Throughout the STEAM education course, my opinion of science teaching was altered, which directly influenced developing my identity as a science teacher. My developing science teacher identity as the STEAM-based educator started with reflective writing and critical thinking. In the above section, I mentioned my understanding and how I think, feel, and act about learning and science teacher identity. One of the determining elements was experiencing transformative learning through the *arts integration on science- based learning model;* which is mentioned in station III.

Prior to taking this course, I was aware that science lessons that involved laboratories and hands-on activities and provided students to learning by doing were the most effective approaches. However, as a science teacher, I never think of science learning ways through the STEAM approach. Moreover, along this journey, I got an opportunity to reflect on my position as a science teacher or educator and I became more aware of my role, responsibilities as a science teacher or educator to create a favorable classroom environment and public goodness. In where, learners able to feel secure and self-respected in their opportunities in classroom engagement.

Also, I understand the importance of the STEAM approach (as a form critical pedagogy) over other knowing approaches in engaging learners in an effective way. During this journey, we developed different models of the lesson plan (art-based, affective domain-based, ICT-based, inquiry-based, problem-solving based, and STEAM approach based) and realized if we could implement these models of a lesson plan, our students would probably lose multidisciplinary connection to life.

From entire journey, I gained some ideas about multidisciplinary approach. These views [refer to my science teaching and science teacher identity] have changed a lot and knowing the most effective ways to teach science has made them much clearer through a STEAM approach. And I am developing my identity as a STEAM

educator. Similarly, I reshape my perspective of "*science teaching has more opportunities*" with elements from which students can learn and gain knowledge effectively.

After completing my third station, I increased my affinity toward STEAM approach through the integration of different arts in the science pedagogical activities. Unlike some years before, when I did not position myself as a reformative science teacher, I am now more driven toward STEAM approach rather than the dry science teaching approach (where students are not interested). I included some of my practices in the praxis section (Chapter- VII).

CHAPTER-VII
SYNOPSIS, TRANSFORMATION, AND PRAXIS

The central concern of this part is related to how I changed my identity after the engagement in M.Phil. in STEAM education. It was developed by merging key themes of my understanding and reflection on my school journey to the MPhil completion stage. However, it is mainly concerned with the course 'STEAM Education journey'. In this chapter, I organize three major sections. The first part is related to my key insight and reflection on Chapters IV, V, and VI. The second part illustrates my changing identity as a learner, teacher/teacher educator, and researcher and its' importance, and the next part explains my role or contribution to empowering STEAM education and pedagogical transformation as a university academic (praxis). All of these sections are argumentative as well as reflective based on my learning experiences as well as critical reflexivity.

In this chapter, I have discussed my thought /reflections, which helped to reshape my identity and my attempts to reduce the gap between theory and practice after I learned this course (praxis). I think this section of the study will contribute to creating alternative arguments on the educational professional community to challenge and transform their own belief systems about science teacher identity, existing educational research as well as pedagogical practices through STEAM approaches. Moreover, it illustrates how a university teacher/ educator can contribute to enhancing transformative learning and changing pedagogical belief systems to personal transformation after engagement with a new interdisciplinary approach/course and practice. Finally this chapter portrays the transformation-based reflective inquiry in the results of my three research questions.

Synopsis: My Key Insight and Reflection

The overall analysis and reflection on this journey *(2001 to 2020)* seems like a heap of learning experiences for me. Because in the different learning contexts, I got a lot of ideas about different aspects of learning. My M.Phil. journey was unforgettable because it is useful to me as a construction of my teaching philosophical perspectives such as constructivism, sociocultural, and transformative approaches, different forms of STEAM approach, entrepreneurial learning, art-based pedagogy and many more. And similarly, human subjectivity, which is defined as the processes of thinking,

knowing, feeling, cultural values, etc., empowers or focuses on social dynamics and cultural matrices of collaborative practices.

In the journey of different stations, we discussed constructivism, socio-cultural and transformative learning. It is a process of explaining and examining my idea which has proven to be one of the most crucial steps in the development of my knowledge. Upon reflection, I realized a significant portion of my pedagogical growth. Also, it is very useful for me/us to create our own local curriculum/ pedagogy socio-cultural representation beyond the decontextualized curriculum (Luitel, 2009). Also, I learn that sociocultural learning plays a significant role in sustainable science learning and respects cultural diversity in science. Moreover, I make meaning about it, this method of teaching and scaffolds a sociocultural learning environment (Vygotsky, 1978). Hence, as a result, I am convinced with these arguments and try to create space to change it.

Similarly, I changed my understanding of learning and now tried to drive through transformative pedagogical practices (approach). It is an important gaining of my M.Phil. journey, which engages the students in critical reflection and changes on assumptions supporting their values and beliefs (Taylor & Taylor, 2019). It has been articulated in different ways to address demands for 21st-century skills and develop students' multi-contextual abilities to empower learner as a future citizens and sustainable development. It creates debates, decision-making, and practices. Consequently, it enhances me for the implementation of a transformative learning concept which is grounded in Marxist and neo-Marxist critical theory and Freirean perspective**,** critical pedagogy far from institutional and ideological domination (Dirkx, 1998).

At that time, we discussed the different papers mostly related to the different forms of enabling pedagogy related to the STEAM approach. After the overall analysis of the discussion and study of these papers and my professor's role, I conclude that there are many forms of STEAM-based approach; however, I listed these major forms such as STEAM project-based learning, dialogue-based approach, problem-solving approach (PSA), and integrated pedagogy.

Here, I have insight into the meaning, designing, strength, and challenges of these pedagogical forms which allow students should actively construct their learning in multiple ways (reflecting, asking questions, visualizing problems, looking for solutions, and carrying out activities and experiments, artistic way, and critical

thinking/ reflection) and they are highly contextual based inquiries. Furthermore, we critically reflect on our teaching practices with strengths and challenges from the perspective of the Nepali education system. It provides opportunities to me as a real critical reflector.

Similarly, it inspired and engaged me in the action of meaningful integration of STEAM in learning as a new approach using authentic and engaging contexts. It created dialogue-based learning among peers, which empowers communication and deep understanding with learners' involvement in real-life problem-solving. It means that overall engagement helps me to empower my creativity, critical thinking, collaboration, communication, socio-emotional, and lifelong learning aptitudes (Tan et al., 2017). Besides, STEAM-based approaches are the foundation of humanism, experimentation, and cultural responsiveness, broadened active participation (Bell, 2010), problem-solving ability, and to transform the world with interdisciplinary knowledge that focuses on twenty-first skills and integrative work/ action of the future.

Alongside these strengths, I realized different challenges to the implementation of such pedagogical forms. In our (Nepali) context, it is challenging due to different causes such as integrating different disciplines (STEAM) contents or techniques and interpreting their results (interdisciplinary content-area knowledge), the higher-level motivation of the learner and highly creative teacher or facilitator, and interconnection capacity with real-life problems. Similarly, to design a STEAM-based environment, management of full diversity of abilities and prior experiences of learner and classroom situation (Soloway et al., 1994), existing belief systems of all stakeholders, lack of facilities of technology, structured pedagogical practices, and expert-driven curricula are seen as major challenges. However, from this journey, I have insight that STEAM approach is important to transformative learning and I/we must be implemented this form of pedagogy in science or STEAM education. It joined me with the other three discussions as interesting dimensions of learning. They are affective domain, entrepreneurial learning and art-based pedagogy respectively.

In the affective dimension part, I realized that affective domain is an integral part of learning experiences. The learning process is inseparable from affective dimension. Our decisions are influenced by our attitudes, values, beliefs, and opinions as well as by our feelings, interests, and motivation, thus in learning activities, we must be guided through learners' affective aspect also. To create this scenario, I must

be focused on self-efficacy, motivation, art, humanism, and value kept at the center of the learning process affective dimension; however it becomes more complex (Zushoet al., 2003). From this engagement, I realize that I need to improve my classroom practices to address the affective domain and focus on the positive attitude of learners towards learning topics, create a dialogue among peers, engage learners in multiple responding, develop art-based materials, and share, learner as a creator. And on the other side, it motivated me to change our assessment system and practices and include the cognitive and affective measures, participation, attitude, opinions, self-evaluation, and peer-evaluation.

Similarly, "entrepreneurial learning" was new to me; however, after the engagement in this discussion, I built up various ideas about entrepreneurial learning. In the initial phase, it clarified the concept of entrepreneurial learning. Its meaning seems in multiple ways, like it is recognized and acts on opportunities, experiential problem-solving process and action-based, innovation-based learning, socially situated learning, and active co-participatory learning (Rae & Carswell, 2000).

Furthermore, it reshaped me/ us; both teachers and learners are entrepreneurs. Thus, our learning must advocate the entrepreneur's character to all. Indeed, like our country (developing country), it is important for socio-economic transformation. Consequently, from this journey, I realized that entrepreneurial learning is an important component of STEAM education because it provides an opportunity or challenge presented by real-life problems, purposive learning, and empowers the socio-economic as well as an individual process. Also, it deals with academic liberalism, experiential learning and experiential liberalism through multiple ways of learning.

In the discussion about integration of different forms of arts in pedagogical processes, I enjoyed a lot that is already mentioned in chapter VI (station-III's different stages). This verified my thought in science learning (Chapter-V) and it empowered me to integrate arts in science pedagogy by focusing on collective activities of learning for learners to make learning enjoyable, activating body and mind in preparation for daily life application. The important aspect of station-III's different stages are promoting common aesthetic needs or values in our life and learning and create a new space for teachers and learners as artists, which is relevant to science classroom practice like "performance art is a form of pedagogy and pedagogy is a form of performance*"* (Garoian as cited in white, 2006, p.115).

Finally, I learned theoretical and practical knowledge during the engagement time, which provided an opportunity to develop artistic activities in science, for example, poem (the solar system) story of science, integration of music in science learning, visual arts, and liberal arts. It means that the last phase of this journey was very fruitful to me/ us for the development of our aesthetic values and the integration of different forms of art in pedagogy. As a result, it is a milestone for me to the development of arts-based pedagogy in science or a STEAM-based approach in multidisciplinary learning.

Metamorphosis: Change and Transformation of My Identity after STEAM Education Engagement

The term metamorphosis is mainly used in the life cycle of insects or amphibians. It is the process of evolving through two or more distinct stages from an immature form to an adult form (like caterpillar change in to beautiful butterfly, tadpole change in to frog) or psychological transformation in a human being. Here, I use this term as my psychological transformation as well as for changing the action of real-world practices. Hence, in this section, I reflect on my changing identity as a learner, teacher, educator, and researcher reshaped by M.Phil. journey under a topic of metamorphosis. It means how a traditional science teacher/ educator/ researcher becomes a STEAM teacher/educator/ researcher (a transformative agent) in different stages.

Mainly, this part is concerned with my three aspects. They are related to my changing perspective of learning, why these changes are important, specific changes in my practices, and paradigmatic transformation in research. I used autoethnographic reflection, as a consequence of this journey. It has been fruitful for me to give context to my academic and

professional experiences with science and STEAM education. Moreover, as a STEAM education scholar, I got a lot of ideas by using STEAM education or approach to explore my professional and personal experience through critical reflection. Actually, with this course and institution, I emerged as an attempt to collective work or relationships among oneself, culture, and education. And, I am motivated by the work of my professor who have used and shared to gain a deeper understanding of their own professional paths, I gain transformative methodology or chances to get a critical viewpoint on my recent professional work and research.

Additionally, it is a turning point in my academic and professional paths regarding the science education that I currently stand on. Alongside it creates the multiple moments of inquiry in my work and it evokes to me think about how the teacher/educator might help students access these pathways in our culture by learning about individual history of wonderful engagement, and proficiency in science activities. In this spirit, I have written many critical reflection-based or experienced-based journals or papers on assignment tasks. They gradually shift my identity from a teacher to a reflective practitioner and create a space for contemplation of the transformation's starting point of the professional practitioner. Also, this journey is an insemination of the possibility of self-reflection as a method of inquiry for me. Through this writing and engagement, I am enabling to examine my pedagogy as a teacher/ educator to support social justice through teaching science as well as socio-cultural perspectives. Besides, it explores how I perceive the outside world and myself.

In the pedagogical and research area, my first mindset (like structural or mechanistic worldview of learning and positivistic paradigm in research) occurred at the beginning of my M.Phil. In this context, I experienced multiple actions for further improvement in my work through attention to my active participation. Finally, the relationships with people, academic experiences, and research ideas of this engagement have all shaped and been shaped me.

From this journey, my first and most important envisioning is the integration of a multidisciplinary or STEAM approach in science education beyond the disciplinary- oriented scientist science learning, educators, and educational bureaucrats. Furthermore, in my belief systems (traditional science learning), it (STEAM journey/approach) can change that my work is not just a professional development; it is an important transformational action. Concerning the different parameters (changing perspective of learning or goal of learning, content, method, its importance, philosophy of teaching, specific changes in my/ own practices, and research), I clearly realized that I changed or shifted my identity.

Before joining this course, I had different belief systems about learning, teaching, and research. Now, they are gradually shifting from one worldview to another worldview. Firstly, I change my perception of the purpose of science learning, i.e. *The main purpose is to prepare the future scientists of a society to the future*

citizens of a society. Secondly, where I grew up, the learning scenario was highly structured and discipline-oriented. However, now I realize that discipline-oriented educational practice is not sufficient for the present time (21st-century skills). As a result, I change my perspective from single- disciplinary to multidisciplinary i.e., d*isciplinary-centered teaching to multidisciplinary teaching.*

Similarly, the teaching/ learning activities are mostly dominated by the teacher and "chalk and talk" medium but nowadays they are gradually changing to "power point-based" .However, such kind of activities cannot only advocate the holistic or present demands of learning, as a learner and teacher educator. I try to turn my action from *teacher-dominated teaching to child-centered learning*. Moreover, based on the activities, I really transformed from the STEAM-based approach i.e., *"chalk and talk" or lecture cum power point-based teaching to inquiry-based, project-based, and problem solving-based, dialogue-based, art-based, and integrated approach.* In the case of the learner, it needs to change the perception towards the teacher's roles; that is, the teacher is a source of knowledge/information, s(he) is a mediator for knowledge construction and problem-solving.

Additionally, this journey provides some valuable experience to develop curriculum development. It motives me to change my existing beliefs in the curriculum development process and thought. Critically, our curricular practices are seen that content-based; however, this journey always creates the discourse about context-based as well as future curricula. As a teacher educator, this discourse is valuable for me; hence, I change my ideology about curriculum i.e., *content-based curricula, to context-based and with the integration of skills for a sustainable future*.

Furthermore, due to the full engagement of my MPhil course, I reform my views about the place of learning, like school-based learning to multiple learning environments. It means the learning might be transferred from the classroom to society based on real-world experience. Based on the paper discussion of different modules, our classroom discussion and professors' arguments create the opportunity to rethink and revision about our assessment system. It means after the active participation in this course, it rearranges my perspective and practices in the existing assessment system to alternative assessment, which include multiple aspects of the evaluation such as cognitive and affective measure, learners' participation, attitude, opinions, self-evaluation, and peer-evaluation, etc.

In another way, as a researcher, from this engagement, I have gained valuable knowledge related to multiple aspects of research (paradigm, theoretical orientation, nature, design, meaning-making process, praxis, etc.). Our professors/ facilitators provided multiple chances to study and discuss research. They were (chances) highly oriented towards the multi-paradigmatic perspectives, the collaborative inquiry process, and qualitative inquiry. Consequently, I changed my identity as a transformative researcher i.e., *from positivistic or single paradigm to multi-paradigmatic research and problem- solving- based as well as transformative research.*

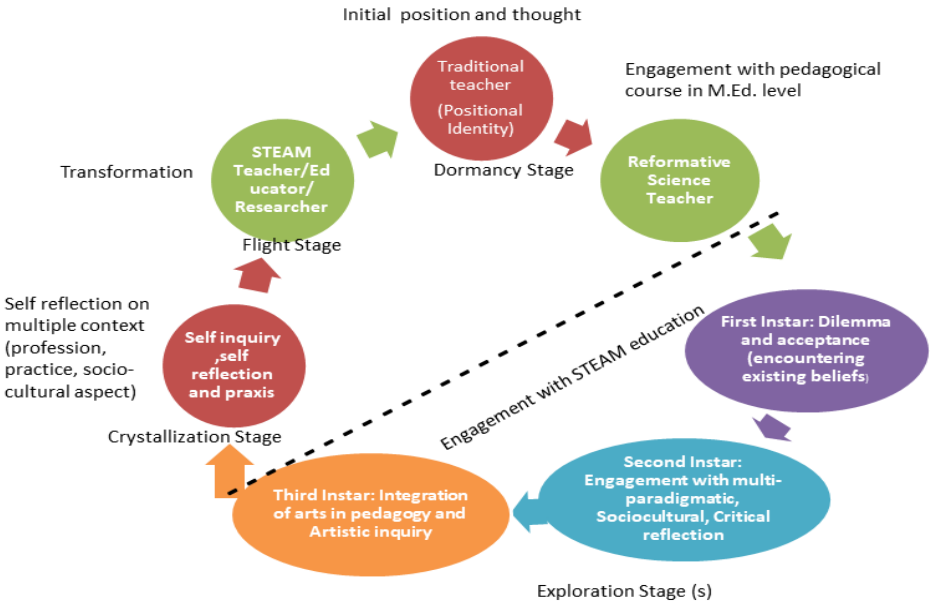
To become an efficacious science teacher for today's classrooms requires self-examination of own identity, beliefs, practices and perceptions. It is also affected by its own social, cultural, ethnic, linguistic, and economic positionality in society. This work illustrates my retrospective and prospective identities (Bernstein, 1996). Like this perspective (in chapters IV, V, and VI), I used my retrospective identities analysis and final thoughts to refer to he prospective identity constructions for the future. Hence, I am probing into my past actions, perspectives, and practices, then building up my identity; it is changed by day by day and it is highly reshaped by M.Phil. The changing identity of a science teacher cannot be
viewed as a static entity; rather, It is negotiated, open, changing, and ambiguous as a result of the culturally available meanings and unresticated power laden in the daily-life context (Kondo, 1990). This is mediated for me by my own experiences both inside and outside of school and university as well as by my own beliefs and values. In my perspective, transformation is an effect of very complicated actions and it occurs in different stages. In the comparison, my stages are also similar to Clark's (1996) four stages (dormancy, exploration, crystallization, and flight) of the metamorphic transformative model (as cited in Clark et al., 2011).

In my initial days, I was highly influenced by traditional thought and positional identity of teachers, which is more similar to dormancy stage. When I completed Master's degree in chemistry education, I changed my thoughts about the existing pedagogical context and practice, but in the field, I did not feel easy to apply it due to the school environment; however, in there, it was felt that I was a reformative science teacher. Similarly, in the STEAM education journey (at MPhil), I was engaged in multiple tasks (which are mentioned in chapter VI) that were closer to the exploration stage (s). In my journey, I feel they are my different instars for

transformation. Alongside the strong convincing, I started to think about self- inquiry, self- reflection, and praxis; these actions I compare with the crystallization stage. And finally, I changed my identity as a STEAM educator/ researcher is the flight stage i.e., transformation. I have illustrated the stages of my transformation journey as a form of the picture below:

Figure 13

My Phase of Transformation



Praxis: My Contribution or Role to Reduce Gap in Pedagogical Theories and Practice

After the study of different literature related to praxis, I also add some bricks to minimize the gap between theory and practice in science education and tried to understand the role of praxis in critical educational research and how praxis relates to real world. Generally, the meaning of 'praxis' is understood in mainly two ways. They are, first, Aristotelian view and Hegel and Marxist's view. According to Aristotelian view, praxis is defined as action that is morally committed, and that is directed toward and informed by customs in a particular socio-cultural context. (Kemmis & Smith, 2008) and second, Hegel and Marxist view, praxis can be understood as history-making action. Here, I focused on how I clamp my transformation as a critical researcher to minimize the gap between theory and practice in science education. In my opinion, my research study always talks about the systems that are related with social issues like freedom, power, social influence, and

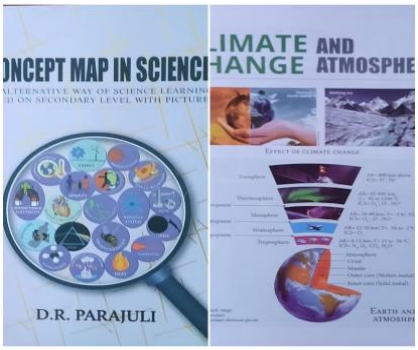
values concerning educational policy and practices in education and it can enrich the understanding and improve practice; it offers an avenue of empower the society/ classroom scenario and science teacher identities. This work belongs to the amalgam of two ideologies of praxis which are growing, such as *German ideology* and *Anglo-American-Australian ideology*.

In German ideology, Marx outlined his materialism, contending that social formations, theories, and beliefs spring from individual and societal social praxis and that social action (praxis) is what creates history. In contrast, much of Europe uses the technical term "praxis" in the post-Marxian sense and Anglo-American-Australian is used in the Aristotelian sense (ibid). Furthermore, from the multiple ways of viewing, nowadays the term ‘praxis’ refers to different concepts and it is related to the particular philosophy used to guide and conduct research, quality standards of research (in action researcher), and it is used in quality to ensure praxis-oriented research and participants under study in the research process.

Like this argument, my study work is oriented to a community of practice of science education. It is an action that exemplifies values like respect for others, the pursuit of truth, and a dedication to the well-being of people. In critical research, the action of a researcher is independent, empowered to act for themselves, and connect practice and theory.

Figure 14

Art Integrated Concept Map Book Developed by Researcher



Moreover, praxis is never without risk. A person must choose how to respond in this circumstance requires making a wise and practical decision (Carr & Kemmis 2003). Similarly, praxis-based researchers’ main concern is how we can change theory, empower social justice, and practical application on society for change. Finally, developing good life means emancipating each other. Hence, during conducting this study, I have been sitting in silence for a year to do some actions related to reducing theory and practice in science education.

For that purpose, I developed an art-based learning tool (concept map in science) which is based on my theoretical understanding of the STEAM education journey. Similarly, as a university teacher educator, I motivate my students to art-based pedagogy- related research work and affective dimension related works. Which

fosters dialectic between everyday's experiences of teachers and students, the actual school and the imagined school and it attempts to inspire justice-full new learning tools for reformative and STEAM teacher/ educator. In such a case, I believe that praxis-oriented actions are some to reducing the space between theory and practice.

Taylor (1993) noted, we have always maintained that *'word and action,' 'action and reflection,' and 'theory and practice'* are all facets of the same concept. This action is not merely the doing of something, so beyond this action, praxis can identify and engage the researcher for creative action. It is the other-seeking and dialogic process that ensures the quality as well as explore the theory and practices and vice-versa (Taylor,1993). However, praxis is a methodical, introspective way of acting. The transition between theory and practice is an ongoing process. Theory and practice are combined to form praxis, where each contributes to the other (Freire, 1985). Like this argument, the art-based research, which is guided by me, act as exploring and bonding theory and practice as an iterative reflective action.

My this action relates theory to practice, in a specific context that challenges the power relationship in classroom practice with administration and I challenged it to lead transformative action, which is another step of praxis; for it I am engaged more time in the field to explore the gap in the ideal assumptions (theory) and scenario of context (practice). So, in this work, I Included my 20 years of experiences which, in addition to being the blending of theory and practice, can also be thought of as the method by which theory is applied and put into practice.

This study was based on empirically supported theory in the science learning contexts and science teacher identity. This work is critical research in science educational issues through auto-ethnographical lenses; hence I govern all my activities continuously by action and reflection. During this period, I strongly agree with knowledge and reflections are not guided by action and reflection, once they lose all value and unusual. Thus, truly this research is a cyclic process that involves the ongoing interaction and combination of four steps action, reflection, praxis, and transformation.

During the regular process of praxis, I identified various spaces in science learning activities comparing with [T] theoretical assumption. As a development of tool, and motivation in art-based inquiry, I tried to use a reflection-action cycle (every chapter is oriented to action and reflection) , where I found that both theories and

practice experiences were changed. This is clearly seen in my changing identity from *Traditional - Reformative – STEAM- based science teacher or educator*. The changing action detects the gap in the ideal situation in our context and tries to add a block in science education. In this study, I followed three elements. They name these three elements insight, critique, and transformative redefinition (Alvesson & Deetz, 2000). Through these three elements, I was seeking the gap knowingly and unknowingly and ensuring the praxis in my research.

According to neo-Marxist ethnographer Paul Willis, praxis describes how one actively constructs their cultural identity in response to their socioeconomic and cultural environment. In the construction of multiple artistic science materials and integration of art in science learning, my work tries to make the recursive connection between theory and practice and emphasizes local practices as well as big and local theory linkage. For example, in small piece of *Teej song*, it connects the global concept of ecosystem and local cultural songs. It means that I tried to immerse in *praxis* to bring my theoretical thoughts and my adaptive actions in a classroom to ensure good in theory and actual practice. Hence, I claim that my action is praxis-oriented and highly applicable to reform science education and change science teacher identity.

While writing this auto-ethnography, I am ensuring the quality of praxis due to the long process (twenty years of experiences) that involves establishing mutually beneficial relationships between me and my context/ world community. Also, in chapters IV, V, and VI; I was engaged in a collaborative process and my actions are oriented to explore the vacuum between theory and practices. Finally, it helps strive to transform the science learning world creatively through science exhibition and other activities. On the other hand, it promoted the actualization of science teacher identities based on their own values with an emphasis on action-oriented research and filled the gap between theory and practices.

Nowadays as a university academic and novice transformative researcher, my actions have been oriented to contribute to the various aspects of STEAM education. First of all, I realized and committed to applying the degree of flexibility and spontaneity to address learners' voices and changing the perception of learning to transformative learning. Furthermore, my main responsibility is guided to stimulate other persons for the transformation of their own and others' actions through critical reflection. Also, I advocate the adopting a commitment to take action as being for

social and educational change. Similarly, I am engaged with communities especially those which are considered historically marginalized ones and socio-cultural issues of learning in society and marginalized pedagogical thought and science teacher identity.

Thus, as a university academic, I am promoting transformative research, which is likely to benefit participants and community as well as further improvement of society or social change and support for a social justice agenda (Mertens, 2007). Moreover, I focus on STEAM-based research agendas like contextual, socio-cultural, and art-based inquiry to address global and local problem-solving.

Throughout this autoethnographical writing, I am concerned about how crucial it is to connect research methodologies with the deliberate advancement of social justice, educational change, and indigenous research methodologies. And my every action was driven through the process of action and critical reflection and the nature of systematic art-based inquiry (methodology). Additionally, as a science teacher/ educator, I try to create a different learning scenario, which respectful relationships with the full range of societal stakeholders, including the powerful and the less powerful, allowing for the emergence of a better understanding of the challenges on my classroom (science/ chemistry classroom). From this work or practice, my students have realized and taken a positive attitude toward transformative learning and STEAM education.

Similarly, in the classroom practice, I changed my practices and included the STEAM-project based, problem-solving, dialogic, and integrated approach to learning. Besides, I motivate my students to apply these perspectives (transformative learning, research, STEAM-based approach, art-based systematic inquiry, collaborative works, action and critical reflection, etc.) in their practices. Critically, such kind of learning actions are useful to our context. Thus, now my role in the educational field is to back up the advantages. That is possible when applying this strategy to finding culturally respectful solutions to wicked problems. Also, it enhances integrated

Figure 15

My Classroom Practices Focused toward Artistic Learning Material Development (Students' Work)

learning to solve real-life problems. Then I changed my identity as a STEAM educator.

As a STEAM scholar, I am developing or designing different STEAM-based learning materials, projects, and other academic works to further familiarize it with our professional community and society. On the other hand, in the STEAM-based approach, learners have a different role, they are active learners, so I am always fostering students' creativity through active designers, and productive contributors to futures (learner-centered).

And I am trying to create an intercultural or multicultural model in science education. It focuses on the development of intercultural competence in individuals. However, here one question is arising how you create intercultural or multicultural learning. In my case, as a university academic, I focus science learning on 'unawareness dimension' dualistic awareness', 'questioning and self-exploration', 'risk-taking' and 'integration dimension' (Chavez et al., 2003).

Moreover, my teaching /learning activities are focused on creating a setting that is

more favorable for learning as multidisciplinary integration, which aims to include curriculum elements and content from various perspectives, such as perspective from various cultures, local or contextual demands, twenty-first-century skills, artistic work, entrepreneurship, the power balance in learning. Finally, I concentrated on active knowledge construction, which encourages students to actively participate in acquiring knowledge that they construct by utilizing the various experiences and backgrounds that

students bring to the classroom. Furthermore, my concern is oriented towards human social activities, socio-cultural aspects or cultural activities (language, belief systems, value, and social discourse and practices).

For the practical implication, I am interested in emphasizing interpersonal social interaction, collaboration, and dialogue in the science/chemistry classroom and laboratory activities (Alexander, 2010) and providing value for political, social, economic, and cultural perspectives in learning (diversity). The major insight of this journey is critical reflexivity. Thus, I am strongly committed to applying critical reflection in my current practices and creating professional discourse to reduce structural curriculum content, rethink, and revision of assessment modes. Also, I used multiple representations of classroom scenarios. For this action, I created flexible,

dynamic, and multiple situations in the classroom based on the learners' demands. Finally, I act as an individual and social transformer and create mutual induction between the theory and practice i.e., praxis in science pedagogical practices and teacher's identities.

CODA: The Need to Challenge the Existing Practice in Science Education

From the multiple modes of this journey [school life (chapter-IV), professional life (chapter-V), engagement with MPhil journey STEAM education course (Chapter-VI), and after a silent year (reflection and praxis)] I make different meanings about my pedagogy and identity. Finally, I reshape my ideology about pedagogical and research perspectives from a positivistic worldview to a multi-paradigmatic worldview. Similarly, it provides multiple understandings and meanings of cooperative and context-based learning for responsible and purposeful education as well as the living. It means that this engagement empowered me (as a learner, teacher, teacher educator, researcher) about the need to solve our real-life problems, twenty-first-century skills, and change for the future. In this endeavor, it contributes to meaningful and transformative education. Moreover, it emphasizes the human capacity for transformation and an effort to move forward to achieve worthy life goals and learning.

In probing all my experiences and stories, I found that it threatens the success of the existing pedagogical perspective (*mechanistic worldview-based-model*), which is deeply rooted in our context. This model seems as in the resistance of creative science learning and development of a good educator akin to Freire's (1974) '*education for critical consciousness',* in fact. This is a major problem for my context, wherein the real educators are marginalized so that pseudo-educators can take their place, and administrators are given more authority to maintain maximum control, minimal deviation, and alienation of the real educators who are happy to "exercise irresponsibility in the form of artificial work" (p.511). The school environment and teacher actions where I grew up are the situations in a dilemma between '*managerialism and professionalism'* (Lumby & Tomlinson, 2000). Critically my context was dominated by managerialism rather than professionalism. Science's pedagogical activities are oriented to the "quality control" procedures (pass, merit, and career-based jobs) like a factory system.

On my side, I clearly see that our system needs to offer a postmodern solution (multi-disciplinary approach or STEAM approach) to those educators and students

who are frustrated by this system can bring up a problem that they personally encountered. Additionally, something that although they struggle with it and the general public accepts it. They must be familiarized with non-mechanistic worldviews. Finally, challenging the existing model needs a shift towards quality education and contextual learning, not only quantification of education. And science teacher identity is seen as a strong thought about identity "*s(he) has to take this job because s(he) cannot do anything in other sectors*." We need to challenge this thought on the ground though critical thinking and actions.

EPILOGUE
FOR A CONTINUED DISCOURSE

Many people would look to the epilogue to expect resolution and a happy ending,
but in my study, that is not the case. I also desire my experience to end happily, but the journey is still very raw and continues in my side. Where, I review the decisions I think it is necessary to re-think about science pedagogical practice and science teacher identity. The truth about the world around me was not just what I intended to put in the paper however I would like to start a transformative science education campaign from my experiences. As an auto/ethnography research, I could not have been expressed any other way because this was a reflection of my life (lived experience) not only a dissertation. These experiences should be viewed as the transformation of a science teacher/educator and as a present reality for me. In my opinion, educators, administrators, and policymakers should have a discussion about the future direction of the Nepalese educational system and the identity of science teachers in light of the finding of my study.

Even so, I am aware of what transpired after my numerous critical reflections in here, I did not reveal what I ultimately decided, my changing thoughts, and action only. I expressed my dynamic decision and I chose to unfinished transformative science journey as a new STEAM-based educator. I believe that the study will resonate longer, encourage some to seek out systematic change in science pedagogical practices and science teacher identity. In different sections of this study, I have seen my inclination towards art; this epilogue also incorporates a poem because art has public literacy to sow the seeds of something new. Hence, I am going to announce my epilogue from the stage.

In the Beginning,

Respected Chairman of this House,
Honorable Minister of Education,
Concerned Stakeholders,
Educationists, Respected Teachers,
Ladies and Gentlemen!!
Welcome to all!!

It is nothing,

But

It is something.

It is nothing,

But

It is something.

It is nothing,

Because

It is just my experience,

It is just an experience of a science teacher.

It is something,

Because

It is an experience of twenty years,

It is a river of some teacher's tears.

And

It is a layer of structural fears.

It is something,

Because

In the journey of this lesson,

I found my changing position.

I found my identity in different roles,

Every role has many holes.

In my initial days,

I was full of bad rays.

I loved and stood for just teaching,

I was inspired to high grade reaching.

I was growing in a hard structure,

I could not do better.

Truly, I think I am a science teacher.

I think,

I wish,

I could have become a school's lion.

I come from the Zion.

I am a school's lion.
Because
My students were scared of me.
I came from the Zion
Because
I was a science content sea.
Critically,
It was my great feature,
I was a stereotype science teacher

After Master's Degree,

With new knowledge,
With new experience,
With new commitment,
I returned to the classroom crease.
With wishes of,
A good teacher in society's image.
With
An unlimited reservoir of patience.
But,
That structure,
That machine,
That paradigm,
All were trying to grind me.
Even though
All together crushed me,
They made me a joker
I continued to push ahead to better myself
I was helping my students.
Even though
I was growing in a hard structure.
I could not do better.
Truly,
I think I am a reformative science teacher.

I act as a reformative science teacher.

With/within Engagement in M. Phil. Journey,

With
Breaking the adventure of dilemma,
Adapting to the new environment,
Listening to the professors' argument,
Shaping to new cognitive sentiment,
Taking new thoughts as a prince,
And
Make sense of my experiences
I began to question my every decision,
I moved down the path of self-introspection,
Critical reflection on own actions,
Gradually, changing thoughts and climbs.
Moving from,
Functionalist paradigm to multi- paradigm
Permanently shifted paradigm's axis
Focused on self-reflection and praxis.
Finally,
I had fallen down the STEAM hole,
I changed my identity to transformative role,
Every role has directed to the emancipatory pole.
Changing identity at different levels,
But,
It is seen as a challenge
Truly,
I think I am a transformative science teacher.
I become a STEAM educator.
With pride and commitment,
Along this journey,
I act as a STEAM educator.

My Request to the Stakeholders,

Teaching is not one way,
Like whooping cough.
Grade sheet is a representation,
High grades and pass rate are not enough
Learner's mind is an empty stockpot,
We need to change such thought.
To understand child psychology,
Avoid the ‘banking pedagogy’.
Do not make learning just informative,
Now, we need to lead being transformative.
Learner/ Child should be the center of learning,
Transformation must be our great earning
Focused on learner’s activity,
Culturing towards their creativity
Integrate science and arts,
As the high value of learning parts.
Listen to me, dear stakeholder,
Our role should be of scaffolder.
All of us,
Need to change own roles
To fill education’s holes

Next step,

In my opinion
We need to conduct campaign
It would do for other teachers,
Reflect on the experience of his/her,
Unravel the system around them,
And,
Personal identity and consequences they face,
Do not hide on the hem.
Critical reflection should continue,
Have to bring out your own point of view.

Actions should not run a single cable,

And

Should break the autocratic hierarchical level.

Increase own action and validity,

Should change the position of our own identity.

Without being divided into different sections,

Let's shake hands on transformative action.

Thank you!!!

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