STUDENTS' EXPERIENCES OF LEARNING SCIENCE IN SECONDARY CLASSROOM: A NARRATIVE INQUIRY

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A Dissertation

Submitted to
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AN ABSTRACT

Of the dissertation of *Amrit Bhandari* for the degree of *Master of Philosophy in STEAM Education* presented on *19 January 2025*, entitled *Students' Experiences of Learning Science in Secondary Classroom: A Narrative Inquiry.*

APPROVED BY

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Niroj Dahal

Dissertation Supervisor

As a student in Nepal, I studied science by memorizing terminology and formulae by heart, with little regard for their practical applications. Our educational system followed a traditional model. I prepared for tests, reviewed teachings, and followed the rules. I was still inquisitive and frequently questioned how science was related to daily life. Seeing my students struggle in the same ways motivated me as a teacher to establish a learning environment where knowledge and curiosity were valued over retaining information. To close the gap between conventional approaches and transformational learning methods, I am researching how Nepali students experience science learning.

As a researcher and science teacher in Nepal, I began to learn about the experiences of secondary school students studying science in classrooms that were influenced by our country's distinct educational and cultural setting. I explored the experiences of six Grade 10 students using narrative inquiry, backed by the interpretivist and critical paradigm with socio-constructivist theory, to better understand how they deal with the possibilities and challenges of learning science. This study documents their voices as they move from rote memorization to meaningful and conceptual understanding through semi-structured interviews and theme analysis.

The findings show that hardship, curiosity, and achievement interact dynamically. Students face numerous difficulties due to traditional teaching approaches that promote memorization over theory-practice connections. Nonetheless, the student narratives demonstrate the positive impacts of experiential learning, collaboration, and encouraging teachers. Experiments, field trips, and group discussions are all important ways to foster critical thinking and active engagement. These anecdotes highlight the shortcomings of outdated teaching strategies and demonstrate how contemporary, student-centered techniques like STEAM can enhance learning's relevance and engagement. Nepal's Science education should prioritize relating courses to real-life situations, promoting student involvement, and leveraging technology to prepare students for new challenges. Future studies should examine how combining digital technologies with regional cultural practices might help Nepal close the gap between rural and urban science education.

…………………… 19 January 2025

Amrit Bhandari
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शोध सार

स्टिम शिक्षामा दर्शनशास्त्रको स्नातकोत्तर डिग्रीको लागि अमृत भण्डारीको शोध प्रबन्धको शीर्षक "माध्यमिक तहको कक्षाकोठामा विज्ञान सिक्ने विद्यार्थीहरूको अनुभव : एक संकथन" ६ माघ २०८१ मा प्रस्तुत गरिएको थियो।

अनुमोदित

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निरोज दाहाल

शोध निर्देशक

हाम्रो देशको शिक्षा प्रणाली अधिक परम्परागत जहाँ पढ्ने, परीक्षा दिने, अंक ल्याउने अनि उत्कृष्ट ठहरिने प्रकारको छ। अझ बिद्यालय तहका बिध्यार्थीहरुले प्रयोगात्मक पक्षलाइ कम महत्त्व दिएर विज्ञान सिकाइ परिभाषा, सूत्र र सिद्धान्तहरू कण्ठ गरेर मात्रै अध्ययन गर्नुपर्ने अवस्था हुदा मैले पनि सम्पूर्ण विज्ञानको सिद्धान्त र सुत्रहरुलाइ कण्ठ गरि व्यवहारिक र प्रयोगात्मक ज्ञानको कमी हुँदा पनि उत्कृष्ट अंक ल्याई बिद्यालय शिक्षा हुदै उच्च शिक्षा सम्म आफुलाई विज्ञानको बिद्यार्थी स्थापित गरेर अध्ययन गरे । यति हुँदा हुँदै पनि विज्ञान दैनिक जीवनसँग कसरी सम्बन्धित छ भन्ने मेरो अन्तर हृदयमा कुण्ठित जिज्ञासाले अहिले म शिक्षकको रुपमा स्थापित छु । अहिलेको अवस्थामा पनि आफ्ना विद्यार्थीहरूलाई उही समस्याबाट गुज्रिरहेको देख्दा नयाँ खालको सिकाइ वातावरण बनाउने प्रेरणा लिएर परम्परागत दृष्टिकोण र समसामयिकक माग संगै नव परिवर्तित सिकाइ बिधिहरु बिचको दुरीलाई चिरफार पार्न म नेपालमा माध्यमिक तहका विद्यार्थीहरुले विज्ञान कसरि अध्ययन गरिरहेका छन् भनि अनुसन्धान गरेको छु ।

एक अनुसन्धानकर्ता र विज्ञान शिक्षकको हैसियतले यहाँका विशिष्ट शैक्षिक र सास्कृतिक पृष्ठभूमि बोकेका देशको शिक्षा प्रणालीबाट प्रभावित कक्षाकोठामा अध्ययनरत माध्यमिक तहका विद्यार्थीहरूले कक्षामा विज्ञान सिक्ने सम्भावना र चुनौतिको अनुभवहरू बटुल्ने प्रयासमा तारकेश्वोर नगरपालिका अवस्थित ३ संस्थागत बिद्यालयहरूका कक्षा १०मा अध्ययनरत ६ जना विद्यार्थीहरूको बिज्ञान कक्षा सिकाई अनुभव कथात्मक अनुसन्धान विधिमार्फत संकलन गरेँ । यसमा व्याख्यात्मक र आलोचनात्मक दृष्टिकोण तथा `सामाजिक–संरचनाबादी' सिद्धान्तलाई आधार बनाइएको छ । अर्ध- संरचित अन्तर्वार्ता र विषयवस्तु विश्लेषण मार्फत मैले विद्यार्थीहरूको अर्थपूर्ण र वैचारिक बुझाइमा उनीहरुको आवाजलाई प्रश्रय दिएको छु।

अनुसन्धानलाई अभिलेखीकरण गर्दाको कठिनाई ,जिज्ञासा र उपलब्धिले गतिशील रुपमा नतिजा देखाएको छ। परम्परागत शिक्षण पद्दतिका कारण विद्यार्थीहरूले कठिनाईको सामना गर्नुपरेको छ , अभ्यास बिना पनि कण्ठस्त विधिमा जोड दिईएको पाईयो । फलत: सिद्धान्त र व्यवहारक बीचको सम्बन्ध

कमजोर हुन्छ। यद्यपि, विद्यार्थीहरूको कथाले अनुभवात्मक सिकाइ, सहकार्य र उत्प्रेरणादायी शिक्षकको सकारात्मक प्रभाव देखाएको छ। प्रयोगशाला, भ्रमण, सक्रिय समूहगत छलफल जस्ता अभ्यासले आलोचनात्मक चेत र सक्रिय सहभागितालाई अर्थपूर्णका साथ हेर्न सकिन्छ। यस्ता अनुभवहरूले पुराना शिक्षण रणनितिहरुको कमजोरीलाई उजागर गर्दै STEAM अवधारणा जस्ता विद्यार्थीकेन्द्रित प्रविधिहरूले –सिकई कसरी सान्दर्भिक र प्रभावकारी बनाउन सकिन्छ भनि प्रस्ट पारेको छ।

अबको शिक्षाले विज्ञान पाठ्यक्रमलाई जीवन र जगतसँग जोड्न, विद्यार्थीहरूको संलग्नतालाई प्रवर्द्धन गर्ने प्रविधिको उपयोग गर्न प्राथमिकता दिनुपर्छ अनि मात्र विद्यार्थीहरू जीवनका नयाँ चुनौतीहरूको सामना गर्न सक्षम हुनेछन् । आगामी अनुसन्धानहरूले डिजिटल प्रविधि र स्थानीय संस्कृतिको समायोजनबाट ग्रामीण तथा शहरी शिक्षा बीचको दूरी घटाउने सम्भावनालाई पनि अन्वेषण गर्नुपर्ने हुन्छ।

.... ६ माघ २०८१

अमृत भण्डारी

उपाधि उम्मेदवार

This dissertation of *Amrit Bhandari*, entitled *Students' Experiences of Learning Science in Secondary Classroom: A Narrative Inquiry*, presented on *19 January 2025*.

APPROVED BY

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

…………………………… 19 January 2025

Amrit Bhandari

Degree Candidate

DECLARATION

I hereby declare that this dissertation has not been submitted earlier to be considered for candidature for any other degree.

…………………………… 19 January 2025

Amrit Bhandari

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DEDICATION

This effort is dedicated with humility and sincerity.

To the educators, mentors, mentees, and innovators who aspire to make science learning a journey of research, interest, and exploration.

ACKNOWLEDGEMENTS

I have had the honor of learning from remarkable people and institutions from the beginning of my academic journey to the development of this dissertation. I sincerely thank Niroj Dahal, my academic supervisor, whose wise counsel and rigorous thinking have positively impacted my development as a researcher. The faculty of Kathmandu University School of Education has fueled my thirst for knowledge and dedication to STEAM education. To my mentors, whose understanding of constructivist pedagogy and narrative inquiry has been a constant source of inspiration, I sincerely appreciate the time you took to polish my concepts and contribute your extensive knowledge. My research participants, pseudonamed Saugat, Pema, Anshrika, Karma, Bisakha, and Anjila, are primarily responsible for this work; their stories give these pages vitality. I appreciate you sharing your stories with me and serving as a reminder of the transformational potential of education. I also appreciate the teachers and school administration supporting my research and conducting interviews. Your commitment to creating worthwhile educational opportunities has served as both an inspiration and a vital component of the framework for this study. I am deeply grateful to the University Grant Commission, whose faith in the importance of this research made it financially possible.

To my family, I appreciate more than words can express. I want to thank my parents for teaching me the virtues of curiosity and tenacity, which have helped me overcome many obstacles. To my spouse, Ms. Krishna Kumari Thapa, and sibling Er. Deepak Bhandari and his daughter, Anshrika Bhandari, the silent power behind this accomplishment, have shown their everlasting faith in my skills and their sacrifices.

This thesis is more than just the result of scholarly research; it is evidence of the strength of community, the ability to work together, and the never-ending spirit of research. I want to thank everyone who has shared this journey with me sincerely. You own this work just as much as I do!

Amrit Bhandari, Degree Candidate

ABBREVIATIONS

AD	Anno Domini
ASHA	American Speech Language Hearing Association
BS	Bikram Sambat
CAS	Continuous Assessment System
CCA	Co-Curricular Activities
COVID	Corona Virus Disease
ECA	Extra-Curricular Activities
EI	Emotional Intelligence
ERO	Educational Review Office
HoD	Head of Department
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information and Communication Technology
IQ	Intelligence Quotient
KUSOED	Kathmandu University School of Education
MPhil	Master of Philosophy
MSc	Master of Science
MOOC	Massive Open Online Course
NCF	National Curriculum Framework
NSF	National Science Foundation
PM	Post Meridian
POE	Predict Observe Explain
SEE	Secondary Education Examination
SEL	Social Emotional Learning
SESP	School Education Sector Plan
SLC	School Leaving Certificate
STEAM	Science Technology Engineering Arts Mathematics
STEM	Science Technology Engineering Mathematics
US	United States
ZPD	Zone of Proximal Development

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CHAPTER I
INTRODUCTION

I have worked as a secondary school science teacher at one of the institutional schools in Kathmandu Valley for a decade. During my academic career, first as a teacher and then as a researcher, I had the opportunity to observe several facets of the teaching-learning process. As a science student and teacher, I have witnessed many scientific breakthroughs, developments, and research. I am driven to discover more about students' experiences with problems and solutions they used to overcome while learning science. The study is timely given the current state of affairs, in which students appear to be less focused on their learning environment. With the above, this chapter outlines the research study, including the study's background, problem statement, purpose, research questions, significance, and delimitations.

Background of the Study

Science is a compulsory subject in school for students of all ages. Science has always offered a challenge to both instructors and learners as a mandatory school topic to be taught and learned from the onset of their early classes. According to Saido et al. (2018), science education aims to give students the higher-order thinking abilities they need to successfully handle everyday life's difficulties. The results highlight the importance of developing critical thinking and problem-solving skills as fundamental elements of science learning. Acknowledging science as a subject, research, and iteration can be difficult for students and even teachers to grasp since it entails a complicated, time-consuming workflow. I discussed the difficulties that instructors and students in Nepal experience when learning and teaching science.

Being dependent on rote learning in science education is the main problem since it discourages students from gaining conceptual understanding. Instead of encouraging critical thinking and inquiry-based learning, many teachers concentrate on imparting knowledge. The purpose of this study is to investigate how conventional, lecture-based teaching approaches affect students' understanding of science and how hands-on instruction can improve the way students learn.

The fundamental reason for this is that the facts, insight, and abilities students get in this subject inspire them to use and contribute their ideas to technological advancement to improve the world (Jones & Wyse, 2013). Science is an excellent subject for experiential learning that engages both the visuospatial senses.

When I reflect on my own, science was frequently taught authoritatively, where retention was more valued. Without having the chance to interact more deeply or critically, my peers and I followed the instructions given by our teachers. Behaviorism was founded on using rewards and punishments to influence behavior and teach new skills. Learning is proven through action in behaviorism and must be apparent and manifested in behavior. I have realized that teachers optimize rewards and punishments to accomplish their desired outcomes. Many of my colleagues could not concentrate on the subject matter, but I was above average, and so were others, but in very small numbers. It might be due to the multiple intelligences of a person.

I earned a master's degree in microbiology and had previously worked in paramedic education, conducting research and teaching in high schools. My understanding of science is more grounded in reality. I still find it challenging to articulate the effectiveness of a pragmatic teaching approach. The educational system in Nepal limits hands-on engagement by giving practical learning 25% of the weight and classroom instruction 75%. Science education still focuses on recalling information, which leaves limited opportunity for inquiry-based learning and experiments in real-world situations. As a result, students lose opportunities to practice critical thinking and apply what they have learned to real-life challenges. My study is to investigate these problems in Nepali science classrooms, bringing out the gaps between theoretical understanding and practical application. The aim is to find strategies to change science education into more student-centered and experiential, emphasizing exploration and inquiry. Students can overcome everyday problems by applying analytical techniques, improving their performance in science, and improving their achievements. As a result, efficient approaches to science education are required. Hands-on activities increase students' enthusiasm for science (Hodson, 1991). Experimental activities are essential to secondary school education because they foster the development of foundational knowledge and an analytical way of life.

I believe the growth of basic abilities and developing a good scientific attitude and ideals are essential. One of the goals of science education is to instill positive attitudes and values (Pacia, 2014). As our system endorses rote learning and memorization in science, it degrades any student's cognition and thus fails to comprehend the conceptual understanding. It promotes a behaviorist approach to learning in which science teaching and learning practices are highly devoted to grades and scores in the assessment. Teachers use the traditional chalk-and-talk method and the banking model of education (Freire, 2005), in which learning is confined to conveying knowledge to learners' supposedly empty minds (Taylor, 2014). Learners are passive receivers in this case, and our pedagogical procedures are teacher-centered. Teachers in experimental course groups, on the other hand, present values and ideals through experimentation and allow students to conduct their experiments. When challenged with jargon while experimenting, students might seek guidance from their teachers. Students communicate and work with their peers in experimental classes to develop new knowledge based on what they learned in conventional classes. It is critical for both students and the nation to offer pertinent, today's skills that will enable them to become visionaries in an ever-changing world. Today's educational system is not sufficiently integrative or collegial, and does not concentrate mostly on addressing genuine, ongoing issues. STEAM education promotes project-based learning across several subject areas to create a dynamic and welcoming learning environment. In contrast to traditional teaching approaches, STEAM combines several disciplines, enabling students to participate in interdisciplinary learning and hone their problem-solving abilities through practical involvement and prototypes.

Traditional methods, including the Vedic educational system, are still widely used in Nepal. Science teachers inquire about students and anticipate proper answers (Acharya, 2016), and they analyze the students' responses immediately. However, the focus has shifted toward learner-centered education, wherein learners collaborate in mini-groups and are exposed to cause-and-effect relationships, allowing participation in discourse and having their opinions affirmed or rejected. Students can build their knowledge independently, in groups, or with assistance from their teachers. My early experiences with rote learning mirror what Vygotsky (1978) describes as a limitation in knowledge construction- learning takes place in a sociocultural context where cooperation promotes in-depth understanding of the subject at hand. To understand further, students must absorb information, evaluate what they have learnt, and acknowledge how their knowledge has changed. A teacher was once a student. Therefore, it is natural that his or her learning experiences, pedagogical techniques, and practices influence and reflect on his or her future job. I started teaching science in 2011 after finishing graduate school. At the time, our teachers engaged in completing the science lesson in the time frame provided. Since we didn't interact much, students asked me to get set up for a private coaching or tuition class. Now that I am familiar with science standards, pedagogy, assessment, and instruction. I recognize the importance of timely feedback in supporting students' learning. But to teach science effectively, teachers must move towards inquiry-based learning, encouraging investigation rather than merely evaluating quick fixes. To improve students' scientific comprehension and engagement, teacher training should strongly emphasize flexible direction, observable strengthening, and system support. Students come to the class with various levels of science knowledge and norms. Teachers must be sensitive to cultural and other background differences, prepared, and capable of adjusting education to these variations. Fundamental thinking skills, firsthand understanding of the natural world, and curiosity are all skills that can be developed to acquire science proficiency (National Science Foundation [NSF], 2006). Freire's (2005) concept of the banking model critiques the passive reception of knowledge, aligning with my study's aim to promote inquiry-based science education. Vygotsky's (1978) constructivist approach emphasizes social learning, reinforcing the need for hands-on, student-centered methodologies.

With time, I joined the MPhil program at Kathmandu University, and somehow, my mind habits changed. I want to demonstrate how approaches like constructivist teaching and the STEAM framework may improve science education in Nepal. Reflecting on my teaching career, I have realized the need for professional development to better prepare students for the challenges of the future in science and technology. A constructivist classroom aims to empower students to take charge of their education. They are offered to work with colleagues, explore different strategies, and build knowledge through metacognition and observation.

Statement of the Problem

As a secondary school science teacher, I have noticed that students are less focused and passionate about class activities. All appliances and applications require hands-on technical competence due to the convergence of technologies. However, many Nepali schools are still decades behind, with rote-based textbook studies of tedious and obsolete curricula. Traditional teaching approaches that promote rote memorization have long influenced science education in Nepal, where students are required to memorize definitions, formulae, and theorems with little involvement. This method has become embedded in the educational culture, where conceptual knowledge and critical thinking are frequently subjugated to tests and grades. Instead of being a process of inquiry, discovery, and practical application, the dominant culture sees science education as a way to acquire knowledge to pass tests. This has resulted in a system where science education, despite its theoretical depth, frequently lacks real-world, experiential learning opportunities to connect with students and help them relate to the subject.

In Nepal, school teachers typically urge students to recall formulae, conventional problem-solving processes, significant definitions, theorems, facts, hypotheses, and axioms (Pant, 2017). However, learning experiences and their connections to everyday life go further than cognitive and conceptual dimensions, fundamentally integrating pragmatic and supporting existence (Roth et al., 2014). Science education in Nepal strongly emphasizes academic achievement regardless of originality and independent thought. This culture impacts both teachers and students. Teachers frequently feel compelled to use traditional methods rather than experimenting with innovative, student-centered ways because of the rigorous curriculum and assessments.

Focusing solely on transferring knowledge and skills is no longer sufficient in education. It is vital to influence students' attitudes, behaviors, and motives. Students will find it difficult to handle problems in the future, both for themselves and the environment, if they lack certain skills and qualities. Zeidan and Jayosi (2015) stated that students having a positive state of mind toward science are more inclined to focus on learning it. In other words, when students embrace active learning strategies, science becomes more intriguing to them. The influence of communication, learning resources, and competent mentoring on student achievement is beneficial (Mushtaq & Khan, 2012).

Most Nepali students dislike science class, which is considered one of the most complex subjects in the country. SLC and SEE findings from past years reveal that students find this subject obscure and challenging. According to the Educational Review Office (ERO) (2019) study, students' learning outcomes in SEE results for 2018 in science subjects are quite low compared to other domains. Chapagain (2021) further states in his journal that around 37% of students had a less than 5% competence level, i.e., below the average. In my science class, students appear to be visibly there but cognitively absent.

The US Department of Education states that it is more critical than ever that children are keen to put skills and experiences to address problems, interpret the information, and know how to acquire and assess evidence to make choices in this immensely complicated world. Teachers confront various challenges when doing hands-on work for learners during science instructional activities in the secondary classroom. Effective scientific instruction combines motivational and learning principles with valuable approaches, according to Krajcik and Czerniak (2018). They promote project-based learning (PBL) as a fundamental method that reflects scientific inquiry and promotes hands-on learning. As a result, they were created to investigate the impact of a realistic application in science education and how to excel in it. I would also want to discuss how helpful practical alternatives in science education are to hone learning. STEM and STEAM instruction are all about honing these talents. STEAM is an academic genre that tries to pique students' appreciation of art and sciences and instill a lifetime of love in them from a tender age. Science, Technology, Engineering, the Arts, and Math are all innovative subfields, yet none employs a single research and analysis approach. This study applies the STEAM framework to explore interdisciplinary approaches that enhance conceptual learning and real-world applications in Nepali science education. Hands-on STEAM instruction isn't about expensive equipment; it is about how we can encourage students to think and create with the simplest of things, like problem-solving, taking thoughtful risks, and engaging in thinking outside the box.

Several factors may contribute to science students' disempowering forces in class, including the structure of the science curriculum, the assessment system, and teaching methodologies. Still, the most essential is the pedagogy we employ in our classroom. In our classrooms, the standard lecture-based method, shaped by behaviorism, is widely used, in which the teacher transmits content-related information passively in a unidirectional way to students. So, there are many hindrances to the existing science, and its orientation serves the vested interest of some educational stakeholders. So, the output of science was not up to the mark, and it affected the students' academic attainment and educational prospects. For science teachers and educators, connecting students in the classroom and assisting them in developing conceptual understanding is already a constant struggle. The science curriculum in Nepal is decontextualized, with science concepts and practices completely ignoring the social contexts of Nepali situations (Bajracharya & Brouwer, 1997). Furthermore, it is questioned that Nepali science curricula was separated from the context too. As a result, such a curriculum cannot truly connect our students.

Considering this problem from critical pedagogy and socio-constructivist perspectives, the existing approaches do not motivate students to participate actively in science. According to socio-constructivism, learning occurs more effectively when students collaborate and relate their learning to real-world circumstances. It promotes a change from memorization to experiential, participatory learning. Instead of merely imparting knowledge, critical pedagogy encourages students to participate actively in their learning. This change would make science education more compelling by assisting students in separating what they learn from what they know and their own cultures and lives.

Purpose of the Study

The purpose of study is to explore students' experiences of learning science in secondary-level classrooms in Nepal.

Research Question

How do secondary-level students narrate their experiences of learning science?

Significance of the Study

As my research is focused on science learning practices in secondary school, the findings of this study enable the stakeholders to adopt new learning methods based on diverse approaches. Furthermore, my research findings will aid other educational scholars in determining the usefulness of teaching and learning science. When striving to build public awareness of science for democratic objectives, experiences and interest themes will be crucial factors to consider. This research study reveals the importance of integrating collaboration and technology into the curriculum, which enhances students' perceptions of it as a successful first step toward changing practice. This research will focus on students learning science in the context of real-life situations, either via inquiry or hands-on experiences. It also emphasizes how pedagogy, assessment, and science curriculum interact to help students sustain a high level of learning so that concerned stakeholders can pay attention to students' perspectives on science learning and instruction. One could uncover the significant loopholes in how science can be taught, learned, and assessed through students' experiences. Thus, it can be used to develop standards, curriculum, assessments, instruction, and even policy.

Structure of the Dissertation

Through its six chapters, this dissertation provides an in-depth account of students' science learning experiences. The study's context, problem description, research goal, driving question, and its relevance are all introduced in Chapter I. Reviewing literature, Chapter II provides theoretical, empirical, and thematic viewpoints that contribute to the study's framework. The procedures for gathering data, choosing participants, and conducting analysis are described in Chapter III, which also discusses the research methodology with an emphasis on narrative inquiry within interpretive and critical paradigms. The students' experiences in the form of stories are presented in Chapter IV and are studied through thematic lenses, documenting the ways they learned and experienced in science learning. Chapter V deals with themes on curiosity, pragmatic application, and experiential involvement. Through constructivist and STEAM-based methods, it highlights that teachers encourage student agency, teamwork, and self-directed learning. It promotes a change from rote memorization to student-centered, inquiry-driven methods that relate science to students' communities and daily lives. The study is concluded in Chapter VI with thoughts, important findings, policy and pedagogical impacts, and future research prospects. Through all these chapters, readers are encouraged to gain a deeper understanding that storytelling may guide the way toward science learning, which is more influential and compelling.

CHAPTER II
LITERATURE REVIEW

This chapter discusses reviews of several types of literature that aided in developing my research. This section assesses existing literature, focusing on students' attitudes, learning experiences, teaching methods, and assessment strategies in science education. Based on classroom science Learning and Social Constructivism theory, I have reviewed many kinds of literature, articles, journals, and dissertations to help define the research objectives and framework. The reviewed literature has provided direction in achieving my research objectives. I have divided this section into three sections: thematic review, theoretical review, and empirical review.

Thematic Review

It summarizes the literature on students' experiences with science learning from diverse perspectives. I have reviewed papers, journals, and online sources on science learning in schools, the 4C (Constructive, Critical, Creativity, Collaborative) Learning Model, POE (Predict-Observe-Explain), and many sorts of learning experiences that we observe from multiple viewpoints in secondary school education. The reviewed literature has significantly informed my research study.

Learning Experiences

Learning science at school involves mixed emotions and various challenging and varied experiences. Learning can occur in any context and at any time, and personal, societal, cultural, and particular fields of study influence it. A few learning experiences are in-person or group, and blended or hybrid. According to the American Speech-Language-Hearing Association (ASHA) (2020), there are three learning experiences: group, individual, and blended. Participants collaborate while they attend workshops, seminars, and conferences. Participants sometimes work independently, with no interaction. They can go through journals, newsletters, and interactive multimedia. In a mixed, hybrid, or blended mode, participants contribute using features of both group and individual formats. Exploration on excursions allows students to study and apply classroom information concisely. Fieldwork opportunities connect classroom learning with the outside world, from communities and classrooms to ethnographic and research settings. Students may be subjected to a multitude of topics as a result of their experiences. Apart from school, students gain learning experience via informal education. According to Coll and Coll (2019), Informal science education environments like research centers, museums, exhibitions, and zoos present students with different, compelling science educational experiences and many science learning materials that can be closely tied to scholastic outcomes for school educators and learners.

Science Learning in School

Some of the requisite abilities students acquire in school are problem-solving and critical thinking. As a result, science is one of the prime subjects for learners to study since it provides them with the critical thinking abilities they need in all courses. Similarly, Scientific aptitude and problem-solving skills are essential for applying scientific concepts, such as facts, laws, hypotheses, and theories, to novel challenges. When learning science skills, these abilities as claimed by Setyawarno & Kurniawati (2022), encourage higher-order thinking that encompasses the aspects of observing, asking, experimenting, assimilating, and communicating.

Through activities that encourage students to apply higher-order thinking abilities such as analytical, cognitive, reflective, and science process skills, science education enables learners to cultivate their higher-order thinking skills so that they can meet the challenges of everyday life (Aktamış & Yenice, 2010; Davidson & Worsham, 1992; Zachariades et al., 2013).

Given that learning is a cognitive process, a critical issue arises: does our educational system integrate this understanding effectively? According to Lyons (2006), critical contemporary challenges in understanding science are linked to tenet ideas like teacher-centric pedagogy, abstract content, and needless rigor in science classrooms, as stated by students in the studies. I believe better learning results may be attained if teachers provide several types of feedback to students during science class. Shirazi (2017) discovered that being engaged and motivated in the subject was the most essential of the school-related criteria determining attitudes toward school science curriculum material in a study titled ‘Student Experience of School Science.’ Research shows that practicum and perceptions of science as a complex subject are driven by student passion.

I consider the importance of science and am excited to work and learn in my career and personal life. Science is not only something that a handful of students do in their maker space; it is a work that is relevant to our lives, something that everyone can easily relate to. Science is all around us. We are all interested in it and strive to have an intimate tie with the subject to understand what is happening inside and out. These abilities are essential in all aspects of a student's education and life, from school to work. Nepal's current education plans and policies, including the Education Policy 2076, the National Curriculum Framework (NCF) 2076, and the School Education Sector Plan (SESP) 2022–2032, all give prominence to move away from rote memorization in science learning to more inquiry-driven, hands-on, and contextually pertinent learning. These protocols support skill-based and student-centered methods, promoting the effective use of local resources, real-world applications, and hands-on experiments. Fair, equitable access to labs and digital tools is encouraged with STEAM integration (Science, Technology, Engineering, Arts, and Mathematics), especially in rural regions. Primary strategies include teacher professional development and assessment reform, which advocate aiding students' cognition, curiosity, and readiness. Governmental frameworks and assessments frequently focus on STEM education at the middle and high school levels. Science education teaches young students problem-solving abilities that will benefit them throughout their schooling and get them interested in science immediately. The structural and process aspects of educational systems are linked to the quality of teaching and learning. Similarly, Woessmann (2016) highlighted that the importance of educational policy, schools, and teachers in encouraging high student achievement is becoming more widely acknowledged (Hanushek et al., 2014; Woessmann, 2016).

4C (Constructive, Critical, Creativity, Collaborative) Learning

Students learn to challenge assertions and discover the truth through critical thinking. They learn how to research facts and statistics independently. They become interested in what is going on around them. They also assist others in developing critical thinking skills. Creativity aims to inspire students to think in ways that are different from what is expected of them. Students learn how to resolve an issue, offer alternatives, and pick the right plan of action to reach a common objective through practicing collaboration and teamwork. Students learn how to convey their ideas through communication effectively. The 4C learning approach influenced the students' sensory-motor and affective learning outcomes. Industry 4.0, also known as the Fourth Industrial Revolution, has been discussed in many fields, including education (Supena et al., 2021). According to their research, students' psychomotor and emotional learning outcomes are positively impacted by the 4C learning model.

Constructivist-collaborative learning, they stress, incorporates important ideas like scaffolding, the Zone of Proximal Development (ZPD), assimilation, accommodation, cognitive imbalance, and schemata. The experimental group's learning process, which used the 4C model, was successful. It may be seen in the students' excitement for learning. It was designed to make the scaffolding process easier by using peer tutorials. It attempted to induce conceptual shifts based on constructivist ideas, allowing students to develop a new, more scientific understanding. Supena et al. (2021) argued that students were invited to offer their initial thoughts or views based on their study materials. In the area of interpretation, they improved their analytical skills. This was due to the student's ability to organize difficulties.

Learning allows you to experience the process of producing information firsthand. In addition to social connections, other crucial factors influencing learning include prior knowledge, passion, and learner behavior, which include values, attitudes, and interests. The search for alternative ideas is the process of critical learning. The act of bringing fresh and innovative ideas to life is known as creativity. Students can engage in creativity through planning sessions and communication. Creative teaching and learning strategies can help students develop the ability to express themselves creatively. Collaborative learning is a peer-to-peer learning algorithm. According to Ergin (2012), the stages included in the constructivist approach while on an instructional physics are engage, explore, explain, elaborate, and evaluate. Thus, the five E's, when integrated, allow students to become one-person think tanks. When those individuals join forces, they can do practically anything!

POE (Predict-Observe-Explain)

POE (Predict-Observe-Explain) is a strategy for determining learners' scientific knowledge and understanding. It assesses their knowledge and comprehension of scientific subjects. A similar method works well in mathematics, especially statistics (White & Gunstone, 2008). It can be used to discover students' initial thoughts, provide feedback to teachers about students' understanding, spark conversation, motivate students to learn more about the concept, and generate investigations. Growing student enthusiasm and desire to relearn science using a POE inquiry strategy were anticipated by their Internet cognitive failure. (Hong et al., 2014).

As the curriculum changes, Prabawati et al. (2020) claim that 21st-century learning comprises a move from teacher-centered and student-centered approaches. They highlight the Predict-Observe-Explain (POE) model's ability to improve students' conceptual knowledge and suggest it as a successful substitute for traditional classroom instruction. To assess the impact of the POE model on concept comprehension, they also suggest applying this learning process to various natural science subjects. Joyce (2006) found that students autonomously write predictive statements about what they expect to see and why. The presentation is carried out in the case of the items they view, and time is given to concentrate. Students are asked to take notes on what they see. Students are invited to make changes or additions to their explanations to include the observation. After students have presented their explanations, they discuss the issues together and critically reflect. In the twenty-first century, critical thinking skills are a must-have. Another study (Larasati et al., 2018) suggested that it develops critical thinking abilities in students using the Predict, Observe, Explain (POE) scientific learning approach.

Theoretical Review

This part presents the theoretical framework of my research. This survey describes how students perceived their science curriculum, assessment, and instruction. "A theoretical foundation is part of a theory (or theories) in a study that reflects the researcher's beliefs and presents a well-defined lens for how the study will interpret new knowledge" (Collins & Stockton, 2018, p. 2). This qualitative study explores students' experiences to help them enhance science learning from social constructivism that has influenced their understanding level.

My research question suggests Vygotsky’s Social Constructivist Theory as a referent, significantly focusing on science learning, the 4C learning model, and the POE method. This study examines students' experiences while learning science in their daily classroom. I'll use social constructivism's theory to help me develop interview questions for data collection. I will evaluate the data using the same theory to generate codes, categories, and themes, followed by data collection. The theory also guides the methodology and determines how data and transcripts are created (Kuby et al., 2016). The research explored how learners actively generate knowledge based on personal meaning and guided by prior knowledge and events.

Social Constructivism Theory

When knowledge on a subject is contradictory, a teacher working with students poses questions about it, and students hypothesize their answers, collaborate to innovate, and make connections regarding what they have already learned. When students discover new topics, the learning and reflection keep the cycle going until the concept is applied to new situations. According to constructivism, students can use their previous experiences and knowledge to excel in their learning. The constructivist theory of learning underpinned the Science in the Curriculum. Pedagogy based on constructivism requires an interaction between teacher and learner, including eliciting prior knowledge, exploration, and reflection. There was little evidence that teachers applied constructivist pedagogical approaches. With the implementation of the new curriculum, any related professional development is needed to help teachers understand the theory underpinning the document.

Students will constantly try to organize their freshly acquired knowledge based on their distinct mental schema of the outside world. Several interconnected facets impact the construction process. Among them are students' opinions and assumptions regarding the nature of science. Their drive and level of interest are also important factors. The culture of the classroom also has a big influence. Further influencing the process are chances for dialogue, discussion, and social engagement (Hadzigeorgiou & Schulz, 2019).

The current teaching and learning methods have failed to establish a link between the disciplines. To work with teachers and keep learning, I must be aware of their convictions, basic views, and experiences with the problems they encounter. Content pedagogical knowledge would inform how teachers teach or present the subject. I conducted interviews, watched the classroom, and determined how learning practice in science has been applied and areas where it could be improved. My ability to make conclusions is aided by constant involvement and student conversation. Learning occurs through social interactions. Learners are social beings and necessarily come up with collaboration, discussion, inquiry, and communication. In this process, they develop an understanding of the subject. Socio-cultural theory believes that learners construct and co-construct knowledge from associated culture and with interaction, including peer collaboration, cognitive apprenticeships, problem-based instruction, and other methods that involve learning with others, which help students contextualize subject matters in the classroom. As a result, sharing and negotiating socially constructed knowledge is integral to all teaching and learning.

Vygotsky (1978) argues that cognitive growth occurs from social interactions and guided learning, and a child can perform with the help and guidance of others but cannot yet perform independently because children and their peers co-construct knowledge.

Empirical Review

I have reviewed recent national and international journal articles on my issues from different sources. These research articles aided me in formulating my research questions and bridging the gaps in my knowledge.

A study entitled “What is learning for secondary-school students? Ferreira et al. (2019) examined students' perceptions in Brazil and Finland, focusing on secondary school students' learning experiences by defining the fundamental learning factors. They employed a qualitative technique to conduct the study, using images from students throughout their daily routines to elicit a group conversation about how students learn. The dialogue between participants from Finland and Brazil raises questions regarding learning processes as diverse and culturally dependent activities, emphasizing crucial aspects of secondary school students' learning experiences.

Kervinen et al. (2020) investigated the study "The resurgence of everyday experiences in school science learning activities." This research was to see how students participate in investigations, physical gestures, and storytelling analyses of the universe used to orient science learning, especially its surroundings and substance, within their established theory. We observed students connecting their everyday experiences with science interventions in a non-conceptual manner. It was decided that school science researchers and stakeholders should do more to discover how it would affect students' imaginations by studying in depth how storytelling and romantic understanding can be used to help students think in the context of the science curriculum.

Hadzigeorgiou and Schulz (2019) conducted quasi-experimental design research on 'Engaging Students in Science: The Potential Role of "Narrative Thinking" and "Romantic Understanding" and discovered that students' narratives are a bridge to studying science. Involving students in science and assisting them in making sense of its concepts has been a constant struggle for teachers. Science can be an interesting topic, but it can also be challenging to educate because it is distinct from ordinary knowledge regarding argument. Such a barrier is considerably bigger when we talk about science ubiquitously in all curricular programs. The study aimed to examine how narratives and stories may be used to convey significant scientific concepts.

Maranan (2017) researched "Basic process skills and attitude toward science inputs to an enhanced students' cognitive performance" to investigate the relationship between mastery of procedural abilities, scientific mindset, and Grade 7 student performance, which could be used to develop a science intervention program. Baldwin and Wilson (2017) found that using a shared book technique allows students to develop both science and literacy skills, which will help them learn science in the future. Students could relate conversations to their daily lives and transcend expectations because of the hands-on and outside exercises. Preschool is ideal for youngsters to engage in scientific discussion and research.

Acharya et al. (2018) researched the "Relevance of learning science through inquiry-based participatory action research in basic public schools of Nepal: A proposal," intending to provide a platform for science teachers to act as co-researchers and contribute to the co-creation of knowledge and its production through classroom teaching and learning strategies. The goal of this study was to transform traditional science classroom pedagogy (chalk and talk approach) into inquiry-based science teaching in Nepal's basic public schools using Classroom-based PAR through authentic learning outreach activities in the school garden, hands-on activities using improvised low-cost and no-cost materials, and the use of information and communication technology (ICT). The first step toward societal change is classroom pedagogy.

Research Gap

The literature review reveals how various elements, such as a student's identity, self-esteem, and socio-cultural background, influence their choice of science courses. These aspects are equally as significant as their experiences in science school. Few scientists and educators have examined how students view science education and learning. The literature study identifies two significant research gaps. Students' opinions and interests have not significantly impacted science curricula, assessment, and teaching. There has not been much research on the consequences of the findings for the science curriculum and how science is taught, learned, and evaluated. Therefore, I am looking for it. The current study was motivated by my observation of insufficient research on science experiences in secondary schools.

Key Message of the Chapter

Chapter II analyzes extensive research on secondary school science learning experiences. The three primary elements of it are empirical, theoretical, and thematic reviews. Among the subject areas covered in the thematic review are learning experiences that are influenced by both individual and sociocultural factors, science education in schools which focuses on analytical cum problem-solving skills, and inventive strategies like the POE (Predict-Observe-Explain) strategy and the 4C learning model (Constructive, Critical, Creativity, Collaborative). These components highlight the importance of inquiry-driven and hands-on education. The theoretical review is based on Vygotsky's Social Constructivist Theory, which suggests the importance of setting, scaffolding, and teamwork in knowledge construction. The study's methodological decisions and data interpretation are supported by this framework. The empirical study identifies a research gap on how students themselves describe their learning experiences by referencing recent national and international studies. Overall, Chapter II establishes a solid conceptual framework that supports the exploration of relevant, student-centered approaches in science education through the use of narrative inquiry.

CHAPTER III
RESEARCH METHODOLOGY

The research techniques used to address my research question are covered in this chapter. The philosophical foundations of my qualitative research, such as epistemological, ontological, and axiological beliefs, an interpretative research paradigm, and narrative inquiry as a research methodology, are made clear in this chapter. The chapter includes the following: study area, data harvesting techniques, quality standards, and ethical considerations for my research.

Philosophical Assumptions

It provides an overview of the philosophical assumptions or beliefs that determine how a problem is generated and the study's purpose to examine, which affects how I collect data to address the concerns. I'll review the philosophical assumptions underpinning qualitative research and how they integrate into interpretive and critical paradigms that function during the research project.

Epistemology

The epistemology of my research is social constructivism, where knowledge is constructed through collaborative work. It is subjective, as participants can offer different views concerning the same issue. The epistemology of any research determines whether knowledge has to be acquired or experienced. I can make sense of data through my own data analysis and conceptual thinking, influenced by participant interactions. The data impacts our investigation in the social environment, which is why faith is required while learning new things. I jointly create knowledge with my contributing participants by interaction, exchange of thought, introspection, dialogue and inquiry.

Ontology

Ontology is all about the nature of being, existence, and reality, and it tests our underlying belief system. My research is based on relativist ontology, which holds that reality is created via layers of meaning through socially and contextually acquired understanding. I am collecting varied subjective experiences from participants in my qualitative study. As reality is not distinct, it varies upon each students personal, contextual and unusual illustrations.

Axiology

The philosophical study of value is axiology, which involves ethical issues (defining, evaluating, and understanding concepts of right and wrong decisions). The Axiology of my research is value-laden. My beliefs operate as a guide for me when I conduct my research, and they influence things like who I interview and how I would communicate with study participants. I thus respect and value every individual's voice, challenges and perspectives who was involved in my research.

Research Paradigms

Each research paradigm has a specific goal: to provide a unique knowledge acquisition approach. It consists of an ontological viewpoint on reality, an epistemological understanding of the forms of knowledge that can be generated and the criteria for justifying it, and a disciplined procedure for generating that knowledge (methodology) (Taylor & Medina, 2011). Several major paradigms drive researchers like me when we look at educational policy and practices. Each paradigm encompasses ideas about teaching and learning (or pedagogy), curriculum and assessment, professional development, and other subjects. The research paradigm depicts a predetermined research path. We have encountered various research paradigms, including positivist, postpositivist, interpretive, critical, postmodern, etc. It is not essential for a single paradigm to solve research concerns; in some instances, research may require a multiparadigmatic viewpoint, while in others, a single paradigm may suffice. I used an interpretive paradigm for this study.

Interpretive Paradigm

The interpretivist/constructivist paradigm is more likely to apply qualitative methodologies. My research was connected to the social connections around the globe. The notion of social constructivism has shaped my research. The relevance of culture and context in comprehending what happens in society and building knowledge based on that understanding is emphasized by social constructivism (O'Donnell, 2012). I used the interpretive paradigm to guide my research, which allowed me to reflect on my choices and create meaning as I went along. Interpretivism helps analyze human behavior because it enables researchers to see the importance of human acts (Cohen et al., 2017). It also assists in determining the factors influencing people's behavior and the reasons behind their actions. The interpretive paradigm required active engagement with my participants throughout the entire research process in the context of my study on science learning. These interactions made reflection on my and the participants' behaviors easier, allowing me to understand many realities and create meaning.

Constructivists share the concern and their emphasis on the world of experience as it is lived, felt, and experienced by members of a society that resonates with interpretivists. My primary goal in the interpretive paradigm is to gain insight and in-depth information. I conducted a study to investigate science learning experiences at the secondary level students following the interpretive paradigm. I am an active participant in the study. My identity, experiences, and values have influenced every step. It also depends upon the way I spoke with participants and how their stories were conveyed and portrayed. With a background in science education, I approach this research with a keen interest in how students learn science. As a science student turned teacher, I bring both personal and professional memories so that I can draw conclusions from the experiences of others. I kept a reflexive notebook during the study, record the audio, and transcribed the data. I was able to stay alert to the relational and ethical aspects. My objective was to respect each participant's story without generalizing.

Through a series of interviews, this transition was found based on the perceptions and experiences of one cohort. The research was done in a naturalistic setting. I have asked broad research inquiries to investigate, interpret, or comprehend the situation. The data is presented in a narrative format in the study. Qualitative features are more likely to be appropriate for my intended study, which examines the experiences and perceptions of a group of participants. As a researcher, I aim to learn about my participants' lives (Cohen et al., 2002) by learning about their backgrounds, views, and experiences (Creswell & Creswell, 2003; Yanow & Schwartz-Shea, 2015).

I interviewed participants and heard their stories so everyone could speak their minds and develop some vignettes for a narrative inquiry. The participants' experiences are plotted and story-lined in narrative inquiry, which is meticulously planned and imaginatively written to provide readers with an almost omniscient perspective on the participants' viewpoint. Subjectivity and possible bias are issues that arise because interpretive research involves the researcher as an active participant in meaning-making. My experiences, viewpoints, and theoretical preferences certainly influence my interpretations. But, according to Cohen et al. (2017), qualitative research welcomes subjectivity as a strength that enables a thorough interaction with participants' lived realities. I used several ways to reduce bias and improve authenticity:

Reflectivity: To ensure transparency, I kept a research notebook wherein I methodically wrote my thoughts and presumptions and developed insights as the conversation progressed.

Member Checking or Credibility: My participants were asked to look for feedback on the stories crafted from their experiences after I documented them.

Triangulation: To cross-validate results and outcomes.

However, interpretive research is often criticized for being context-specific, which makes generalization difficult. However, transferability—rather than generalizability—is the proper criterion for qualitative research, according to Lincoln and Guba (1985). My research provides contextual insights into secondary students' experiences learning science rather than trying to produce universal laws. I allow readers to determine whether the findings are relevant to and applicable to comparable educational contexts by providing detailed explanations.

Moreover, interpretivist research is valuable because it reveals complex viewpoints that quantitative generalizations would not reveal, even though it prioritizes depth over breadth. This study uses narrative inquiry to capture the intricate interactions between classroom dynamics, individual thought processes, and sociocultural factors. The findings are useful for practitioners and policymakers in scientific education, even though they cannot be widely applied. By admitting these shortcomings in method, I uphold the integrity and intent of my methodology to highlight the diversity of students' science learning experiences rather than generalizing.

Criticalism Research Paradigm

The critical paradigm examines how cultural elements, power relationships, and societal structures influence education and produce inequality. It seeks to address these problems and effect constructive change. In this research, I discuss how Nepal's scientific education, which frequently depends on rote learning and conventional approaches, affects students' learning experiences using the critical paradigm. This method aids in my comprehension of how curriculum, instructional strategies, and evaluation frameworks affect student participation and performance. Tabron (2023) explains that the critical paradigm operates under a transactional epistemology, where the researcher actively engages with participants. It adopts an ontology of historical realism, particularly in relation to oppression, a dialogic methodology, and an axiology that emphasizes respect for cultural norms. Building on foundational ideas from Guba and Lincoln (1994) and Fisher-Borne et al. (2015), research within this paradigm is characterized by a focus on power dynamics within social structures, the recognition of the implications of privileging certain realities, respect for cultural norms, and the analysis of social conditions and positionality. Additionally, this paradigm views research as a constructive process to uncover hidden agency within social practices to promote liberation and emancipation.

In my work, I employed critical thinking to examine ‘myself’ and others to recognize and alter socially unfair systems, ideologies, and practices known as deep democracy (Kincheloe & McLaren, 2011). I accomplish this by analyzing current science learning and envisioning STEAM-based research. As a critical researcher, I used advocacy and/or other active engagement strategies as a change agent in my study (Taylor et al., 2012). The critical paradigm is the primary research paradigm that helps me think critically about our practices, beliefs, and behaviors and cultivate conscious awareness to imagine new viewpoints and methods. Consequently, the criticalism paradigm enabled me to gain self-determination during my study. The critical paradigm is crucial because it looks for answers and identifies problems. With this viewpoint, I can support changes that increase science education's inclusivity, interactions, and significance while enabling students and teachers to enhance educational opportunities.

Narrative Inquiry as Research Method

This section refers to the study investigating how Nepali secondary school students relate their accounts of learning science experiences. I used a narrative research design to describe people's lives, collect and share stories, and produce personal narratives (Connelly & Clandinin, 1990). This way of studying was picked because, unlike other approaches, narrative inquiry tries to tell the whole story. On the other hand, other methods only give a partial picture of the things being studied at certain points in time and often skip over important developments. Since the study's goal is to listen to their stories, recollect their experiences, and derive meaning from them, other research is considered undesirable. Researchers can use interviews to understand the participants' lived experiences by following the basic qualitative design (Dodgson, 2017). The classroom methods and methodologies students experience would reflect the range of investigations. In narrative inquiry, choosing participants is planned and based on set criteria. In-depth interaction and specific experiences are valued more than the number of participants (Connelly & Clandinin, 1990; Polkinghorne, 1995). This method, which frequently uses a few subjects, like in life history studies, focuses on examining lived events in their sociocultural context (Barkhuizen et al., 2015). Dahal et al. (2024) stated that context-specific and participatory selection procedures are essential for ensuring that qualitative research is honest and accurate.

In my research, interviews are used with a limited initial set of questions that are gradually extended as the study continues. A few queries came up in the field. A qualitative investigation on high school students' experiences learning science was added to the literature and knowledge by gathering, evaluating, and presenting data on the subject. Qualitative research is crucial for exploring the intangible facets of human experience, like emotions and experiences, according to Merriam and Grenier (2019). It is essential across disciplines because it provides a means to investigate things that cannot be quantified. This method provides a greater understanding of intricate human realities by filling in knowledge gaps when statistics are insufficient.

The approach will involve more than just experiments, which are usually the focus of science classes. It will also use contemporary techniques, including tracking interviews, open-ended surveys, and observational methodologies. Interviews, learning strategies, educational culture, and teachers' and students' competency (assessment, curriculum, and instruction) are the sources of data to be collected from 6 students currently in Grade 10 to understand their experience with science learning. I will put each narrative in chronological order, place it in its setting or context, deduce many themes from the anecdotes, and establish a connection between the participants. My research was based on the information I got from secondary school science students during an interview.

Narrative Generation Process

Narrative is considered one of the best ways to explore human experiences. This study aims to explore the students' learning experiences of science at the secondary level. I believe narrative generation was done with great care in this research to meet this purpose. I sought out six Grade 10 students to describe their experiences learning science through semi-structured interviews, focusing on their flexibility and time management. I interviewed them numerous times over a few weeks, giving them time to think deeply about their experiences. The 45- to 60-

minute sessions allowed them to share their ideas about curiosity, teamwork, and their difficulties in science learning. All interviews were audio-taped and transcribed with the consent of the participants. Students were given access to the transcriptions for validation to ensure authenticity. A characteristic of narrative inquiry, this sequential process enables a deep, living connection to each student's unique voice while allowing a rich, developing inquiry into their experience.

Narrative Handling

This section describes student experiences which were thoroughly transcribed, anonymized, and arranged to maintain veracity. I reviewed and coded the stories generated in order to identify important themes, applying a socioconstructivist lens and interpretive paradigm. Students' opinions were kept front and center throughout this process, which also made it possible to analyze their science learning in a relevant way.

Narrative Process

A crucial stage of narrative inquiry is narrative handling, in which the gathered stories are systematically treated to maintain their authenticity and get them ready for analysis. This investigation initiated the handling procedure as soon as each interview concluded. To assure accuracy and privacy, I transcribed the tapes that same day. To distinguish between the researcher and the participants, each transcription was laid out into two columns: one for my questions and the other for the participants' answers. All personal data was eliminated, and pseudonyms were employed to preserve each student's identity. I could recognize important themes, pick out details in the students' answers, and create interview questions by reviewing the transcriptions several times. I consistently improved the data through this cyclical method, ensuring I captured the richness and genuineness of the students' voices. The data is handled in a way that places the participants' voices at the center of the research. It is inconsistent with the tenets of narrative inquiry, which place a high value on maintaining the credibility of individual stories.

Crude narratives are converted into deep insights that improve our comprehension of the educational experiences of science learning throughout the meaning-making phase of narrative inquiry. This study used a thematic method to analyze the students' narratives, starting with 83 basic codes and dividing them into 28 categories. Seven dominant themes that represented the students' science learning experiences were found as a result of these groups. I reviewed the transcripts several times, refining the interpretation using a socio-constructivist lens (Vygotsky, 1978). The complete transcripts of every interview session were read several times in order to develop themes (Josselson & Lieblich, 2001), expertly applying an experience-centered approach (Squire, 2008). I complied with the three suggestions Squire (2008) made for experience-based narrative analysis. Using a thematic approach, I first created topics from each interview (Riessman, 2008). I followed up with well-considered explanations. Finally, I used data analytics that were both top-down and bottom-up.

The stories are developed in three stages. The first is entry into the participant's science learning, in which students talk about their first experiences with science. Here, I have mentioned how I approach my research participants. They talk about their first experience with science learning. I didn't start conversation with a fixed set of question looking for an auto response. I created wonder, mystery that how students learn science outside of textbooks, tests, excursions, practical lab works. I wanted to know their classroom settings, how their curiosity is leveraged or suppressed, what motivates them and the ways they connect what they learn in class to their own lives. These factors play major indicators in narrative inquiry. Every story they shared is related with time, bringing back memories of present, past and future. Peers, parents, teachers, and school culture are external social entities that affect emotions, beliefs, frustrations, fears and aspirations in their story. Places like science lab, library, makerspace, classroom, school overall influenced the meaning of experience in science learning.

The place's atmosphere and curtain opening when they shared their challenges and discoveries were written. It is the main body of the conversation where participants express their opinions freely as asked via semi-structured questions and the curtain's closing, in which they consider their life-changing educational experience. This is where I, as a researcher, make some sense of the participants' stories.

I have used one of the concepts of narrative inquiry that is reflected in the metaphor of the curtain: that students share their lives or experiences in the form of stories, and that these narratives are multi-layered, contextual, and they are too kept hidden until the situation allow them to become apparent. These narratives disclose their confusing state to clearity and annoyance to wondering. They share distinctive, passionate and rational experiences with science learning. What is shown and what is kept confidential are both symbolized by the analogy ‘curtain’. Metaphors such as ‘opening the curtain’ and ‘closing the curtain’ were employed to organize the narrative journey, providing a methodical yet passionate framework for presenting the results. It has been used in this study to organize and represent the narratives of each participating student depicting their independence, endurance and growth. ‘Opening the curtain’ refers to the point when a student's story is invited, and starts to be heard. The opening of story in this study enables participants to take center stage, as in a drama or play, when the curtain rises to show a stage. Something unnoticeable becomes visible when the curtain rises in a theatre. It is not always the curtain that opens in the play. Here, ‘Closing the curtain’ refers to a moment of reflection and remembrance of the narrative, not its conclusion. I refer to this as a time when we ended our conversation and time to contemplate, as I make my move towards home. It is sometimes counted when I reached home in the evening and start memoing the story. Stories in narrative inquiry are never at the desired final state; they are constantly developing. Both their stories and life always go on. The curtain closing indicates that the storytelling act has come to an end. Provided the respect to every participant and opportunity to view the world from varied perspectives, it has to be noted that every experience is the story of being, nurturing, and rethinking.

I made sure the research reflected the richness of every student's narrative. I carefully considered their experiences and appreciated their unique voices. Additionally, I balanced their narratives with more comprehensive instructional frameworks. This methodology reflects the fundamental beliefs of narrative inquiry. It emphasizes the iterative nature of meaning-making. This procedure looks into the content and context of the participants' stories. The aim is to gain more insight into the students’ experiences in science learning.

Study Site and Research Participants

The research setting was done at three secondary schools in the Tarakeshwor Municipality of Kathmandu Valley, where 2 participants were taken from each school. Six students, four girls and two boys of the age 15-16, studying science in their regular secondary classes (Grade 10), were invited to participate. I included those regular students who were enrolled in Grade 10 science courses. I ensured that students for my research needed to execute diverse performances rather than simply know the information. It was important that they be prepared to share their learning experiences and personal anecdotes. As narrative inquiry deals to develop story depth, I wanted students who could express themselves clearly in Nepali or English and were reachable for multiple interview rounds. However, students who were unable to attend regular classes were excluded. This strategy assures that the stories gathered were meaningful and pertinent.

Our main goal is to protect the quality of our study by keeping the amount of data reasonable when sampling. According to Creswell (2015), the research participants for qualitative research are a small and informed sample. According to Thompson (2012), purposive sampling ensures ‘reasonably representative or balanced samples’ (p. 135). I have used a purposive selection strategy, selecting six students from three institutional schools for the study to understand in-depth the problems that students experience while learning science. To learn and understand central phenomena, I preferred purposive sampling to select informants based on their specific knowledge and/or experience with the empirical research issue and sites. In this sampling strategy, I determined what needs to be known. Then, I searched for people capable and willing to contribute information based on students’ knowledge or experience (Bernard, 2017). This criterion aims to obtain saturation in the data on high school students' science learning experiences. This strategy is in line with Dahal et al. (2024), who stress the value of context-specific and participative selection processes in qualitative research. I used Bernard's (2017) methodology to identify people with particular knowledge and experiences linked to the research subject to investigate the main phenomena. Our objective was to achieve data saturation about the science learning experiences of secondary-level students.

Interview as Data Collection Tool

Face-to-face semi-structured interviews have been conducted to collect data. Interviews and participant observation are used to collect data for this research (Angrosino, 2007). The open-ended questions were used to learn about student participants' experiences, attitudes, and perspectives when it comes to learning science in secondary classes so that I can develop in-depth accounts of my participants involved. Open-ended questions allow participants to freely express themselves, reducing the impact of the researcher's biases and prior findings (Nohl, 2009). Rapport building with the interviewee before the interview is a must to create a comfortable zone. I developed a few open-ended questions to evoke students' experiences and perceptions based on study topics guided by social constructivism theory. The supervisor and other research fellows reviewed the progress of the study.

Each interview took 45 to 60 minutes, and I did them one after the other. Various question formats and probing strategies prompt them to provide more information. With prior consent, I recorded the interview online and took the field notes. I continued collecting data until saturation occurredany cycles emerged, and no new information was obtained or any cycles emerged for anything new to happen. The interviews were recorded, notes were taken, and various transcripts were gathered. Multiple interviews were undertaken to obtain more information, with new questions appearing along the way. The respondents' transcribed narratives were used to create various vignettes.

Data Analysis and Interpretation

After gathering data from the interview, I analyzed it to confirm the likely consequences of the data from the first step. In the second round of data collection, I specifically focused on the study topics. The data analysis began with exploring data to get a common sense, memoing thoughts, exploring how to organize the data, and deciding if additional information is needed (Creswell, 2013). After reaching data saturation, we transcribed, categorized, and assessed the data by producing broad and specific themes. Transcripts of taped interviews were written under pseudonyms. To guarantee the legitimacy of the interviews and the veracity of the data, we gave participants access to transcripts. The transcribed data were carefully coded and categorized, and themes linked to the research questions were retrieved (Saldaña, 2016). I used a methodical and open process to ensure the data analysis was credible. Pseudonyms have been used to protect the participants' identities during the transcription of the interviews. For accuracy, I reviewed the transcripts several times before sharing them with the participants for confirmation. I started with 93 basic codes and refined them into 31 categories, underlining important data patterns. I derived 10 broad themes from these. Throughout, I kept reflective memoranda to record my ideas and choices. While upholding intellectual and moral integrity, this procedure yielded an extensive understanding of the students' science learning experiences. We have carefully analyzed each theme, applying the socio-constructivist theory and referencing relevant research to address the research question.

Quality Standards

The quality standards for qualitative research are trustworthiness, accessibility, honesty, verisimilitude, authenticity, and transferability. As a quality standard, I used trustworthiness and verisimilitude. Quality considerations (Bergman & Coxon, 2006) are important at every stage of the qualitative research process, from formulating research questions to data collection to analyzing and disseminating results. Authenticity and trustworthiness are among the quality characteristics of interpretative research by Guba and Lincoln (1994). Assuming that a single complete set of quality criteria will be developed is unrealistic, given the diversity of qualitative research paradigms. We developed these rules using social constructivism as our epistemology.

Credibility

Credibility means that the results can be believed, which can be helped by evaluating the results with research participants and ensuring they match up with a theory. Here, I will engage in analysis with data sources for a long period and present the reader with detailed descriptions of the data so that an effort can be made to build intimacy with the participants through non-ambiguous responses. I will then summarize the information given and pose questions to the participants to determine accuracy at the focus group interview. The study gains credibility when the participants accurately confirm the presented summaries (Merriam & Grenier, 2019). Variables like triangulation contribute to credibility and trustworthiness.

Transferability

It is a type of external validity that refers to how useful the phenomena or outcomes of one study are to philosophy, action, and areas for further research (Lincoln & Guba, 1985). The study findings will be valuable to other stakeholders in a similar field. I may supply comprehensive data and detailed explanations as a researcher to meet the transferability criteria, allowing readers to see parallels between the researcher's personal experiences and their own.

Dependability

I will make every effort to ensure that the data and findings in this study are consistent. To ensure internal consistency, I will conduct repeated interviews with the same participant to ensure that what they say in one part does not refute what they say in another (Atkinson, 2002, p. 134). I will keep records of all parts of the research process, including meticulously formulating the research problem, participant selection, fieldwork notes, and transcription verbatim.

Confirmability

The aspect of neutrality is addressed through confirmability (Lincoln & Guba, 1985). I must ensure the analytic technique follows the acknowledged standards for a specific design. The interpretation has to be based on the data rather than my personal preferences and points of view. I employed the voices of the respondents without any biases to maintain confirmability.

Verisimilitude is the next quality level, which refers to the characteristic of appearing to be true or accurate. As a result, to achieve verisimilitude in a narrative study, I will attempt to recount the stories so that they will resonate with and seem convincing, resulting in a life experience of being in an identical situation.

Recognizing your role in the research is what reflexivity is all about. As a qualitative researcher, I am also a part of the research process, and my prior experiences, perceptions, and convictions will impact the findings. Reflexivity helps me with the interpretation of narrative data from qualitative research. Reflectivity (Goldstein, 2017) was used as a secondary but crucial data source, and it provided the subjective framework in which significant discoveries had arisen.

Ethical Considerations

Ethical consideration is made mandatory in the field of social science research. I am aware of the ethical considerations (set by KUSOED) when performing any research investigations, as they are crucial in the research process. The variety of issues sociologists investigate and the procedures they use to acquire significant and trustworthy data may raise ethical considerations (Cohen et al., 2007). I must be aware of each stage in the research process as it poses ethical concerns. According to Manandhar (2018), "ethical consideration constitutes sampling procedure, respecting participants, informed consent, respecting the privacy of every participant, use of language, and other ethical considerations" (p. 49) in any research. Before anyone engages in this study, I need permission from each respondent/participant and the school administration to inform them of the maleficence and beneficence. Before collecting any data, I also need to clarify the objectives and aim of my study. They will be free to express their opinions when responding to the research. I shall be very attentive and courteous to my study subjects. I repeated this study's participants' culture, language, social practices, and ethical issues. I tried my best to maintain confidentiality by keeping the participants' personal information and opinions private, and anonymity can be maintained. Since I will be having a conversation aged below

18, I have provided them parental consent form for students from minority communities so that they authorize child’s participation. I also provided the transcribed copy of the interview to the participants to check the accuracy of the information.

CHAPTER IV
JOURNEY OF SCIENCE LEARNING

This chapter presents a thorough exploration of the experiences of six secondary school students of Tarakeshwor Municipality in Kathmandu: Saugat, Pema, Anshrika, Karma, Bisakha, and Anjila through a narrative inquiry technique based on the interpretivist paradigm. The transition from rote memorization to conceptual learning, the creative role of instructors as mentors, and the importance of experience and contextual learning are just a few of the important themes that come to light from their stories. The chapter also describes how technology and teamwork can improve students' educational experiences. Based on socioconstructivist theory, the approach shows how peer connections, culturally relevant teaching, and individual agency affect students' learning results. These revelations provide a better comprehension of their educational experiences, derived from a thematic analysis of their accounts.

This chapter is part of the larger conversation about science education. It foregrounds current developments, including STEM integration, context-based learning, and the relationship between curriculum, student involvement, and teacher facilitation. The findings serve as a basis for Chapter 5's in-depth theoretical and practical considerations. They hope to encourage innovative and inclusive teaching methods through compelling stories that equip students to handle the scientific and technological challenges of the contemporary world.

Entry into Pema's Learning of Science

The school's principal carefully planned my appointment with Pema, who ensured that everything was ready for a productive and easy conversation. The school, which lies in the tranquil hills of Tarakeshwor Municipality, has a long history of academic success, as proven by its track record in the Top 10 SLC Board twenty years ago (2060 BS). The school has a distinction that still influences its teaching methodology.

The faculty and staff greeted me warmly at the school premises when I arrived on a sunny afternoon, reflecting the institution's friendly ethos. I was personally presented to Pema by the principal, who made sure she was comfortable and ready for our talk. This careful planning demonstrated the school's dedication to encouraging cooperative and thoughtful discussions.

Opening the Curtain

The interview was conducted in a bright administrative block of the school with a relaxed atmosphere that supported rich discussion. The school's dedication to education was demonstrated by its well-kept grounds, spotless classrooms, and updated notice board that encouraged intellectual curiosity. Her articulate and perceptive responses demonstrated admiration for the school's integrated teaching methods and emphasis on comprehensive learning. After getting into the discussion, he indicated that I could start recording the interview and begin formally with his introduction. I have narrated his interview as follows:

> *Pema exhibited confidence that drew me when I sat down to talk with her. Each episode in her book reinforced the rich patterns of occurrences that influenced her evolving perspective on science. 'Science has always fascinated me, but it hasn't always been easy,' she remarked softly. Instead of just being an acceptance, her remarks spoke to her path, which was filled with challenges, unexpected turns, and life-altering events. Pema's story began with memories of her early school years, where she was exposed to an inclusive and equitable classroom environment. 'There won't be any comparison between the students in schools. Our school is a place free from rivalry. Within the school premises, everyone is treated equally,' she said.*

Pema talked about how the first time she walked into her science class, she felt like she was entering a world full of questions waiting to be answered. She remembered her first chemistry lesson in the school laboratory: the simple but magical reaction between vinegar and baking soda. 'It felt like magic taking place before my eyes,' she said, her eyes lighting up. That moment lit up an interest that made her want to learn more about the world through science. As Pema entered middle school, she felt an affinity for chemistry, a subject that matched her love of experiential learning. *As she talked about her experiments in the school laboratory, her voice was lively: '*

> *I like working with chemicals; it feels exciting and makes learning fun. The theoretical understanding was translated into real-world experiences, such as observing bases and acids' reactions. However, her journey wasn't always filled with wonder.*

Pema described how physics presented a series of difficulties, saying that Newton's Laws of Motion initially felt like a challenging puzzle. Reading textbooks and attending lectures didn't help either, as everything seemed ambiguous and disconnected from reality. However, her teacher noticed her difficulty and used a simple ball to illustrate the laws:

My teacher showed how the ball would keep rolling unless stopped by something, and instantly it all clicked,' she said in a pleased tone, adding, 'I realized then how much I rely on visualizations to grasp vague ideas.' Chemistry, on the other hand, became her relief. For Pema, each reaction was a piece that fit precisely into the bigger image, making it similar to putting puzzles together. 'Chemistry feels hands-on and enjoyable,' she remarked, while biology, though equally vital, sometimes impairs her with facts that need memorization.

Pema praised her instructors, calling them the building blocks of her academic path. She clarified that her teachers were crucial in creating a helpful culture. Their method of guiding her through her zone of proximal development was similar to the socioconstructivist scaffolding theory proposed by Vygotsky in 1978. Pema highlighted their focus and endurance, saying, 'Our teachers never hurried. They continued to explain till we fully grasped the idea. In our school, the teachers play an important role. They are cooperative and always ready to help, no matter how long it takes. They explain concepts in multiple ways, using charts, diagrams, and real-life examples. They are patient, repeating lessons until we understand. Their approach makes the classroom a supportive space where everyone feels encouraged to participate.' Pema internalized cultural and environmental teachings through these field visits and connected them to general science principles.

She further said:

In addition to broadening my knowledge, incorporating place-based learning enhanced my understanding of how science and society are intertwined. We can learn others' mindsets on how they perceive our surroundings. The history and Geography of a certain place entail new findings for other new people like us. Religion and culture provide new insight to other visitors like me.'Another important aspect of her high school experience was teamwork. 'During a project on ecosystems, one of my friends explained the food chain *using a story about her garden,' she said, showcasing group projects that promoted peer learning.*

She remarked, saying supportively:

No matter how often I pose inquiries, they never lose patience.' In addition to giving concise explanations, her teachers fostered an inclusive setting where nobody felt excluded. 'The classroom became a place where I could unleash my interest without fear because of their encouragement. 'Working together with her peers was another essential component of her education. Pema remembered with fondness a group ecology project in which her team constructed a model of a sustainable environment. She thought, 'It felt like we were making something worthwhile together. It didn't seem like schoolwork. Science is about collaboration and mutual understanding; it is not just about solo attempts.' Field trips gave Pema's schooling a new perspective by bridging the gap between theory and practice. She described trips to locations like Lumbini and Pokhara as being melancholic, where she brought teachings about environmental protection and historical preservation to life. She claimed that these outings made science practical and reminded her that it is everywhere in nature, history, and life. Visiting new places was roaming and learning many things—there are ways to preserve ancient heritages and the environment, and collect knowledge. These educational excursions for me were life-changing,' she noted.

Pema's educational prospects were significantly impacted by technology as well. '*I frequently use my phone to look up subjects that I don't understand*,' she said. '*It is similar to having a personal tutor available to me.*' In addition to what she learned in class, online videos and tools helped to clarify difficult concepts like molecular processes. Despite having little free time, Pema prioritized using technology for educational purposes, demonstrating her commitment to becoming a science expert. Pema's progress was evident in assessments as well. '*Our teachers give us more than just grades; they give us detailed input*,' she said. '*It assists me in recognizing my areas of strength and improvement*.' She stated that she preferred formative evaluations since they helped her develop gradually. She explained, 'It is a way to keep pace and build confidence eventually.'

Pema faced difficulties along the way in her science learning. Online education presented unique challenges during the pandemic, but she rapidly adapted:

> *'Online classes can be equally productive as in-person ones if we concentrate and get involved,' she noted. She thrived even in a virtual setting, which included asking questions, practicing frequently, and utilizing digital resources. We did a virtual class because our teachers didn't let us feel like we were in an online classroom. They behaved and instructed similarly to how they did in class. I remember our school adopted the virtual class as soon as possible, as some other tech-friendly schools in Kathmandu Valley, and we were so inquisitive about how the class would run. Our school even had a morning assembly via Zoom, integrating those students who connected first because of the auto limitations,' she said, praising her teachers' adoption of online learning tools like Zoom and Google Classroom. Pema continued to learn outside of the classroom in casual settings. I tried small experiments in my kitchen and watched YouTube videos to understand concepts better. My parents' support helped me study even more, yet occasionally, their lack of technical expertise kept me from going further,' she said. Pema was enthusiastic but recognized that learning science can be demanding. 'Science can be difficult at times. She noted that students lose interest because they cannot grasp its significance. This opinion stresses how crucial it is to place science instruction in the context of students' everyday lives to keep them interested. 'Ongoing assessments help us remember better and understand concepts deeply,' she expressed an affinity for formative assessments over traditional tests.*

Pema took a moment to consider her progress:

> *I have learned to accept challenges and celebrate little victories,' she added.. The experience has influenced me as a thinker as much as a student. Her desire to pursue a medical career was an appropriate consequence of this life-changing experience. Pema said that 'learning science may be difficult, especially in areas she didn't find particularly interesting. Online learning is an avenue to investigate digital literacy and keep up my academic vigor despite early difficulties. Pema addressed the value of a supportive learning environment in her closing remarks. 'Connecting theory to the real world, interactive instruction, and encouraging teachers have been crucial,' she said. 'Science is a method of understanding life, not just a collection of formulas and theories.*

Her story was a tribute to the value of inquiry, determination, and personal connection in learning, and it went beyond a simple retelling of her experiences. Pema's story effectively captures the spirit of science education, not only as a subject but also as a way to see and interact with the outside world.

Closing the Curtain

As our talk ended, the school grounds were illuminated by the mellow glow of the late evening sun, which created a calm environment. As I considered Pema's quiet confidence and insightful remarks, her considerate answers stayed in my head. During our conversation, Pema expressed her conviction that science can be made more interesting and relevant through projects, experiments, and presentations. Her thoughts demonstrated a thorough comprehension of her schooling and a strong feeling of ownership for directing her learning.

Her compassionate yet determined presence made an impression on me as we separated after the hour-long conversation. Her clarity of thought and dedication to learning reminded me of the power and resiliency young learners bring to their studies. I was optimistic about her success and wished her well as she prepared for the SEE. Her narrative, which I took with me as I left, is evidence of the value of curiosity, hard work, and careful consideration in education.

Entry into Anshrika's Learning of Science

During my research on Baisakh 5, 2079 BS, I met Anshrika as my second research participant. She has been studying continuously in that school since kindergarten. The school had changed its regular hours to 2:00–6:00 PM for their Secondary Education Examination (SEE) students so that students can utilize time in early hours.

The school's head teacher ensured everything was ready for my meeting with Anshrika. When I arrived, I was welcomed and shown to the school library hall, a peaceful area ideal for a concentrated conversation. In addition to the longer study hours for Class 10, students were engaged in extracurricular and co-curricular activities, creating a lively school environment that day. Anshrika was punctual and focused. She expressed her gratitude to her teachers, saying they were committed to making even the most challenging subjects interesting and approachable. Her story started as follows:

> *I understand that, for me, science has constantly been a means of world exploration rather than just a subject. I am lucky to have been in a classroom*

that encouraged innovation, curiosity, and teamwork. But there have been difficulties along the way.' Anushka started the conversation by saying her classroom environment is diverse and collaborative. Teachers go above and beyond to ensure every student is seen and heard. She stated happily that there was healthy competition without comparison and that they were encouraged to develop as friends rather than as rivals. She remarked, 'This strategy in our school has fostered a fair culture and made me and my fellow students feel appreciated for our distinct achievements. The instructors diligently answer questions and ensure no one feels left behind, making them pillars of support.' As the conversation continues, she has an affinity for science, especially chemistry. Working with chemicals is exciting; it is like an experimental activity. But not every scientific field fascinates her in the same way. She found chemistry and biology's physical, experimental character fascinating, but subjects like geology and astronomy seemed far away. She found solace in study groups when things got hard, especially in chemistry. 'When balancing equations felt impossible, my classmates and I worked together, sharing ideas and supporting each other,' she recalled. Anshrika was struggling with the rigors of chemistry as exam season drew near.

She further said: '

Equation balancing was impossible, and the periodic table was a foreign language. It made me see chemical reactions as tangible and familiar recipes. Like how spices are combined in cuisine, chemical reactions can be compared to recipes. Anshrika openly discussed her difficulties, especially with the intricate chemistry terminology. 'Memorizing chemical names feels like learning a new language,' she said. I can still clearly recall one of my favorite science class experiences. Our teacher decided to depart from the textbook during a discussion on heredity. They actively discussed our physical characteristics rather than simply providing theoretical justifications. 'Observe your hands. They sparked curiosity by asking, 'Do they look like your parents' hands?' She described how, as a living example of genetic inheritance, it made sense that my grandmother's unique qualities had been passed down through the generations and manifested in me. I am proud of my ancestry as fellow students enthusiastically shared stories of their generations that had been handed down through the years.'

There was a lot of giggling and amazement in the classroom as we compared student characteristics and looked back at their family history. It was more than just a lesson; it was a time for them to connect with their topic of study. However, science has never been a straight path of explanation. I occasionally had trouble understanding topics involving molecular equations and reactions. Despite the difficulties, I discovered how to ask for assistance differently. Online resources become vital, especially YouTube. I would view films that clarified difficult concepts, reiterating what we had learned in class. In addition to bridging the gaps, this self-directed learning stimulated my zeal for learning.

Additionally, excursions had an extensive effect on my educational journey. I observed how science is incorporated with tradition and culture through trips to locations like Pokhara, Gorkha, and Lumbini. Seeing the way theoretical ideas, such as biodiversity and geological formations, are brought to life in practical contexts was interesting.

She stated: ‘

Outside the classroom, I loved exploring topics that attracted me. I wasn't much into movies or television, but YouTube became my go-to place for learning. I watched videos about animals, geography, and space, which expanded my understanding of the world. Through these moments of self-study, I realized how much I enjoyed learning at my own pace, diving into topics that grew my curiosity.' Technology became a tool for exploration, helping her see the connections between what she learned in school and the larger world. Even though she was excited about digital tools, Anshrika recognized that her friends' unequal access was a clear reminder of the socioeconomic obstacles in education. She noted that 'not everyone has the same opportunities to use technology for learning,' which emphasizes the necessity of providing equal access to educational resources. Her understanding was irreversibly changed by these journeys, which demonstrated that science is not limited to textbooks but pervades every aspect of our lives.

Another essential component of her educational path has been teamwork. Group initiatives, particularly in the laboratory, provided an opportunity to learn from her peers. She said with a strong sense of group work, ‘

Our best abilities were shown when we collaborated. Every participant contributed distinct viewpoints that enhanced our group's knowledge. I miss those times when everyone was working together, especially when the pandemic forced education to be done online. Even if Google Meet and other tools helped close the distance, there was still a noticeable lack of in-person engagement. 'The cooperative spirit she valued was disrupted by the COVID-19 outbreak, which presented new difficulties. 'Online classes felt different—less interactive, less engaging,' she said. However, her teachers' tenacity and adaptability were crucial for alleviating the difficulties of switching to online learning environments like Zoom. They put a lot of effort into modifying their teaching strategies and providing technical assistance so that students could continue learning efficiently despite the shift. Their commitment to maintaining educational continuity implies educators' critical role in assisting students in adjusting to and being resilient in tough times. Her statement, 'Our teachers treated us the same way online as they did in the classroom,' demonstrated their flexibility and dedication.

A new set of difficulties was brought forth by the epidemic, especially concerning focusing on online lessons. 'I occasionally struggled to avoid the interruptions of social media and games, just as some of my peers did. Nonetheless, our teacher's commitment was evident. They instantly adjusted, making studying interesting even in a virtual environment with interactive tests, digital notes, and screen-sharing. Even in situations that were far from ideal, their unrelenting efforts kept us inspired.' The application of continuous assessment was one of the noteworthy methods during this time. Her teachers assessed using daily assignments, presentations, and active involvement rather than just tests. This comprehensive strategy was innovative for many students, particularly those intimidated by regular tests. It provided several ways to show understanding, which enabled science in-school learning to feel more equitable and accessible.

Looking back on this trip, she saw science as a perspective through which I observe the world, not just as a subject. 'Science is not just about exams; it is about seeing the bigger picture and understanding our role in it,' she said. She has learned to be resilient and curious and to embrace obstacles due to them. Learning out how things function, enjoying the process, and overcoming *obstacles are more important than being the top student in the class or receiving the most excellent grades. She took the lessons she learned during these early years as she pursued her goal of becoming a doctor. She spoke confidently, 'My teachers' continuous support, the closeness of my peers, and the limitless possibilities for growth molded the person I am today.' To her, science is a dynamic narrative that bridges the gaps between theory and practice, curiosity and discovery and goes beyond formulae and investigations. This experience taught her that education is about never ceasing the pursuit, not knowing all the answers.*

Closing the Curtain

I was still thinking about Anshrika's narrative when I left her school. Our quiet space for the interview seemed to be a reflection of her gentle nature. Anshrika expressed her optimistic sentiments about the difficulties in learning science and noted the value of teacher assistance in overcoming these difficulties. She talked about how difficult ideas may be easily understood with the right support and direction. From Anshrika's narrative, I learned how important it is for children to have support from teachers who guide them through challenges and foster curiosity in addition to their textbooks. Her experience demonstrated educators' critical role in mentoring learners and creating a classroom atmosphere encouraging curiosity. It served as a reminder that quality science education involves more than just imparting knowledge; it also entails encouraging students' curiosity and engagement.

Entry into Karma's Science Learning

The third research participant I approached for my study was Karma. On Chaitra 14, 2079 BS, I arrived at his school in Tarakeshwor Municipality at precisely 3:31 PM. Despite its simple architecture, the school building demonstrated its constant commitment through wall paintings and flex or hoarding boards. After graciously setting up the meeting, the principal welcomed me and ensured everything was ready. Then, I was led by one of the department heads to a peaceful room on the upper floor. I had planned a contemplative conversation with Karma; that quiet place was ideal.

Opening the Curtain

Karma was well-dressed and greeted me at his school in a friendly manner. He was eager to start a conversation, and as we got started, I sensed that we both were curious. Throughout our more than hour-long chat, Karma enthusiastically discussed his experiences learning science. The main excerpts from the interview are in narrative story form below:

> *The first time I learned about science, I felt like I had entered a world of limitless possibilities, a place full of secrets waiting to be discovered. At the beginning of each lesson, our teacher would ask, 'What don't you understand today?' This straightforward question gave me the ability to direct my own learning. However, there were times when the answers remained unclear despite this encouragement. I recall having trouble understanding valency and molecular formulas. My knowledge was often doubted as the teacher steadily went over each step, line by line. However, having the flexibility to explore and constant support helped me overcome these setbacks.*

Karma's science education reached its most demanding stage by secondary school. He struggled with physics and chemistry, acknowledging that 'Physics formulae feel challenging, and valency in chemistry puzzles me sometimes. However, my teachers helped to fill up some of these gaps by using real-world examples to improve learning. This method supported an improved girth of the subject matter by allowing the participant to draw links between abstract ideas and practical experiences. Group projects and weekly quizzes are formative assessments that promote accountability and reinforce learning.

> *When theories were translated into real-world situations, science came to life for him. One clear memory is of a lab experiment that he did in which light was refracted through a slab of glass. 'It was quite fascinating to see the bending of light, something I had only heard about, take place before my eyes.' His textbook's vague concepts seem to make sense. Karma had awe-inspiring early experiences with science. 'I like studying plants and the functioning of water cycles. It all seemed so amazing. He said I developed a keen sense of scientific ideas during these early years through tactile activities like creating rudimentary machines, sketching solar system schematics, or even playing with Montessori kits at school. By encouraging this spirit of inquiry, educators played an important part. 'I think information retention would be better when teachers use strategies like project work, gamification, social science exhibitions, and arts and crafts. These captivating and participatory techniques reinforce learning. However, I could not adequately*

address some of his learning issues due to the lack of laboratory equipment, which limited the possibility for hands-on inquiry.'

Building paper windmills to learn about energy or creating clay solar system models increased his interest and gave him concrete methods to relate theory to practice. Despite his passion, he frequently could not thoroughly investigate scientific occurrences due to a lack of laboratory resources. 'I wanted to do more experiments with magnets to see how they work, even though we learned about magnetism in class,' he said. Talking about his friends, he said: '

My classmates served as my guides outside of the classroom. We solved math problems working together in the morning hour. The burden of difficulties was lessened by this friendship, which transformed study into a shared experience. However, not every student was as excited. Some of my friends thought science was monotonous and occupied classes with distractions because of unnecessary talk. Their lack of interest made concentrating difficult, particularly when exams were approaching.'

Teachers greatly influenced his childhood. Instead of limiting themselves to textbooks, his teachers used real-life examples to convey concepts. For example, one instructor explained equity and equality using a social studies story. Similarly, such efforts helped science feel less scared of us. They reminded me of my potential at difficult times rather than merely pointing out my weaknesses. Even when the subjects appeared stressful, that balance of firmness and positivity gave me the confidence to keep trying.'

Another dimension to his journey was the transition to online learning during the pandemic. 'Virtual whiteboards, Zoom, and screen sharing made courses unexpectedly interesting. Distractions were less common in online classes. Our Maths teacher made concentrating simpler by using GeoGebra and virtual boards to solve problems,' he said. He did, however, miss the company of his friends during this time, illustrating the sociocultural aspect of education. He also draws attention to how technology is changing education and the persistent problems of inequality and apathy. But there were unavoidable circumstances: technical issues and teachers' suspicions that we weren't paying attention when the recording devices weren't on. Real-world learning activities and excursions made a lasting impression on me. The real-world applications of theoretical knowledge were apparent through visits to *locations such as science centers and robotics labs. He said, 'I became more interested in science after attending the science center to learn about robotics. These experiences exposed a fundamental reality: science is something to be experienced and practiced, not just studied. Naturally, there were difficulties. One mistake might ruin a whole solution, making physics seem like a hardship. Chemistry was sometimes difficult due to its molecular structures and valency restrictions.' Nevertheless, He learnt resilience from these difficulties.*

As he reflected on his experience, he saw how much a teacher's instructional approach can influence a student's viewpoint. 'Our science instructor always begins by asking us to voice any questions. They ensure that each of us understands. Our teachers are more like pathfinders; they don't just lecture us; they create an environment where we feel comfortable asking questions and exploring ideas.' Karma clarified. He described how teachers used formative assessments to assess their students' understanding of the subject matter and modify their teaching strategies accordingly. I occasionally get assistance from my bench partner when I ask them questions about matters I'm unsure of. Sometimes, I teach them,' he said. Projects involving groups, like creating a model of a river environment, demonstrated the effectiveness of problem-solving in a group. However, he pointed out that not all her peers were as excited as she was. He noted that some classmates treat the class as a joke, underscoring the difficulties in creating a classroom climate where all students are equally interested. 'Our teachers often create groups for us to work together,' he said. 'They appoint leaders, and we discuss and try to resolve any confusion we have amongst ourselves. This cooperative method created a positive learning atmosphere in addition to assisting students in learning from one another.' The courses valued curiosity and made learning seem more possible in a group project than in an authoritative knowledge delivery. Karma clarified, 'It is not just about preparing for exams, our teachers want us to understand and enjoy the learning process.'. However, the need to finish the syllabus occasionally took priority over the depth of knowledge. He frequently craved a change in urgency, from completing chapters to encouraging more in-depth interaction with the content.

For me, science has become a way of thinking and understanding the world, not just a subject. 'It has taught me to ask questions, make connections between concepts, and appreciate the wonders of learning in addition to memorization of information. There have been successes and setbacks along my journey, which are not linear. But if there is one lesson I always remember, it is this: science is about having the guts to ask the correct questions, not knowing the answers.'

Closing the Curtain

After an hour of conversation, Karma's narrative reverberated as I left his school. I could still hear him as he responsibly and thoughtfully reflected on his educational experiences. I recalled how composed he was and how attentively he delivered every statement about science learning. I met with my supervisor that evening to talk about the insights I gained from my interviews and how to write the narrative meaningfully. Reflecting on Karma's experience, I realized how much I still don't know about the importance of reflection in a student's academic journey. Karma's experience made me think about how learning and development are continuous processes for students and me as a researcher. His viewpoint on the importance of work, direction, and analysis in learning gave me much to consider.

Entry into Saugat's Learning of Science

I found myself reflecting on my research preparations when I was driving to school. Even after reading, making plans, and talking with my supervisor about my thoughts, I still felt like something was lacking. I was welcomed and put at rest by the welcoming faces of the staff and students when I first arrived at the school. I took a minute to compose myself, concentrating on the well-known environment, the teachers' voices, and the students' flow through the corridors. Since I had already entered the school, I needed to be alert and concentrate on my work. I had already discussed my goals and expectations with the principal. I was prepared to start, and everything appeared to be in order. With new students, a building under construction, and a new playground where children participate in various sports, the school has seen changes throughout the years. In particular, the local language I could hear in the conversations around me made it feel comfortable. With these familiar elements, I found it easier to establish a rapport with the students in my study.

After assessing the situation, I decided to speak with Saugat, whose interest in his studies had caught my attention, and I felt he would be someone I could look up to for my science education research.

Opening the Curtain

On Wednesday afternoon, Chaitra 9, 2079 BS, at approximately 2:30 pm, I talked with Saugat about his experiences learning science. Due to the yearly examinations going on at school, it was found peaceful, and most students concentrated on academics. Earlier in the day, I visited Saugat and told him I wanted to know more about his science learning experiences. We decided to talk to his class as he looked receptive to the idea.

The space featured a relaxing ambiance and was well-lit by natural light, free from distractions. I wanted the conversation to feel easygoing. Saugat appeared confident and prepared to speak as we got started. I explained why I wanted to hear his story, and he nodded and smiled as he responded intently to my questions. I asked him about his earliest way of learning science, difficulties, and favorite things. I could notice Saugat thinking carefully about his experience of learning science as he spoke. He described the challenges he had faced and the incidents that had inspired his interest in the subject. I took notes and recorded the conversation on my phone to document what he said. I became increasingly interested in his story as he talked. I now better understand how students approach science in the classroom.

> *'Science is not just about memorizing facts. It is about understanding concepts, seeing patterns, and discovering how everything fits together.' he began, his voice a blend of curiosity and conviction capturing the essence of this pedagogical shift. 'I recall feeling completely lost and helpless. The written textbooks were bulky and densely packed with unusual words and ideas that looked incoherent. How am I ever going to study this?' Saugat, along with his classmates, felt fear too. Science appeared to be a mountain too high to scale. He adopted rote learning long ago. At first, learning science was difficult. He remarked, 'I used to rot a lot. Students who did not finish my teachers' written and rote assignments were subject to the mild punishment of breaking the code of conduct.' My mind was loaded with data, definitions, and*

formulas that would be deleted after an exam. I was surviving; I wasn't learning. However, when I started paying attention, something transformed. 'In essence, science, in my opinion, is just taking concepts. It would be simpler if we adopted concepts,' Saugat said, expressing his understanding of how crucial it is to understand fundamental concepts. Students collaborate with their teachers to achieve a shared objective through project-based learning opportunities provided by our primary school teachers. Students were given a deadline to complete the requirements set forth by the school. Before our term exams, we must finish one project to qualify for Continuous Assessment System (CAS) points. When he realized that science, particularly physics, developed like an account of events, it was a turning point in his life. 'While in physics, there are almost no things to understand. We need to understand concepts, but in astronomy, it is not related to concepts,' Saugat notes, depicting the multifaceted nature of several disciplines in science. Every idea builds upon the one before, serving as a stepping stone. Suddenly, the subject that had formerly scared me started to show its magnificence. He began to view science as an adventure, a process of learning, inquiry, and reasoning. I remember watching the '3 Idiots' movie, which was entertaining, plus science fiction. I still love even now,' he shares, illustrating how culture can influence students' contentment with science subjects.

An important factor in this change was his teachers. They brought science to life rather than merely lecturing from manuals. The day his physics teacher clarified the confusion between gravity and gravitation is something he remembers. The teacher clarified that gravitation is the fluctuating force of attraction between any two objects in the cosmos, whereas gravity is the constant pull we experience on Earth, 9.8 m/s^2. That little explanation suddenly made such a big ideological. 'Our teachers focus on practical examples connected to real life,' he exclaimed. For instance, in chemistry, we studied the usage of gases in industry, and in physics or astronomy, we learned how gravity differs on different planets. This made science an engaging, collaborative process where ideas like planetary gravity and industrial gas use were more meaningful and clear.'

His teachers were distinctive for being approachable; they welcomed questions, regardless of complexity, which created a sense of freedom in the *classroom and made students feel curious rather than nervous. Peer collaboration also became a pillar of his learning process; science is often considered an individual effort, but he found it collaborative. He recalled working on a chemistry project about ionization energy. 'At first, none of us understood it, but a friend clarified it by using an analogy. It is like climbing stairs—the higher you go, the harder it gets to pull someone up. That moment of mutual understanding built the idea for all of us.'*

The experiential learning opportunities provided by his school were among the most memorable parts of studying science. Field trips brought conceptual concepts in ways that no classroom could. His class visited a biogas plant and The Living Mountain Lab (formerly known as the ICIMOD Knowledge Park at Godavari), where they saw how organic waste changed into fuel. Another trip to a botanical garden, Godavari, introduced us to biodiversity as we saw rare plants and animals. They related ideas from their textbooks to the authentic world around them. He recalled visiting a botanical garden and the Living Mountain Lab both at Godavari, where they explored floral and faunal biodiversity and renewable energy processes. 'We saw how organic waste is turned into fuel, how irrigation is made possible by varied techniques for saplings to grow, and how plants grow in different conditions. It brought the concepts we were learning about ecosystems, biodiversity, and renewable energy demonstrating sustainable technologies. As forests were conserved within certain land, it allows us to provide the best use of alternative fuel to avoid an energy crisis. I mostly love cultivating organic fruits. We know how organic waste is converted to fuel.'

Among all the fields of science, physics fascinated him the most. Unlike chemistry and biology, physics felt like finding a riddle, which typically required retention. His journey wasn't easy, though. A new schooling method was brought about by the COVID-19 pandemic: online courses. The thought of learning from home seemed pleasing at first. The absence of face-to-face interactions with instructors and peers created a gap. He missed the spontaneous conversations, collaborative projects, and practical experiments that added interest to science education. The COVID-19 pandemic thrust Saugat into the world of online learning. 'I got a mobile for online studies during the lockdown,' he shared. 'Technology is essential now—it helps us *search for information, but it can also distract. We may be engaged to some other unnecessary tasks, which leads to addiction. I mostly prefer relaxing music and educational movies to help him concentrate when working on numerical/math issues,' reiterated by the participant's dual perception of technology as an enabler and distracting factor. Technology facilitates networked learning and provides access to a wealth of educational resources, but it also has drawbacks, such as the potential for disengagement, as Saugat pointed out. Because of this dual character, technology must be carefully included in teaching pedagogy.*

One of the most potent themes in Saugat's story was the relevance of the role of peers. He claimed that 'group work is the best way to learn. Not everyone will grasp everything the first time. We improve mutual understanding when we exchange thoughts. One person's effort is responsible for all of the achievements made by everyone. Even if we had to meet at a friend's house to complete our assignments, we used to complete them well in advance, provided we had the time frame.

One vivid memory popped up during the conversation. He stated, 'My friends and I had trouble understanding the idea of ionization energy during a chemistry project. A friend compared it to ascending stairs, saying that it gets more difficult to pull someone up the higher you go. I found the analogy to be realistic.'

Amid the triumphs, Saugat highlighted challenges. 'Fear is a big barrier. Many students think science is too hard, so they avoid it. I remember we were feared once when we were sent to the Quiz Competition on behalf of the school, and we could not get the expected result. However, after that day, we confidently went to such a competition and clinched the position, ' he confessed. This anxiety, which originates from strict, test-focused systems, inhibits interest and participation. In his reflections, he also contrasted formative and summative evaluation techniques. 'Formative assessments can feel repetitive, but summative ones let us show what we have learned,' he said. 'In retrospect, I can see how much I have developed as a thinker and a science student. Learning isn't only about passing tests. It is about asking questions, seeking answers, and seeing patterns in disorder.' For him, science is now a lens through which he sees the world. He has learned perseverance, curiosity, *and the delight of discovery from science. He looks forward to spending the rest of his life on this quest.*

Closing the Curtain

After I spoke with Saugat, his story remained in my mind for the next few days. His voice and the thoughtful looks he carried as he reflected on his journey are still audible to me. His analogy of understanding science as piecing together a puzzle strikes a deep resonance; it is both challenging and gratifying, revealing discoveries one piece at a time.

I start to learn about the honor and accountability of being a listener and a receiver of stories. Even though my thoughts are disorganized, I have the assurance that connections and patterns will eventually appear. I let myself be amazed at this early point and recognize the richness of the stories I am compiling. My supervisor and I met that night to discuss the interviews and start constructing the story. Reflecting on my conversation with Saugat, I see how much I still don't know about the complex relationships between teaching, learning, and curiosity. As I am exhausted, I am ready to sleep.

Entry into Bisakha's Learning of Science

One of my research participants was Bisakha, a student born in Nuwakot and brought up in the metropolis of Kathmandu. After making plans with the principal three days before my visit, I went to her school in Tarakeshwor Municipality in the afternoon. I had known the school so closely for more than ten years. The school was situated between rural and urban life and projected a well-rounded learning atmosphere. After a cordial welcome from the school family, a faculty member showed me to a serene library space where windows let in plenty of natural light.

Meeting Bisakha was a pleasure as she shared her real-life experiences of learning science. From the start, allowing her experiences to take center stage, I let her narrative guide our conversation, which went like this. Bisakha was fortunate to be in a science study class with mixed emotions, including a blend of barriers and eureka moments. For her, science was a quest for insight into the world rather than just a study of textbooks and classroom discussions. Her teachers greatly influenced this experience and fostered an atmosphere where inquiry was encouraged, comments were welcomed, and nobody felt excluded. They transformed the classroom into a place where everyone could learn from one another. She remarked, *The school learning experience is quite good. The teachers are friendly and cooperative. They teach in a way that doesn't create hesitation in asking questions*.' Bisakha's participation in the class seems to be influenced by the teachers' sincerity. In her description of the lack of dominance and discrimination, she noted that 'they treat every student equally.'

Bisakha remembered how thrilling it was at first with biology and the Earth's history chapters. Discovering the origins of life was like finding the mysteries of time itself. She said:

I was drawn to science for reasons I couldn't ignore. Social studies has always been my preferred subject, even if I wouldn't say it's my favorite. 'I like the various social chapters,' she added passionately when asked for more details. 'I like the various kinds of social chapters. I relate to them in some way. Science, however, wasn't far behind. I prefer biology and Earth history in science,' she said contemplatively.

There were ambiguities in her scientific journey. Bisakha enjoyed biology, but she longed for more real-world, hands-on experiences.

'We don't spend much time in our lab, even though the teachers know it. It appeared that the lack of lab sessions represented a lost chance for more in-depth interaction. We might comprehend better and have a more visual and hands-on experience if we could visit a maker space in the school.'

She thought. Middle school was a time of greater involvement when practical experiences blended with formal instruction. She remembered clearly a school field trip to a botanical garden in Godavari.

It brought the textbook diagrams to life as I walked through the greenery and noticed photosynthesis, which is described as sunlight passing through leaves,' she recalled. These outings were essential components of her education, not just recreational activities. 'I drew sketches in my notebook, labeling them with newfound vocabulary.

She added during the return bus journey. It wasn't homework but an artifact of her connection to nature.

She discovered that her learning method wasn't compatible with learning facts and formulas by heart. But a project-based test in her high school of education was a game-changer.

The task involved creating a sustainable water filtering system and integrating biology, physics, and chemistry. For the first time, the curriculum felt cohesive instead of fragmented for her. With hours of research and practical experimentation, Bisakha flourished. With pride in her voice, she continued, 'Designing a sustainable water filtration system was one such lab work that marked a change within me. Everything—biology, chemistry, physics—was coming together.' The importance of multidisciplinary approaches in science education is made apparent by this transition from fragmented to integrated learning. The ease with which her teachers connected several subjects was noteworthy. For example, 'concepts such as homogeneous and heterogeneous mixtures were not merely scientific rhetoric; rather, they served as links to more general concepts in other fields.' This multidisciplinary approach is what helped her remember what was being taught.

One particularly memorable experience was a field trip to a botanical garden. The smell of dirt, the feel of the leaves, and the green colors made it seem like biology was a pleasing science discipline. But there were also voids. Although there was a science lab at our school, it was rarely used, sad to say. 'I have always longed for more practical trials that could turn theoretical concepts into real knowledge.' She further reiterated,

'During the epidemic, I remember having trouble understanding the concepts of force and motion in online classes. Lessons frequently felt lacking in the absence of tangible examples or demonstrations. Despite our teacher's best efforts, which included applying analogies and creating diagrams on Google Meet, I had to watch internet dramas and films to make sense of anything.'

Group projects turned into a vital component of her education. Working with peers involved more than just sharing the job; it also involved bringing different viewpoints together. Bisakha excelled in group projects in the classroom. Group projects in her science class let abstract concepts come to life. She further explained:

'How the eclipse came to be when her teacher showed us the positions of the sun, moon, and earth, where light glinted, and it was noticed that some areas of the moon and earth did not get light, completely or partially. Ever since I connected it to my life, I even researched Eclipse's scientific and cultural explorations." For one project, he remembers that they used colorful charts and pictures to convey scientific concepts on the classroom walls graphically.

'I became aware of the value of teamwork during these times of shared innovation and discussion. Each person contributed something special, and by working together, we could learn things at a level that seemed unreachable on our own.'

She further said:

There were difficulties in school. She experienced self-doubt occasionally, particularly when learning online. Bisakha's story revolved around her relationships with her teachers and peers. 'Even though some of my connections were difficult. Some of my friends are toxic because I was bullied, and I was cautious about putting too much faith in people. Others gave her strength. I don't think any of my friends are permanent,' she said. She used to be reluctant to raise questions, fearing that they would be dismissed as unimportant or reveal a lack of knowledge. Her growth as a student was characterized by overcoming that anxiety and figuring out how to interact with the subject matter, whether through additional practice or different tools.

It is impossible to undervalue the importance of our instructors in this journey. They fostered curiosity and self-assurance in addition to being educators. Her voice grew softer as she remarked, 'They inspire us to perform better when we perform well. They advise improvement and patience when we don't.' In her narrative, her teachers stood out as faithful mentors. She said,

'They wanted to understand us, not just teach us. I remember one of my teachers using historical social systems to illustrate the idea of mixtures; it was a surprising and interesting connection. But I also observed that a few teachers struggled to convey their knowledge adequately.'

It helped her recognize that teaching is about communicating with children, understanding their challenges, and helping them.

As our discussion ended, Bisakha shared her aspirations for the school system. 'More memory tests and quizzes with multiple choice questions should be administered in schools; they can help us learn new things and grow,' she remarked. She also had pedagogical objectives in mind. She claimed that rather than focusing solely on raising grades, instructors should also focus on enhancing students' skills and productivity. Her thoughts highlighted the necessity for educational systems to place more emphasis on skill development than memorization.

'I see myself a lot different from my older version,' Bisakha said, reflecting on her self-development. She said, 'I used to have problems understanding, but as I mature, I can now properly understand subjects.' Her final remarks, given with assurance and humility, perfectly captured her philosophy of education. She concluded that 'Grade isn't everything. It is about how education shapes you. There may be triumphs and losses in every step, but in the case of a failure, we should move on to the next one with confidence.' Reflecting on these conversations, I see that her narrative is about how to learn. It is about learning to be resilient in the face of adversity, enjoying inquiry, and appreciating the importance of teamwork. Creating learning environments where students feel heard, seen, and inspired to reach their full potential is crucial.

Closing the Curtain

I appreciate Bisakha taking the time to talk about her experiences, mainly because she was open about her struggles. As our interview concluded, I saw how her attitude changed; her eyes brightened when she talked about her strengths but darkened when she spoke of her worries. Her voice, which was a mixed emotion of bravery and uncertainty, conveyed the struggles she experiences with social anxiety and how it affects her confidence. I thanked her for being so honest and admired her for having the guts to share her experience. I was reminded of the silent struggles many students encounter while coping with, especially in subjects like physics. As I did with everyone I talked to, I ensured Bisakha was okay with using their stories in my dissertation. She graciously offered to help more if necessary and granted her permission.

Entry into Anjila's Learning of Science

On a cold winter afternoon, I met Anjila at her school, which she called her *'second home'.* Anjila, whom her mother raised, had become a committed and inquisitive student. I visited her school, which is well-known for its robust extracurricular activities, on March 23, 2022, and the staff made me comfortable. At 3:48 pm, the school's academic coordinator led me to a research room where we began talking. They had already been notified about my visit to the school.

Opening the Curtain

Anjila has studied at this school since her kindergarten days. She is one of the studious girls admired by her teachers and friends. Her home was near the school. She mostly took part in inter-school competitions on behalf of the school. During our conversation, Anjila talked about her experiences studying science and how it influenced her schooling. Her friendly environment at the school helped me to frame her viewpoint better. The school felt more like a community to me. I intend to investigate how Anjila's upbringing and experiences shape her approach to science education by following her life story. Her narrative provides insightful information about the challenges and driving forces influencing a student's academic journey.

> *As Anjila reflected on her journey throughout school, she was reminded of the blend of emotions of curiosity, struggle, and triumph that define the experience of learning science. Anjila remarked, 'I always found science fascinating but difficult at times. There were colorful illustrations in her science books in her early school years, which her teachers turned into storytelling sessions. Early class was a period of wonder and foundational learning for me. With a hint of melancholy in her voice, she recounted, 'The stories about animals, planets, and the water cycle made me curious about how the world worked.'*

She had unexpected challenges in high school, especially in physics and chemistry classes. Her stories also bring out the ability to transform immersive and collaborative learning environments. *'High school provided me with an opportunity for advanced exploration, allowing the application of basic abilities acquired in middle school to more detailed projects and research initiatives.'* She stated, reminiscing about her high school experiences. She acknowledged that at first, *'chemical equations and physics formulae felt like puzzles I couldn't understand.*' Her difficulties were lowered, nevertheless, by her instructors' engaging methods. She added, 'Our science teacher, *good at storytelling in our school, presented Newton's rules as a story of inquiry and learning*. To make complex principles easier to understand, He prompted us to envision giving examples of Newton sitting beneath the tree, just as a layman with curiosity like ours.

Her teachers have been instrumental in cultivating an environment that promotes understanding and questioning. They use various instructional techniques to make concepts come to life in their imaginations, *such as engaging group projects and illustrations. Their commitment goes beyond simple teaching; they proactively allow us to investigate science from different angles*.' He recalls her amazement at connecting theoretical concepts with practical applications, making physics and chemistry seem approachable and applicable. Among the things she remembers most from class was the enthusiasm she and her classmates felt during group discussions. Science is never an isolated effort, even though it can occasionally be complex. She regularly found that she was learning as much from her peers, showing the importance of collaboration in the learning process.

Talking about the digital world, she said:

I had a never-ending hunger to learn about the digital world outside the classroom. I had access to a vast amount of information through my cell phone. These activities supported what I had learned in class, whether watching documentaries about biology and astronomy or getting into the scientific ideas delicately portrayed in plays. They enabled me to stop being a passive student and actively participate in my studies. I was especially drawn to documentaries about rare species and climate change because they broadened my perspective and made science more relatable.

She frequently longed for the hands-on experience of doing experiments, managing test tubes for chemical reactions to happen, and learning subjects firsthand as her teachers aimed to bridge the gap between theory and practice through classroom discussions. The COVID pandemic makes this situation more difficult because online education no longer includes hands-on examples. However, she also found it challenging especially on online classes to cope with the technology-driven learning. She acknowledged that physical interruptions and power cuts made it hard to concntrate.

Anjila studied in informal and digital settings, improving her understanding of science. She used her smartphone as a portal to online resources to research subjects her teachers had introduced her to in class. *I frequently streamed videos on biology and astronomy. It brought the subjects to vitality*,' she said.

My teachers' comments and support were helpful in keeping her motivated. They encouraged a growth mentality by highlighting areas that required improvement and praising achievements.

Anjila often discussed her hardships, particularly confidently during tests and self-study, when she shared her experiences. 'Everything made sense at school, but it felt like the pieces didn't fit together at home,' she said. Her experience has been captured by the dualities of learning, which oscillate between success and hardship. Teachers were essential in overcoming these gaps. She remarked*, 'They never gave up* *on us.'* Anjila gave her teachers a lot of credit for her development since they developed a balance between encouragement and discipline. She argued that they accepted criticism when needed and pushed us to step beyond our comfort zones. While helping students overcome challenges, her teachers promoted independence. Their feedback and critiques often served as the cornerstone for my academic growth, enabling me to pursue excellence in learning.

> *Both formative and summative assessments facilitated her academic progress. Through its continual input and final assessments, she recognized her positive attributes and fixed her weaknesses, proving a thorough growth. As these assessments were beneficial, she could view learning as an evolving process. 'In physics, we once worked in groups to construct simple circuits. It was initially confusing, but she explained that talking with my classmates helped me see how everything connected. Practical applications aided her comprehension. 'During a lesson on chemical reactions, our teacher asked us to observe rusting on metal objects at home and explain the process,' she told me. These links improved her ability to have critical thinking skills.*

She acknowledges that science has been more than an academic discipline when she reflects on her experiences; it has been a prism that has taught her to observe, evaluate, assess, and engage with the world. She addressed emotional aspects of learning, considering how her achievements and failures support her confidence and improve her self-control. The relationship between emotional and learning development is apparent in how these experiences influenced her resilience and personal agency in her educational journey. She embodied the comprehensive viewpoint fundamental to education when she said, *'It is about how learning shapes you as a person. The grade is not all that matters.'*

Closing the Curtain

I appreciate Anjila sharing her knowledge and opinions about learning science. She wanted a more participatory and experiential learning environment that included field excursions, project work, and real-world scenarios. Her openness and ability to articulate her objectives were much appreciated. As the school day ended, so did our conversation, and I continued to think about what she had said while driving home. Her earnest and thoughtful comments stood out to me since she showed her dedication to education and the change she wants to see in the field. She graciously permitted me to incorporate her story in my dissertation and offered to help further, if needed.

Myself in the Story

This research journey has often led me to reflection on its transformative nature. Even when complying with all ethical standards, documenting my participants' experiences has sometimes proven challenging. Since they are open and willing to share their stories, they inspire me to illustrate their realities accurately. However, I am also responsible for meeting in person as a researcher.

After hearing their stories, I can feel Pema's passion for chemistry, Karma's persistence in physics, Bisakha's courage in adversity, and Anjila's path to self-confidence. These data, as stories, are full of questions, struggle, and commitment. I frequently question whether I can fully respect their trust and consider their experiences. I can see my multiple roles as I proceed through this process. I am simultaneously a participant who relates to their emotions and an observer who documents their narrative. This balance compels me to reflect on this journey's impact on me and how I can most effectively convey my experiences.

It has been an experience of humility. I now understand that the study involves more than just receiving data. Another objective is to appreciate and relate to the human element of education. The participants' experiences are covered in this chapter, along with my reactions to their stories, which inspire me to learn science in depth.

Key Message of the Chapter

This chapter presents the stories of six students: Saugat, Pema, Anshrika, Karma, Bisakha, and Anjila. Each reflects experiences and varied perspectives in science learning. I looked into my research on how science learning is authentic and meaningful through curiosity, teamwork, and hands-on doing. Each story brings the change from didactic to constructivist approaches, from Saugat’s early difficulties with rote memorization to his inevitable passion for physics, Pema’s delight in practical chemical experiments, and Anshrika’s wonder to know about genetics. While Bisakha prioritizes research expeditions and multidisciplinary initiatives in bringing science to life, Karma restates the significance of inquiry and experiential learning. Anjila’s journey reveals the importance of digital literacy and teacher-led interactions in understanding physics and chemistry classes.

I've also extensively mentioned how teachers maintain welcoming and congenial learning environments with innovative teaching strategies. In addition, I have focused on the importance of hands-on doing, field visits, and real-life applications in stimulating students' passion for science. Peer interactions and cooperative projects have also added importance. It has been studied how technology can be both a boon and a curse against injustice and distractions. Additionally, I have noted how science education extends its influence outside the four walls of classroom by encouraging critical thinking, emotional growth, and resilience through its narratives. This chapter lays the groundwork for Chapter 5, which provides a detailed analysis of these experiences. These stories are reviewed in more detail in the upcoming chapter 5, which also offers a theoretical interpretation and analysis of each student's narratives to draw insightful conclusions for reforming education.

CHAPTER V
SCIENCE LEARNING RE-IMAGINED TOWARDS TRANSFORMATION

This chapter presents the educational experiences of secondary students' science learning, analyzed through narrative inquiry. This chapter discusses students and the learning of science, specifically what responsibility students give to things into which they learn by shaping their understandings of the science tenets, how those ideas connect to the real world, and how they matter in their lives. As per the narrative inquiry perspective, this study demonstrates how students' experiences with the same lecture varied based on their origins, prior knowledge, and how their sociocultural conceptions influenced their experiences. Examples of student collaboration to produce information are discussed in this study. It emphasizes how students work together through inquiry, research, and group discussions. These components encourage students' ongoing interest in science outside of the classroom. Students will therefore be able to tolerate and be internally motivated even when faced with challenging science subjects. Students' interest and involvement are the cornerstones of their lifetime science learning journey, as demonstrated by the interpretivist and critical paradigms and the socio-constructivist theory. This chapter captures their reflections on curiosity, collaboration, and mentorship. Through vignettes, metaphors, and personal reflections, the narratives bring to life the seamless blending of observation, experimentation, collaboration, and engagement that defines their educational journeys. The study spotlights students' natural curiosity as a primary motivator for their academic path, illustrating how their innate fascination with science encourages ongoing participation. The chapter also demonstrates how students co-construct knowledge through mutual assistance and joint discussions, capturing participatory dynamics in science learning. Practical simulation, which connects theory and practice, is a key component of science education for students. This study shows how students can directly observe daily life to evaluate assumptions, hypotheses, solve issues, and gain knowledge of science learning.

Curiosity in Science Learning

Students' stories explain how imagination can serve as a motivating drive for them to research the unanswered mystical problems in science. This study examines how students are drawn to explore the frontiers of scientific discovery by curiosity, much like explorers mapping out new terrain. In finding how students engage with science learning, one of the key themes that emerged from the narrative data is the 'Curiosity in Science Learning,' a concept embodying how curiosity functions as a fundamental drive in the learning process. Both of their experiences demonstrate how curiosity stimulates fascination and turns science into a realm of limitless possibilities. For example, Anshrika is enthralled with genetics when reading the Heredity Chapter, and so is Pema, who has remarkable chemical interactions. These stories depict science learning as a joint effort through independent research, group discussions, and practical applications using narrative inquiry. Responses from participants indicate that experiential learning, contextualization, and a supportive educational environment are necessary to enhance curiosity.

Pema was initially drawn to the demonstration of a chemical reaction between vinegar and baking soda. She referred to this encounter as '*magic*,' highlighting how it changed her understanding of science from a set of rote facts to an area of exploration. For her, this bubbling reaction was not merely a chemical process but an astonishing display, revealing hidden properties. She interpreted the reaction as a metaphor, which involves an exchange of ideas that results in something novel and unexpected for the learning. Reflecting on this chemical reaction, I remember the same feeling in my early education. In my school physics lab, I performed experiments on electric circuits. When the small bulb gleamed, it felt like I was holding a miniature cosmos. I realized that science is about observing, modifying, and replicating things. Like me, Pema's story strengthens Johnson's (2017) claim that scientific research flourishes in settings that promote students' innate curiosity.

The occurrence marked an important shift in Pema's learning, consistent with the constructivist theories of Vygotsky (1978), which hold that knowledge originates from related experiences. Nonetheless, Anshrika's experience shows the importance of contextualized learning. She discovered real-life and practical uses after reading the Heredity Chapter in her biology class. She did this by comparing her classmates' characteristics to their parents. This made difficult subjects more relatable and approachable. I, too, remembered during my early teens, we discussed genetics in class. I also understood how the genetics theory applied to real-life applications since I grew up in a large family with varied genetic traits. I compared their inheritances and variations with one member to the next of my family which perceived about the relevance of chapter. As like Anshrika, who links her friends' characteristics to their parents, I also link it to my own family. This is a practical example of Mendelian patterns which we have to study in our science course book. Socioconstructivist theory was applied, where meaningful learning occurs as individuals actively engage in community.

Anshrika excelled at incorporating science concepts into her own life, while real-world examples took aback Pema. This contrast illustrates how different teaching philosophies may align with different types of students and call for teachers to modify their approaches to cater to every student. Seeing these different perspectives as a researcher requires knowing how various contexts and experiences affect learning.

Karma's narrative serves as an example of awakening that inquiry-driven education, when fueled by curiosity, can provide the best for the students in science classrooms. His teacher's approach was a philosophical directive to start a quest for understanding. Karma recalled the teacher's catchphrase: *'What questions do you have? Let's work this out together, please!'* Instead of just teaching, this question reframed the classroom as a space for collaborative inquiry. This inquiry-based method, a defining feature of constructivist education, fostered a community where asking questions was seen as the first step toward a deeper understanding, knowledge was seen as a collaborative rather than a solitary pursuit, and each student's voice was valued. This method of instruction is evident that the value of peer interaction in the construction of knowledge is in line with socioconstructivist concepts. However, Karma also pointed out several difficulties, especially when discussing chemical structures and other challenging chapters in science. He struggled to figure out the intangible character of ideas he couldn't readily recognize. Acharya (2016) investigates the direct and indirect effects of sociocultural activities on science classes in primary schools.

Additionally, the study analyzed instructional methods that foster students' growth in critical thinking skills. Sociocultural and constructivist theories form its foundation. Acharya emphasizes that teaching methods that are hands-on, minds-on, and hearts-on can aid in the development of critical thinking abilities of students in elementary school.

As an example of this shifting, Karma thought of a situation in which he was invited to ask questions on atom interactions in a lecture on chemical bonding, but he struggled to visualize these micro-processings. *'It was like trying to see an object that wasn't there,*' he said, acknowledging that it was distressing to struggle with thoughts that seemed wonderful. Here, the absence of imagery left Karma's curiosity unsatisfied, showing the drawbacks of inquiry-based instruction. This observation is supported by Johnson (2017), who claims that classroom discourse influences students' learning desires and presses teachers to strike a balance between encouraging curiosity and offering them scaffolding, particularly when discussing more difficult scientific subjects.

In addition to discussing how practical instances made science less difficult, Saugat claimed that *'science became approachable when presented through examples from everyday life, which offered context and usefulness'.* Educational research emphasizes the need to relate abstract ideas to students' real-world experiences. Anjila's story demonstrates how learning is impacted by individual curiosity and self-assurance. She admitted that science was difficult, but linguistic subjects like English and Nepali felt simple. This supports Sheldrake's (2016) claim that various factors affect scientists' self-confidence, including perceived importance and recognition. Because of the link between confidence, engagement, and academic success, Anjila's anecdotes draw attention to creating a positive learning environment.

The participants' narratives are consistent with contemporary theories and practices in education. For example, the benefits of experiential learning have been discussed extensively in the literature, with writers urging that students' knowledge is enhanced by active participation in the learning process (Kolb, 2014). Pema, Anshrika, and Saugat's experiences show how contextualization, adaptation, and hands-on learning encourage interest in and participation in science. Furthermore, research indicates that inquiry-based approaches foster deeper learning and critical thinking abilities, highlighting the significance of inquiry-driven education as demonstrated by Karma and Anjila's experiences (National Research Council, 2012). Social relationships build knowledge together, and the examples here illustrate how joint research creates an atmosphere that stimulates inquiry and curiosity.

Socioconstructivist theory highlights the significance of social interactions and context in learning. This theme fits very nicely with the interpretivist paradigm, which is centered on interpreting students' subjective experiences and enables a thorough investigation of how curiosity affects learning outcomes. The stories of Pema, Anshrika, Karma, Saugat, and Anjila indicate how students' science learning is significantly influenced by their keen interest. Their stories show the significance of contextualizing experiential learning and promoting teaching methods that interest students and motivate participation. Scholars and educators must be aware of the various ways that curiosity may be nourished since it can impact how education is delivered. By doing this, we may establish a learning environment where students are encouraged to be inquisitive and to take control of their education.

Learning Beyond the Four Walls of Classroom

The concept of 'Learning Beyond Four Walls of the Classroom' becomes essential when appraising students' experiences of learning science in Grade 10. The opinions presented by the participants, namely Anshrika, Karma, and Saugat, relate that science learning has to go beyond conventional teaching methods. This shows the socioconstructivist approach, as there is active engagement in the learning process. One can use technology and real-life experiences to understand the realm of science. This approach is designed to help students grow, excel, and succeed, ultimately aiding independence and curiosity while connecting academic knowledge to practical applications.

The passion for science is not only powered by formal education, as said by Anshrika's experiences. She said retaining scientific formulas did not catch her attention as much as reading historical manuscripts and biographies. This realization draws attention to a closer look: Anshrika finds learning to be a multifaceted process driven by her multitude of interests rather than one that is only focused on academic coursebooks. Her zeal for literature, particularly biographies, manuscripts, and historical accounts such as the varied treaties, rites, rituals, civilization, and the Renaissance, aids her in connecting academic subject matter to students' everyday lives. *She remembers, 'We find easy to relate with our textbook after we had an excursion to our national projects of pride, antique Durbar Squares, Narayanhiti Palace Museum and other historical cum cultural sites taken by the school.'* Learning must occur inside and outside the classroom, where students can pursue their interests independently. Barkley and Major's (2020) argument that students must invest cognitive resources in co-constructing their learning environments is highly supported by Anshrika's story. She is shaped by her education, persuading that curiosity fulfills a quest for knowledge that formal education could overlook. Using online resources as a teaching tool is another way that Anshrika shows her effort to learn, besides the classroom. *'I learned about the natural world in ways that textbooks couldn't,'* she says, referring to YouTube and other social media sites. With digital platforms as essential learning resources, this assertion reflects an increasing tendency in contemporary education. Multimedia is a beneficial information and communication technology (ICT) tool for teaching and learning, as stated by Puranik (2020). Additionally, she suggests using various digital media to improve student retention and engagement. The importance of modifying teaching methods to incorporate technology and create a more vibrant learning environment is manifested by Anshrika's dependence on these ICT tools.

In contrast to Anshrika's account, Karma describes how hands-on experiments in the school lab transform vague theoretical ideas of science into tangible understanding. *'Previously, it was just words in the book, but we could observe it proceeding in the lab,'* he claims. This experiential learning method focuses on how practical application solidifies theoretical knowledge. Karma's story illustrates the positive effect that lab work may have on students' science learning. Karma's observations are supported by experiential learning theories, which hold that learning occurs most effectively when knowledge is applied in real-world situations (Fenwick, 2001). His experience discloses the value of ongoing access to laboratory activities, an idea shared by other participants who felt disadvantaged by lost opportunities for experiential learning. Anshrika enjoys reading books and surfing the internet, while Karma finds purpose in conducting scientific research.

The disparity makes clear the need to offer various engagement opportunities that accommodate various learning styles and students' wide range of learning attitudes. Saugat's story highlights the value of experiential learning through travel and outings, enhancing Anshrika and Karma's stories. Following an expedition, he notes that *'there are some things in the course book that we find hard to understand, but they can be made easier.'* He learned a lot from his visit to a botanical garden, which also presented the practical applications of scientific ideas on our surroundings, like biodiversity and climate change. These outings help to bridge the gap between theory and practice, supporting the socio-constructivist approach that promotes direct involvement with the environment (Allison & Seaman, 2017).

Including excursion opportunities in the curriculum is part of a larger educational approach that prioritizes experiential learning as an essential part of students' comprehensive education. Karma thrives on hands-on learning. Anshrika's story focuses on technology and independent study, Saugat highlights the value of learning outside of the classroom, and Karma encourages practical laboratory work. This multimodal strategy supports the idea that science education should be an integrated approach that uses a range of strategies to connect with students. As a researcher, one must be empathetic and receptive to the experiences and perspectives of participants as we become involved with their stories. One can learn more about how students generate information by closely examining their stories and analogies.

Synthesizing their narratives while recognizing the connection between their experiences and the body of literature that is already in existence is vital. Using multimedia by Anshrika supports Puranik's (2020) assertion that various technical sources can improve learning environments. Karma's enthusiasm for laboratory work aligns with Fenwick's (2001) focus on experiential learning, while Saugat's opinions on field trips concur with Allison and Seaman's (2017) observations about experiential learning. The difficulties of teaching science are better understood by relating the participants' viewpoints to the literature.

Each participant's narratives reflect how the interpretivism framework and socioconstructivist theory support learning outside of the classroom. By arguing that knowledge is co-constructed through interaction with people and the environment, socio-constructivism points to the significance of social interactions and contextual elements in learning (Vygotsky, 1978). The stories of Anshrika, Karma, and Saugat show how dialogic forums, teamwork, and laboratory activities may all help students to understand science. The interpretivism paradigm supports subjective experiences as reality is contextualized and socially constructed. The rich, complex character of secondary-level students who are more enthusiastic about science learning experiences is captured in this study. Each story marks a unique instructional design that appreciates and encourages individual experiences while presenting how students interact with science.

As the idea of 'Learning Beyond the Four Walls of the Classroom' suggests, independent study and experience impact how learners think of science. Examples can be set like Anshrika's inquiry of language subjects and information communication technology, Karma's desire for a practical laboratory, and Saugat's field trip excursions, collectively, are some of the ways students can learn science with fun. Creating vibrant learning settings is crucial in promoting meaningful and more authentic engagement with science, as this narrative inquiry envisages authentic and meaningful learning of science as we hear students' experiences. For students to be interested in and excited about science, researchers and teachers like us must understand the importance of varied learning opportunities inside and outside traditional and even modern classroom settings. Each participant's voice truly captures their distinct findings.

Power of Collaboration

Collaboration is the vital ingredient when it comes to science learning. It acknowledges the importance of social interaction in instilling psychological, cognitive, and social development. Students' cooperation between colleagues, peers, and teachers signifies the interconnectedness of learning in a nurturing and congenial environment. It also aims to help them build critical interpersonal skills and emotional resilience. Teamwork in school-like institutions develops a sense of identity and belonging, essential for learning and facilitating meaning-making as we go through participants’ stories. This part explains how collaborative settings increase students' educational status, delving into socio-constructivist learning theories. She explained:

> *Creating a sustainable ecosystem model or whatever the project work was delivered by school teachers of different subjects to be done either in the classroom or at home with assistance from friends and families; it provided a platform for collaborative innovation and support. Working in groups allows us to pass along ideas to one another, which helps me feel more capable of solving scientific problems. It has influenced my communication skills, too, said Pema.*

Finding the right solution to any problem is only one aspect; arranging things together and coming to a conclusion is another. As a result, science is simplified when working together. This signifies the importance of teamwork in enhancing both active engagement and thorough understanding of research in the particular field. Reflecting on my personal experience, I remember how my biology class on ecosystems, chemistry class on elements, and physics class on simple machines shaped my conception of interconnectedness. These are just a few examples. I find it more than studying plants and animals (flora and fauna), chemical equations, tools, and appliances; it was a perfect analogical representation for community and interconnectedness.

Research by Ballen et al. (2017) argues that improved teaching alternatives bring higher learning results. Group problem-solving influences students' interpersonal growth and academic achievement in the classroom. This aligns with Pema's experience because the collaborative efforts with friends and teachers helped her connect theory to practice. Learning outcome and emotional well-being are also seen amongst individuals. When students interact with their peers, they co-create knowledge via dialogic discussions, and knowledge sharing within the community.

Karma's story talks about the affective and cognitive aspects of collaboration. He noted how peer discussions played a vital role when he was struggling with difficult subject matter in any subject. According to Karma, '*peer discussions were pivotal for deepening understanding of difficult subjects, especially subjects like Mathematics and Science.*' This points out how important collaboration is for fostering a positive learning atmosphere where students feel comfortable resolving conflicts with one another. This makes sense with Appleton et al. (2008), who observe that student participation and cooperation help improve learning outcomes when basic understanding is needed. Saugat's story focuses on the need for collaborative learning. His classroom is seen as vibrant, where peers exchange knowledge gained and work together happily to solve common problems. Saugat's experience supports the notion that peer support increases motivation and engagement because he saw peers' interest in their studies increase as they better understood difficult subjects. His findings claim that knowledge is created via healthy cooperation, which fosters a sense of identity and belongingness.

Group learning has many benefits, social or psychological, which are further supported by Bisakha's experiences. It promotes dialogic and meaningful conversation where different ideas are exchanged from various schools of thought. It enhances her awareness of science learning.

> '*Project work in science requires teamwork. Teamwork makes the dream work. Whether it is about social or personal issues, the teacher helps us to portray our art drawn on the wall as mural art. We sometimes do a social science week in our school, where students do the project jointly or independently based on the monthly themes.*

Collaborating in groups facilitates synergistic learning and even simplifies difficult concepts in science. This notion is strengthened by Vygotsky's theory of social learning, which insists on the worth of teamwork in knowledge formation.

As group work is dynamic in the classroom, it generates an environment where students can develop knowledge and learn from one another's ideas. Comparing Anjila's story to our own, we see a common thread of how collaboration builds communication and teamwork skills and promotes mutual support. We celebrate differences, where students learn to rely on each other. '*Science teaches us more than just equations and deriving laws; it was a subject that required teamwork, patience, observation skills, ethics, integrity, and resilience*,' she said, reflecting on how her classroom promoted collaboration and peer support. Science often stems from trial and error. The philosophy sees education as an interactive process that enhances discourse with fellow students, developing a sense of critical thinking and social learning. I, as a researcher, provide an ambience in which students are comfortable sharing their experiences freely to move together towards success. Building rapport and trust is essential for student to open up about their experiences. I concentrate on how peer interactions impact students' understanding and interest in science, and how their experiences resemble teamwork in school. Karma highlights the encouragement he gets from his classmates through shared goals and learning from mistakes. For example, I note that the experiences of all my friends and circle are shaped through mutual effort and reflection to create an open classroom environment.

In science education, teamwork highlights the value of cooperation for whole child development, i.e., students' intellectual, social, emotional, and psychological growth. The transformational effect of cooperative learning environments, which is also called empowered learning, is felt in the stories of Pema, Karma, Saugat, and Bisakha. As students work together to solve challenges and broaden their knowledge, they improve their understanding of scientific domains. Teamwork promotes individual outcomes, and they feel ownership. Students gain critical interpersonal and emotional skills. Students grow through social interaction and guided learning. This is in line with socio constructivist ideas, which emphasize the social aspect of education and maintain that group involvement and discussion are the most efficient ways to construct knowledge.

Teachers may build rich learning environments that enhance students' academic progress, curiosity thrives, and give them a sense of belonging by cultivating a collaborative culture. Learning feels relevant to cultivate a well-classroom culture. The interpretivist paradigm indicates students' subjective experiences. Here, knowledge is constructed through personal experiences and context, which impacts their knowledge and awareness. With the growing popularity of online learning avenues, these social platforms support collaborative learning. It provides insightful information about increasing student involvement in their choice of learning. Teachers can also gain practical ideas for creating collaborative learning environments in various school settings by researching, reflective practices, and their professional development.

Teacher's Role: Constructing a Learning Cycle

By exploring the theme 'Teacher's Role: Constructing a Learning Cycle,' I aimed to understand how teachers impact secondary students' science learning. Participants share their experiences in this section to create an effective instructional ecosystem or pedagogical design. It links instructional design, teacher involvement, and the ensuing learning environment. The participants' viewpoints underline teachers' critical role in fostering equality, curiosity, and integrative involvement. This process focuses on acquiring knowledge, considering both cognitive and affective aspects.

> *'The teacher's willingness to listen to my voice, even if they were incorrect, gave me the confidence to try again without losing motivation. My emotions would not get exhausted, so I would actively participate in learning.*

Pema's analysis clarifies a positive teacher-student relationship. It is based on the significance of trust and impartial relationships where a progressive mindset exists. This theme explores student development as teachers create a fine learning environment that fosters emotional fortitude and intellectual curiosity. Townsend (2017) asserts that cultivating good relationships with students lessens the negative experience dynamics like low motivation and high failure rates. Their experiences, like inclusive practices, role modeling, and positive reinforcement, bring the value of teachers in developing cooperative, respectful, and self-assured school learning cultures. Pema's story reveals how trust can motivate students to keep going. Townsend (2017) adds the value of mindfulness exercises and emotional control to promote a pleasant school climate conducive to learning and growth. Putting these strategies into action is consistent with my research findings in science classrooms. Students become aware of emotions, reducing conflict and promoting calm, focused regulation.

Karma reflects that his teacher *teaches from the heart, with intimacy, not just from the curriculum. They are mentors and facilitators.'* This viewpoint aligns with

John's (2002) research, which discovered that good teacher educators are knowledgeable about topics like objective, careful planning, ethics, and subject understanding in addition to the fundamentals of content delivery. Dawson et al. (2014) stated that kindness and differentiated instruction adjust content and process based on students' needs. Karma claims that the teacher's approach of connecting complex lessons to everyday context helped the students relate to intangible concepts. Vygotsky's socio-constructivist theory, which holds that learning is a socially built process, is embodied in this approach. Here, the teacher supports the process of co-creation of meaning by motivating them and facilitating dialogue through shared experiences.

The significance of context-based education in helping students gain real-world relevance and cultural and community connections led to student-centered inquiry. These are all brought out by Karma's experiences. While the cognitive advantages are still being investigated, Podschuweit and Bernholt (2018) support this strategy by declaring that including context-based learning improves motivation. It is clear from analyzing Karma's story that when teachers assist students in connecting scientific ideas to practical situations, they become more confident. Thus, I've decided that context-based learning techniques are useful in solving everyday problems, analyzing community issues, or designing prototypes. It facilitates students' involvement with real-world applications.

Saugat's story suggests supportive scaffolding, such as simplifying a hard task into easy-to-do steps, providing hints or models. It is a connected component of good teaching that makes students feel comfortable. There is no feeling of seclusion. He states, '*My teachers are cooperative, and they create* a *fine atmosphere in the classroom where every learner is allowed to pose questions.'* According to Pianta et al. (2012), positive student-teacher relationships promote participation through mutual respect and trust, improving the classroom's social dynamics. Appleton et al. (2008) state that the affective component of student engagement is essential in educational contexts due to the direct effect of students' emotional comfort on their cognitive engagement. This narrative illustrates its agreement with socio-constructivist theories. Saugat's description of his teachers creating a 'comfortable ambience' promotes the teacher's role in generating dialogic and collaborative environments where knowledge production may flourish.

By upholding interpretivist principles, which emphasize the development of spatial and situational knowledge. Physical setting, cultural background, social interactions, and experiences influence learning. Saugat's admiration for multidisciplinary approaches is shown by the statement,

> *'In addition to imparting knowledge, our teachers enable us to see the world from many angles. They instill the skills needed to apply for purposeful learning. Our teachers go beyond teaching us the facts and figures. They shape ethical values with a growth mindset.'*

It shows how teachers nurture emotional intelligence. This viewpoint supports Dawson et al. (2014)'s assertion that the curriculum is planned to facilitate interdisciplinary connections. The teacher's responsibility is to encourage creativity and critical thinking skills, which are essential for advancement in the twenty-first century. It may include asking thought-provoking questions and encouraging risk-taking.

Despite Saugat's critical approach to various teaching theories like behaviorism, social learning theory, or cognitivism at his school, Karma's and Saugat's experiences support constructivist teaching methods. Saugat admires teachers who use constructivist approaches. He points out that most teachers follow more conventional approaches, placing more emphasis on penalties than student participation, lecture-based instruction, rote learning, and the chalk and talk method. This conflict highlights the common teaching strategies in classrooms and poses how authoritarian teaching strategies affect self-confidence, reduced motivation, student participation, and comprehension. It highlights the unavoidable significance of analyzing a balance between rigidity and flexibility. Durán (2015) argues that student-centered methods encourage dialectical interaction between teachers, peers, or child and adult, which is best supported by sociocultural theory in contemporary education.

Anjila's story provides an additional layer that appreciates the significance of continuous assessment and responsive feedback.

She said:

> *'In order to boost student participation and exhibit their knowledge and cooperation, our teachers used a variety of presenting strategies like story telling, flipped classroom, interactive activities, and visual aids during our school days. It is done via projectors, smart interactive boards, smart TVs, computer lab visits, and even displaying their own cell phones.'*

In her story, she highlights how formative evaluations like quizzes, observation, self-assessment, and visual aids like displaying charts, diagrams, videos, and slides help her understand difficult scientific subjects. This aligns with McLaughlin et al. (2005), who provide the idea of '*Student Content Engagement*' as an indicator of an active learner's involvement with complex subject matter based on assignments, assessment, reading beyond textbooks, and projects that allow them to reflect and analyze information.

Bisakha claims that self-esteem is increased by constructive feedback, positive reinforcement, self-reflection, valuing diversity, and encouraging criticism. Bejtic (2024) found that constructive criticism increases drive and resilience, consistent with her experiences with teachers who offered instruction without making her feel incompetent. Teachers at her school foster a growth-oriented culture by maintaining a balance between ideas and support. As a researcher, I think a swift response has a transformative effect on science learning. During a physics experiment, for example, providing students with tailored feedback allowed them to see shortcomings without giving up. It fosters a culture of continuous learning. Learning here is valued, encouraged, and embedded in everyday practices for a growth mindset.

The narratives also show the intimate emotional connection between teachers and students. It enhances integrated development in the classroom. Bisakha's experiences in a nurturing and welcoming school show the significance of compassion and emotional engagement. She said, *'There is no discrimination between students, and teachers treat us equally. My teachers guide with care. We are treated with respect, sympathy, and fairness.'* A sense of belonging is promoted by this inclusive environment and is required for effective engagement, as said by Pianta et al. (2012). Students can ask inquisitive questions and realize their academic potential in a conducive environment. This is created by teachers who understand and meet each student's unique needs. To outgrow students' potential and promote whole child development, teachers adapt their instruction methods to meet each student's unique, distinct strengths and limitations. A socio-constructivist classroom is built on compassion and teacher support, as Bisakha said. Subjective aspects like students' prior experiences, emotions, beliefs, and interpersonal aspects of learning like classroom culture and peer support have a big impact on student participation. The interpretivist paradigm makes sense in this situation. This method suggests the value of interpersonal or social dynamics in the learning process by appreciating the personalized experiences of every learner. It represents individual and group interactions as it develops a stronger bond between students and the subject matter. Teachers actively engage in meaning-making processes that support students' emotional and cognitive development. They are the co-creators of knowledge. Participants believe that teachers establish a learning environment and encourage social, cognitive, and psychological growth.

These anecdotes illustrate how constructivist teaching methods applied by teachers in the classroom have revolutionized science learning in secondary schools. These methods clarify hard and obscure ideas to accessible and credible ones, creating a welcoming and encouraging atmosphere. These strategies discuss the need of relevance and engagement in developing effective science learning experiences. Schools could implement professional development programs emphasizing emotional intelligence and mindfulness for educators to better support teachers' roles in the learning ecosystem. Peer mentorship programs, where senior students guide juniors in difficult classes like chemistry and physics, can foster a collaborative environment and align with socioconstructivist principles.

Teachers serve as mentors as they nurture character, empower skills, support decision making, and provide individual guidance. They establish sound relationships with students via compassion, creativity, and inclusivity. Vygotsky's socioconstructivist theory states that these relationships enhance knowledge acquisition, where the instructor and student participate in cognitive structuring. They allow students to participate in their education actively. They play a critical role in facilitating knowledge development. They reflect on their progress by providing students with individualized input and conducting continuous assessments. In addition to improving academic performance, this method gives students a sense of agency and responsibility. It motivates them to participate fully in their educational endeavors and apply meaningfully by encouraging inquiry, discussion, and reflection.

This theme's findings are teachers' ability to create emotional and social well-being. It prioritizes choice, voice, and agency. It is considered the primary indicator of a successful science learning environment. The participants' stories highlight teachers' varied responsibilities in creating a favourable environment. They promoted a classroom culture that allows them to thrive academically, socially, and emotionally. The transformational potential of successful teaching practices is clarified by integrating Townsend's (2017) literature on a positive learning environment. Dawson et al.'s (2014) support for compassionate leadership and Bejtic's (2024) concepts on supportive feedback. Teaching is an art of forming minds and compassionate hearts rather than just a career by integrating interpretivist and socioconstructivist paradigms. Students gain the self-assurance, inquisitiveness, and persistence needed to negotiate the difficulties of science learning successfully. Teachers must cultivate trust and provide constructive criticism for students in a caring classroom community. Teachers can establish a friendly learning atmosphere by communicating with students more skillfully. Students get the clarity of thought and feeling of purpose needed to stimulate confidence, curiosity, and collaborative growth.

Bridging Theory and Practice in Science Learning

Students' voices regarding science as a discipline that combines rational reasoning, exploratory thinking, and inventive research are made clear in this section. It emphasizes that science is about integrating theoretical knowledge to practical experiences as they make learning relevant and applicable. Science learning has to move beyond rote learning and promote meaningful engagement by leveraging multidisciplinary disciplines via STEAM-focused approaches.

Saugat says, ' *Science is a discipline that values innovation and accuracy. Science requires precision, structured thinking, and rational progression*.' He acknowledges the need for artistic inquiry and states that science courses would go further in the basics, including innovative space explorations and cutting-edge technology. He cites, for example, *' Elon Musk triggered his passion in planetary research,'* demonstrating that students' passion often transcends the limitations of coursework.

This stance is supported by Hyry's (2021) study, which characterizes new technologies as a part of a worldwide movement towards sustainable solutions. Any research is stepping beyond traditional bounds and experimenting solutions. His observation about space travel is supported by Hyry's research, that students' interest in innovative projects encourages scientific and innovative thinking. These skills made learning simpler so that it becomes effective for students like Saugat to show their potential. It indeed pushes the limits of science learning by motivating students to think beyond the box.

The story of Bisakha argues in favor of critical thinking over conventional success metrics when it comes to learning any subject. The same exists in Saugat's tone. *'Grades in numbers and alphabets are not everything. It may not always show* *our strengths or weaknesses. The skills and experiences are what count. It is dynamic and continues to evolve.'* Her stance on achievement is measured by the depth of conceptual understanding and the application rather than by 3 hours examinations represented numerically or alphabetically. One of STEAM's objectives is developing soft skills that allow students to 'see the world differently' . The nature and quality of teacher-student interactions have a major impact on promoting this engagement, according to Pianta et al. (2012). It too suggests that classroom settings should be supportive to encourage students' social and emotional learning.

Both Saugat and Bisakha quests for an innovative way of teaching that implies the addition of knowledge and creative inquiry. Science involves within a multidisciplinary approach to explore sustainability. A more comprehensive approach to science education is powered by blending rigorous evaluation with creative exploration. Learning functions best when there is a meaningful inquiry and productive interaction, according to Vygotsky's socioconstructivist theory.

Students like Saugat and Bisakha are taught science in their school as a broader discipline rather than an independent subject. They are eager to see the natural world by observation and experimentation. Hyry (2021) supports students' creativity as they take responsibility for projects through design-led thinking. Saugat's enthusiasm in the universe and Bisakha's passion for continuous learning beyond formal education can be related to seeing science as a process rather than a static set of facts. They can apply knowledge through projects and problem solving rather than by grades in assignments. Wilhelm et al. (2019) claimed that diverse subject areas must be approached practically and reflectively to boost aptitude in sustainable development education. They promote using instructional resources like physical tools, digital resources, interactive resources, and assessments that link theoretical content and practical problem-solving mechanisms. Researchers must understand the influence of participant stories on classroom teaching. Saugat and Bisakha's viewpoints express that curriculum and pedagogy could better go hand in hand to meet students' curiosity and need for fulfilling future-ready citizens. Their opinions appreciate the value of promoting inquiry-based and experiential learning. Students are assisted in making the connection between theory and practice. Meticulous planning for theoretical frameworks must be revised to implement student-centered approaches successfully. Furthermore, this study is enhanced by interpretivism, which acknowledges the contexts and personalized nature of each student's experiences.

Their narratives reveal that students who actively participate in school subject matter are shaped by their learning objectives and the pedagogical settings. Researchers consider their voices as unique experiences. These stories enhance our knowledge of science's ability to inspire and learn. It helps provide insightful perspectives on viewing and interacting with the outer world. For example, realizing Bisakha's preference for practical skills over grades compels our mindset shift from passive to active learners. It even assists schools to redefine success.

In conclusion, 'Bridging Theory and Practice in Science Education' envisions a significant shift toward a blended learning pathway in science education. The stories of Saugat and Bisakha show that science is a creative undertaking that stems from observation, research, inventiveness, and originality. Their evidence suggests that fusing STEAM pedagogy into science teaching promotes a future-ready mindset. The use of both creative and analytical thinking in scientific problem-solving is encouraged by this method, which raises students' thoughtful and analytical involvement with the subject. This approach can develop the mindsets and outlook of students required to deal with contemporary world challenges. Bisakha's final remarks, '*The important things are the competencies and insights that we gained from our past experiences. It also helps our growth beyond classrooms, implying a larger STEAM education goal*. Learning has to go beyond traditional bounds and equips children to be resourceful, future-ready citizens.

Teaching, Learning, and Assessment

The stories delivered by each participant illustrate the connections between curriculum planning, assessment practices, and instructional approaches in secondary science classes. These various components combine to produce an effective class for students of any subject. I can relate them to the interpretivism paradigm and socio-constructivist framework to an intense perception of their science learning. Pema's reflection best summarizes the limitations of a hard-bound curriculum:

> '*When we have to follow the textbook page by page, it feels like there's no space for us to think outside the box. Teachers are always planning for the next lesson after they finish one. There is limited space for what's up next. Doing research or practicals based on that topic is a way thing.'*

This premise highlights the constraints imposed by a rigid curriculum that prioritizes subjects over inquiry, restricting students' curiosity and inventiveness. This supports Dunstan and Cole's (2021) claim that an overarching focus on information delivery causes students to become passive learners, lacking the creativity and critical thinking skills needed to meet new problems. On the other hand, Pema also described a life-changing event, *‘I felt more engaged when we worked in groups and got to design our own experiments. Instead of only learning about science, it was like finding it.’* This illustrates how inquiry-based and experiential learning may rekindle interest and involvement. The importance of such adaptable instructional approaches is highlighted by Rodríguez et al. (2019), who confirm that creative workshops using stimulatory strategies enable learners to build study findings and creative abilities.

As a teacher cum researcher, I can identify with Pema's story that students are inspired to take responsibility for their learning process. Curricula must be carefully integrated when blending knowledge with research to help students and teachers. Giving students the freedom to create their projects is one such strategy. Students gain a sense of freedom in their learning process by empowering them to take charge of their education. Students participating in the research design process also better comprehend science chapters.

The respondent's accounts of assessment procedures show apparent differences in the ways that evaluation affects learning, ‘*I always assumed that the tests were just about memorizing facts for a grade, but the project-based assessments helped me see science as something I could do, not just learn about*,’ Pema said. Her viewpoint aligns with the 'constructive alignment' approach of Biggs (1996), which promotes observations that integrate assessment criteria with instructional strategies to promote conceptual thinking. Karma noted the necessity of constant evaluation methods by stating, ‘*Teachers will create performance or rubric charts and administer formative evaluations on various chapters every single day. They will take daily tests on different chapters. Using that chart, the instructor will analyze each student's grades.’* Although this shows a methodical strategy for monitoring development, it could not provide the formative feedback required to promote a growth-oriented mentality. Schull et al. (2021) claimed that *‘embedded assessment practices’* are a way to bridge the gap between formative and summative assessments by including continuous evaluation into learning activities. A fair evaluation system is necessary. As a researcher, I advocate for evaluations that assimilate Karma's systematic approach with Pema's preference for project-based review to promote accountability and active engagement.

> ‘*Teachers instruct the theoretical lessons that underpin our teaching and learning methods to real-world scenarios with research. At the same time, some teachers force us to read course books as they know we are taking the SEE. They will reward and punish after the Pre-Board exams are taken,’*

she explained. Although this approach aims to provide a preliminary understanding with hands-on learning, her difficulties with chapters like chemical reaction, hydrocarbon, and classification of elements reveal the gaps between theory and practice. Biggs (1996) claimed to align teaching strategies with curriculum objectives to boost learning.

Furthermore, Anshrika's statement that *'academic rubrics have to be followed for CAS to evaluate points' refers* to a standardized, well-planned approach to evaluate student learning in a step-by-step process. Vygotsky's scaffolding theory, however, suggests that combining tailored instruction with rubrics could provide clear expectations, fair and transparent grading, targeted support, and help students like Anshrika get adaptive thinking in difficult science chapters. I recognize Anshrika's difficulties and recommend embedding peer-driven learning experiences within the curriculum.

Every student participating in this research agreed that curriculum, assessment, and pedagogy must be integrated into a planned instructional design framework. Curriculum provides a roadmap to fundamental structure, inquiry-based learning, and even lifelong learning. Formative and summative methods should be combined in assessment procedures to encourage self-directed learning and support incremental input. It ensures an overall understanding of students’ accountability for learning goals. Pedagogical approaches bridge the gap between theory and practice. Student needs and curriculum goals have to be defined. Considering their experiences, educational foundations like informed practice and curriculum design may have a pivotal effect when fused with the socio-constructivist worldview. By adopting integrative and inquiry-driven teaching strategies, teachers may cultivate students' curiosity, critical thinking, and a constant love of science.

The interpretivism paradigm and socioconstructivist theory extend critical perspectives when analyzing these stories. The interpretivist approach prioritizes each participant's distinct educational journey and respects their unique individual narratives. Vygotsky's scaffolding mentions the need for teacher-student interaction to promote differentiated instruction. For example, Saugat's interest in modern subjects like exploring planetary expeditions, such as Mars, and his obsession with astronomy highlight the importance of revising the curriculum to suit students' interests because it promotes intrinsic motivation.

Fostering Student Agency and Self-Directed Learning

The transforming impact of encouraging agency and self-directed learning in science classrooms is reflected in students' words, namely Pema, Karma, Saugat, Bisakha, and Anjali. The examples illustrate how taking control of one's education enhances academic achievement and equips individuals with the skills they need to thrive in a complex and ever-changing society. Their stories concentrate on the importance of student autonomy and, thus, fostering thoughtfulness, flexibility, and decision-making capabilities.

Pema's reflection:

> *It was one day ahead of our Annual Parents' Day. I remember we had a science fair organized by our school, where other schools and stakeholders were invited to witness the event. When we were allowed to select the subjects from our course book for one of our research projects. I initially felt slightly disoriented, but then I understood I could research something that caught my attention. This makes it important to encourage students to shape their knowledge progression.*

Karma's claim:

> *I perform well in online classes. In school, my friends interrupted me so that I could not get focused. They force us to do whatever we want in class, whether right or wrong. However, since there won't be anybody around during an online session, it is easier to understand and ask teachers questions.'*

This illustrates how isolation in controlled settings encourages self-directed participation.

The stories have recurring themes of autonomy, independence, and freedom, with Pema's unique study into green energy and Bisakha's use of online resources for extracurricular learning. Stefanou et al. (2004) point out that fostering agency involves delivering a sense of possibilities and abilities to make informed choices for student-centered inquiry. Like previous studies, Pema's first impression of surprise becomes wonder as she realizes her inner potential. Originality and ethical self-awareness are more likely to flourish in students who take charge of their learning process. This shift in Pema's experience shows the importance of decision-making and goal-setting for mind and heart development. Bull (2017) argues that equitable access to educational technology overcomes gaps and promotes learner agency. As part of his proactive use of technology to go beyond the curriculum, Saugat uses a QR scanning code to access the *'Did You Know?*' sections of his science and maths book.

Karma's narrative raises a clear opposition: digital technologies can create a focused, uninterrupted environment that elevates learning outcomes, whereas traditional classrooms are typically thought to promote collaboration. Reimann (2021) explains that solitude could promote self-reflection and focused work. In my opinion, as a researcher, Karma makes a compelling rationale. His acknowledgment of the importance of face-to-face interaction in the classroom draws attention to the conflict between independent decision-making and shared goals. It is important to balance the interpersonal skills acquired through face-to-face interactions and the freedom that digital media encourages. Students can benefit from both collaborative learning opportunities in traditional settings and the flexibility of the digital era.

Stories of participants remind me of a similar case in my studies. During a workshop, for example, I witnessed students initially reluctant to lead group projects later take leadership roles after being given the chance to select their preferred subjects. This aligns with Anshrika's purpose of intrinsic motivation, which maintains that her passion for history and current affairs in social studies drives her academic pursuits despite external factors. This idea is aided by Reeve and Tseng (2011), who support the relevance of agentic interaction. Thus, it helps promote student empowerment in educational settings to academic success.

Anshrika's purposeful use of YouTube and Google to increase her academic aptitude shows the evolutionary strength of digital resources. It supports Slamet et al.'s (2024) evaluation of MOOCs as platforms for accessible and adaptable learning. Anjila uses technology as a *'search engine to reach far off places and to know the world through one single palm '*; thus, it conveys the broader utility of digital technologies in building agency. Pema and Saugat's experiences point to the need for research and investigation. Zacarian and Silverstone (2020) believe that by cultivating an inclusive culture of agency, many learners can become informed community members or socially conscious citizens. Through self-awareness of her academic aptitude and shortcomings, Bisakha's narrative exemplifies the values of diversity and adaptability. There is always room for improvement if one is academically challenged or has a certain learning gap.

To encourage student ownership and empowerment, providing the resources, opportunities, and a favourable environment for students to take initiative in their learning is imperative. This concept fits into socioconstructivist theory, which sees students as active participants in the meaning-making process, and interpretivism, which provides students' unique narratives as their experiences. Participants, namely Anjila, who uses technology as an enabler, and Bisakha, who uses both digital and conventional tools independently. They have proven that students may connect with science education in many ways when given the opportunity. The narratives of Pema, Karma, Saugat, Bisakha, and Anjila explain their progress toward educational reform. They place a high value on giving individuals freedom and cultivating a helpful state where students can realize their full potential. Learning resources are available, and constructive suggestions are welcome to promote agency. Socioconstructivists agree that this type of learning enhances academic growth and imparts authentic life skills. Ensuring that every student's voice is heard, acknowledged, and given authority requires a balance between autonomy and teamwork. The need for instructional practices that promote both self-empowerment and collective involvement is brought out by this perspective, which agrees with my study.

Digital Literacy and the Role of Technology in Science Learning

This chapter has resulted in notable modifications to students' learning styles, information processing abilities, and knowledge acquisition process based on digital resources and technological tools. This change reflects increased scope and practical relevance of scientific concepts through online resources. Students can recognize the utility of science in their everyday life and view it as a complement to a larger set.

Karma's story of attending a Zoom meet for the first time with his teachers during an online class hosted by the school during the early phase of the COVID pandemic, when schools were physically shut down, promotes the connection of digital transformation among students in science learning.

Reflections from Karma:

> *After hearing about Learning Module Software (LMS) being used for the first time at my school, 'questioning the teachers about the teaching methods, causes discomfort and adjustment for everyone, particularly the parents, who described the shift to an online learning environment for students during the COVID pandemic.*

He openly discusses the freedom and concerns that followed the move to online learning. *'Google Meet is better than Zoom because it enables unlimited access, like there is no additional software installation, and is connected with a simple browser link.'* In response, Anshrika criticizes that virtual learning affected the chance for connectivity and exposed the digital divide, for instance, the disparities in students' digital readiness. These voices provide a framework for understanding that technology facilitates science education, teaching, and learning, and learning progressions are restructured. Anshrika critiques that there is a diminished chance of peer interactions during virtual learning. Saugat's narratives focus on how digital technology improves concentration and changes learning realms. These stories reflect the dual nature of digital literacy by highlighting the benefits and drawbacks of using technology in the classroom.

Tiwari (2024) describes the pandemic as causing a 'digital metamorphosis' in education, signifying a long-term change in teaching and learning frameworks. Staying focused and improving digital literacy are needed. Anshrika observes that some students are involved in chatting and playing games during online classes, lack parental supervision, have poor internet access, have cameras turned off, and have prolonged screen time. To maintain constructivist pedagogies in online learning settings, Gabriel (2004) claimed that ongoing communication, collaboration, and participation are essential to augment the learning phenomenon. These are what my observations during the pandemic speak about: strategies like gamification, fine technical setup, engaging content, reducing external interruptions, synchronous conversations, and flexible platforms were required to maintain concentration in a digital setting.

It is obvious that Karma found online class difficult to adjust to at first, but Saugat found that technology-driven methodologies were useful and comfortable. His use of '*soothing concentration music while studying subjects to help him concentrate'* is a prime example of self-directed learning, which is essential to education in the twenty-first century. As Tan and Koh (2014) point out, nurturing abilities like self-control and critical thinking prepare students for globalized, technologically advanced situations. Dewey (1915) believed that education ought to evolve with current demands constantly. Saugat's regular study on whatever digital tools are found and Anshrika's effectiveness with platforms like Google Meet reflect the differences in student involvement.

These stories from the participants show that technology would be a shared workspace when viewed from a socioconstructivist standpoint. Digital settings can become transformative classrooms, as seen in Saugat's use of online simulations and Bisakha's use of Facebook for proficiency in linguistic learning. The claim is further supported by Belk (2013), who explains that technology facilitates students' co-creation and the establishment of shared digital identities that break conventional borders.

The use of possible digital tools by Saugat and Anshrika's worry about not interacting with peers when attending virtual sessions highlights the larger problem of online learning. It can be seen that there is a danger that a sense of community may be built in virtual environments. Collaboration is essential to constructivist learning because it encourages the exchange of ideas amidst varied schools of thought, particularly in remote learning spaces, claims Gabriel (2004). This problem can be addressed by using solutions like project-based assignments, balancing screen time, building safe online spaces, and shared online whiteboards, which promote teamwork and ensure accessibility. Digital competency broadens research that addresses the gaps between conventional education and future-ready skills, as seen by Bisakha's experience. She said, *'We sometimes use Facebook and Google in our classroom by teachers to explore information, which turns technology into an extension of our classroom. Our computer labs are equipped with internet facilities.'* This supports the claim made by Maclean (2022) that digital environments enhance learning activities by allowing students to co-construct knowledge. Her experience gives acceptance to the socioconstructivist idea that students learn immensely when they are immersed in interactive lessons, presentations, join live lectures, do video conferences, peer reviews, and explore information in authentic settings. These stories collectively reflect the interpretivist paradigm as they reveal the participants' contextual experiences. Technology-driven learning encourages meaningful and directed academic progression. For example, Saugat's usage of virtual simulations reflects learning through visual representation and inquiry. He also remembered that he and his friends had developed a Sanitizer dispenser at schools after the first phase of COVID when schools were resuming. He said, *'We used Arduino, IR Sensor, old bottle to design a workable dispenser as it was a dire neeed of that time that led to hygiene. We have installed it outside classroom and we got appreciation from our school administration, teachers, friends and families.'* This exhibits how design thinking aids students to solve problems in our day to day life integrating empathy, ideate, and prototype.

Karma's sincere attention, Anshrika's perceptive thought, and Saugat's hands-on participation all glued me. Their experiences sought for the role of teachers in digital spheres. *'How can teachers use digital resources to support Karma and other students for their authentic learning, especially those who face technology adversities, or help students like Saugat use digital tools productively and even safely so that they could augment their learning experiences?'* These findings challenge didactic instructional methods to cater for every single students as they are born unique.

Technology and digital skills in science education are tools that play an integral part in modern learning. They are revolutionizing the fundamentals of education. By contrasting participant narratives with literature, a range of digital inclusion can be shown, from self-directed reasoning to adaptive resilience. Researchers like Kalyani (2024) and Tan & Koh (2014) claim that the pandemic has brought attention to the necessity of delivering digital literacy, independent learning, and interdependent prospects for effective pedagogy. Based on socio-constructivism, these findings suggest that technology serves as an access to information, produces creative expression via videos, enables peer-to-peer learning, provides a prompt feedback system, and empowers students according to their choice. Industry 4.0 requires modern hi-tech skills and instructional reforms to prepare future-ready citizens (Ahmad et al., 2022). They suggest MOOCs 5.0, which enhance flexible learning through blockchain, IoT, and AI technologies. By infusing compassion, ethics, and virtues into the curriculum, this approach could offer ideal dynamics for science learning that drives inquisitive learning.

Affective Dimension of Science Learning

Science learning deals with emotional experiences that concern students' drive, involvement, and belief in self. Pema's statement, *'I remember the first time I did a chemistry experiment—it felt like magic,'* exemplifies how experiential learning inspires interest and builds emotional bonds beyond intellectual comprehension. Karma's observation that '*weaknesses are felt when teachers tell us that you can't do that, can't read that, and it makes us low*' further illustrates how crucial emotional scaffolding is in helping young learners become more resilient and self-assured. These stories brought the emotional aspect of science education, where students' pride, joy, or fright majorly influence their ability to participate and prosper in the classroom.

The intrinsic motivation stems from emotional engagement in the classroom. Pema uses the word 'magic' to describe her first chemistry experiment in the school lab with teachers and friends, exemplified by the above statement. The value of emotional intelligence (EI) in classroom settings is argued by Gregory and Kaufeldt (2015), who consider mindfulness, compassion, and positive sentiments vital. Goleman's (1995) claim that emotional intelligence (EI) is more important than IQ for setting clear objectives in the modern era. This is supported when Pema proudly knows the principles behind the chemical reaction.

The unpleasant emotional experiences bring negative impact on learning. This is shown by Anjila's comment when losing confidence after struggles and presented challenges with Maths, especially numerical problems in Science. Bandura (1997) suggests that student self-efficacy strengthens emotional patterns, learning behaviours, and independent learning, thus achieving intrinsic motivation. Parsons et al. (2011) further state that these achievements must be incorporated into the pedagogy and course design to overcome emotional and academic hinderances. I favor realistic objectives in science education because they give students like Anjila confidence by allowing them to make consistent progress. Karma's narrative of teacher impact extends beyond the social-emotional component of teacher-student relationships: *'Hurting and scolding even in a trifling matter makes us feel low and down our morale, sometimes even affects our mental health, whereas if they boost us, then it builds our confidence, positive energy, emotional resilience, and overall self-esteem.'* This is supported by Acar et al. (2017) and Rudasill et al. (2013), who stated that positive peer interactions and emotional well-being influence effective teaching pedagogy. Socio-constructivism guides teachers' efforts to maintain healthy relations with school fraternity. Since working at the school in 2018 AD, I have felt that teachers' words of encouragement may bring a turnaround change in students' perceptions. It aids in simplifying difficult subject matter, regardless of the subject, and enhances their interpersonal skill. Gomez-Arizaga et al. (2016) argue that teaching and learning methodologies would only come a long way when student voice is heard without any bias.

Bisakha's conflict with social anxiety and insecurity connects the link between emotional stability and academic growth. Her reflection on feeling 'insecure' in class aligns with the findings of Wentzel (2003) and Wentzel et al. (2014), who acknowledge the importance of creating environments that promote positive peer interactions and mental health. From a socioconstructivist perspective, such situations demonstrate how learning is strongly relational and context-influenced. Students are more inclined to participate in the learning process when they feel morally supported by teachers, parents, and the community. It ultimately broadens their entire educational experience.

It was the day to felicitate SEE students, probably in the Chaitra month. I remember leading group discussions in one interactive session where motivational speakers were invited, and students discussed their misunderstandings of science in a friendly setting. In our school, we were given project work as an assignment that needed to be submitted within a given due date. Friends would help with this in the library or the classroom during leisure periods to accomplish the work. Our other groups doubt the work done. This validated the socio-constructivist paradigm by lowering anxiety, taking risks, increasing motivation, and promoting a culture of group learning. The interpretivist lens facilitates understanding of these emotional imbalances. Teachers assign students to keep reflective assignments. At the end of the year, every student of each class should participate in the reflective learning odyssey programme hosted by the school in which they record their cognitive development and emotional flows. It analyzes the various aspects of the learning process. Students' state of mind could be observed in real time using technology-enhanced tools, like feedback algorithms, and has to be scrutinized properly. Assessment is a vital component of the pedagogical process in both traditional and modern learning, as per research by Ogange et al. (2018). E-learning can improve student interaction and learning outcomes, especially in science education. It consists of formative evaluations, constructive suggestions, and welcoming feedback. Embedding social-emotional learning (SEL) frameworks into science classes may promote a whole child teaching approach.

Emotions, cognitive processes, resilience, and social settings interact to influence students' learning journeys when it comes to science instruction. The difficulties faced by Anjila, Karma's need for acceptance, and Pema's pride even at the smallest things all show the importance of promoting resilience and self-confidence. Research by authors like Parsons et al. (2011), Goleman (1995), and Bandura (1997) indicates that emotional experiences and motivation are pivotal for successful science learning. These stories reveal that psychological, social, and cognitive factors interact unexpectedly to produce authentic learning. This resembles a socioconstructivist standpoint. Teachers may create stimulating environments for students that make learning science thought-provoking.

Challenges: Struggles of Understanding

The subject ‘Challenges: Struggles of Understanding’ in the study of secondary school science education points out multiple barriers that learners meet while trying to understand scientific ideas, especially in traditional classroom environments. This chapter explores students ' narratives through storytelling and reflections on pedagogical practices, the role of fear, limitations of theoretical instruction, and the need for a balance between structure and freedom in learning environments. It reveals their varied perspectives on learning science.

As Pema's narrative says, when science is taught in conventional or standard teaching practices, many children lack engagement or become less involved in the learning process. This remark presses the need for instructional changes to make the subject more approachable and inviting for students.‘*Despite the difficulty, the way of teaching is similar to that of other subjects. It all seemed like an impossible task. I couldn't connect to its gravity*,’ She says. She finally feels relieved when the teacher compares Newton's First Law with a rolling ball. This suggests that relevant, context-based metaphors simplify complicated theories. The limits of lecture-based learning in science education are highlighted by Armbruster et al. (2009). Criticism departs from conventional, test-focused instruction and establishes an environment where students' opinions, insights, and experiences play a major role in their education.

I recall a similar incident where my classmate’s explanation of electron orbits in chemistry helped me comprehend atomic structures more practically. By comparing the motion of electrons to that of dancers on a revolving stage, each with a unique role and amount of energy, my friend replaced the formal model taught in class. This imagery model used as an analogy broke down a difficult concept into an accessible one. Learning is indeed a collaborative process; knowing starts from group ideation. ‘*Conventional classes do not encourage student participation, but have their conviction.*’ Pema's experience supports this. The catalytic force of active learning to help students acquire a greater sense of responsibility for the concerned subject matter is further argued by Reyes and Villanueva (2024).

Pema's narrative informs about the urgency of an interpretivist approach that prioritizes understanding each person's opinion. Here, interpretivism drives me to actively generate insights and learn science as a subject through analogies or metaphors. This story supports the premise that learning is a communal experience and an interconnected process. Students can easily connect with science subjects by providing hands-on, real-life illustrations. Particularly for branches of science like biology and physics that mostly depend on sensory data processing, Anshrika's approach clarifies the limitations of distant learning during epidemics. She observes that *'Teachers struggle to finish the provided syllabus since students are often distracted in online classes. They sometimes run their classes despite students understand,*' implying that virtual classrooms would find it difficult to match scientific laboratories' interactive and collaborative aspects. Kelley (2021) claims that, laboratory experiences along with digital platforms, are vital for chemistry classes . Face-to-face interactions deliver higher interest and active participation which can not be rightly compared with only the online digital media.

Furthermore, Bereczki and Kárpáti (2021) found that even expert teachers can not integrate creativity into technology-based teaching. It suggests that timely support and continuous adaptation are required for technology to be successfully implemented in a modern classroom. There are advantages to incorporating technology. However, Anshrika's experience indicates that revised and updated teaching strategies are still needed for today's modern education. As a researcher, I want to have a blended learning mode instead of replacing the whole teaching phenomenon, and use technology to bridge gaps. The conflict between guided and autonomous learning is discussed in Karma's remarks.

> *'Our batch's entire class shares similar experiences. It might be because we are from the same institution and teacher, but are friends with unique differences. Formulae and equations used in chemistry and physics classes are difficult. Memorization has to be done a lot in biology class. Sometimes, it is challenging to ask questions in front of the class. It might be that the question would be too easy for other students, or some might feel inferior in class.'*

The necessity to maintain a balance between promoting self-directed learning and guided facilitation, or let's say instruction, is recognized by successive learning. This is known as pedagogical flexibility, and for challenging subjects like science, it is crucial to have flexible teaching strategies (Ryan & Tilbury, 2013). A study by Woods & Copur-Gencturk (2024) found that teachers who work in various educational settings also learn more about the subjects they teach. Karma's story represents cooperative learning where students enhance academic achievement by sharing thoughts, promoting diversity, developing social skills, and seeking more information. In contrast to a didactic instruction model, this collaborative design facilitates an interactive learning environment. It pushes teachers to be more self-reflective and sensitive to the needs of students.

Saugat's experience introduces the problem of dread in science teaching. He observes that many students are reluctant to engage with science completely, adding, *'The biggest barrier is fear, either of not understanding the Science terminology or what their friends and teacher say, or of not understanding even the easiest subject content*. *They believe that science is unintelligible and challenging.'* According to DeBellis and Goldin's (2006) theory of meta-affect, or feelings about feelings, students might turn their fear of failing into curiosity if they can identify and process it in safe settings. To elaborate, Radoff et al. (2019) talk about how, when given safe spaces for experimentation and error, students might see challenging ideas as *'stimulating, intriguing, even euphoric'* experiences. During my learning, I remember grappling with Newton's law of motion, where theoretical understanding didn't always mean solving complex problems. However, it was transformational to try again, break down each step, and ultimately reach the end. I discovered that science requires resilience, or the capacity to overcome obstacles and continue. This resilience is fostered by the challenges and iterative nature of scientific inquiry, which is fundamental to the scientific method and teaches students valuable lessons in persistence and problem-solving.

This insight corresponds to socio-constructivism, which claims that the educational process cannot function without the sentiment of the students. When students overcome their fears, they can become more resilient and receptive to science. This aligns with the paradigm since a more comprehensive view of the student experience may be obtained by considering the psychological learning factor. As a researcher, I would promote classroom settings that purposefully address emotional learning hurdles by introducing cooperative, encouraging conversations about challenging aspects of science and allowing students to see setbacks as a necessary component of their educational process.

Although Bisakha's school has a science lab, her narrative highlights the disconnect between theory and practice, saying, '*We have a lab, but we don't go often*.' This addresses the lack of real-world applicability, a typical criticism of science education. Reiss et al. (2013) found that practical, besides theoretical work, is essential to science. However, it is not done following rubrics, and there are inconsistencies in the internal evaluation system. Bot et al. (2005) claim that experiential learning promotes continuous learning as knowledge production is based on practical applications, which is essential in STEM subjects. As a researcher, it shows the significance of encouraging lab appliances and makerspaces to support hands-on learning. I think laboratory experiments to design prototypes or innovations supplement the theoretical information. It is indeed essential to the science curriculum.

Although Anjila studies beyond her regular classes using a smartphone at home, she believes that her learning involvement has lagged since her school lacks adequate digital resources. The commitment and forthcoming challenges of digital learning in post-pandemic education were discussed by Forde et al. (2024). They compared varied modes of teaching modules like face-to-face, blended, and online approaches to practical skill acquisition. Alternative educational settings, like visits to a factory, innovation lab, makerspace, science museums, libraries etc, provide participatory learning possibilities that accelerate classroom instruction (Ramey-Gassert et al.,1994). These examples show that the use of educational resources and nontraditional learning settings can deepen students' understanding. Technology integration in their curriculum opens a new trajectory for meaning-making, particularly where classroom resources are limited. Interpretive principles are maintained by providing a range of learning pathways. I favor carefully fusing digital resources and interactive applications with textbooks to improve science learning. This approach enhances the learning process and ensures students with varying learning styles can access the content, resulting in a more welcoming and effective learning environment.

In conclusion, secondary students’ hardships in science education are revealed in ‘Challenges: The Struggles of Understanding’. According to participants, learning is most effective when it considers different social, psychological, and cognitive specifics. Besides theoretical principles, teachers use creative, useful, and inspiring instructional strategies to make science learn in fun for students. The constructivist approach to science education may promote meaningful interactions by integrating multimodal, experiential, and emotional learning components.

Key Message of the Chapter

Field data gathered through participant narratives of secondary school students' experiences of learning science has focused on the varied, multifaceted nature of students' learning attitudes, social interactions, and interpretive meaning-making processes. Students' viewpoints discuss that knowledge is co-constructed and meaning is understood through dialogic interaction and interpersonal relationships with fellow friends, mentors, and the science curriculum through stories of success, challenges, curiosity, and exploration. Rojas-Drummond et al. (2024) offer an approach that connects adopting dialogic practices by educators, students, and institutions to implementing educational improvements toward these practices. Systemic, assimilative, or additive implementations depend on the extent of the expected change. The framework's main goal is to transform traditional classroom methods into dialogic processes, prioritizing the students' learning needs and presenting teachers as engaged co-creators with institutional endorsement.

These results state that learning is a contextualized phenomenon that is influenced by the constantly changing relationship of interpersonal exchanges and cultural-historical-contextual settings rather than just being a standalone cognitive activity. Vygotsky's socio-constructivist theory suggests that those participating students move through the ‘zone of proximal development,’ with each student in a classroom functioning independently and what they can do with help from others. With its foundation in narrative inquiry, this study also shows how unique experiences connect to more general happenings. These patterns are carefully taken into consideration as subjective experiences by both interpretivist and critical perspectives. This approach backs up the socio-constructivist claim that learning is highly contextualized, and that each of their story contributes to a broad spectrum.

CHAPTER VI
INSIGHTS AND FUTURE AVENUES IN SCIENCE LEARNING

Learning science at secondary schools in the Kathmandu Valley has allowed me to closely observe participating students' strengths and challenges while attempting to learn science. This study was based on my observations of behaviourism teaching techniques and my experience as a science educator. Many students find it difficult to grasp the nature of scientific concepts. It can be a gap brought about by rote learning and exam-focused pedagogies. Parents were more focused on grades than learning outcomes. I was motivated to learn more about students' experiences and to come across their stories as data in my research. Every moment has influenced my undertakings from crafting my research question to addressing ethical dilemmas. The difficulties I encountered, like appreciating the opinions of other students and overcoming the struggles of narrative inquiry, were valuable yet satisfying to date. I must say, every challenge pushed me academically.

I tried to maintain a wide range of their experiences by listening carefully to their stories, observing their gestures, and the echo of their voices. I encountered two major hardships: Choosing participants and ensuring their anecdotes were fairly represented. However, in the end, these challenges improved my knowledge of narrative inquiry. During this study, I required self-reflection, sensitivity, and flexibility to balance my roles as a researcher and teacher. I experienced a confused state, especially when the participants’ narratives moved from my assumptions about the nature of science learning. But these tough times also served as learning opportunities that pushed me to rethink my theoretical underpinnings and analytical methods.

Shaping the study subject, interviewing, analyzing the data, and identifying themes were some of the key phases in this journey. This journey turned into a radical shift of learning, unlearning, and relearning rather than only investigating science education. I am aware that research is sensitive. With my own experiences and feelings, I created narratives from sample questions designed to inquire about my research participants. It showed the detailed aspect of science learning of how, where, and why it occurs. This approach broadened my study and provided that learning is a relational process influenced by interactions among students, teachers, and the larger educational fraternity.

Reflections on My Research Journey

This journey was initiated before the formulation of my research question. As a middle-class student who excelled academically in my school days, I was always torn between mixed emotions- feelings of fascination and frustration. Even though I was very good at the theory, I often felt nervous about the numerical problems between the chapters, especially in physics. The stories of the celestial bodies, planetary science, mysteries of chemical reactions, and the reasoning of physics all captivated me with the beauty of science.

At first, I wanted to be a doctor. But in the end, I decided to become a paramedic and then a teacher after seeing that I could impact children in the years to come. While teaching science in a high school, I realized unexpected things. I learned that rote memorization, inadequate hands-on activities, lack of motivation and conceptual understanding, teacher-centered learning, and a focus on content rather than inquiry-based critical thinking were some of the problems with science learning. Each participant's story touched an emotional chord. It also provided insightful information that students opt for science learning in the coming days, which can be resourceful to many.

The methods were similar to what I had experienced in my school days. There was nothing new. Behaviorist curriculum persisted over inquiry and critical thought. This realization drove me to conduct this research by compelling me to hear students' stories. One exciting part of this research was how students cope with their personal experiences with science. This work has strengthened my belief that it captures the depth of their emotion and experiences. It gives voice to those who are marginalized and are often considered inferior. It also made me rethink my prejudices and assumptions and consider scientific education from my participants' point of view. Working with these students to make meaning has been eye-opening, and shared learning is one essential component of socioconstructivist theory.

Developing My Research Plan

My research objective is based on my experience teaching science in secondary schools. As I have seen many students facing hardships in the subject, I see this as an opportunity to research the main agenda- ‘Science Learning’. I have used narrative inquiry to enhance science instruction. Based on my experience as a teacher, I have realized that effective teaching pedagogies must be adhered to in the classroom. Traditional teaching approaches that focus on content and provide less concept make learning difficult for students. This motivated me to pursue an M.Phil. in STEAM Education, and after my M.Sc. in Microbiology. I started studying modern approaches to teaching like constructivism, critical pedagogy, and so on. Such practices are multifaceted and truly student-centered. My research focused on bridging the gap between theoretical knowledge and real-world applications. I am always curious to know how students perceive and learn science. It has been my asset to reproduce this dissertation.

Framing My Research Question

Developing my main research question, ‘How do secondary-level students narrate their experiences of learning science?’ was a foundational move in my study. It began as a result of persistent passion. Changes to the questions have been made a multitude of times. I was able to craft this research question after reading more and getting feedback from mentors. Originally, the question seemed to be more obscure. My first goal was to identify the root cause of the student’s disengagement in the science classroom. But as I learned more by listening to stories, I felt that their narratives also touched on agency, curiosity, perseverance, resilience, and challenges.

I must ensure that the students' narratives accurately portray their voices in my research. They have extensively talked about teachers' instructional approach, peer relationships, and sociocultural environment, which influenced in one way or the other. As I constantly developed this study, I analyzed students' narratives from a practical, emotional, and cognitive standpoint. It has been observed that learning enables continuous thinking, feeling, and acting. The three teaching philosophies, namely executive, facilitative, and liberationist, displayed the effects of structured instruction, group projects, and emancipation in student involvement. Science education, when taught with inquiry, critical thinking, and active engagement, leads to increased learning outcomes with the addition of curiosity, teamwork, and experiential learning. Thus, the interpretivist and critical paradigms expose knowledge's subjective and analytical aspects, respectively. They both served as the cornerstone for the development of the research problem. Krajcik and Czerniak (2018) use such a pedagogical philosophy in which there is a combination of learning and motivational principles with practical ways to teach science. They support project-based learning (PBL) as an indispensable strategy. It facilitates experiential learning and takes scientific research into account. Students were given opportunities like formulating questions, designing prototypes, observing nature, and developing explanations based on evidence. PBL assists teachers in making lesson plans more relevant and practical. It shows my dedication to empowering students as active learners. In this way, I got closer to capturing the core of my research with each iteration.

Responding to My Research Question

To address the study topic, I used narrative inquiry to assess the experiences of six secondary school students with varying educational backgrounds. Participants were given a forum to discuss their experiences through semi-structured interviews, ranging from moments of wonder and revelation to difficulties interpreting key scientific concepts. Important themes emerged from their stories, such as the value of experiential learning, the transforming potential of inquiry, and the connection between instruction and teamwork. Through a thematic analysis, I found links that emphasized the shortcomings of conventional pedagogies and the potential for creative approaches to improve the applicability and interest of science learning.

Democratic Questioning in the Science Classroom

Participants were asked with open-ended inquiry techniques. Each student was provided equal participation opportunities, irrespective of their academic history. Saugat, for instance, explained that his teacher purposefully rearranged the questions in the classroom to create a cordial setting. Each student feels appreciated and valued, and even the school is. This approach encouraged every student to respond, regardless of whether they are academically advantaged or disadvantaged. But Anjila saw that some teachers unknowingly only focused on exceptionally talented students, leaving the others unconcerned. The anecdotes validate the importance of democratic questioning for students. This creates a classroom climate that values participation, mutual learning, and respect.

The study found that students agreed it's important to balance easy and challenging questions in science lectures. Low-level questions were essential for reinforcing basic knowledge, whereas high-level ones encouraged critical thinking and application. For instance, Pema explained how her teacher separated the questions into more challenging and simpler ones, such as 'How would you design an experiment to test this hypothesis?' This method not only increased her comprehension but also aroused her interest. On the other hand, participants complained that classes were boring and deterred participation due to an over-reliance on simple questions like ‘Define Newton's Laws.’ The results imply that a deliberate combination of the two question kinds can improve understanding and critical thinking.

The stories also emphasized the importance of organized and unplanned research in science classes. By planning their questions ahead of time, teachers could facilitate discussions and ensure that important topics were covered. Karma, for example, described how his teacher introduced the idea of chemical processes using a series of prepared questions that gradually made it harder for him to level his understanding. However, student responses to unexpected questions were equally significant. Anshrika explained that her teacher impromptu discusses genetic anomalies and hereditary traits to satisfy students' curiosity. This adaptability encouraged stronger participation and showed the merit of responsiveness to students' queries.

How Inquiry Affects Student Involvement

Probing questions when asked to participants about their learning culture in the classroom, fairs, lab, projects, or even research significantly increased their interest in science. Bisakha described that her teacher promoted cooperative learning and active engagement in class discussions. When asked challenging questions, Anjila also proclaimed feeling more responsible and motivated to study. Conversely, most students were hesitant or uninterested in such questions. The narratives support the idea that logical questioning aids in students' understanding and enriches an interactive learning space.

Problems in Putting Effective Questions into Practice

The narratives illustrate the setbacks students confront when putting theoretical questions into reality. Time limits avoided in-depth conversations. Others pointed out that different teachers have their school of thought. It depends upon the teacher when formulating provocative questions or advancing arguments (Dahal, 2017). For example, Saugat mentioned examples where his friends lost interest when they were posed questions continuously. These difficulties imply the need for curricular changes and targeted teacher development courses emphasizing questioning as an integral component of science learning.

Engaging with Theoretical Lenses

It has helped revisit the theoretical underpinnings of my research, namely the interpretivist and the criticism paradigm, and the socio-constructivist theory. Socio-constructivism entails how context shapes cognition and holds that knowledge is created via social interactions and experiences. Students' learning journeys were influenced by their prior experiences, interaction with peers and teachers, environmental factors, and digital mediated technologies, just to name a few. This theoretical perspective understood those frameworks. The significance of social constructivism for science education is argued by Khalid et al. (2023). He identified it as a driving force behind curriculum reform. Social constructivism increases student achievement in science and technology, illustrating innovative design thinking. Such modules suggested diversity, collaboration, and engagement.

I gained a thorough understanding of the subjective nature of these narratives by using the interpretivist paradigm. It acknowledges that each student's story is shaped by their perspectives and contexts. I enhanced my analysis and interpretation by analyzing these theoretical frameworks. Vygotsky's theory serves as the basis for this framework as it highlights the roles that social interactions, cultural contexts, and group learning play during knowledge formation. The interpretivist paradigm further states the importance of students' narratives as subjective and placed within socio-cultural settings.

By applying the critical paradigm, I hope to enhance secondary school students' perceptions regarding the insight of science. This involves creating a climate in the classroom where students are motivated to ask questions, assess scientific theories, and apply what they have learned to real-world problems like environmental issues or technological advancements. Criticism in classrooms also motivates students to take responsibility for their studies. Educational criticism aims to encourage students' critical thinking, support curriculum development, and improve educational practice, in-depth contemplation, and active questioning throughout the learning process. It enables students to envisage and argue with standard concepts critically. It helps to connect theory to practice and constructively analyze what they have learned rather than simply collecting data.

The participants' stories illustrated the dynamic interplay between individual initiative and collective engagement. These results validated Vygotsky's Zone of Proximal Development hypothesis, which maintains that learning occurs through supervised social interactions in a supportive environment. Additionally, this perspective addressed the limitations of traditional behaviorist approaches that prioritize memorization over conceptual understanding. The findings provide a shift toward constructivist pedagogies. It focuses on inquiry, collaboration, and contexts, which is consistent with theoretical underpinings based on recent discussions in science education.

My Methodological Pathways

Methodological pathways have to be shared when executing research. I choose to use narrative inquiry as my methodological framework to evaluate students of Grade 10 regarding Science learning experiences. Through narrative inquiry, each participant's stories are analyzed in detail, providing a plethora of vignettes for understanding. I tried to co-construct meaning with the participants through vignettes, conversation, and theme analysis, ensuring students' voices are central to the study process. However, there were challenges associated with this approach. Engaging with students' perspectives required a careful balancing act between ethical considerations, particularly when it came to ensuring that their voices were appropriately conveyed. I overcame the challenges of consent and confidentiality and the potential impact on participants' lives of sharing personal stories. These ethical dilemmas brought into focus that the liability to answer follows qualitative research. Merriam and Grenier (2019) claimed that qualitative research is essential for analyzing the intangible aspects like trust, care, sense of belonging, creativity, and emotions of the student experience. It made me aware of students' experiences as I had the privilege of hearing meticulously, respecting truly, and considering thoughtfully.

Additionally, the challenges of addressing numerous narratives from 6 participants showed me the importance of reflexivity in my methodology. To recognize my biases and assumptions, they have to be recognized so that they can influence or not. After reviewing my participants' stories, I learned to address them critically. I was conscious of power dynamics in the researcher-participant relationship, such as practicing reflexivity and meaning-making while interpreting the effects and outcomes.

Reflecting My Implications

My research has an extensive branch that takes place in and out of the classroom, and is also resourceful for students, teachers, and concerned stakeholders.

It adds to the contemporary discourse about pedagogical approaches and science learning. This study promotes a more inclusive and student-centered method of teaching science by listening to students, placing them at the centre of the stage. Teachers acknowledge the importance of students' voices in learning settings that encourage inquiry, teamwork, and experiential learning. Narrative inquiry can be done as an effective approach to study educational experiences from the data gathered. They demand that a pedagogical shift is needed to encourage student-centered, inquiry-based techniques consistent with socio-constructivist tenets. Teachers need to be prepared to design inclusive learning settings. It is also sensitive to catering to their students' various needs and goals. The study also showcased the importance of incorporating student voice into curriculum development and evaluation procedures. Teachers and policymakers may help students develop a sense of agency and ownership by appreciating their viewpoints, ultimately improving their participation and academic performance in science.

Conclusion

This study explored learners' experiences and highlighted the importance of rethinking science learning at the secondary level as dynamic and inclusive by elevating the students' voices. I must summarize the results and consider their implications for science education. This study highlights the importance of educational strategies prioritizing students' voices and providing insightful information. Hearing these stories, teachers and students can better understand the complexities of teaching and learning science. The main objective of this study was to promote instructional strategies that increase understanding and engagement among students. As conventional approaches frequently fail, creative approaches that cater to students' experiences are desperately needed in this modern Gen Alpha society.

Teachers must be prepared with resources and training that support inquiry-based classrooms where students' opinions are valued. The study's emerging questions point to directions for further investigation, such as exploring the effects of various teaching philosophies on student participation in multiple settings. This chapter concludes by reflecting on my research experience and extending an invitation for further discussion on enhancing scientific instruction by genuinely interacting with student narratives. The results challenge conventional knowledge and promote systemic reforms in education by urging inclusive, collaborative pedagogies that empower students, elevate their voices, and encourage lifelong engagement with science. It has been found that Science learning takes place when it is followed by conceptual understanding, team work, real life practical settings, laboratory works, place based learning, continuous reflection, peer interaction and student centered instructional approaches.

Limitations of My Research

Although this study provides insightful information on how students view science learning, it is essential to recognize its limits. Six secondary school students from Tarakeshwor Municipality comprise only a few of the research participants, which restricts the range of viewpoints and universality to other demographics and educational settings. Even if reflexivity was maintained, the narrative inquiry approach's reliance on data provided by the participant included potential biases such as episodic memory and the researcher's subjective nature, despite its ability to facilitate in-depth analysis.

Nepal's exclusive cultural and educational environment limits the study's application to other regions. Since learning is dynamic, temporal constraints hinder the capacity to document longitudinal changes in students' views and experiences. Future studies could use longitudinal designs to examine how students' narratives change over time, increase the number of research participants, and include various geographical areas to overcome these constraints. Findings could be triangulated using multiple techniques, including teacher interviews and classroom observations, improving validity.

Looking Forward

As I wrap up this chapter, I feel optimistic about the potential for more scientific education research. New developments offer fascinating opportunities for investigation, such as the use of technology in the classroom and the increased focus on social justice in education. Future research might look more closely at how these patterns relate to students' stories, providing a deep-seated understanding of how science education is changing. Furthermore, real-world implementations of this research can promote inclusive, student-centered science classrooms where every student feels free to tell their story. Teachers and policymakers may collaborate to establish learning realms that respect diversity and fairness in science education by prioritizing students' voices. This dissertation has been a very personal journey in addition to an intellectual undertaking. It has strengthened my conviction that stories can bring educational challenges and encourage revolutionary adjustments in teaching methods.

My participants' stories witness the depth of their experiences and the possibilities for development and comprehension in science learning. I take them with me as I look to the future. Longitudinal studies could also look at how collaborative and experiential learning styles affect students' academic and personal growth over the long run. Everyone can prosper, yet hardship is a regular aspect of life, according to Osher et al. (2020). We can better understand the connections between thriving, equity, and learning by investigating these concepts. This method questions accepted practices in education. Encouraging inclusive cultures in science classrooms enables students to flourish and realize their most significant potential. These approaches can improve the conversation about science learning and help create more inclusive and life-changing educational opportunities.

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APPENDICES

Appendix I: Interview Guidelines

<u>Introduction</u>

Greetings

Introducing myself to the participant, administration (name, working station, my research objectives).
Explain the participants on how can best learning be fit to the students opting science subject.
I will ask what was their prior and current learning experiences and how would they like to learn the subject in the near future.
Information collected during the course of the project will be kept safe.
Participants' name will be kept anonymous.

<u>Interview Guide</u>

Good morning/ afternoon/ noon/ evening

- How are you?
- How is the school learning experience?
- How are teachers in terms of teaching, cooperating, facilitating ……?
- Which are/ is your favorite and the least liked subjects? What led you to say so?
- What do you like/ dislike about me doing such a research project taking you student as a participant?
- How can we make it better for students and as a whole the school environment when we carry out research for this subject?
- How are your friends? How curious, eager they are in subjects?
- Do you love academic or non-course books?
- How often do you watch TV or surf the internet or …….?
- Which genre do you love the most which you engage in TV or surfing the internet?

- Do you love Sci-fi, geographic movies, or shows in channels?
- How do teachers teach subjects?
- How often do you visit labs, excursions….?
- How did they help in understanding subjects?

(Group work/ collaboration/ lecture method/chalk & talk/Teacher centric/student centric)

- Do your teachers finish the course on time? What do you love the most when in science class?
- How was your online learning experience in zoom/ teams/ google classroom/ meet (Learning application tools)?
- Do you think that 25 CAS marks were appropriate? What do you think was done? How it should be?
- How does your teacher measure knowledge, skills, and attitude in assessing subjects?
- How do teachers differentiate the instructions to meet the needs of learners?
- How do teachers assess students' work?
- Is there a certain number of assessments that should be graded in your school within a fixed time (monthly/bimonthly/trimeseter)?
- Are there alternatives to letter grades? Reflect on how you were graded as a student?
- What options would you think the most effective feedback (goal referenced, tangible & transparent, actionable, user-friendly, timely, ongoing, consistent)?
- Why assessment is important to drive student learning?
- How do assessments identify students' weaknesses and strengths?
- What was the type of assessment that your teacher provides?
- Which type of assessment do your teachers, or school follow?

Formative	summative
Informal	formal
Continuous	final
Process	product
Divergent	convergent

- What are the difficulties/constraints/disempowering forces that students face while learning science?

- Is it really difficult for students as they don’t give time or might be teachers not dedicated?
- What would you expect from school to enhance or strengthen your learning experience?

Thank you for participating and can I contact you again if I have any further questions or need further clarification?

Appendix II: Parental Consent Form

Research Title:

STUDENTS' EXPERIENCES OF LEARNING SCIENCE IN SECONDARY CLASSROOM: A NARRATIVE INQUIRY

Researcher:

Amrit Bhandari
MPhil, STEAM Education
Kathmandu University

Dear Parent/Guardian,

request has been sent to your child to take part in a study that looks into how secondary school students learn science. To gain an understanding of how students learn, what challenges they face, and what motivates them to move forward, I am eager to hear their personal stories.

What Will Happen in the Study?

• Your child will be inquired to share their own experiences while learning science.

• 45–60 minute one-on-one interviews, will take place at multiple rounds.

• The interviews will be audio recorded so that it can be listened meticulously and describe their stories later.

• The information exchanged will be responsibly presented and used only for scholarly purposes.

Confidentiality and Privacy

• Your child's identity will be kept confidential.

• A pseudonym will be used while writing in a paper.

• No photographs or recordings will be taken.

Statement of Consent

• You understand the objective of the study.

• You understand that participation is completely voluntary.

Child's Portfolio

Name of Child**:** ____

Name of School**:** ____

Name of Guardian**:** _____________________________

Signature**:** __________________________ Date**:** ___________