

EXPLORING STUDENTS' EXPERIENCES OF MOBILE DEVICE USE IN
STEAM-ORIENTED LEARNING: A NARRATIVE INQUIRY

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AN ABSTRACT

of the dissertation of *Sandila Basnet* for the degree of *Master of Philosophy in STEAM Education*, presented on *16 April 2026*, entitled *Exploring Students' Experiences of Mobile Device Use in STEAM-Oriented Learning: A Narrative Inquiry*.

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From accessing information, communicating, and learning to conducting business and engaging in entertainment, the wide use of mobile devices reflects its multifaceted impact on how individuals and society function in the technological era. Its rapid advancement and widespread adoption in day-to-day activities have meaningfully influenced educational practices at the higher education level. Moreover, university students demonstrate a high level of reliability in mobile devices for their academic learning experience, mainly after the post-pandemic context. However, their growing use has led to distractions during learning, reduced face-to-face interaction, hindered creativity, hindered the development of strong interpersonal skills in many students, and also affected twenty-first-century STEAM skills in Nepal. Thus, the purpose of the research is to uncover how mobile devices are influencing the academic learning process, examine potential benefits and challenges within this evolving educational paradigm, and assess their influence on STEAM approaches. For the study, I selected six participants using a criterion-based selection strategy and employed narrative inquiry as the research design to explore the lived experiences and stories of university students and how they engage with mobile devices in educational settings. Guided by social constructivist theory, my study examined how participants constructed knowledge through interactions with peers, teachers, and mobile devices.

Subscribing to the interpretivist paradigm, I have conducted in-depth narrative interviews with participants, focusing on their experiences before and after integrating

mobile devices into their academic learning, and have analyzed the data using thematic analysis. To ensure the credibility and quality of the research, trustworthiness, authenticity, and reflexivity were further supported by the temporal, social, and spatial dimensions. The study found that mobile devices empowered students and transformed their academic learning patterns by strengthening their autonomy and independence, enabling them to access multiple sources of knowledge aligned with interdisciplinary STEAM approaches, such as inquiry-based and hands-on learning, and to develop problem-solving skills. However, due to over-dependency on these devices, participants have experienced a decrease in creativity and critical thinking skills. The intersection of device, learner, and social aspects (DLS) of the FRAME model revealed that learning occurs beyond individual abilities or technological access; instead, it is a dynamic, socially connected process through sharing and collaboration. In the initial phase of learning, participants showed a dependent learning style, relying heavily on their lecturer and peers to complete learning tasks. However, when they started using mobile devices, they shifted to a collaborative learning style. Moreover, in a digitally mediated environment, participants' learning reflected elements of both active and reflective learning styles. Thus, the research shows that integrating technology into academic learning can enhance holistic, learner-centered approaches. The research will be helpful for educators, policymakers, and researchers, as it can serve as a background for further research and aid in improving pedagogical approaches to thoughtfully integrating mobile devices into the academic learning environment. Moreover, this opens the door to further research on the effective use of mobile devices by students in their academic learning process and on ways to enhance twenty-first-century skills through STEAM approaches.

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16 April 2026

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शोध सार

स्टिम शिक्षामा दर्शनशास्त्रको स्नातकोत्तर उपाधिका लागि सन्दिला बस्नेतको शोधप्रबन्धको शीर्षक “STEAM उन्मुख शिक्षामा मोबाइल उपकरण प्रयोगसम्बन्धी विद्यार्थीहरूको अनुभवको अन्वेषण: एक कथात्मक अध्ययन” ३ वैशाख २०८३ मा प्रस्तुत गरिएको थियो।

.....
निरोज दाहाल, पीएचडी

शोध निर्देशक

सूचना प्राप्ति, सञ्चार, सिकाइ, व्यवसायिक क्रियाकलाप तथा मनोरञ्जनमा संलग्नतासम्म, मोबाइल उपकरणहरूको व्यापक प्रयोगले प्राविधिक युगमा व्यक्ति तथा समाज कसरी सञ्चालन हुन्छ भन्नेमा बहुआयामिक प्रभाव पारेको देखिन्छ। यसको तीव्र विकास र दैनन्दिन जीवनमा व्यापक प्रयोगले विशेषतः उच्च शिक्षामा शैक्षिक अभ्यासहरूमा महत्वपूर्ण प्रभाव पारेको छ। विशेष गरी महामारीपश्चात् सन्दर्भमा विश्वविद्यालयका विद्यार्थीहरूले आफ्नो शैक्षिक सिकाइ अनुभवका लागि मोबाइल उपकरणहरूमा उच्च निर्भरता देखाएका छन्। तर, यसको बढ्दो प्रयोगले सिकाइका क्रममा ध्यान विचलन, प्रत्यक्ष अन्तरक्रियामा कमी, सिर्जनात्मकतामा ह्रास, अन्तरव्यक्तिगत सिपहरूको विकासमा अवरोध तथा नेपालमा २१औँ शताब्दीका STEAM सिपहरूमा समेत प्रभाव पारेको देखिएको छ।

यस सन्दर्भमा, यस अनुसन्धानको उद्देश्य मोबाइल उपकरणहरूले शैक्षिक सिकाइ प्रक्रियामा कसरी प्रभाव पारिरहेका छन् भन्ने उजागर गर्नु, यस परिवर्तनशील शैक्षिक परिप्रेक्ष्यमा यसको सम्भावित फाइदा तथा चुनौतीहरूको विश्लेषण गर्नु र STEAM दृष्टिकोणमा यसको प्रभावको मूल्याङ्कन गर्नु रहेको छ। अध्ययनका लागि मापदण्डमा आधारित छनोट विधिबाट छ जना सहभागी छनोट गरी कथात्मक अनुसन्धान विधि (Narrative Inquiry) अपनाइएको छ, जसले विश्वविद्यालयका विद्यार्थीहरूको जीवन्त अनुभवहरू तथा उनीहरूले शैक्षिक वातावरणमा मोबाइल उपकरणहरूसँग कसरी संलग्न हुन्छन् भन्ने कथाहरू अन्वेषण गर्दछ। सामाजिक संरचनावादी (social constructivist) सिद्धान्तद्वारा निर्देशित यस अध्ययनले सहभागीहरूले सहपाठी, शिक्षक तथा मोबाइल उपकरणहरूसँगको अन्तरक्रियाबाट कसरी ज्ञान निर्माण गर्छन् भन्ने कुराको अध्ययन गरेको छ।

अर्थव्याख्यात्मक (interpretivist) प्रतिमानको आधारमा सहभागीहरूसँग गहन कथात्मक अन्तर्वार्ताहरू सम्पन्न गरी मोबाइल उपकरणहरू समावेश हुनु अघि र पछिका उनीहरूको शैक्षिक अनुभवहरूमा केन्द्रित भई तथ्याङ्क सङ्कलन गरिएको छ। उक्त तथ्याङ्कको विश्लेषण विषयगत विश्लेषण (thematic analysis) विधिबाट गरिएको छ। अनुसन्धानको विश्वसनीयता र गुणस्तर सुनिश्चित गर्न

विश्वसनीयता (trustworthiness), प्रामाणिकता (authenticity) र आत्मपरावर्तनशीलता (reflexivity) लाई समयगत, सामाजिक तथा स्थानगत आयामहरूले थप सुदृढ पारेका छन्। अध्ययनले देखाउँछ कि मोबाइल उपकरणहरूले विद्यार्थीहरूलाई सशक्त बनाउँदै उनीहरूको शैक्षिक सिकाइ ढाँचामा रूपान्तरण ल्याएका छन्। यसले उनीहरूको आत्मनिर्भरता र स्वायत्तता वृद्धि गर्दै बहुविषयगत STEAM दृष्टिकोण (जस्तै: अनुसन्धान-आधारित तथा प्रयोगात्मक सिकाइ) अनुरूप विभिन्न स्रोतहरूबाट ज्ञान प्राप्त गर्न र समस्या समाधान गर्ने सीप विकास गर्न सहयोग पुर्याएको छ। तर, अत्यधिक निर्भरताका कारण सहभागीहरूमा सिर्जनात्मकता तथा समालोचनात्मक चिन्तन क्षमतामा केही हास आएको देखिन्छ।

FRAME मोडेलअन्तर्गत उपकरण, सिकने व्यक्ति तथा सामाजिक आयाम (DLS) को अन्तरसम्बन्धले सिकाइ केवल व्यक्तिगत क्षमतामा वा प्रविधिमा पहुँचमा मात्र सीमित नभई यो साझा र सहकार्यमार्फत हुने गतिशील सामाजिक प्रक्रिया भएको देखाउँछ। सिकाइको प्रारम्भिक चरणमा सहभागीहरूले आश्रित सिकाइ शैली प्रदर्शन गरेका थिए, जहाँ उनीहरू शिक्षक तथा सहपाठीहरूमा निर्भर थिए। तर, मोबाइल उपकरणहरूको प्रयोगसँगै उनीहरू सहकार्यात्मक सिकाइ शैलीतर्फ रूपान्तरित भएका छन्। साथै, डिजिटल माध्यमयुक्त वातावरणमा उनीहरूको सिकाइ सक्रिय तथा मननशील (reflective) सिकाइ शैलीहरूको मिश्रण देखिएको छ। तसर्थ, यस अनुसन्धानले देखाउँछ कि शैक्षिक सिकाइमा प्रविधिको एकीकरणले समग्र (holistic) र विद्यार्थीकेन्द्रित दृष्टिकोणलाई सुदृढ गर्न सक्छ। यस अनुसन्धानले शिक्षक, नीति निर्माता तथा अनुसन्धानकर्ताहरूलाई उपयोगी पृष्ठभूमि प्रदान गर्नेछ र मोबाइल उपकरणहरूको प्रभावकारी तथा विचारशील प्रयोगका लागि अध्यापन विधिमा सुधार गर्न सहयोग पुर्याउनेछ। साथै, यसले भविष्यमा मोबाइल उपकरणहरूको प्रभावकारी प्रयोग तथा STEAM दृष्टिकोणमार्फत २१औँ शताब्दीका सीपहरूको विकास सम्बन्धी थप अनुसन्धानका अवसरहरू सिर्जना गर्नेछ।

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सन्दिता बस्नेत

उपाधि उम्मेदवार

३ वैशाख २०८३

This dissertation entitled *Exploring Students' Experiences of Mobile Device Use in STEAM-Oriented Learning: A Narrative Inquiry*, presented by Sandila Basnet on 16 April 2026.

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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.

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DECLARATION

I hereby declare that this dissertation is my original work, and it has not been submitted for candidature for any other degree at any other university.

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ABBREVIATIONS

DL	Device Usability
DoE	Department of Education
DS	Social Technology
FRAME	Framework for the Rational Analysis of Mobile Education
GoN	Government of Nepal
GPA	Grade Point Average
IBL	Inquiry-Based Learning
ICT	Information and Communication Technology
IEMIS	Integrated Educational Management Information System
IT	Information Technology
KU	Kathmandu University
LS	Interaction Learning
MKO	More Knowledgeable Others
MoE	Ministry of Education
MoST	Ministry of Science and Technology
NCF	National Curriculum Framework
NEP	National Educational Policy
NOU	Nepal Open University
OLPC	One Laptop Per Child
OS	Operating System
PDA	Personal Digital Assistant
PU	Purwanchal University
RFID	Radio Frequency Identification
SESP	School Education Sector Plan
SSDP	School Sector Development Plan
SSRP	School Sector Reform Plan
STEAM	Science, Technology, Engineering, Arts, and Mathematics
TU	Tribhuvan University

UNESCO United Nations Educational, Scientific, and Cultural Organization

ZPD Zone of Proximal Development

CHAPTER I

INTRODUCTION

In this chapter, I have articulated the background of the research agenda that sets the context. The statement of the problem outlines the specific issue being addressed, and the research purpose highlights the specific goals my research study will focus on. Furthermore, my research questions provide a clear focus and direction for my study. Likewise, the significance of the study lies in the potential contributions my research will offer.

Background of the Study

In recent years, technology has become an integral part of our lives. It has transformed how we communicate, access information, and carry out everyday activities, and it has also influenced every domain, such as education, business, social areas, healthcare, and many more. Likely, in recent years, Nepal has also witnessed Information and Communications Technology (ICT) integrated into its educational policies and practices (Bhandari et al., 2025). Regarding digital adoption in Nepal, mobile penetration exceeded 100%, while internet penetration reached 63% (Ministry of Communication and Information Technology [MoCIT], 2019). This indicates a high likelihood of ICT policies' success in the Nepali education system. However, not long ago, educational practices were entirely confined to educators or facilitators who emphasized long-established lecture practices, assignments, and evaluation based on class quizzes and terminal examinations (Tran, 2016). Traditional work on education's dimensions focuses solely on implementing specific procedures, plans, strategies, and skills for student engagement (Brenda & Portelli, 2004). Thus, the culture of this teaching approach was passed down from one generation to another, and the educational outcomes are not as top-notch as they should be. As per the study conducted in the School Education Sector Plan in Nepal, the teaching process needs to be improved by upgrading teachers with new knowledge, skills, and technology, and by more effectively and widely employing ICT in teaching and learning (Ministry of Education, Science & Technology [MoEST], 2022).

Coming from an IT background, I perceive technology as the architect of our modern world, intricately designing the bridges that connect our ever-evolving digital landscape. I believe Technology serves as both the catalyst and canvas, having

advanced rapidly over the years and revolutionized every aspect of human life, spanning communication, transportation, healthcare, education, and entertainment. This is a technological era, and leveraging technology can significantly enhance and even revolutionize the educational process. Technology is widely used, information is constantly updated, and the customization of education has led to the emergence of remote, online, and mobile learning (Talan, 2020). It can advocate for affirming and advancing relationships between educators and learners, reform traditional ways of acquiring knowledge and working together with peers, reduce accessibility disparities, and adjust learning experiences to fulfill the needs of every learner. Wang et al. (2022) stated that the emergence of an industrial revolution has sparked a desire for educational changes, aiming to incorporate information and communication technology (ICT) into instructional practices.

Nepal has a robust stance on integrating information and communication technology (ICT) into the education sector. It underscores the imperative of leveraging technology for its schooling to align with technological practices (Rana et al., 2019). The National Curriculum Framework for School Education, 2005, has presented ICT as “a proven tool for educational transformation” (Ministry of Education and Sport [MoES], 2005, p. 11). Moreover, the National Curriculum Framework for School Education in Nepal, 2007, highlighted that the use of Information and Communication Technology (ICT) can be beneficial for communication, information transmission, and teaching across various subjects. Additionally, it emphasizes the incorporation of ICT into the curriculum as a separate and distinct subject (Curriculum Development Center [CDC], 2007). Furthermore, ICTs can help address structural problems in the education sector by expanding access to education services and helping bridge quality gaps (Ministry of Information and Communication [MoIC], 2015).

The mobile device has proliferated alongside the belief that using these devices is helpful for teaching and learning. In a fast-paced world where time is of the essence, the evolution of mobile phones transcends their traditional role as mere communication tools. Instead, they have transformed into convenient gateways to an abundance of information, accessible effortlessly in education through the development of various applications. Throughout my educational journey, I have been using mobile devices more frequently for a variety of purposes. Likewise, mobile phones' popularity among university students results in growing opportunities for

both the learning of students and the educator's teaching process in educational institutions. They have been immersed in a digital age characterized by the widespread availability and adoption of smartphones. The incorporation of mobile devices into the educational process allows teachers to introduce innovation into both teaching and learning methods (Heflin et al., 2017). With the onset of ubiquitous handheld technology, educators are exploring wide opportunities to integrate mobile devices into collaborative learning environments to enhance students' learning. It was clear that reliance on mobile devices had increased sharply during the COVID-19 pandemic. Mobile devices have seamlessly integrated into students' lives, serving as indispensable tools for learning, social interaction, and daily task management. As a result, there has been an unparalleled shift toward online education, with the use of mobile devices for learning (Oguntuase & Bakare, 2022). Simkhada et al. (2020) stated that during the pandemic, educational institutions improved their e-learning platforms by establishing shared distance-learning portals, ensuring access to educational content via mobile technology, thereby enhancing educational continuity.

The STEAM approach integrates the subjects of Science, Technology, Engineering, the Arts, and Mathematics. "A STEAM education could be defined as one that proposes an integrated teaching of scientific-technological, artistic, and, in general, humanistic competencies, with integration understood in a progressive sense that goes from interdisciplinary to transdisciplinary " (Perales & Arostegui, 2021, p. 2). Connecting diverse fields of subject knowledge with STEAM education helps cultivate a well-rounded individual capable of addressing challenges through creativity, critical thinking, and innovation. The STEAM approaches, i.e., Creativity, building confidence, gaining problem-solving skills, and nurturing collaboration, are imperative skills in the 21st century (Siregar et al., 2023). The authors further explored how STEAM delivered via mobile devices has effectively and efficiently enhanced students' learning. Nowadays, mobile technology-based learning has gained widespread popularity globally due to its multifaceted capabilities and proven effectiveness in facilitating diverse learning methods.

Statement of the Problem

Mobile technology has become an essential part of individuals' lives, transforming how they communicate and access reliable information. In early 2025, Nepal had a total of 39M active cellular mobile device connections, equal to 132% of Nepal's total population, and 16.5M internet users (Kemp, 2025). In Nepal,

smartphone use among college and university students has increased rapidly (Khatiwada, 2025). It was observed that after the COVID-19 pandemic, research primarily focused on device access, learning outcomes, and their prevalence. However, they have overlooked students' lived experiences and interpretations of mobile device use in their academic learning journey.

As per Shrestha (2016), there are growing efforts to explore ICT practices in the educational sector, and several studies focus on the use of mobile technology in both developed and developing countries. Thus, my main concern is to capture the lived experiences of university students regarding mobile device use in their academic learning in Nepal. The current uses of mobiles for learning in Nepal are not fully understood (Kaphle, 2019). Constant changes in mobile technology and a lack of proper research highlight the need for this research. Even though these devices are widely used in the academic learning process, how these devices are shaping the STEAM approaches, such as critical thinking, hands-on activities, creativity, inquiry-based learning, and collaboration, remains unclear within the Nepali context. The issue is critical to address, as it prepares university students for competitive demands and fosters development as adaptable, tech-savvy, and interdisciplinary thinkers in an ever-evolving digital landscape. Therefore, the core problem addressed in this study is the absence of a narrative-based understanding of university students' mobile device adoption and how this experience influences STEAM approaches.

Purpose of the Study

The purpose of this study is to examine university students' experiences with mobile devices in their academic learning and to understand how they narrate their experience of incorporating mobile devices into a STEAM educational approach.

Research Question

How do university students narrate their stories of adopting mobile devices in their learning processes?

How do students describe their lived experiences with the influence of mobile devices on STEAM learning approaches?

Rationale of the Study

The increasing use of mobile devices by university students for accessing information, communicating, and engaging in academic activities has transformed the global education landscape, including Nepal. The students are gradually shifting towards digital learning, which is like moving beyond traditional classroom walls.

Thus, I want to explore how using mobile devices can enhance pedagogical approaches that improve existing educational settings. This study will assist in understanding the transformative potential of integrating mobile technology within the STEAM education approaches. Today, students want to be active learners by interacting, exploring, and collaborating. So, examining how students narrate their experiences with these devices in their academic learning helps uncover how learning takes place in the digital environment.

In the Nepali higher education system, progress in digital transformation across many aspects is evident, but pedagogical adaptation is still in an evolving phase. So, without analyzing students' lived experiences, integrating technology remains only at the surface level rather than contributing to the construction of knowledge and the development of twenty-first-century skills, i.e., STEAM approaches. Thus, by analyzing participants' narratives and lived experiences, the study's findings can provide educators with practical insights into assessment that help address problem-solving abilities and critical thinking, relate knowledge to real-world contexts in this transformative digital age, and advocate for the holistic development of university students. Also, this will aid in identifying pedagogical approaches and various instructional techniques. The deeper insights from this research aid curriculum developers in adapting diverse content, methodologies, and learning resources to better cater to university students' varied learning preferences, thereby enhancing engagement.

Therefore, I would say this research is essential to explore how mobile device usage intersects with twenty-first-century skills, i.e., STEAM education approaches, especially in the context of Nepalese universities, and to provide a grounded understanding of how students experience and interpret technology-mediated learning in this digital age.

Structure of the Dissertation

There are six chapters in my dissertation. The first chapter provides the background of my study, followed by a problem statement that explains why the research is being conducted. The purpose of the study outlines the research's main agenda. This section also shows the significance of research for educators, researchers, and policymakers.

The second chapter reviews the literature related to my study. It is divided into thematic, theoretical, policy, and empirical reviews. The thematic review describes

the themes such as mobile devices, STEAM education and its approaches, Mobile device and learning frameworks, mobile technological aspects in learning, and the university students' learning process through mobile devices. In the theoretical review, I outlined the social constructivist theory and its key aspects, which I focused on learning. In the policy review, I discussed ICT policy; in the empirical review, I discussed literature relevant to my research topic.

The third chapter deals with my research methodology. Initially, I have discussed philosophical assumptions, i.e., ontological, epistemological, and axiological. I have discussed the research paradigm, which further justifies my research study. In research design, I elaborated on narrative inquiry as a research method. This focuses on collecting and analyzing stories or narratives to gain a deeper understanding of participants. Furthermore, I discussed the research participants, the total number, and the research site. I have elaborated on the data collection and analysis strategies of my narrative data. In quality standards, I detailed how I maintained the credibility and authenticity in my research. Finally, in the ethical considerations, I discussed how I maintained participants' confidentiality.

The fourth chapter presents and discusses the narrative stories as narrated by the six participants in the Kathmandu Valley. I have divided the stories into six different sections to focus on each participant individually. I have directly added the participant's stories in direct quotes to provide authenticity. A narrative approach to storytelling ensures that participants' experiences remain central to the analysis.

Chapter five analyzes the narratives thematically. It forms a discussion based on themes derived from narrative analysis through the lens of Social Constructivism. It is mainly for meaning-making and for unfolding students' academic learning activities. I have linked the narrative data presented as research questions, which provide in-depth findings for the study.

The final chapter concludes with overall insights into my study. This chapter outlines how I envisioned my research agenda and formulated my research question, chose the research methodology, outlined limitations, and discussed the research's implications, showing the study's significance by highlighting its contribution to the field and offering recommendations for further research.

Reflections on Chapter

In this chapter, I have established the research context and introduced the theoretical base. I have critically reflected on the traditional teaching pedagogies and

ICT practices in the academic learning process. Reflecting on my experience as a student, I have articulated the rationale, problem statement, and purpose of the study, and formulated a research question. Through research questions, the benefits and challenges of using mobile devices whilst learning can be examined, and the ways in which STEAM approaches are affected can be explored. This research is expected to provide teachers with a vision and goals for preparing students for twenty-first-century skills. In Nepal, this research will strongly advocate for the integration of mobile devices into the education sector.

CHAPTER II

LITERATURE REVIEW

The purpose of this chapter is to provide an overview of the existing literature underlying this research. This section examines the existing literature on mobile device use to understand better how other researchers have adopted mobile technology concepts and their roles in university students' learning processes. Several review studies have examined knowledge of mobile technology in educational practices.

Thematic Review

Thematic reviews are focused on identifying and analyzing themes or patterns that emerge from the literature on a particular topic. The author Dawadi (2020) states that it is generally a search for themes that leads to the capture of descriptions found in the datasets. This thematic section in my research provides clear views of different concepts relevant to my research and aids in synthesizing information from several studies. I believe these themes/concepts aid in simplifying the research agenda and give a clear view of the research objectives.

Mobile Devices

Mobile devices are portable electronic gadgets, such as smartphones, tablets, and wearables, that enable communication, computing, and information access while on the move. "Mobile devices such as PDAs, mobile/smart phones, and mobile computers are becoming increasingly ubiquitous and transforming everyday lives both at home and in the office" (Goud, 2014, p. 31). Moreover, the devices, likely notebooks, mobile phones, smart watches, tablets, convertible devices, and other forms of readers tend to be used by a large portion of the population, and children are also no exception (Fojtik, 2017). Since these devices come in different shapes and sizes, it vastly differs from each other in terms of hardware and software capabilities, likely in processing power, the size of the memory, resolution of the screen, the OS, different web browsers, different scripting languages, the supported file formats, and many more. (Georgieva & Georgiev, 2007). Just as computers have their own OS, mobile devices have an operating system that determines the functionality and features available on the devices, such as keyboards, thumbwheels, e-mail, wireless security, application synchronization, text messaging, and more (Goud, 2014). The

more updated the OS, the more benefits an individual can receive. The OS is the foundation that enables different applications, allowing users to access various features and digital learning environments. Mobile technology has become an essential part of today's life and has transformed the way we work, communicate, and access information. According to 2025 data, the total number of mobile users worldwide is projected to surpass 7.49 billion (Waweru, 2025). In Nepal, as of early 2025, cellular mobile connections accounted for 132 percent of the total population (Kemp, 2025).

STEAM Education and Its Approaches

Modern education seeks new methodological approaches to engage students in the learning process and to generate and impart knowledge. STEAM education has become one of the types of education that is essential for the educational system, and to face the challenges of today's society. The integrated five disciplines, likely Sciences, Engineering, Technology, and Mathematics pedagogies with Arts, take various forms with myriad intentions, processes, and positive outcomes (Carter et al., 2021). The STEAM approach changes students' thinking and learning processes. STEAM approaches focus on practical skills, develop students' creativity skills, and help students learn collaborative skills (Jurayeva, 2023). Project-based and inquiry-based learning aid students in building understanding by addressing real-world challenges using knowledge acquired throughout the experimental phase (Panasan & Nuangchalerm, 2010). The STEAM approach, Design-Based Learning, is a pedagogical approach in which learners apply prior knowledge and problem-solving abilities. Using this approach, students can enhance their talents and creativity by drawing on diverse resources and designing solutions through design (Azizan & Shamsi, 2022). Likewise, mobile devices facilitate STEAM education approaches, such as hands-on exploration through interactive simulations and virtual labs, and increase collaboration among students while learning.

Learning Styles of Students

Learning styles influence how students process and learn, as well as their approaches to different learning situations (Amir et al., 2011). Different classes use diverse approaches, whether for practical or theoretical purposes, and teachers play an important role in shaping students' learning styles to retain their attention during lessons. This makes them active learners in their learning process and also in the classroom (Hernandez & Alvarado, 2023). The concept of learning styles has a long

and evolving history in educational psychology. We can see that in the past several decades, there have been numerous theories and models that have been proposed to understand the ways people learn (Emma, 2024). Dunn and Dunn's learning-style model comprises different learning styles (Amir et al., 2011). In an independent learning style, students prefer to work with others who need less supervision from the instructor or teacher. They like to perform independent assigned tasks and feel that they know what is important for them. In the avoidant learning style, students prefer to avoid learning, and absenteeism is high. They prefer to be isolated in the classroom. A dependent learning style is about the type of learning where students are heavily dependent on their lecturer and peers to complete learning tasks. Collaborative learning is a learning style in which students prefer group work, discussion, and projects, as they believe they grow by sharing. In a participative learning style, Students are very attentive and complete their coursework requirements on time. Competitive learning style refers to a learning style in which students aim to perform better than others, take every competition seriously, and are dominant figures in classroom discussions (Amir et al., 2011).

The Felder–Silverman Learning Style Model was developed by Richard M. Felder and Linda K. Silverman in 1998. The Felder-Silverman divides learning styles into four dimensions: active-reflective, sensing-intuitive, visual-verbal, and sequential-global learning styles (Supangat & Saringat, 2020). Active-Reflective Learning Style, these types of learners tend to learn by just looking at things rather than reading textbooks. They prefer to work in groups doing brainstorming rather than working individually. Reflective learners tend to receive information, listen to it, and engage in deep thinking. " Unlike active learners, reflective learners prefer a learning situation with the opportunity to think about the information being presented without any distractions. Reflective learners sometimes take notes in lessons." (Supangat & Saringat, 2020, p. 8556). Sensing-Intuitive Learning Style: Sensing learners enjoy working with facts and figures, such as playing with numbers, and are patient. Intuitive learners do not like repetition; they like to work more with principles and theories. Visual-Verbal Learning Style: Visual learners perceive information through sight and grasp the whole concept. They prefer learning through pictorial demonstrations, such as flowcharts, drawings, and timelines. Verbal learners tend to perceive information just by hearing words. They can access information through formal written texts or informal speech. Sequential learners follow the instructions,

which makes them easier to understand. Global learners take time to understand a concept (Supangat & Saringat, 2020). The learning styles vary, and it should not be viewed as a determinant of achieving educational success; rather, they can serve as a valuable tool, informing learning experiences that personalize and engage development that respect the students' diversity in terms of aspects such as sensory, cognitive, and personality-driven needs (Emma, 2024).

Mobile Devices and Learning Frameworks

Mobile devices have become an inevitable part of human life. It is also essential to understand how mobile devices can influence the students' learning processes. However, there is concern about how a student can make full use of the device. How can learning through mobile devices be effectively used in both formal and informal settings? Thus, the Framework for the Rational Analysis of Mobile Education (FRAME) model offers insights that address such issues. The model was originally developed by Marguerite Koole in 2009, which expounds on mobile learning as an interaction among three aspects: mobile technologies, human learning capacities, and, lastly, social interaction. "The Framework for the Rational Analysis of Mobile Education (FRAME) model describes mobile learning as a process resulting from the convergence of mobile technologies, human learning capacities, and social interaction" (Koole, 2009, p. 25). This model provides in-depth knowledge of the technical characteristics of mobile technology, as well as the social and personal aspects of learning. In the FRAME model, mobile learning experiences are viewed as existing within a context of information.

The FRAME model describes three aspects of mobile learning: device (D), learner (L), and social (S). Basically, the device focuses on the technical aspects of mobile devices, such as their capacity and portability. Learner aspects concern prior knowledge, cognitive abilities, and motivation; social aspects concern interaction, communication, and collaboration among peers or teachers, which act as social constructivist aspects of knowledge construction. The model also highlights intersections of aspects, such as device usability (DL) and social technology (DS), which show the affordances of mobile devices. Interaction learning (LS) comprises instructional and learning theories, with an emphasis on social constructivism and the primary intersection among three aspects. Mobile learning (DLS) indicates an ideal mobile learning situation. Koole (2009) states that this model describes a mode of learning where, regardless of the location of the learners, both physically or verbally,

they can easily interact with various people or access the information/ systems from anywhere and anytime. This model considers the mobile device as a mediating tool that enhances learning through social engagement. Also, through software applications such as text messaging, email, or audio conferencing, mobile technologies may aid learners in interacting with people of learning communities as they can get information and negotiate meaning (Kenny et al., 2009). Through an examination of how extensively each part of the FRAME model is employed within mobile learning scenarios, professionals in the field, including practitioners, educators, and teachers, can employ the model to create impactful and well-designed mobile learning experiences (Koole, 2009).

Mobile Technological Aspects in Learning

The portability of mobile devices provides users with access to a broader, more flexible set of learning materials. Mobile technology has significantly expanded learning opportunities and has the potential to reach a global audience, making education more flexible and adaptable to individual needs. It supports a wide range of documents, including images, audio, and video, catering to diverse students' learning preferences. One of the main aspects of mobile devices is that they allow students to take control of their learning and switch their learning context from formal to informal or from personal to social (Dias & Victor, 2017). It aids the self-discovery process and develops imaginative thinking skills when multimedia instruction is delivered via a mobile device. Learners feel that using mobile devices allows for greater freedom and control over their learning process, i.e., self-regulated learning. The study by Lok & Hamzah (2021) reveals that mobile devices have proven to be an alternative platform for students to discuss ideas with other students.

University Students' Learning Process Through Mobile Devices

A university student is an individual who pursues a higher degree at a university, including both undergraduates and postgraduates (Xi, 2015). They have been immersed in a digital age characterized by the widespread availability and adoption of smartphones. In the case of mobile devices, i.e., mobile technology, it has become an essential part of today's life and has transformed the way we work, communicate, and access information. Learning has undergone a fundamental transformation due to the influence of mobile technologies, enabling students to access educational content anytime, anywhere, and providing interactive, personalized learning experiences (Martin & Ertzberger, 2013). Shrestha (2016) noted that the

focus of mobile learning has shifted significantly, moving away from basic content delivery on mobile devices to consider learners' mobility and transitioning from formal classroom settings to more informal contexts. In Parajuli's (2016) study, it was found that all undergraduates have mobile devices and use them informally both within and beyond their class settings. A maximum of them possess positive responses towards the use of mobile devices for learning. The result showed that learning materials and tools, i.e., mobile applications, designed to meet students' needs and consistently guided by an instructor, are beneficial for enhancing students' achievement and improving learning outcomes (Klimova, 2019).

Mobile devices offer multimedia capabilities that can enhance the learning experience and make it more engaging for students. Excessive mobile phone use among students was associated with lower grade point averages (GPAs) (Ayer & Thakur, 2019). Likewise, Wang et al.'s (2022) research findings show that the high smartphone usage group demonstrated superior academic performance compared to the low smartphone usage group. A learning process using mobile learning technology could improve student activity and understanding in the classroom (Rizal et al., 2021). Patil and Dhanawade's (2023) study showed that mobile phones are highly useful tools for students, as they can help them upgrade their skills and academic achievement by searching for the required content on the internet. These technologies offer learners flexibility; they can learn at their own pace and at a time that suits them. They can revisit content, review lessons, and engage in self-directed learning, which can contribute to improved academic achievement.

Theoretical Review

The theoretical reviews are vital because they help determine the research's problem statement, purpose, significance, and research questions. Turner et al. (2018) conclude that the theoretical review serves best when it provides a historical review of a theory's cycle, including how a specific theoretical agenda has been examined, supportive and non-supported hypotheses, and any other hypotheses that were provided, whilst making required adjustments due to non-supported hypotheses. Whilst categorizing the theoretical and conceptual foundations outlined across multiple research articles, one can derive insights into common themes and observe how researchers apply these foundations in the context of mobile learning in higher education (Krull & Duarte, 2017).

In my study, I have used a narrative inquiry approach, which allows for a deeper understanding and exploration of university students' lived experiences when they adopted mobile devices in their academic learning journey. Through Social Constructivism Theory, which covers technological aspects, it also addresses the social and collaborative dimensions that shape university students' learning process, elucidating the relationships among technology, social connections, and knowledge construction.

Social Constructivism

The social constructivism theory was introduced by Lev Vygotsky in 1968. The theory posits that knowledge is actively constructed by individuals within a social context, emphasizing the significance of collaborative learning and shared experiences. Social constructivism is a teaching technique that emphasizes student participation, discussion, brainstorming, and sharing. This technique allows for the creation of various groupings and interactive tactics (Saleem et al., 2021). The theory states that learners play an active role in constructing their knowledge, personalizing their learning journey, and building connections with others. In my research, I will be focusing on scaffolding, MKO, and ZPD.

“ZPD is Vygotsky's term for a series of tasks that are difficult for children to master independently but can be learned with help from others, such as teachers or more capable friends. “(Wibowo et al., 2025, p. 434). The ZPD illustrates how learners can advance their understanding by engaging in meaningful interactions and collaborative activities with others using technology. In scaffolding, skilled people such as teachers or students adjust their guidance level; when these students' abilities increase, the level of guidance decreases (Wibowo et al., 2025). The goal of scaffolding is to empower learners to become independent, self-regulated learners who can tackle complex tasks and challenges with confidence. The More Knowledgeable Other (MKO) refers to a person who understands better or have a higher ability than of a learner to perform any task, process, or concept (Md Yusof, 2021).“Social constructivism considered to be one of the deep approaches, is characterized by an orientation towards sense-making, construct- ing of personal understanding and active learning “(Marzouki et al., 2017, p. 31). This aligns closely with my research, as students at university use mobile devices within STEAM education. They do not just receive information passively; they actively seek it, analyze it, and synthesize knowledge.

Using mobile devices for learning purposes primarily implements a social constructivist approach, as it promotes activities such as collaboration and interaction (Marzouki et al., 2017). The theory also helps explain how university students learn through peer interaction by sharing information across social and communication networks using mobile technology. The author states that the teacher should not provide all the information that leads to the main agenda; instead, learners should be active, identify the main agenda, and then understand how the facts are derived (Polakova & Klimova, 2019). The teacher acts as a facilitator, providing only instructional support and adopting different teaching strategies that allow students to find and develop knowledge as they engage in collaborative activities throughout the learning process (Saleem et al., 2021). Moreover, the social constructivist theory positions facilitators not only as knowledge transmitters but also as enablers of activities such as collaboration and inquiry-based learning. Thus, through mobile devices, facilitators scaffold students, facilitate dialogue, and aid in problem-solving, empowering learners to construct knowledge. This aligns with my research focus, as when mobile devices are used to facilitate support, they create meaningful learning experiences for students and encourage active knowledge construction.

In my research, the theory will aid in understanding how interactions with peers and teachers influence the adoption and integration of mobile devices into their educational journey, with a focus on the dynamic and social nature of their learning process. Applying the theory to my research acknowledges how mobile technology supports knowledge acquisition and affects university students' learning processes through STEAM approaches. Thus, I realized that social constructivism is relevant to interpretive methods for understanding university students' learning and knowledge in the present world, particularly in light of technological advancements in social networks and e-learning.

Policy Review

This section discusses Nepal's Information and Communication Technology (ICT) policies. I have tried to cover Nepal's policies from the initial stage of ICT policy formulation and to update existing policies. Through ICT policies, many educational institutions develop and improve their own policies. This basically focuses on promoting educational institutions towards digitalization and improving the teaching and learning process.

ICT Policies

With the commencement of telecommunication services in Nepal, the history of ICT in Nepal dates back to 1913. Global academia has taken a quantum leap in ICT, forcing Nepal to embrace these changes as well. Thus, the Government of Nepal, along with the Ministry of Education, through the National Curriculum Framework (NCF), has initiated ICT as a subject and also used it as a tool for instruction in school education (Saha, 2023). Moreover, in the Constitution of Nepal 2015, in the section, Policies of the State on Articles 51(f5), it is stated that, “Developing and expanding information technology as required by the nation, and making its access easy and simple for the general public, and making maximum use of it for national development.” (Constituent Assembly Secretariat [CAS], 2015, p. 20). In this context, the government has emphasized ICT development across many of its educational-sector policies. As ICT integration advocates, we are developing and expanding various aspects of the education system, thereby advancing national development. Therefore, the first-ever IT policy was implemented in 2000. Even though the IT policy is reviewed every two years to keep pace with rapid technological changes, it was not updated until 2010. Karki (2019) stated that after the revision of the 2010 IT policy, the revised version included (1) integration of computer education into the curriculum from the school level and (2) expanding Internet access in schools, which aids in creating an environment for creating ICT structures in the educational sector. In the ICT Master Plan 2013-2017, there was notable progress in promoting equitable access, upgrading quality, and minimizing any digital division through the use of ICT.

Furthermore, the master plan for ICT in education served as a keystone for the government to understand the importance of an “explicit ICT in education policy in Nepal.” This plan comprises four components: ICT infrastructure, including internet connectivity; content development; human resources; and system enhancement (Karki, 2019). The ICT Master Plan (2013-17) has aimed to reduce the digital divide by refining ICT infrastructure, digital content, human resources, and overall educational enhancement. The mission of the plan is to enlarge equity in education and expand educational services, and to build ICT infrastructures, comprising equipment of ICT, Internet connectivity, multimedia classrooms, multiple virtual data centers, and collaborative learning environments, providing training programs, and developing human resources for ICT facilitators, instructors, policymakers, decorators, and administrators (Ministry of Education [MoE], 2013). In the ICT

Policy, 2015, ICT was considered one of the prime aspects of quality in the educational sector and placed importance on e-education, e-schools, capacity building, and e-learning. The 14th periodic plan emphasized minimizing the digital divide through the use of ICT and applied it across subjects such as Math, English, and Science for electronic and interactive learning, as well as for distance education. Different national policy frameworks, such as the School Sector Reform Plan (SSRP), the ICT Master Plan, and the National Curriculum Framework (NCF), have distinctively implemented ICT-related policy provisions in education (Paudel, 2015). Moreover, the author stated that the Government of Nepal (GoN) and the Ministry of Education (MoE) have already implemented the One Laptop Per Child (OLPC) program as a pilot in some districts. This indicates that now is the right time to promote ICT in education, thereby enhancing Nepal's overall education system. MoE has established computer labs in a few selected schools and has maintained internet connectivity in District Educational Offices and schools. Additionally, the central level agencies, along with provincial (regional) education directorates and all District Educational Offices, launched relevant websites. The Department of Education (DoE) has developed informative digital learning materials specifically for Grades II-VI students in subjects such as Nepali, English, Mathematics, and Science (Karki, 2019).

The SSRP (2009-16) has recommended implementing and expanding ICT-enabled teaching and learning processes in every school, developing infrastructure, providing teacher training, and offering various teaching methods using ICT (MoE, 2009). The School Sector Development Plan (SSDP) 2016-2023 included “ICT in Education” in its report. MoE has explained how crucial ICT is for providing quality education and for the country's overall development. The objective is also to deploy ICT across all grades of the Nepali educational sector to improve educational outcomes, while providing educational and training facilities. It is an extended form of SSRP intended to use technologies for managing different educational information, such as through IEMIS, along with ICT, establishing ICT learning centers, strengthening infrastructure in the model schools, developing required portal websites, such as e-libraries, providing training to teachers, and availability of both offline and online learning platforms (main focus on subjects such as English, Mathematics, and Science) through the use of ICT and preparing teaching and learning resources (such as DVDs, several animated materials or videos, etc.) specifically for subjects like Mathematics, Science, and English (MoE, 2016).

Furthermore, the plan mostly focused on various aspects of ICT in education, such as (1) using ICT appropriately to enhance the pedagogical practices, (2) developing instructional materials along with adequate human resources and integrating technology in the curriculum itself, and (3) using ICT for improvement (Joshi, 2017). The MoE has initiated the School Education Sector Plan (SESP), a 10-year project plan that includes ICT in education. The plan emphasizes the use of ICTs in education to strengthen student learning by making learning more relevant and to aid good governance in educational management (Ghimire, 2024). A few objectives of the plan include increasing ICT use in teaching and learning, delivering education-related services swiftly through ICT solutions, and improving overall education management through appropriate ICTs. Furthermore, Ghimire (2024) outlined some of the expected outcomes and targets of the plan: to establish an ICT center which comprises a digital learning platform, to expand ICT infrastructure in various schools along with extending internet connectivity, to develop ICT-based teacher training, and lastly to ensure the teaching and learning process is technology-enabled.

The National Educational Policy (NEP) 2076 is considered a holistic approach that aims to reshape the country's education system (Lal, 2025). Through the NEP, a paradigm shift in Nepal's educational system can be witnessed, as it mitigates inadequacies in historical and systemic aspects and aligns it with aspirations and global standards. The NEP strategy is to integrate ICT as an integral part of the teaching-learning process and to make the environment technology-friendly, more practical, and result-oriented. The 16th plan for FY 2024/25–2028/29 primarily focuses on digital transformation and technology-driven development as the two primary national strategies (Rajkarnikar, 2025). The author stated that Nepal's 16th five-year plan has emphasized the use of digital technologies to deliver effective public services, improve governance, and boost economic growth. Since education is one of the fundamental pillars of nation-building, the plan, directly or indirectly, helps integrate ICT into the education sector to enable a technology-driven nation. Education sector plan, 2021-2030, “The ten-year education sector plan recognizes the challenge of increasing access of students to ICT resources and technical education “(K. C., 2023, p. 56). This plan has set the vision of “A School with Complete Infrastructure” for developing the school's infrastructure. To improve rural schools as well, the Education Vision Paper 2079, published by MOEST, aims to provide alternative energy technologies for use in rural schools. Later, the IT-based

curriculum will be integrated into the school, an e-library will be established in the secondary school, and online education materials will be easily accessible to both teachers and students (K. C., 2023).

Empirical Review

Empirical review is a method for obtaining knowledge and detailed insights by developing connections through direct and indirect observation or experience (Chaudhary, 2025). This review is quite flexible, as the researcher can adjust methodologies as required and the sample size to suit any requirement (Neumann, 2020). This review helps me design a research method and identify the research gap by comparing it with other related studies. Very few reviews or studies have examined the benefits of mobile devices in the educational context, particularly their role in supporting STEAM approaches in Nepal.

Huda et al.'s (2024) study found that students responded positively to STEAM education and to integrating technology into schools. For the study, 250 students were surveyed using a quantitative approach, and data were analyzed using Structural Equation Modeling with Partial Least Squares (SEM-PLS). This research has practical implications for educational practices, showing the importance of transdisciplinary collaboration and effective teaching strategies that enhance student interest and foster technological integration in secondary education. However, this study does not address pedagogical approaches, and students' voices are rarely highlighted.

A study by Salhab and Daher (2023) focused on evaluating students' engagement in learning through mobile devices. The students became emotionally, socially, behaviorally, and cognitively engaged whilst accessing learning content through mobile devices. Using the social engagement theme showed that learners shared how students contributed to social activities on mobile devices and maintained social networks during learning. Similarly, in the study, the cognitive engagement theme is measured, and it shows that using mobile devices in learning helps change how students engage cognitively with segmented learning materials across various segments, "bite-size" instalments delivered through brief micro-lecture videos. Regarding behavioral aspects, the study included students' effort, time on task, and attendance record, whereas emotional engagement themes included students' excitement, educators helping students, and increasing levels of motivation. "Students confirmed that m-learning offers many options for personalized learning and different

learning styles such as games, micro-learning videos, discussions, images, concept maps, and interactive videos” (Salhab & Daher, 2023, p. 211). The study's gap is to explore the effects of design on students' experiences, particularly their engagement in the learning process. The recommendation for future research is to conduct a controlled study to investigate students' engagement using learning analytics.

The study by Siregar et al. (2023) aims to describe the impacts of an integrated STEAM Project implemented through mobile technology on the Mathematical Reasoning ability of elementary school students and to outline the design of the integrated STEAM Project and the mobile application. For data collection, a quantitative descriptive and quasi-experimental research design was used. The study showed that implementing an integrated STEAM mobile application improved students' reasoning ability. It showed the difference in results before and after the implementation of the STEAM project's integrated mobile application. As the study mainly focused on mathematical reasoning ability, the gap lies in its failure to examine cognitive and affective outcomes and to provide limited qualitative insights into both teachers' and students' experiences. The research further advocates providing information and recommendations for developing learning models that improve reasoning abilities.

One research study done by Ahmad (2020) examined students' perceptions of the use of mobile devices in an educational setting. Mobile devices have shifted significantly toward personalized, customized learning, mainly outside formal learning environments. Notably, using a survey approach, this study revealed that students have a strong preference for using mobile devices across various aspects, including collaboration (84%), communication (75%), and teacher assistance (79%). The use of mobile devices enhanced students' interaction, fostered their engagement, and extended collaborative learning beyond the traditional classroom setting. The author suggested that future learning pedagogies can be built on platform-based learning, employing mobile devices and other advanced, integrated, on-demand learning technologies. Since the study was based on only one university, the findings may not apply to all universities.

A study by Adjei (2019) aimed to understand students' perceptions of using smartphones for learning, whether it is useful for academic achievement, and how the device has impacted learning activities. The integration of mobile devices is gradually evolving as a compelling means to enhance teaching and learning practices in distance

education. Using mobile devices enabled easy access to course materials through online platforms and digital engagement with the material. This study used a survey research design and questionnaires. It was found that mobile devices were easy to use and played a noteworthy role in students' academic pursuits. The research gap lies mainly in perceptions of smartphones rather than in measuring their direct impact on students' academic performance.

Ayer and Thakur's (2019) study examined the positive and negative effects of mobile phone use on undergraduate students' academic performance. Mobile devices enhance students' position when used properly, enabling them to participate in the academic activities of the school and college. Students were using mobile devices haphazardly at home and in college, which in turn distracted them from their studies. A simple random sampling technique was used to measure academic performance, and there was a significant difference in the Grade Point Average (GPA) between past- and present-semester students; it was higher in the present semester among students who used mobile devices. Regarding the gap, I believe the educational institution's role in the study has yet to be explored, and the findings are limited to a cross-sectional design. The recommendation for the study is that the college should have developed its mobile application for virtual distance learning classes, and that the college must have a clear policy on student use of mobile devices.

Another study, Parajuli (2016), emphasizes that mobile devices can play a crucial role in Nepalese higher education, and the study further explores the availability of mobile devices for learning purposes; the costs of the device, how it is used for learning, policies of the institution, and attitudes of students towards mobile learning. The study was conducted in rural and semi-urban areas, as well as in public institutions. Based on qualitative data, the study indicated that students possessed sound technological knowledge, used mobile devices informally to learn both inside and outside the classroom, and many showed positive attitudes towards their use for learning. The author further explained that "Students can be members of a global learning community and get opportunities to use the vast resources that are available on the Internet" by using mobile technology (Parajuli, 2016, p. 52). However, the author suggested that parents and teachers should be supportive enough to encourage students to use mobile technology for learning to help them reach their full potential. The study's gap is that it has not included the viewpoints of teachers and parents regarding the use of mobile devices for learning.

Research Gap

While the above-mentioned research has established a positive relationship between mobile devices and student outcomes, there is a lack of in-depth investigation into the underlying processes and contextual factors that mediate or moderate this relationship in Nepal. In this chapter, I have reviewed several qualitative and quantitative research studies published in international and national journals on the use of mobile devices in academic learning and their influence on STEAM approaches. As Salhab and Daher (2023) focused on university students' learning through mobile devices, there is a gap in research on how mobile devices affect STEAM education approaches. Likely, the study by Siregar et al. (2023) was limited to elementary school students and focused on reasoning ability, leaving a gap in understanding how the device has affected other important learning outcomes, such as inquiry-based and hands-on learning. Ahmad's (2020) study focused on students' perceptions rather than on the actual data. Ayer and Thakur (2019) primarily relied on GPA as the sole indicator of participants' academic performance, whereas Parajuli (2016) identified students' positive attitudes towards mobile device use in mobile learning but failed to consider teachers' and parents' perspectives. Thus, there is rarely any research on STEAM approaches to learning in educational settings that uses mobile devices.

Even though there has been an advancement in the application of theory in research, I found a lack of theory application during the review. The research I reviewed mostly focused on outcomes-based perspectives and lacked theoretical grounding. Moreover, theoretical explanations of how mobile devices are influencing STEAM approaches, such as collaborative learning, inquiry-based learning, creativity, and hands-on learning, are also limited.

Methodologically, the researchers focused only on GPA, reasoning ability, and engagement measures, using data collection methods such as surveys, interviews, pre- and post-tests, and phenomenological focus groups, which yielded measurable outcomes but failed to capture participants' lived experiences. Moreover, interpretivist qualitative research using thematic analysis of narrative inquiry still lacks an understanding of how university students construct knowledge through mobile devices.

Therefore, I am sure that this research will aid in exploring diverse pedagogical approaches and instructional strategies that can be employed in mobile

device contexts to enhance the learning process through a social constructivist lens, by collecting stories using a narrative research design with university students, especially in Nepal.

Reflections on Chapter

In this chapter, after reading various articles, theses, and journals, I have presented the research objectives and their findings. Introducing the different concepts, theories, and ways of data analysis showed how important these are in making the research meaningful. These journals helped me develop the themes required for my research. Furthermore, social constructivism in my research has helped me establish a theoretical basis that effectively guides my analysis and data enhancement. Through the literature review, I also understood how important mobile devices are for motivating students in academic learning.

CHAPTER III

RESEARCH METHODOLOGY

This chapter outlines methodological details developed for this research. I have discussed the research paradigm and research design and have explored the study's setting and research site, as well as the research participants. This chapter also incorporates the data collection tools and strategies used to gather the information for discussion and interpretation.

Philosophical Assumptions

In my research, I have chosen narrative inquiry because it is one of the powerful ways of exploring participants' lived experiences and deriving the meanings students and educators have used mobile devices in the learning process. James (2018) stated that, because of narrative inquiry's holistic nature and in-depth approach to each participant, it tends to focus on a relatively small number of participants. Under philosophical considerations, ontology, epistemology, and axiology are considered. Moreover, in my research, my participants did not just 'tell stories' (in coherent structures, i.e., having a beginning, middle, as well as end) (James, 2018); 'telling stories' was like my task being a researcher, as I wrote the data collected as narratives that mainly highlighted the learning experiences of the participants broadly and transition experiences more precisely.

Epistemology

Epistemology is a core area of philosophy that concerns the theory of knowledge (Sol & Heng, 2022). For research, I have used a subjectivist epistemology to explore how individuals construct knowledge through interactions and their personal experience. It emphasizes the role of university students' narratives and perspectives in constructing knowledge and understanding of STEAM approaches using mobile devices within their existing learning frameworks. This approach can shed light on the points that influence students' learning about mobile devices.

Ontology

An ontology is a formal model of the structure of a system, its related entities, and their relations, which is useful for research (Guarino et al., 2009). Multiple realities are used in the research, which aids in recognizing and exploring the diverse perspectives and dimensions of student engagement. It would also investigate how

mobile devices influence different STEAM approaches to academic achievement, such as subject-specific knowledge, critical thinking skills, creativity, and problem-solving abilities.

Axiology

Axiology is an attempt to unite and assess a diverse range of pre-existing and intersecting inquiries about the fundamental concepts of goodness, ethical behavior, value, and obligation (Biedenbach & Jacobsson, 2016). My research process is value-laden. The value of this research lies in its commitment to providing a holistic, student-centered perspective that acknowledges the evolving role of mobile technology in education.

Research Paradigm

A research paradigm is an outline that directs how research is conducted. “Paradigms search for what is a reality in that particular issue, how knowledge can be created with the selected issue, what steps are necessary to follow to complete the research task, and what value should be taken into account” (Khatri, 2023, p. 22). The research paradigm is important because it provides guidelines for conducting research, helps analyze data, helps the researcher select appropriate research questions and design the study, and aids in interpreting findings (Shrestha & Sharma, 2024). Moreover, choosing the right paradigm strengthens the credibility and transferability of the research. In my research, the Interpretivism paradigm has been used. This approach insists that reality is socially constructed and is subjective. This paradigm applies to this research because it helps identify in-depth life experiences. Through this paradigm, while analyzing data, researchers can explore on their own, can explain or express, and also attempt to place themselves in the participants' shoes or into their thinking pattern so they can reconstruct the participants' narrative into intended meaning (Pervin & Mokhtar, 2022). It is useful in my research as it closely aligns with social constructivist perspectives. For instance, Shrestha and Sharma (2024) state that the paradigm recognizes that knowledge is constructed through the assistance of larger social and cultural contexts. Summarizing, we can say it is the product of recurring social interaction and negotiation.

To examine critically, I have also employed a critical paradigm, focusing on factors such as access and equity that influence participants' academic learning experiences. ‘Critical researchers desire to expose taken-for-granted beliefs, values, norms, and social structures by highlighting the problems and the structures behind

them, encouraging self-conscious criticism, and by developing emancipatory consciousness in researchers and social members in general.' (Okesina, 2020, p. 61). The study explores participants' lived experiences through a critical lens to uncover the values and beliefs surrounding mobile device access and examine how existing educational structures have influenced students' academic learning processes. So, the focus is on equity and access, such as whether participants had equal opportunities to use mobile devices or other technologies, or to access internet facilities for academic learning. Additionally, it explores how teachers' pedagogical approaches, students' learning practices, and classroom practices have affected students' learning experiences.

Furthermore, as I have chosen narrative inquiry as the research design, this paradigm is suitable for this study, as the focus will be on exploring an individual's life experience (Pervin & Mokhtar, 2022). In the research, through the paradigm, the participants' narratives of adopting mobile devices while learning and in different approaches of STEAM reflect that the multiple realities are shaped by several aspects, such as the participants' backgrounds, social interactions, and their learning environments, rather than just focusing on the single objective truth. Thus, for my research, I have used the interpretive and critical paradigm, as it values multiple realities and does not focus on measuring cause-and-effect relationships; it helps explore meaning-making, generate perceptions, and critically elicit participants' stories.

Narrative Inquiry as Research Design

Ansari et al. (2022) stated that research design is a broad framework that outlines the overall plan for conducting research. A good research design is paramount as it provides accuracy and consistency to the research. The research design I have employed is a narrative design. "The narrative approach is about inquiry, which is directed towards collecting human experience in the form of narratives where data is produced in narrative form " (Butina, 2015, p. 190). Narrative inquiry stands as a qualitative research approach that focuses on the collection and analysis of stories, or narratives, to gain a deep understanding of the meaning-making processes individuals engage in. In educational research, the narrative inquiry was primarily used by Connelly and Clandinin in 1990 (Fatimah et al., 2021). A narrative can take the form of a story; it is a mode of recognizing and understanding meanings, and at present it is considered an approach to inquiry (Barrett & Stauffer, 2009). Narrative is particularly

well-suited to alternative learning approaches such as guided discovery and inquiry-based learning (McQuiggan et al., 2008). A narrative research design allows for deeper exploration by focusing on collecting narratives, or stories, from participants and then analyzing recurring themes within those narratives. Narrative research can provide rich qualitative data that illuminates students' and teachers' subjective experiences and how mobile technology learning affects their engagement and learning processes.

“The three dimensions of the metaphoric narrative inquiry space are the personal and social (interaction) along one dimension; past, present, and future (continuity) along a second dimension; place (situation) along a third dimension” (Clandinin, 2006, p. 47). Drawing on the individual experiences and social interactions of university students, I have investigated their relationships with technology, their interactions with peers and teachers via digital media, and the influence of social dynamics on their attitudes and behaviors regarding the integration of mobile technology into STEAM approaches. In temporal dimensions, I have talked with university students about their past experiences with mobile technology, how they use it now, and their opinions about the future importance of STEAM approaches using mobile technology in their learning process. Likewise, in the place dimension, I have questioned various aspects, including the accessibility of mobile devices, norms surrounding the integration of education and technology, and the physical learning environments.

In the research, I have employed a thematic narrative inquiry. The thematic narrative inquiry focuses on identifying and analyzing recurring themes, patterns, and underlying meanings in narratives collected from university learners. It is a way of classifying what is common to the topic discussed or written about, and of making sense of any commonalities found (Braun & Clarke, 2012). This approach is well-suited to uncover the overarching trends and insights concerning how these students adopt and integrate mobile technology into their learning experiences. It allows for the discovery of common themes and variations across narratives, shedding light on the collective experiences of university students and how these experiences relate to the adoption of mobile devices in education. Thus, narrative inquiry is relevant to my study to understand and make sense of my participants' experiences with using mobile devices for learning through STEAM approaches.

Research Site and Participants

As a main researcher, I have engaged in interviewing, analyzing collected data, and reflecting simultaneously. Using the narrative, I have collected stories and lived experiences of my participants by being aware of my own assumptions. The study is based in the Kathmandu Valley. The respondents in my research were six university students and teachers. Details are as follows:

Pseudonym	Gender	Age	Academic level	Professional Role	University
Shikshya	Female	28	MBS	Student	Nepali University
Chetana	Female	33	Master's in Nursing and Clinical Psychology	Teacher	Nepali University
Samarth	Male	43	MBA	Teacher	Foreign university
Lakshya	Male	32	MBA	Student	Nepali University
Gyan	Male	35	MPHIL	Student	Nepali University
Shanti	Female	29	EMBA	Student	Nepali University

I used a criterion-based selection strategy in my research; it ensured that the best participants were selected based on their ability and mobile device use (Dahal, 2017). The strategy of my sampling procedure is (1) I have identified university students and teachers who use mobile devices for educational purposes. (2) I conducted interviews with the initial data collected on the experiences of participants. With mobile devices, how they were used for learning, and how this has influenced STEAM approaches. University students are part of the digital-native generation and have grown up with mobile devices. Thus, they are potential research participant who will share their experiences, challenges faced, and learning process in adopting mobile devices. Another participant is teachers working with university students, who can provide insights into how students are integrating mobile devices into their teaching methods and into students' responses when using STEAM approaches.

Data Collection Procedures

Author Butin (2015) argues that collecting and analyzing data are not sequential processes; rather, both are concurrent activities. For data collection, I

conducted interviews and analyzed the narratives. Multiple interviews were conducted and recorded via mobile recorders.

Narrative Generation

For data collection, I conducted face-to-face interviews with six participants: four students and two teachers. The duration of my interview depended on my research questions and participants' responses. I asked my participants for a feasible time and place, and they suggested times and places accordingly, such as during lunchtime, after office hours, and during their leisure time. The interview location was sometimes peaceful and at times noisy; however, this did not affect the interview sessions.

My interview is phenomenological. I conducted the unstructured interview because it is flexible, and using open-ended questions helps gather information and understand the participant's feelings and experiences. Moreover, it helps collect rich, in-depth data that captures both details and complexities (Taherdoost, 2021). To collect data, I initially prepared questions and asked follow-up questions based on responses, which clarified answers, elicited in-depth experiences, and encouraged participants to provide detailed information. Before conducting the actual interviews, I thoroughly revised my interview questions to identify ambiguities and added new ones to ensure clarity and relevance. Sensory orientation gained during the fieldwork experience aids in transcribing authentic data.

Narrating Process

I have conducted interviews a maximum of three times to ensure authenticity. Each interview was intended to last 60 minutes, but the duration varied across participants, depending on their desire to share experiences. After each interview, I transcribed the audio recordings by listening carefully. I have written stories with direct quotes that reflect how they have shared their experiences and thoughts. To maintain confidentiality, I have given pseudonyms to the participants' names and the colleges' names. I re-read the transcribed data to ensure I have captured the essence of the participants' stories correctly. Furthermore, additional questions were personalized on a need-to-know basis for different participants. To ensure the accuracy of the narratives, I used to ask similar questions to confirm whether their responses aligned with the earlier statements.

Meaning Making of Narratives

It is said that, in narrative inquiry, data analysis involves re-storied lived experiences within a coherent narrative framework, with a main focus on elements such as plot, setting/environment, characters, and, lastly, themes, to uncover the meanings individuals hold for their stories (Dahal, 2025). For meaning-making of narratives, I choose Braun and Clarke's (2012) narrative thematic analysis. The different stages are as follows:

1. Familiarising yourself with the data

At first, I organized and prepared the data, then transcribed the audio. The data obtained through interviews with participants are transformed into dialogues/conversations for analysis in my research. In transcribing the audio, Butin (2015) transcribes each participant's audio, and non-narrative lines are written in the form of casual conversation. "Common to all forms of qualitative analysis, this phase involves immersing yourself in the data by reading and re-reading textual data (e.g., transcripts of interviews, responses to qualitative surveys), and listening to audio-recordings or watching video data" (Braun & Clarke, 2012, p. 6). I have read the organized data several times to assess its relevance to the research questions. Through this process, I became more familiar with participants' responses, which acted as a foundation for further identifying the codes and generating themes in later stages.

2. Generating initial codes

The analysis is followed by quotes and coding; i.e., data sections are tagged with either interpretative or descriptive tags, which can take any form, such as inductive, data-driven, or deductive; even pre-existing theories can be applied (Dahal, 2025). It is said that for analysing the data, codes act as the building blocks (Braun & Clarke, 2012). Also, Dahal (2025) stated that similar codes are categorized into themes to bring out the meaning of the data, which often involves constructing a coding frame/ thematic atlas. After thoroughly reading the data, I coded the most repetitive words, or let's say the potential words relevant to the research question, which helped me in generating themes.

3. Searching for themes

I have become mindful of potential biases and write notes on themes and questions that arise from my observations (Neumann, 2020). Braun and Clarke (2012) stated that searching for themes is an active process; we can either generate themes or construct them rather than discovering them. In my research, I have generated themes

by combining the codes so that they describe a coherent, detailed, and meaningful pattern in the data. While making the theme, I made sure that the theme together tells an overall story of the participants about the data and conveys richness and complexity.

4. Reviewing potential themes

“This phase involves a recursive process whereby the developing themes are reviewed in relation to the coded data and the entire dataset. “(Braun & Clarke, 2012, p. 9). Initially, I revisited the themes to check them against extracts of data and made sure the theme coordinates in relation to the collected data. I have re-read the data to check whether the theme actually did capture the entire dataset meaningfully in relation to my research question or not.

5. Defining and naming themes

In a good thematic analysis, one should ideally have a singular focus which should not overlap or repeat, and it should directly address the research question (Braun & Clarke, 2012). In this section, I have tried to define and name the theme that identifies the core idea of each theme, which reflects analytical essence rather than just being a general topic. Though the themes are distinct, they are related and address the research question. By analyzing narratives through themes, this approach allows one to systematically explore and make sense of the data, generating insights into the adoption of mobile devices in university students’ learning process.

6. Producing the report

The final phase of analysis is producing a well-structured report, i.e., a journal or a dissertation (Braun & Clarke, 2012). After the theme was identified, I narrated the participants' stories, connecting them to the theoretical perspectives through both top-down and bottom-up interpretations of the data. I tried to narrate stories in a way that reflected what was expressed and shared, taking into account temporality, sociality, and spatiality.

. While presenting the findings, I have tried to avoid repetition, paraphrasing, or passive phrasing and unnecessary complexity to ensure clarity and readability in these themes.

Quality Standards

In my research, I use trustworthiness, authenticity, and reflexivity to ensure a favourable outcome. Trustworthiness is about the authenticity and truthfulness of qualitative research outcomes (Cypress, 2017). Dahal (2023) stated that to increase

trustworthiness, researchers should make it clear to interviewees that their language is free of judgment; interviewers are not evaluating their tone, language, or dialect. I have ensured trustworthiness by establishing rapport with interview participants, actively listening to their responses, and fostering an open, non-judgmental atmosphere. Moreover, I have described the research, its methods, and its findings, allowing readers to assess the applicability of the results to comparable situations. “Transferability denotes the extent to which other contexts and policymakers can use the findings of a study,” (Dahal, 2023, p. 2305). In my research, despite the small sample size, I ensure transferability by offering thick, detailed explanations and descriptions that allow readers to decide whether it is applicable in their own contexts. Also, I have used direct quotes and rich descriptions to enhance the transferability of interview data. Reflexivity is the process by which researchers step back to critically examine the effects it has on the research and on their interactions with participants. Moreover, I strive to maintain reflexivity in my research by critically reflecting on any biases to improve the quality of my findings. Being a researcher with familiarity with mobile devices, how they are used in learning processes, and the practices of the current educational arena, I have recognized that my beliefs about the knowledge of technology and learning process could shape how I have conducted interviews, listened to their side of stories, analyzed their narratives, and identified themes.

Further, I have also focused on aspects such as temporality, sociality, and space to ensure consistent and high-quality outcomes and maintain the quality standards. “Directing attention temporally points inquirers toward the past, present, and future of people, places, things, and events under study” (Clandinin & Huber, 2010, p. 3). In this study, the credibility of participants' stories about how their learning had been shaped by mobile devices in the past, present, and future was examined. In the sociality section, the researchers had to discuss both personal and social conditions. In the study, the emotions and how societal conditions have shaped their learning were identified, ensuring transparency. For narrative inquirers, this dimension aids in identifying the sequence of events, which helps maintain the quality of the research.

Ethical Considerations

It is crucial to prioritize ethical considerations to ensure the well-being and rights of the participants. Maintaining participants' safety and trust throughout the research project is a fundamental ethical consideration (Cacciattolo, 2015). I have

ensured that the participating candidates are fully informed about the questions, how the generated data will be used, and what (if any) consequences may arise (Fleming & Zegwaard, 2018). I have provided concise details outlining the aim of the study, the steps undertaken, the possible advantages and drawbacks, voluntary participation, and the right to withdraw at any time. Also, I have safeguarded participants' confidentiality and anonymity by using identification codes or pseudonyms rather than revealing personal information in research reports or publications. The collected data is stored and handled securely to prevent unauthorized access or disclosure.

Reflections on Chapter

In this chapter, I have discussed my research methodology. My ontological assumption is based on multiple realities; my epistemological assumption is based on subjectivism; and my axiology is value-laden. Through an interpretive approach, I focused on generating how the knowledge was constructed. To collect depth data, I employed narrative inquiry and conducted in-depth phenomenological interviews via mobile phones. I have then discussed the process of analyzing the collected data through thematic narrative analysis, such as gathering the data, transcribing it, generating themes, and linking with the theories. In terms of quality standards, I focused on trustworthiness, authenticity, and credibility to create a non-judgmental environment. I had initially built rapport with the participants and tried to maintain my personal biases as much as possible. Lastly, I concluded the chapter by integrating ethical considerations. Voluntary participation, taking consent, ensuring safety, and the rights of the participants were taken care of. Pseudonyms were used whenever necessary to maintain confidentiality.

CHAPTER IV

ENTRY WITH NARRATIVES

In this chapter, I have narrated the lived experiences of six participants, comprising both students and teachers. Basically, the interviews and follow-up interviews were narrated. They have shared how mobile devices were introduced into their lives, their advantages and disadvantages, and how they have affected STEAM approaches. The names of the participants, addresses, and their institutions are pseudonyms that preserve their identities.

Narratives Insights: Unfolding Story of Shikshya

To start with, Shikshya is an MBS student, and she is very friendly; she willingly shared her lived experiences without a hint of hesitation. She completed her schooling at Sagarmatha School in Kalaiya, an intermediate from Dingla College in Birgunj, and a bachelor's from City College in Kathmandu, with a BE in computer engineering, and is currently pursuing an MBS in Finance. Earlier in the day, I met her, requested the interview, and elaborated on my research agenda; she instantly agreed to share her side of the story. We discussed a convenient time and place for the interview, and after deciding, I bid her goodbye and said I would meet on the interview day. On the confirmed interview day, I met her at nearly 1 PM, which was her lunchtime, so she asked me to interview at her desk. Before starting the session, I noticed the noise in the surroundings. At times, she was distracted by interruptions, but I accepted that these issues are outside our control, as they are part of doing research in the social world. Thus, after small informal talks, I proceeded with the interview after obtaining consent to audio-record her stories.

The narratives of interviews are:

Born and brought up in Kalaiya, Shikshya spent her entire childhood without electricity, and there were no signs of technology. Recalling her past, she shares that, as a 1990s kid born in a village, she studied by lamp. There was no proper school infrastructure, so she always had to carry a jute sack to study. She further shared that it took more than 8-10 years to bring electricity to her village. She studied at Kalaiya till grade 10 and soon after went to Birgunj to complete her intermediate degree. Thus, I concluded that during her schooling, she did not use technology while studying, or, let's say, did not have any technology-related classes. So, I wanted to

know when she started using technology in any form. She explained, *'I was not allowed to use mobile devices at those times as it was restricted in the house itself and college as well. At that time, there was no practice of using Google to search. Though dial-up devices were available at that time, we had to go to a cyber café to use the internet. My first mobile device was a keypad phone, used only for calling. Later on bachelor's teachers used to teach by showing slides on a projector.'* Since she studied Hindi at an intermediate level in her Bachelor's, she initially found it difficult to understand, as she was a bit out of practice with Hindi fluency. In those times, YouTube was her guiding light, even though finding the right content was difficult due to resource constraints. She used to refer to Hindi YouTube channels as she found them easier to understand. During those times, she sometimes found online books to download and read offline. She added, *'I even used to search teaching videos online and referred to them as I felt easier to understand in such a way.'* She continued, *'In my master's degree, since I studied in a government college, it is not that strict, so even though I attended classes in the earlier semester, I could not take many physical classes, so I was dependent on constructing my knowledge through mobile devices.'*

Due to Sikhsya's busy schedule, i.e., because of work and family commitments, she is not able to attend her Master's classes and thus is using mobile devices to browse the internet for the course content. She widely prefers using YouTube and Google. For instance, due to pregnancy, she could not attend the fourth-semester exam and was also unable to attend classes. So, she started learning through YouTube videos, downloaded solutions in PDF format from Google, and practiced the numerical subjects accordingly. She mentioned, *'I use YouTube for learning purposes, whilst watching content videos, I prefer the comments section as it helps me clear my doubts. Sometimes, I even add comments in there, and I used to find my friends' comments too, which is indeed helpful.'* During COVID, she said there were Zoom classes, and the teacher shared all the necessary content online. She added, *'At that time we used to have online classes in the morning, which was convenient for me, and it used to be only about two hours long.'* It was fruitful to her, but many of her colleagues used to join classes without properly listening to the lectures. It used to be helpful to her as all the ready-made materials were easily available. When asked about the difference between physical and online classes, she found online classes more helpful because she could concentrate properly and write down key points at her own pace, which was not possible in physical classes. She found online classes were more

detailed than physical classes. I asked her convenient use of using mobile devices; she shared, *'The mobile device is used over laptops as I get everything easily and can search through voice records. Even without a network, mobile phones can still be used via mobile data. Due to its portability, I often preferred mobile phones.'*

When I asked about the advantages, Shikshya explained that, while using mobile devices for academic learning, she found a significant difference between using them and studying without one. *'During the old days, I had to be fully dependent on teachers to answer any queries and had to concentrate on lectures and only used to find similar types of responses, but now I can refer to different sources and compare the solutions provided, and it has brought ease in my learning processes.'* She had to be based on books and research on mobile, and the way of handling answers is different. She said, *'If I got there early, like using devices for academic learning, my marks would be better. As in the initial phase, though I used mobile phones for learning, it was limited. However, during the final year, I completed the project using mobile devices, which enriched my knowledge. There were times when I needed to learn how to resolve errors and bugs during the project, and I learned new ways by researching mobile devices. I also learned that Google sharing was possible and had greatly helped our collaborative projects. The most frequently used search portal is Stack Overflow.'* This has helped her in upgrading herself and accelerating more. Talking about social media usage, she prefers YouTube for cooking videos and Facebook & TikTok only for refreshment. She could not concentrate for long; whilst studying, she often used social media only for refreshment.

I asked whether she found distractions while using it for learning. She nodded and said it was uncontrolled behavior on her part. While studying on mobile devices, distractions occurred. During exam times, she used to deactivate her Facebook accounts as she got easily distracted by the notifications. Also, she explains further that if she got more distracted, she used to uninstall apps as well. Her notifications are off so that she doesn't get bothered, and she uses a timer app during exam time for about 10 minutes only to refresh her mind. Due to the continued use of mobile devices, screen time has increased, leading to health issues. She added, *'I had faced eye problems, headaches, and back pain problems as I used to sit in the same posture for a long period. Now, I use Blue-ray specs, and I walk occasionally if I feel I have been sitting in the same posture for a while. By being self-aware, I try to maintain my*

screen time and also prefer listening to audio of YouTube videos instead of watching.'

I asked her about the integrated approach of teaching, and she replied, *'My teacher used to teach us by integrating different subjects; at that time, I had no idea that they were practicing this approach of teaching.'* I asked for examples if she remembers any, she said, *'In my bachelor's, I had to frequently make applications through coding, and it was not a simple task. Understanding it at the beginning was very tough, but the teachers tried to simplify it for us by breaking it down into simpler forms and showing the connections between different subjects. I must say, it simplified the meaning-making process.'* I further questioned whether approaches such as Creativity, Collaboration, and Inquiry-based learning benefited from the use of mobile devices in the learning process. I felt that mobile devices have helped personalize her learning experience through inquiry-based learning. She added, *'I usually prefer taking screenshots of reading materials from Google so that I can use them later. For instance, when I am offline or if I have to read while traveling. As I am from an Engineering background, I find formulas difficult, so most of my screenshots are of them. These screenshots are mostly useful during my exam time. Since there are many ideas and ways of providing solutions to the problems on the internet, I collect them all and modify them in my own way, and learn.'* She has also found that mobile devices have increased her digital literacy skills and helped her construct knowledge. She recalled her bachelor's days and shared that she even took online courses in PHP and WordPress on mobile devices and earned her certificates. She added, *'In India, there is the Byju mobile app, which provides lots of informative learning videos, and it is also like providing tuition to students. It is very beneficial.'*

Shikshya added, *'ChatGPT is like serving cooked food. This has significantly reduced the creativity of students like us. Even though I do not prefer using these apps, it has made students more reliant on them, and the habit of doing research has decreased. No exploration, no learning. When students find ready-made answers, they find it time-saving. I still prefer using Google rather than ChatGPT.'* When asked about project-based learning through the use of mobile devices, she said, *'During the year 2012 AD, being an engineering student, I had to do a final year project with my three friends. We collaborated and created a student management app through CSAP. I did not have a laptop, so I used my mobile phone for research. We divided the work:*

one did research, one handled the database, and the other did coding. The app included the student's roll number, contact number, address, and prior educational certificates.' For collaborative learning, she prefers using Google Docs. She added that they used to add notes to them and circulate them among themselves. There will be no data loss, and anyone can share the information at any time. She is also part of WhatsApp and Viber groups where they make group calls and respond through messages if they are busy when asked about learning materials. Teachers were also added to the group, and they provided answers to the questions whenever asked.

At last, I asked her about her thoughts on the future role of mobile devices in academic learning. She responded, *'I have been using mobile devices for a long time, and I strongly feel that the mobile device's future is bright, but today, many are addicted to using mobile devices. They are over-reliant on them, using mobile devices just before bed and immediately upon waking. Besides being used for learning purposes, mobile devices have increased social addiction; they are used for YouTube, Instagram, LinkedIn, Twitter, and many other social media platforms.'* She further added that mobile devices hold great potential in remote areas, as they can improve students' learning levels in villages and other remote areas. Talking about her village area, she mentioned that many children and students use mobile devices for entertainment, including TikTok, Facebook, Instagram, and YouTube. *'Only a few houses have routers now. In remote areas, too, mobile device use has increased, especially during COVID times. Its potential is high in remote areas, as teachers can leverage mobile devices to learn and, in turn, help students explore more by advising them on useful applications. The government should provide a helping hand by ensuring free internet access and network facilities, so they can use data and learn. Literacy programs in village areas could also be of great help.'* When asked if mobile devices should be allowed to be used in the classes, she said, *'Yes, it should be allowed only after a bachelor's, they should be allowed to search online, share information, take notes, and teachers should teach students to use mobile devices productively. In the future, there will be more advancements in mobile-friendly applications. Students will have more curiosity, and they will do more research through mobile devices.'*

I collected all the required information, so I concluded the interview by summarizing the entire process and how she felt throughout. She assured me that her responses were based on her stories. I thanked her and mentioned that I might ask

further questions if any doubts arise. She agreed and assured me that she would be available to provide additional information whenever needed.

Narratives Insights: Unfolding Story of Chetana

Chetana is a psychologist by profession and a psychology teacher at Nepal's renowned universities. She has been in the teaching profession since 2014, and since then, her teaching journey has been a continuous learning process. Chetana has completed her schooling in Dang and the intermediate level from the prestigious college in Kathmandu, and has further completed two master's degrees: "Master's degrees in clinical psychology" and "Master's in psychiatric nursing" from United College of Nursing and Everest College, respectively. On my way to the interview at her workplace, I felt anxious because I had only spoken with her on the phone, and my mind was racing with ideas on how to start our discussion. However, to my surprise, I instantly connected with her because she was friendly. I also felt fortunate because it was '*Aama ko mukh herne din*', i.e., Mother's Day in Nepal, so she had no patients, which made the interview process much easier. However, there were some distractions in between at times due to her prior meeting commitments. We engaged in an informal conversation for a certain period. I took the opportunity to explain to her my research title, purpose, and objectives of my research. We discussed several aspects of mobile devices by exchanging meaningful ideas and insights. This leads to open dialogues and deep conversations between us. Sensing that the environment was more comfortable, she suggested moving forward with the formal interview process, and with her consent, I began recording our interview. The narratives are as follows:

In the first phase, I asked Chetana about her familiarity with mobile devices and other technologies during her early childhood. She recalled and added that in 2006 A.D., she was in 10th grade, and the mobile device was launched for the first time, but she was not very tech-savvy at the time. I asked whether she had any technology-related classes in school. She added, '*I was not lucky enough to have any computer classes, you know, Dang was still developing back then. During that time, I only referred to the teacher's handout and read notes from books.*' Later, at the intermediate level, too, she had no access to a mobile device as she was in a hostel. Even though there was an opportunity for media exposure, she still did not search or learn; she relied solely on lectures. She further added, '*There was no technology, so my teacher used to teach with chalk and markers in the classroom. Only during the bachelor's program in nursing did teachers use the projector and a transparency file*

on the device; before that, they taught only on blackboards. We used to go to the cybercafé to use computers sometimes, since I did not get any computer classes during my schooling.’ She started using a mobile phone during her bachelor's. *‘Since I am a student of nursing, when I was in my bachelor’s, I got exposed to using mobile devices. I learned that we can learn on mobile devices and gather information for learning. Since I have to explore, and initially, I used to search and learn through Google by searching relatable content, downloaded books, and reference books through the link provided by the teachers, and learned through mobile devices whenever convenient.’* During her bachelor’s days, for research data collection and fieldwork, she moved to a remote area and communicated with her supervisor via email and mobile phone. Her supervisor used to say that they had sent the email using ‘CUT PASTE HIGHLIGHT,’ but at that time, she did not understand them. *‘If I had had mobile devices earlier, I felt it would have been a lot easier to remove my confusion. I felt that teachers were irritated when I asked many questions, as the book was the only source to clear confusion, and we used to have a lot of confusion during that time. So, if I was allowed to use mobile devices whilst reading, education would have been enhanced.’*

After completing a bachelor’s degree, Chetana started teaching. Initially, she used PowerPoint and a projector, but after the COVID pandemic, she started using mobile devices. She shared, *‘I did not know using such kinds of devices would simplify the teaching and learning process for my students...let’s say I can check students’ status through various social groups, as using a laptop every time will make it difficult to open and work. I use a mobile device to join Google Meet, take attendance, and provide learning materials. Through mobile devices, students from different areas, Bajura, Butwal, Itahari, and Darchula, are connected to this platform. However, I have also faced difficulties when adopting mobile devices for teaching, as I had issues opening videos during online teaching and was dependent on others for help.’* For online classes, one of the colleges gave her an orientation on how to use Moodle while teaching, so it was a lot easier for her. She noticed drastic changes in how technology, and even mobile devices, were used in teaching. Different universities follow different teaching methodologies. For instance, at one university, she learned about Google Classroom, started using it on mobile devices, and began posting notes, assignments, and grades. At another university, the teaching methodology was based on a Module, with all learning materials, assignments, online

classes, and open exams aligned with it. She was amazed at how far the field of teaching and learning had advanced. She further elaborated, *'While teaching, I learned that through mobile devices we can create Google Classroom, upload reading materials in Moodle, do live streaming or take online classes, check the assignments, and give them marks as well. I gave immediate feedback to students and communicated with them through social media.'* She felt that these devices are easily accessible, cost-effective, and that time and resource management is readily available. During her time, she did not have access to these facilities and had to pay in dollars for learning materials, even though they were not available when required. Thus, she felt that the students are privileged to learn from anywhere and at any time in their chosen university through mobile devices. Now, for students' ease, they have created WhatsApp, Viber, and Teams groups, but back then, she used Yahoo Mail and Skype to communicate with the teachers. She recalls that once she had to travel to a remote area where she did not have access to a laptop and Wi-Fi, so she used a mobile device, took mobile data, made a PowerPoint, and took her classes. One of her students provided her with feedback that, even though she was in a remote area, she managed to teach them well, rather than cancel the class, as there would be a loss for the students and it would be psychologically difficult for her. The students' positive feedback encouraged her, and she thought that this was only possible through mobile devices.

When asked about using the application for teaching on mobile devices, she showed me both her mobile phones, including apps such as Teams, Google Classroom, and ChatGPT. For teaching purposes, she generates links, shares them with students, and records the classroom so students can listen to them during absences or whenever required. Since Chetana has been in the teaching field for a long time, I asked her to share her perspective, and she shared, *'Mobile devices have brought positive perspectives in the case of teachers. I can grab the necessary information without any intervention. Through e-learning, I can make classroom discussions more meaningful by creating breakout sessions to foster interaction. I can take classes from anywhere, anytime, which does not affect my classroom routine through the use of mobile devices.'* In the case of a student's case, she added, *'Likewise, students can take classes from anywhere. They can get connected with different professors through webinars or video conferences and gain knowledge. Since it is easy and convenient, it has brought a positive impact for both students and*

teachers.’ Chetana felt that mobile devices have changed the traditional learning pattern by enabling blended learning, thereby transforming learning. In terms of benefits, she reflected, *‘Mobile devices have eased the way of taking online classes as well. Online resources can be accessed in real time, making them more convenient and easier for students. Regardless of the distance, students can access and communicate with various foreign professors while residing in Nepal. Students take control of their learning in autonomous ways where the teacher plays the role of facilitator.’* Chetana felt that the educational system had undergone significant change. *‘Following the path of the traditional teaching-learning method is not convenient anymore, as it is becoming more student-centered. During the learning process, where their active involvement is evident, they tend to show engagement and participation. There will be peer involvement, which will encourage discussion forums and lead to cross-cultural benefits. So, being in the 21st century, we teachers must apply interactive approaches in the teaching process.’*

When asked about instances of an interactive approach, while teaching, she replied, *‘I have been teaching Psychology, and knowingly or unknowingly have been integrating different subjects. For instance, you know that different aspects of behavioral, biomedical, and societal sciences, as well as mathematics, are integrated to determine a patient's IQ level, and students are also made aware whether the tools used are statistically significant. These ways of practical linking help students to garner the knowledge that helps them do their practical work more effectively.’* Then I asked about different STEAM approaches influenced by mobile devices. So at first I asked about inquiry-based learning, she shared, *‘I have designed the assignments in such a way that it is widely visible how they have completed their assignments through inquiry-based learning using mobile devices. The use of mobile phones has increased the ability to research, as they allow access to thousands of books online and enable communication with teachers whenever needed, which is only possible through mobile phones. Thus, students have broadened their knowledge as their learning horizons have expanded.’* I asked her for her opinion on students' creativity, and she said it was decreasing. During assignments, she has found that most of her master's students prefer using Google and ChatGPT to paste content and get good marks, but she feels the quality has been compromised, and for most students, their creativity has decreased when using mobile devices. *‘ChatGPT has become like a shortcut for them, but only if the students could take only reference and learn by*

themselves, it would be great in their practical life instead of getting good marks only.’ When I asked for collaborative exposure, she showed me her WhatsApp group on her phone, where work was distributed among students. She narrated, *‘For instance, in WhatsApp, there is a division of work for conducting online seminars: one person must search for the facilitator, another must manage all online work, and another must conduct Q&A sessions. They often conduct field visits, undertake case-based work, and run workshops, and students must provide a video recording. I believe doing so also increases students’ hands-on activities. All these activities were sent by email, shared on the WhatsApp group, and uploaded to Moodle. I get notified on my mobile phone, check it in my free time, and give feedback as well. Students also take notes on their mobile devices for their assignments and fieldwork.’* She added, *‘During online classes, I have taught students to take the history of the patients, how to address child problems if they do not like to study or do not attend exams, and the students have to do it practically by going to classes.’*

Further, I asked what benefits Chetana felt from using these devices for academic learning purposes. She added, *‘Even from remote areas or foreign countries, students can learn, and take lessons from expert facilitators for webinars as her students are taking now, which she believes is only possible through mobile devices. Students have easy access to information about different countries, which is possible through mobile devices, or they can even contact experts through mobile devices.’* She added, *‘Learning hunger is needed for both teachers and students. The mobile device is pocket-friendly, and everything is available on mobile. Thousands of books are available online for students to access on mobile devices. They search for notes and keep them on mobile for later purposes.’* She further added, *‘Students can create PowerPoint slides using mobile-friendly software, making their learning easier. Regardless of location, students can access information whenever and wherever they want with mobile devices, thereby increasing their knowledge. Since this is the time of AI, learning through mobile devices is cost-effective, and it solves the problem faced, grammatical correction.’* Along with the advantages, she certainly felt there were challenges as well. She stated, *‘Being a psychology teacher, I see students face mental and physical problems such as vision problems, lack of focus, distractions, problems in creativity, and academic performance. Students often complain about their posture, and some even say they have trouble sleeping. It is often found that this has decreased the level of thinking skills.’* I asked her about the

feasibility of using devices for academic learning purposes. She replied, *'While choosing mobile phones over a laptop, in different situations, it is quite difficult to carry a laptop everywhere, but mobile phones are always with us, and we carry them everywhere. It does not require much space; if there is no internet, we can still access learning materials and listen to online lectures using mobile data. For presentations or to take notes, we can do it on mobile devices.'*

During the online session, Chetana used to get confused about whether students were listening properly. She thought the students might have found the one-way teaching monotonous, since the class session lasted three hours. She said that taking online classes on mobile devices was challenging for some students, who found it difficult to communicate, lacked empathy, and felt distracted. She further added, *'Nonverbal communication will not be captured through mobile devices. It is quite difficult to read students' body language, which is important when teaching a Psychology subject. The students shared that the physical classroom was more helpful as they could learn about body language for analyzing cases.'* Thus, to make sessions interactive, she used to conduct experience-sharing sessions whilst teaching online. To minimize distractions, one of the universities where she teaches held physical classes for two to three days per semester. She said, *'During technical sessions, it is better to conduct physical classes rather than online classes. Sometimes, students make the video off, and I do not have a clue whether they are learning or not; they get lost during online classes because they question me whether I have taught the content already. Thus, during online sessions, students must make structural adjustments to account for environmental and family interference, just as in physical classes. Moreover, the geographical structure can sometimes cause internet issues that hinder learning, and this must also be addressed. Sometimes, I wonder if learning through online classes on mobile devices is effective or not.'* She also shared that patience is lacking in students due to the availability of mobile devices, as they have started developing the feeling 'to get it as fast as possible. Due to notifications from different social media accounts on mobile devices, they easily get disturbed, so they must be self-aware. Also, families should first understand that they can be the cause of distraction for students while taking classes on mobile devices.' She herself takes her classes at her clinic to avoid distractions from family. So, orientations must be given to family members as well.

Chetana felt that excessive use of mobile devices has caused harmful effects on health. *'Such as blue rays and electromagnetic radiation, more screen time affects the eyes and causes fatigue, and one gets easily irritated if we call them out, as they might be thinking that they are only using mobile devices for a brief period.'* She further explains that increased use of mobile devices has affected the quality of life and family relationships, leading to frustration among students. When I asked what the future holds for mobile devices, she added, *'You know, there is still a gap in rural areas, and the government should play a significant role in working on such issues. Given the current AI era, according to the SEE results, students lack adequate learning materials. Just as the Government provides scholarships to students, students should be provided with mobile devices at a reasonable, affordable cost. The Government can train teachers to go to those rural areas and make them aware of the benefits of mobile technologies and devices, which can be used for learning, as everything is on mobile devices. In rural areas, teachers must be provided with training in the technology and made aware of how using mobile devices can be beneficial while teaching and learning. Students should be made aware of educational sites or apps. The government should set aside the budget for the technology aspects of these areas at a subsidiary cost.'* When asked if mobile devices should be allowed in the classroom, she said, *'Mobile devices should be allowed after the bachelor's level of study. However, certain social media apps must be restricted, and educational sites should be allowed for use when they can engage. It can be used in the learning platform and encourages group discussions.'* At last, she concluded, *'Thus, one must analyze their physical, mental, spiritual, and social aspects and become self-aware. Being an educator and psychologist, I believe that technology must not use us, but we should use technology, and one must be self-aware whilst using a mobile device.'*

Thus, I collected a lot of information needed for my research and asked her availability if I needed it during the confusion, and she happily agreed to assist whenever required.

Narratives Insights: Unfolding Story of Samarth

Samarth is an Information security officer and a cybersecurity law and policy MBA teacher at Hilton College and Boston College. He has been in the teaching profession for more than five years. He completed his schooling at Modern Boarding School, Purano Baneswor, and his PCL (intermediate) from Laliguras College. He had to rejoin the bachelor's program due to personal issues but later completed his

bachelor's degree in computer science and is currently pursuing an MSc at Broadway College. On the day of the interview, he was dressed in formal attire and spoke very politely and confidently. I had already shared my research project agenda and asked him if he would be willing to share his experience with me. Thus, at the agreed-upon time, I arrived at his work area around 11 AM, and he requested an interview at his office desk. Because many staff members were present, the first interview was disrupted. Recognizing the hassle, he suggested that we conduct the second interview in the meeting hall, as it was a quiet place with no interruptions. Thus, I continued with the interview with his permission to record.

The main excerpts from the interview are in narrative story form below:

Samarth was born and raised in Kathmandu, the capital city of Nepal. Even though he was born in the capital city, he explained that there were limited technical facilities when he was a child. Coming from a middle-class background, he did not have access to mobile devices or computers. He said, *'There used to be cordless devices, and this device was called a PDA, but it was very costly, which cost more than a lakh. It was a mobile phone with a keyboard and a small screen, like a computer.'* He added, *'Speaking frankly, I used a computer only after completing my SLC degree. I still remember when I was in school: computers were just being introduced in Nepal, and we had to pay extra fees to join computer classes. During my schooling, the intermediate level was called PCL. I used a computer for the first time in my friend's cybercafé. I learned how to use a computer and then began working in computer maintenance and earning money.'* Additionally, he got the idea of using different basic software after taking a three-month computer bridge course. When asked when he started using mobile devices or mobile phones, he said that after NTC removed incoming call charges, he bought his first mobile phone for Rs. 19,000 about 25 years ago. In his educational journey, too, he has managed to use mobile devices, but only very minimally. During his bachelor's days, he said he attended evening classes at college and did not need mobile devices for learning. He added that, since he studied network technology, various projects were assigned, and they needed high-performance laptops for simulation. However, he had used mobile devices to access the learning materials provided by teachers; for instance, he used to listen to book texts in audio format through an Android app while working or doing chores. He has continued this practice in his master's journey as well. He further added, *'Using a laptop every time is hectic, so I use mobile devices to listen to audio*

by using wireless earphones, allowing me to multitask efficiently, and I even search the research content of his master's thesis online....'

Talking about how Samarth's teachers used technology whilst teaching, he said, *'It was not in practice. Even though I studied in Kathmandu during my bachelor's days, the teacher used a lecture-based method that was more like a one-way process. The teaching methodologies followed more of a traditional pattern, used boards for teaching, and failed to demonstrate how the contents of the book could be related to real-life situations and could be applied to the future as well.'* He recalled that after 2016 A.D., various IT colleges were established, and the scope of integrating technology into teaching and learning processes was expanded. He further added that gradually, there was a change in teaching methodologies due to the popularity of YouTube and different online streaming channels where learning content was shared. He said, *'Since my teacher failed to share the connection of content with real-life context, and use technology, I try to become an exemplary teacher by filling the gap of what I missed out on as a student, and try to provide facts, figures, and ways to utilize the taught content. Undoubtedly, using technology in the very process is prime, be it mobile devices or computers.'*

I asked how he resumed classes during the COVID pandemic. He replied, *'During the COVID-19 pandemic, physical classes were not possible due to various safety concerns, so the educational institutions where I was teaching resorted to using mobile devices for teaching. Since then, the practice has been continuous as per the guidelines provided by the college.'* He added, *'We relied more on mobile devices during the pandemic, and even after COVID, the college has decided to continue the practice because if similar incidents occur in the future, it will make students more accustomed to such situations. Now, we teach online and provide them with assignments online.'* Shifting to using mobile devices for teaching during the pandemic was not difficult for him. He said that today's students are tech-savvy and way more talented at using these devices. Thus, using mobile devices was neither difficult for him nor for the students. *'However, during video streaming, there were quality and audio issues due to poor internet connectivity. During online classes, I always doubted whether students understood the material and were actively listening. Since it was all online on mobile devices, though the video was on, I could not make proper eye contact, and students also did not ask questions. I always wondered whether students joined classes only for attendance, so I used to ask questions, but*

they couldn't answer. So, he concluded that, like physical classes, online classes are a bit less interactive, but if students genuinely wanted to study, they could learn online as well.

Samarth even used mobile devices to track students' progress while teaching online, and he found that students' progress was quite low. He faced problems, such as no response from students, even though they were using headphones during online classes. Students do not respond when called upon, so he could not tell whether they were listening, playing games, or watching movies. I asked him for practical examples of using mobile devices in teaching. He shared that, since his subject is cybersecurity, he initially showed students, using a mobile device, how a website works. *'For instance, in <https://www.abc.com>, each terminology, www, com, https, has different functions, and I used to elaborate the meaning of every word to students on how the entire process works. This illustrates how mobile devices can provide practical learning experiences for students. Like Gurukul, students used to sit under a tree, read, and do what the guru said, but now it has changed. Technology has advanced and is widely used, which has brought impacts on learning attitudes and skills.'* He added that he always focuses on 'Building by Learning'. So, he focuses less on theoretical knowledge and focuses on a practical approach. He believed that if there is no practical knowledge, there is no link in his subject, specifically. Furthermore, he shared, *'By using a mobile device, I have made a content video for YouTube where I showed the setup process for the lab or uploaded lessons, and the students can use different mobile devices to learn the content, regardless of whether they are absent or are sick.'* At one of his colleges, where he teaches, he uses an Android app called Vednam. I asked him to explain more about the application, and he elaborated *'This application is used to monitor overall student progress and to provide learning content. I use this app to alert students to upcoming classroom content, monitor student attendance, assign tasks, and give marks. Even students can check their progress online and access the learning materials on mobile devices.'* Usually, the university he is teaching at prefers using the Teams app. He uses Teams on mobile because it is convenient for assigning assignments and taking online classes. He said, *'The app can be downloaded on Windows or Android since it is supported on mobile as well. I do not have to open the laptop every time and can check through mobile, and the same goes for students as well ...'*

Samarth believes that the traditional way of learning and teaching has changed with the use of mobile devices. He noticed changes in students' perspectives as well; mobile devices helped them visualize the content and understand it more clearly, enhancing their learning. He explained that mobile devices have brought benefits to students' learning. *'In today's context, every student has mobile devices at their fingertips; they take them everywhere with them. So, whenever required, they can quickly access information or conduct research without opening a book by searching online on their mobile devices. The more they research, the more they learn. As I explained earlier about the Vednam app, I often share learning content in the form of videos and PDFs, and students access them through the app, which instantly notifies them. I also assign them research tasks in the app so they can present them directly in class. It has made their learning process much easier.'* He recalls that sometimes he had to rush after giving lectures, and at that time, he could not give assignments. At such times, he assigned tasks via Teams on mobile, and within milliseconds, they were notified. He has also given students feedback when he is free, without waiting for classes. Since many students could not attend class, they preferred online classes. So, for this very purpose, many students were found using Teams on mobile devices, and it has always provided a platform for discussion.

I asked if Samarth had given projects to students using mobile devices. He shared, *'I have given a few projects that could be conducted through mobile devices, such as network discovery, and probing, i.e., collecting responses through different requests, to manipulate any device and hack it. Instead of writing it on paper, the students are using mobile devices to take notes of what they have researched, which I have given them a day prior.'* However, along with advantages, there come challenges as well. I asked his opinion on the distraction caused by mobile devices. He added, *'The main challenge I have found in students is distractions in their studies. For instance, students are scrolling through reels on social media, watching movies, or playing games, and they tend to lose track of time, just as when we go to a shopping mall: the lights make it difficult to tell if it is day or night. When they are watching reels, I do not find it productive; it does not contribute to learning, and this distraction can significantly affect their educational progress. Doing big projects on mobile devices is also difficult due to the lack of resources available on mobile devices.'* He further shared that many of the students are more addicted to mobile devices, and even though they try to access educational content. He shared, *'They*

might get distracted due to Anime, games, Netflix, and social media accounts. Using mobile devices for long periods has also created a more monotonous environment for them. Since my subject is practical-based, a lack of compatible devices often makes it difficult to perform practical tasks. If one must buy advanced devices, these devices are quite expensive...' He further added, 'Students are using mobile phones in the classroom to verify what I am teaching, and during that time, they miss the content that I am teaching, which is also disadvantageous. I heard of issues related to eyesight; they cannot directly answer the question when asked, as they are too dependent on mobile phones for everything.' He also shared a few ideas for minimizing distractions. He said one can create short clips of learning content to keep students engaged and share them on social media or YouTube, so students stay engaged throughout. He cannot keep students engaged for as long in online classes as in physical classes. In both his physical classes and online lectures, he felt that, 'However, I have noticed that if I speak continuously for long, it becomes monotonous. So often, I give a break for a certain period of time. I prepare short video clips which are about 15-20 minutes long, and they can watch them whenever they want. I have heard that the human mind can only be attentive for 30-33 minutes, then the information will overflow.' He further added, 'While taking online classes, they get easily distracted by notifications of social media or through other information, so I believe delivering learning content online through mobile devices is quite challenging.'

I asked whether he employed an integrated approach while teaching. He began by saying that everything is integrated into cybersecurity. He further explained that subjects such as mathematics, cryptography, science, and technology are intertwined, forming a comprehensive mix in cybersecurity. He shared, 'This integrated approach helps technical students to understand better. For instance, once I have given a project to students about a case of theft at a bank's ATM without using a PIN or card. They were able to take money, and they even converted Nepalese money to dollars, and I gave students the task to research, figure out how the theft occurred, and find out the gap.' He analyzed the case and added that this involves doing risk analysis, which is related to the subject, mathematics, and understanding the mechanism is about technology. 'Such incidents can be prevented if AI or machine learning is used through algorithms to check if they can be prevented. Thus, these instances show the interconnected nature of various disciplines within cybersecurity. The students should

know how to conduct qualitative and quantitative analyses and to put forward their hypotheses. For instance, in the case of reputation, it should be done in qualitative analysis.' After all this, I asked how mobile devices have enhanced various STEAM approaches. So, when talking about inquiry-based learning through mobile devices, he said that during his lecture, he found many students Google different terms when they did not understand their meanings. He shared, *'Often, I provide certain topics for conducting research, for instance, recently I gave the topic of cyber warfare to research, and the students came up with their ideas by googling on mobile devices.'* I have understood that he just acts as a facilitator and lets the students explore on their own to check their curiosity levels. He allows them to make mistakes so that they learn. He added, *'For instance, I have given a project where the students installed mobile applications to check if frequencies clashed. When they scanned and found bars, they had to look up their meanings. As the 2.4 frequency band has 11 channels, they have to inquire which helps them understand Wi-Fi networks, and what happens when there are other signals in the parameter.'* Doing such hands-on activities helps students gain practical exposure and better grasp wireless concepts.

When asked about creativity, he shared that the students' creativity level has increased in cybersecurity as they conducted testing on mobile devices, developed their skills, and learned gradually. He shared that, with advances in technology, ethical hacking is possible through various mobile applications. *'The software Kali is used for hacking, and it even has a mobile-supported OS. However, students have tried testing on test mobiles as it is risky, but many functionalities were not working, so it required advanced mobile devices due to updated features.'* He added, *'Not only gaming or doing streaming only, but even hacking is possible through mobile devices. Multiple applications besides Kali can be installed on mobile devices and used for hacking. They can even use mobile devices to test various projects, such as finding loopholes in mobile applications, counting wireless connectivity devices in a room, determining whether a wireless device is working properly, and even testing the applications of mobile devices with smartwatches. However, some projects cannot be done on such devices, as we have to do simulations and resources are not available in mobile devices.'* However, it has also been said that creativity has decreased because people want it to happen quickly through the use of AI on mobile devices. Samarth always prefers giving case studies so that students can think hypothetically and share their ideas without conducting them in physical class through mobile devices. He

believes case studies improve their problem-solving ability, and they are found researching mobile devices. He acts as a facilitator and lets the students explore the topic on their own, so they research out of curiosity rather than being spoon-fed the information. He shared, *'Hands-on learning has also increased due to the project of the network bar, and through wireless devices, they can gain practical exposure. This is the time of IoT; every device is IoT. As cybersecurity students, they have to think outside the box by challenging AI. Recently, I gave a project about how the ABC company was hacked, what challenges the company faced, and what you would do in case your company faced similar problems involving mobile devices.'* Such practices build their ways of conducting hands-on activities through mobile devices. However, he felt that critical thinking had decreased due to dependency on mobile devices. After teaching the students, he found that they lacked the connection between the learned content and its application in the environment.

I asked what the future holds for Samarth, and he shared, *'YouTube is like a university for us. Even university students from rural areas can learn in the same way as urban area students if I upload the video to YouTube or their University's portal. However, there might be network issues where 4G or LTE is a bit slow as compared to urban areas, or one can put low-quality video so that it gets loaded with low bandwidth as well.'* He further added, *'The Government normally spends less in the educational sector after +2 studies, as per my research. Based on my own observations and students' direct experiences from rural areas, I have found that they have had difficulty adapting to the teaching and learning processes in urban areas. Since their schooling was a bit poor, it is even reflected in their current way of studying at the bachelor's level, as they have found it difficult to write reports, give presentations, and engage with the material. So, the future of mobile devices is bright in rural areas; however, they should be more concerned.'* When asked if mobile devices should be allowed to be used in the classroom, he stated *'Students are using mobile devices in the classroom, which causes distractions, so I do not allow students in the classroom to record the lectures and use them to search any content because they will be missing what I am teaching when their attention gets diverted towards searching the meaning of the content. I always prefer them to use their logic more in learning rather than depending on mobile devices. I prefer them to focus more on critical thinking skills.'*

At last, he concluded saying, *‘Mobile devices are helpful because I do not have to wait till tomorrow to give them topics to discuss, as I can provide them with mobile devices easily, and for students, they can learn in their leisure time by referring to mobile devices rather than going home and studying books at home. The textbook can be read on mobile devices too, through audio instead of being read by itself. Thus, I want students to depend on mobile devices only 25% and learn through doing research by 75% on their own, rather than depending on the AI of mobile devices.’* He further added, *‘Being a cybersecurity person, one should not be fully dependent on mobile devices. One should not rely on mobile devices for everything since it causes addiction and harms our body, and one must positively use them.’*

At the end of our interview, I thanked him for his cooperation throughout the data collection process and assured him that confidentiality would be maintained during analysis and presentation. I also asked if he would be available if I had any confusion while analyzing data, and he said it would be no issue at all and that I was welcome anytime.

Narratives Insights: Unfolding Story of Lakshya

For the research to be detailed and thorough, participants' willingness to share every corner there is to share was deemed necessary. I met Lakshya at the designated interview location and realized he was a bit hesitant at first, so I started with small talk to put him at ease. A small-talk idea really worked, as he himself mentioned, we could start the interview. He consented to audio recording his stories. Thus, throughout the interview, he actively engaged in the research and demonstrated a cooperative attitude. He works at a financial institution as a System Administrator. He has earned his bachelor's degree in computer application from Kapilvastu IT College and is currently pursuing his master's degree in E-governance at Kanti College of Management.

More of His Narratives of the Interview

I started by asking about Lakshya's prior knowledge and experience with technology during his school days. He said, *‘I must say I was incredibly lucky, I got the privilege to study with computers. It was around 1996AD when computers were first launched in Nepal, and they were a bit costly as well. So getting the chance to learn on computers was really considered lucky during that time. And our school introduced computers, but those who wanted to attend the classes had to pay extra, and we used to have two computer classes, but at that time, we used to focus on*

games rather than studying properly.' He further adds, *'During those days, there used to be a pager for sending and receiving text messages, and only my elder brother had a mobile device, and sometimes I used to ask for a mobile phone to play games only during my childhood. We used to have dial-up devices and used to load a balance of certain Mbps, but since we did not have sound knowledge of how to use search engines, we did not practice it much...'* I asked about the availability of internet facilities. He added, *'Internet was a bit costly, so I used to use it rarely in the house for important work purposes rather than for learning. If I need to use the internet, I have to visit Cyber, pay hourly, and search for the content of whatever is in my mind related to learning, or else use it only for surfing and using social media.'* During his intermediate and bachelor's levels, he did not use mobile devices for learning purposes. His academic learning was solely based on the teacher's handouts. His teacher used to teach with a projector and slides and would share content via Yahoo or Google, whatever was feasible. I asked when he started using mobile devices for academic learning, and he shared that, *'Only in my master's I have started using mobile devices for academic learning. During my bachelor's, I initially used a simple mobile phone without internet access. It had a keypad, the screen was too small, the operating system was less advanced, and the device was less user-friendly. Moreover, if we have to use the internet on phones, the data packages are too costly. So, I always used to rely on teachers for teaching content, and I did not have the habit of searching for content online.'*

Lakshya felt that after the COVID pandemic, mobile technology was used even more, and it has now become a necessity for both learning and the technical field. I asked for his current practices now, he replied, *'In my master's, my classes are always online, and sometimes I am at work, so normally I have been using mobile phones to attend my classes. I prefer taking classes on mobile devices rather than a laptop because it is more convenient and easier to use. I have started using mobile devices in Masters, and it has become an inevitable part of my learning journey. Reading materials availability, taking classes online in Teams, and submitting assignments are all done through mobile devices.'* I further asked how he has been using these devices in his academic learning journey. He shared, *'I used to go to Google and Bing to search for any relatable content that I wanted to know. Like when learning new terminology, I do Google at first, and after gaining the required knowledge, I use it further in my learning. Just as in prior days, I used to refer to*

guidebooks and knew the patterns of exam questions; thus, this was generic, but now learning has become more dynamic. These days, without search engines and AI, learning is more difficult. AI has become one of my go-to tools. Before AI, I used to search for content on different websites and analyze it on my own, but now I depend more on ChatGPT and Gemini for reference in my learning materials. 'I asked about his initial phase of using mobile devices, he said, 'Initially, while learning through mobile devices, I used to access content from the e-library and submit assignments or course materials through the websites subscribed to by the college. Though I explored e-library and university sites to get the content, being a technical student, I find that the knowledge is inadequate and use Google and AI tools for exploring purposes through mobile devices...' Lakshya felt a change of perspective in learning through the use of mobile devices; he felt change in his learning patterns, and it has made learning much easier, aids in completing projects on time, and communicating with teachers or friends to resolve any issues faced or having discussions. He reflected, 'Since I have online classes, I often communicate with teachers through social media, WhatsApp. Previously, I had to handle everything from the basics; for example, while working on coding projects, I had to search for content and fix errors, which used to take up a lot of time. Now I use AI tools like ChatGPT, which provide a foundation and let me do advanced-level programming. If I need to find any errors, I can simply refer to these AIs, and they will help me out within a split second. 'He felt it had made his research journey easier too, for instance, it made his research journey easier, as it aided him in making the base of the research, the body of the research, how to prepare the questionnaire, and which technology to use for doing research.

Further, I wanted to know what benefits, challenges, and distractions he experienced while using mobile devices for learning. He answered, *'According to me, having a mobile device is like carrying a teacher twenty-four hours a day. It has transformed my learning pattern, as hard copies are no longer required. I search for YouTube content that provides knowledgeable, relevant information. Before Visual C, I used to refer to books, but now, since I am learning from Google, I have found vast differences. Troubleshooting was difficult as it used to be, relying on books, but now that I search the content online, it resolves faster. For courses, queries, I also depend on AI, and talking about websites, I refer to Stack Overflow and w3schools, which are easily accessible through mobile devices.'* So, talking about disadvantages, he further clarified, *'You know it is like a human behavior. If we see any catchy content or*

videos, we tend to spend time on them for a while. So, I usually lose track of time when using Facebook. Because of my work schedule, I have to provide more remote support, even at home, which happens during learning time, which distracts me while taking online classes. Unknowingly, I sometimes tend to focus more on entertainment than on learning. ‘

I asked if he knew about the integrated approach. He replied, *‘As I recall now, I believe teachers had an integrated approach while teaching us. You know, in programming without integrating subjects, it is difficult to complete any kind of project, as it involves not only programming but also various other subjects. I will give you an example: to make an Application of Accounting, one must understand accounting concepts and mathematical formulas, and have a base in accounting and how it works within that software. Or say, for making the banking software, one must know accounts, such as how to post a voucher, make a journal ledger, understand human behavior, such as how customers will use the app, if the app is related to HR, then one must understand the recruitment process, how to maintain salary, about appraisal, and many more. Thus, besides knowing programming languages, one must know different subjects.’* He added another example, *‘In bachelors, I had made the programming app for the library where I had to know the working process of the library, accountancy, such as how the fine system works, how to do debit and credit, how to finalize the report. Such integrated learning has brought advantages as I cannot study each subject at once, so when learning, if different subjects are integrated, it is much more fruitful eventually...’* I discussed STEAM approaches and whether they were enhanced or diminished when mobile devices were used in the learning process. So, I started with inquiry-based learning, he replied, *‘Inquiry is everywhere, whenever I have doubts, I inquire instantly as the information provider is already in my hand. Also, I share information in my study group whenever a solution or clarification is needed... When doing research projects, I tend to ask a lot of questions, since I cannot remember everything; mobile devices come in handy. For instance, while doing my research, as I have already selected my research topic and while traveling, if some questions or suggestions pop into my mind related to research, I instantly search them via mobile devices, even if it is feasible or not, or I note them down to search later.’* Then, I asked about collaborative approaches. Since Lakshya is in a master's program, he has two groups: unit groups and project groups. He shared, *‘Very often, I along with my group members and I are assigned a topic for*

group presentations where I have to discuss the topic, and I do it collaboratively through mobile devices. Since classes are always online, teachers post questions, and I have to discuss and solve them collaboratively. I often collaborate through social media groups. Let's say we take help and guide each other. '

Lakshya preferred working on mobile phones rather than laptops because he might not have access to a laptop every time, so mobile devices were handy. Lakshya felt his creativity had been enhanced. He shared, *'You know, searching for contents in the reading materials which are in printed form, it would be difficult to access the content at one time, and I have to focus more... In digital searching, content is easier to access, and projects can be completed within the designated timeframe... I felt creativity has improved through the use of AI in mobile devices, as it provides all kinds of answers in creative and thoughtful ways... Also, more sources of information, more ideas are generated, which also aids in being creative...'* When asked what changes he would have felt if mobile devices had been given during his initial period. He stated, *'My level of knowledge would have been more expanded if I were allowed to use mobile devices; if the learning platform were more feasible, like today in my schooling days, I would not be in this field as I am today.'* He shared, *'If I get a chance to use mobile devices during bachelor's time, there will be a much difference in my knowledge and learning.... Now, if we face any error or need a solution to any problem, I can instantly search for it on my mobile devices, which are in my palm. I can refer to AI or Google to search for solutions; such facilities were not available at the time. If these services were available, my skills would have improved a lot.'*

To enhance students' learning experience, I asked whether mobile devices should be allowed in the classroom. Lakshya felt that mobile devices should not be allowed in physical classrooms, as teachers are readily available during that time and can answer any doubts or queries directly. If they have any queries at home, they can refer to their mobile devices. I asked about the future of mobile devices, and he felt that in rural areas, mobile devices should be encouraged because they would be advantageous. He added, *'In rural areas, there have been advancements in the network of Namaste and NCELL as compared to the past. Since students have to travel long distances to study, if they have access to mobile devices, they can connect and study anytime, anywhere. For instance, during COVID, Radio Nepal initiated classes, though they were one-way, and they were very effective for students. The government should work harder to provide adequate network or internet access to*

students in rural areas. The teachers should provide guidance to the students about the beneficial sites or how the students can access the content through mobile devices.'

After completing all my research questions, I ended our interview sessions and thanked him for his time and the support he had provided. I also mentioned to him that I would reach out to him via text or phone if I had any questions.

Narratives Insights: Unfolding Story of Gyan

Born and brought up in Kalanki, Gyan is a hardworking person currently pursuing his MPHIL. He has completed a Bachelor's from Nepal Engineering College in Electronics and Communication and a Master's from Buddha Foundation. He is a very friendly person as he responded thoughtfully to the questions I asked and showed openness while sharing his part of life journey. We had brief talks at first, and he signaled that we could start the interview. After obtaining consent to record, I began our interview...

The Narratives of the Interview

Those who could use technologies such as computers, smartphones, or other devices during schooling or early childhood were considered lucky. I started my session by discussing Gyan's access to technology in his early childhood and whether he was allowed to use it. He said, *'Yes, during my schooling days .. I used to attend computer classes; they were held on certain days. We used to have a few desktops and computers. As far as I remember, mobile phones used to be carried by only a few people...'* He added, *'My parents owned mobile phones, but they were used for incoming and outgoing calls only....'* I asked what the pattern of learning was, he added, *'Teachers handouts and photocopy papers were our source of information. We used to share our notes and print them if required, or else copy them. You know, since these mobile phones were used rarely, there were no Java-based mobiles, and the idea of learning by searching the web or using an application was out of the question. Also, searching content online through a web portal and learning were not practiced....'* He stated he started using mobile devices only at the intermediate level. He added, *'Now there are many internet service providers, but during the 1997 AD, there were minimal inventions of internet facilities, and mostly I had to depend on a dial-up device, which was costly, and I used to carry a keypad phone with an antenna. There were connectivity issues most of the time, connections were slow, and mobile devices were not as advanced as they are now. Only 2G data was available, and it*

used to be relatively slow.’ Since there was no proper search engine or AI, he felt that learning through devices was not possible, and the Internet was extremely slow.

However, I felt a slight shift in his learning practices during his bachelor’s. *‘Even though the platforms were not fully explored, I used to be curious and surf on various Google platforms and Microsoft search engines to search for ideas and learn. However, during that period, the rate of knowledge expansion was not as high as it is now. I sometimes used to refer to online content and make notes, mostly during engineering projects. For projects, I had to be creative, so I used to refer to different blogs to generate ideas, since books only offered limited ideas. To troubleshoot ideas, I generally referred to them and completed projects successfully. I even created a project called ‘Student Information System’, which was both web- and mobile-based. This application contained details of the student’s information, examinations, attendance, and performance, which were reflected in the dashboard. For the project, I had to refer to online sites to generate as much information as possible.’* Moreover, he also talked about his fourth-year project, i.e., a Radio Frequency Identification-related project, in which he had to conduct research, and he used mobile devices for the purpose. Mostly, he conducted self-study, which was affected by the limited materials, but he adjusted accordingly. In his master’s, I felt he got the most out of mobile devices. He shared, *‘In comparison with bachelor’s, my way of learning was comparatively better in my Master’s as technology was slightly advanced. I used to rely on mobile devices and laptops for studying. I had to rely on mobile devices for various technological subjects and download content from the internet. Since I used to find difficulty in programming languages, I often searched for content on the web and downloaded notes.’*

Since Gyan did not have a habit of doing research, he found the MPHIL different, as he had to spend more time on research than in his earlier education. He found it difficult to adapt, but later it got easier when he started using mobile technologies to understand complex content, and it proved very fruitful. He felt, *‘Current study is based on more research rather than theory. My classes are taken on an e-learning platform. As different tech giants have developed various technologies and AI platforms, these have helped significantly with different research projects and assignments. Different sites for lectures, such as the co-pilot’s notebook portion, and lecture notes. in, and for my research works, I use plural sites.’* He realized that mobile devices have transformed his academic learning journey. As in his early

educational phase, he was dependent on teachers for everything, wrote in hard copy, and did further study and completed projects. Now, web access and mobile devices have further strengthened his studies.

I asked what benefits and challenges Gyan has faced while using the device, and he shared a few of the advantages he has found in using mobile devices. *‘I used to buy many books as per subjects, and if I had to gain new knowledge or study further, then I had to buy new books again as per the syllabus and content, which was kind of troublesome. Now, if I want to search for anything or expand my knowledge, resources are easily available on mobile devices. Mostly, I use mobile devices to understand complex content and various AI applications such as Copilot, Gemini, and ChatGPT. Instead of taking notes on paper, I prefer to write notes on mobile devices themselves....’* He feels that knowledge can be gathered instantly and that he does not have to depend on others. His self-learning was enhanced. He added, *‘I prefer using mobile devices to laptops because laptops are quite difficult to carry and move by putting in a bag, mobile devices can be carried in pockets, and by connecting with WIFI, I can search relatable content easily, and it is more convenient.’* Regarding distractions, *‘You know there are multiple sites, and different answers are shown as per different search engines, which brings confusion as to which is closer to the truth, is a bit challenging, so one must use self-judgment to address those questions. So, I suggest that all information be sampled before making decisions, going in depth.’* *‘Using these devices for long has affected his health conditions, such as when he sometimes felt problems in his eyesight. He added, ‘I tried to maintain screen time as much as possible, but it is used more for learning. Also, I sometimes experienced connectivity issues. As mobile phones have a small screen, it is difficult to read from them when I use the device for too long health issues such as blurred vision, eye problems, and I feel a bit monotonous as well....’*

When asked if mobile devices should be allowed in classrooms, *‘You know most of the students use mobile devices for their own purpose rather than for learning... So, only after the master's level, mobile devices should be allowed, but in bachelor's programs, they must be disciplined. Teachers must monitor students while they use mobile devices to ensure that they are using them correctly. Social sites that are used for entertainment should be strictly restricted in firewalls and only allow academic websites, which reduces misuse of mobile devices.’* I asked if he had found any changes in his learning patterns. He elaborated, *‘Indeed, my learning perspective and*

patterns have changed; it has helped me to change the ways of learning by discovering new content. Previously, I had to listen to the teacher and follow the teacher's path, but now I can take any courses I need on mobile devices, for example, by paying a fee to take academic courses for my research. I often study online for machine learning for my research methodology, and learning this way has been remarkable...'

I have asked if his teacher employed an integrated approach to teaching. He replied, *'Yes, now I can join the dots. Teachers used to teach us using an integrated approach of teaching at various levels. For instance, in research methodology subjects, teachers used to provide us with a topic and guide us along a path that integrated research not only empirical but also involving algorithms, different AI-based learning, natural language processing, and machine learning. For instance, my research topic is about researching the hiking process of shares in NEPSE, or let's say it is a trading-related research topic where I had to integrate mathematics algorithms, machine learning algorithms, how a country's political study impacts the share, and how socio-economic factors affect the study.'* He felt that the interactive approach to learning had truly improved his thinking and enabled him to achieve remarkable outcomes with his projects. So, proceeding further, I asked about the approaches to STEAM inquiry-based learning, creativity, and collaboration, and whether mobile devices have played a role in improving or diminishing these approaches. In the case of inquiry-based learning, he found that it has significantly increased, *'Since I have to do research and I often have to search for reliable content online and do a literature review, which I have used mobile devices for. Other than research, I am entirely dependent on these devices to resolve my confusion. I often used to have interactive sessions by chatting with an AI bot. Also, in my master's, I have taken maximum benefits of these devices by researching online and sharing ideas with friends....'* In the case of collaborative learning, *I will give you an instance of my MPHIL class. We have a group where we share information and often communicate... While doing a literature review or writing reports, we share content online. For discussions, we often collaborate through different e-learning platforms... You know we grow more by sharing, so in my case, in Master's and bachelor's as well, we used to interact with each other through these devices and have a fruitful discussion, be it for exams or any kind of projects...'*

Likely, in the case of critical and creative thinking skills, he has felt they have slightly diminished. He felt, *'Since I am more dependent on mobile devices in recent days because of AI and other search engines, it has subsequently decreased my critical thinking capacities. Before, in my earlier educational phase, I was fine not using these search engines, but now I cannot work without using them.'* He added, *'The way I used to think before and learn is affected as I feel that I am not able to think in that way, and it is certainly reduced by being more dependent on mobile devices. Before the invention of AI or other advanced tools, I had to search the web and read every line to find relevant content. But these days, AI tools provide precise content, and I do not have to put much effort or thought into searching for the required content... So, I feel the way I used to be creative is lost in between...'* In terms of project-based learning, *'I had to do different kinds of technical projects where I felt confused about how to begin. For instance, I had projects on microprocessors and various hardware connections, and my teachers used to guide me, but that guidance wasn't enough. I had to research and learn on my own and build my own architecture. Thus, I started learning on my own, and at that time, mobile devices became more useful... You know how limited textbook knowledge is, so I had to research to complete these projects !!'* From these narratives, I can say that the STEAM approaches have been strengthened through the use of these devices.

I asked for his views on the availability/affordability of mobile devices across different parts of Nepal. He said, *'There is a digital divide in Nepal; certain people possess more mobile devices than others. If you compare rural and urban areas, the coverage of rural areas is more than that of urban areas. Technological facilities are fewer in rural areas. The government should play a key role in improving this; it should focus on developing rural areas, which lack infrastructure, including network connectivity, fast internet, cyber facilities, and mobile devices. Using these facilities, students can search content and study various learning materials, whereas the students' computing resources are very limited in rural areas.'* He further added, *'Students might be dependent on a guide, physical paper, and various notes to study. So, students can learn using mobile devices rather than relying on physical paper. They can easily search for and access content on mobile devices and instantly broaden their knowledge, which increases their problem-solving ability. If the facility of mobile devices is provided properly in different parts of Nepal, it will be more fruitful.'*

At last, I asked him what the future he sees for these devices is for learning purposes. *'Since we are too dependent on these devices for everything... It has become essential for further studies as well. It will be very beneficial in the realm of education; however, one must be self-aware and consider creativity and critical thinking skills. To overcome these issues, students must consider the content and research it rather than relying on AI; this will make it more memorable and engaging. Future technological changes have significant potential. You know, the concept of AI was not in practice, but now AI has taken the market, and there is more scope for AI. These changes will eventually bring many changes in learning through the use of mobile devices.'* Also, he added, *'Mobile devices should be used for academic learning rather than focusing more on entertainment purposes as these devices hold great potential and one must make the most out of them...'*

The interview ended, and I asked him if he would be available if I had to inquire about anything later, and he said he would be available at the time of need. I thanked him, and we parted ways.

Narratives Insights: Unfolding Story of Shanti

Hailing from Sitapaila, Shanti is currently pursuing her EMBA. Her educational background shows that she completed a Bachelor's in Information Technology from List College, Kamalpokhari, and is enrolled in an EMBA program at Kissa Valley College. I met her, we had a brief chat, and we mutually agreed to meet on the scheduled date and time for the interview. We chose for quite place for the interview, briefly talked for a few minutes, and started our interview. Initially, she appeared nervous, but as the interview progressed, she became more comfortable and provided me with more open and detailed responses.

Narrative of Interview Sessions

Shanti was also one of my lucky students who used the technology during her schooling. When computers were introduced in Nepal, many schools took the initiative to introduce computer classes. She used to have computer classes very often. After completing grade ten, she was enrolled in the intermediate level of the science faculty. After completing her school, she received a mobile phone. She shared, *'I used to use my parents mobile phone for calling my friends and to play games. I had my first cellphone in my plus two, which we used to call the level back then, now it is called the intermediate level. It was just a simple keypad phone. The facilities of the phone were very limited, one could only send text messages and call, plus there were*

no internet facilities on the device.’ She used to visit cyber cafes occasionally for various purposes, such as printing reading materials, using Facebook, or checking her emails. *‘I, along with my friends, used to go to the cyber cafe, if we wanted to access reading content or to print it. It used to be, occasionally, only because the school and college provided us with reading materials. Mostly it used to be for using Facebook...’* Later, after years, her phone was upgraded, where the facilities were more, such as she could use data or WiFi, use many applications as supported. She shared that she used mobile devices only after her bachelor’s level, specifically for learning. I asked about her mobile device usage at the current state. *‘Before, in my intermediate and bachelor’s levels, I used to go to college every day and learn. Now, I seldom go to college and learn due to my hectic schedule. Sometimes, I take notes on my mobile phone. The one who goes to college shares notes among us in the groups. Often, teachers take classes online (Google Learning), which is later learned through recordings. Taking online classes saves a lot of time as we can watch the recording whenever required.’* During Shanti’s initial days of bachelor’s, she used to say, *‘I just used mobile phones for social media and rarely used them to search for reading materials. Later, as recommended by colleagues and teachers, I consulted the website they suggested, which was indeed useful... Since I had to do coding during those days, I used to search for content specifically for coding. I started using w3schools for learning. With recommendations from friends and teachers, I learned about w3schools, where I found resources and used to refer to them in my initial days of learning. I did a project: I made a mobile photography website. I did it on my own and researched coding online. There are fewer pages than there are now, so finding the right content was not easy. I used to have doubts about whether it was relevant or not, and did a hit-and-trial to see if the code worked or not.’* She further added instances such as, *‘I did a project for a photography website. I used to refer to teachers’ materials and W3Schools code, which were really useful. Since making anything from scratch takes time, I had to go through different codes, hits, and trials, which I mentioned earlier as well, so that I could achieve the desired results.’* I asked her how she is using these devices in her master’s, and she replied, *‘In masters, everything is online, I often refer to subject-wise tutorial contents from YouTube. Also, I refer to the teacher’s YouTube video of their teaching materials. It is difficult to attend classes, so it has become easier when teachers teach online. As I cannot attend physical classes, it is much easier for me. I listen to the recording at my*

convenient time.... In my educational journey, from the first semester to my current semester, i.e., third semester, I have been using mobile devices for learning... Since I work and study, I could not attend most of my classes, so I listened to the audio of the recording and used ChatGPT for learning to get the exact content for the studies.' I then asked her about her learning patterns, which she felt had transformed, 'The first thing that comes to my mind is it has made attending classes easier (laughingly) .. as now I do not have to wake up at an exact time and rush to attend regular classes. If I have to compare it with my earlier phase of education, there were no proper internet facilities, data was costly, I had to attend physical classes, but now I can attend them online, learn through collaborating with friends and teachers for knowledge sharing with the help of mobile devices.' Moreover, she found that learning has become more flexible. As she can listen to the recording at any time, it has become more convenient; she can directly address her doubts on mobile devices, and she is getting peer support for the learning materials in case of issues. I asked whether she found any differences in learning before and after using mobile devices. She said, 'Certainly there is... I used to rely on various textbooks for reading, and especially during exam time, we had to make photocopies of notes at photocopy centers or copy notes from friends. Our educational practices were like that, so we used to follow the same pattern of learning.' She added further, 'But now, if I want any information, I can search instantly for any piece of missing information. If I do not have course content, I can easily search for it and make proper notes, which I am currently practicing.'

I asked her what benefits and challenges Shanti faced using mobile devices whilst learning. She replied, 'Talking about benefits, everything is available online, and it becomes easier to learn. I always try to explore more and be creative. I tend to search for content that I know little about, or to gain extra knowledge. One advantage is that, since I cannot attend every class, I always listen to the class recording, which is readily available anytime, anywhere. I access them while traveling from home to the office and vice versa, and I even listen to recordings at the office.' When there were no mobile devices with her, she had to open a laptop or computer to study, but now she can refer to mobile devices to study and complete different projects assigned. She felt that when a person has more knowledge, it empowers the learning process, which she has personally felt. Likely, in case of disadvantages she felt, 'Though I use mobile devices to learn, often my mind gets diverted towards social media, and I do not keep track of the time I spend on them. I only intend to use them for a short time,

but I end up using them for more than an hour. I rely more on Instagram reels, and I sometimes get addicted to them. Sometimes I receive messages on social media, and while responding to them, time also flies by. Some I often neglect, assuming the teacher will provide content.’ Moreover, she felt it had brought her significant health issues, such as *‘Screen time has increased, at times I refer to ‘thuprai.com’ to buy books online. Well, I do not know if one can still buy books from there but you know, reading online sometimes reduces concentration, causes pain in the eyes, and leads to severe headache. Also, taking online classes through mobile devices is not like attending physical classes; it causes lots of distractions.’*

I asked whether Shanti was allowed to use these devices earlier in her educational phase. What differences would she feel? *‘If I were allowed to explore and learn earlier, I am sure it would have brought a positive aspect in my academic learning.... I used to study with whatever content I had and the notes provided by the teachers, since the internet was not readily available at the time, which was the main limitation, I believe. Thus, if the internet were good and if I were allowed to explore it on mobile devices in any subject, it could have broadened my knowledge. I would have learned a better way to research and explore...’* Moving further, I asked about the integrated approach to learning; she added, *‘Yes, the teacher has been teaching using an integrated approach. In one of my subjects, let’s say International Business, the teacher has been integrating various subjects, such as marketing, understanding human behavior, their buying behavior, and their psychology, and must think about demand and supply, just like economics. Teachers teach how to understand human behavior for conducting business, and understand the psychology of the individual. This has benefited learning because it helps to understand various subjects.’* She found such approaches to learning beneficial because integrating different subjects broadens knowledge. She added, *‘Such as if I have to sell any product in any location, I have to search about the people’s buying behavior, their area of interest for the products. For instance, in Nepal, there is a high craze for Korean products in Nepal, be it cosmetics or any skincare products. Connecting with this, we can see how different subjects are integrated.’* Through mobile devices, she has found that different STEAM approaches have strengthened. In terms of inquiry-based learning, *‘Sometimes, I do not have an idea of something, so while learning, I have to do inquiry. I could not communicate with the teacher right away, so I always tend to rely on mobile devices. At the bachelor’s level, I used to ask a lot about mobile devices*

because of my programming subject, as I had to code and learn. Though the teacher used to provide notes, it was not ample enough, so I used to explore more, do inquiry, and learn.' I asked her for instances, if any, she replied, 'In my master's, I collect questions and inquire about the solutions. I search for content that I require. In case I do not find the books on subjects, my go-to place is Google and Edge.' She admitted that, through different AI platforms, her creativity has increased. I asked if her problem-solving skills were enhanced, she added, 'You know it is linked with inquiry-based learning and a collaborative way of learning. Once I face a problem, I have to solve it, and I tend to seek assistance from peers to research and learn. While learning, I sometimes face problems, and at that time, asking the teachers may not be convenient, as they might not be available either... In bachelor's, during exam preparation, while preparing through past question papers, I often find it difficult to solve the questions. At that time, I used to learn through my mobile. Now also, in master's the content may not be available in the notes of the teacher or in the books, so I often search the materials online through mobile devices. In my Operations Management subject in the third semester, it was difficult for me in numerical, so I used to put pictures in the group, and the teachers used to help me out.' Shanti found that her collaborative learning skills also developed. 'One person cannot perform collaborative activities; it requires a group of people. I have groups in master where we do continuous sharing of notes and information, or the one who goes to the colleges shares the ideas (notes) of the classroom. I believe this is the kind of collaborative learning. Note sharing, reading materials are common among friends through the use of mobile devices....'. She feels more minds, more ideas, which help broaden her knowledge, as perspectives differ from person to person. In her bachelor's, these activities were more common. For one of her group projects, she created a website about travel and tourism. She found that mobile devices have helped her resolve real-world problems by watching YouTube videos of the teacher's tutorial. 'I often refer to the comments on the chat box of the YouTube videos; the videos make it easier because all the queries are solved. I do not have to personally ask them as other people have already asked and they have already answered them, which are relevant.' Shanti felt that using mobile devices in remote areas would be more beneficial for university students. Though mobile devices are not readily available, if they get a chance to use them, they bring ample benefits. Because the road infrastructure is quite challenging in remote areas, students cannot always

attend physical classes. If they get a chance to study online through mobile devices, they can continue their studies. The government and educational institutions should play a key role. If the government makes internet services available, it will bring more ease. Mobile devices can be costly due to economic conditions. The government should bring a campaign or scheme where students can buy mobile devices at a cheaper cost.’ She felt, ‘Trained personnel should train teachers in rural areas on how they can benefit from teaching and learning through mobile devices. Educational institutions should block non-educational sites. Students should be allowed to explore the content and access the information.’ However, she added, ‘In the classroom, students should be allowed to use mobile devices for a certain period only instead of being allowed to use them continuously.’

When I asked Shanti about what the future she sees in mobile devices in the realm of education, she added, *‘You know we are more reliant on mobile devices for everything, to be updated on news, work life, and learning... Technology has already been updated, and there is more to come, with many innovations. Now, AIs such as ChatGPT and Gemini have introduced many features, ranging from audio to images; further advancements are expected in the future. Many educational institutions have started allowing these devices in the classroom, and I’m sure it will be mandatory in the future. If you compare the keypad phones of the past to the cell phones of now, you can see drastic changes. I see great potential in the future.’*

The interview sessions were completed, and I had collected the required information. I expressed my gratitude and asked her if she would be available in case of any confusion. She was ok with it, and we parted our ways.

Reflections on Chapter

This chapter addressed my research question. In the beginning phase, I introduced each participant and built rapport with them. Then, I proceeded to the responses, writing the narratives in direct quotes to capture the essence of the stories as narrated by the participants. Through narrative inquiry, I was able to navigate participants' responses. The research participants' experiences revealed their varied perceptions of adopting mobile devices for personal and academic learning. From the data, I have generated five themes: Access to Technology, Redefining Learning, Dual Edge Impacts, Mobile Tech in STEAM Approaches, and The Next Generation of Education. From the narratives collected, I have concluded that the mobile device, especially the mobile phone, has become an inseparable asset of many individuals. It

has both benefits and disadvantages; thus, one must use it wisely. Furthermore, it has enhanced STEAM approaches, including inquiry-based learning, problem-solving, hands-on learning, and project-based learning. The generated themes are discussed in the following chapter.

CHAPTER V

TRANSITION FROM THE TRADITIONAL FORM OF LEARNING TO DIGITAL LEARNING

This chapter presents the lived experiences of university students, showing how mobile devices have helped them achieve milestones in their respective academic learning journeys. It is based on a narrative inquiry research design. The narrative shows how mobile devices have served as a very important tool for university students in bridging their educational gaps in different phases of their educational journey. This chapter addresses the first research question, and the themes are: Access to Technology, Redefining Learning, and Dual Edge Impacts. The chapter begins with how the technological access of the participants, and their early learning were shaped. The narrative showed participants' learning was redefined when they learned how to use these mobile devices in their academic fields, as it can be observed that there was a shift from a teacher-centered approach to a student-centered approach, leading to active and self-directed learning empowered by the mobile devices. The dual impacts of mobile devices, such as advantages and disadvantages, were narrated by participants. They felt more advantageous in adding mobile devices to their learning as they felt empowered.

Access to Technology

As a developing country, Nepal's technological status was still in its early stages during the 1990s. Khanal (2024) stated that Nepal's IT landscape was still developing during the early 1990s; computers were rare and used by only a few government offices, followed by educational institutions and some big industries in Kathmandu. Moreover, it was around 15th July 1995 that the ISP provider Mercantile began full online access, operated via a leased line through Nepal Telecom, with its backbone in Singapore (Acharya, 2009). Since there was no internet service in the 1990s, there were no internet users at that time. Likewise, Dhital (2018) explains that ICT (Information and Communication Technology) access was limited for carrying out certain administrative work for a few government agencies and for processing SLC examination results; thus, before 1994, computer science was not included in the curriculum.

Regarding rural areas, Simkhada (2023) stated that the biggest challenge was limited resources, i.e., infrastructure and facilities were very limited. He further adds that the government of Nepal has, however, made efforts to increase access to education, especially in rural areas, by improving teacher training and availability, but there are still challenges, such as the unavailability of resources and the poor quality of education. Drawing on Shikshya's narrative, the educational system was constrained, with limited school infrastructure, limited textbooks, and minimal use of technology. Her stories reminded me of the struggles of being a 1990s kid, where pursuing education was quite challenging. I still remember how we used to listen to our teachers as they taught us on the blackboard with chalk and duster, in the absence of infrastructure, limited resources, and technological advancements.

Shikshya shared, *'It was around 1996AD, and I was in a small grade. In our school, there was no proper school infrastructure. So, I always used to carry a jute sack along, not for books but as a seat to study in school. Later, infrastructure problems were sorted. If I talk about electricity facilities, you know it took more than 8-10 years to bring electricity to our village.'* She used to rely on lamps to study at night, and the school's infrastructure was inadequate, such as textbooks, computers, desks, and benches; moreover, teachers used a traditional method of teaching, which follows rote memorization, assignment, and terminal examinations. Thus, the traditional curriculum focuses on acquiring knowledge rather than on developing skills and attitudes, thereby severely limiting learners' ability to apply what they know (Dahal & Bhat, 2024). Despite such hurdles, she has succeeded professionally and now holds a respected position at one of the leading financial institutions. Shikshya points out that her teacher employed a teacher-centered approach, treating the teacher as the primary source of knowledge. When the entire class becomes dependent on the teacher, either they get very close to the audience, or they become full-bore (del Campo et al., 2012). She said, *'I was living in that era where using technology for learning purposes was far from imagination. I had textbooks and handwritten notes, and I used to depend on them only. In our guide, our teacher used to teach us book chapters thoroughly, habituate us to rote memorization, and give exams. So, I used to focus my attention towards the teacher's lectures only, and this used to be only one way ...'* The teacher's pedagogical approach was rooted in traditional methods, i.e., the conventional educational system (Alessa & Hussein, 2023), as evident in Shikshya's narratives. This reminded me of my school days, when

teachers used to lecture us on the book's content, and students were forced to memorize and take standardized tests, leaving little room to explore creatively or practice applying the concepts.

Thus, the teacher has followed an executive approach because they are the controller of information in the classroom. Since the technology was not very advanced, Shikshya believed that her teacher only used textbooks and that, due to the lack of an interactive learning environment, students were passive. As I noticed, she mentioned visiting cyber for various academic activities because there were no mobile phones for online solutions. She added, *'I was not allowed to use mobile devices at those times as it was restricted in the house itself and college as well. At that time, there was no practice of using Google or any search engine. Though there were dial-up devices due to cost issues, I did not use them. However, I used to go to a cybercafé to use the internet and check our results.'* This shows her active learning behaviour connecting with social constructivism theory (Akpan et al., 2020). Initially equipped with basic keypad mobile phones limited to calls and texts, the teacher significantly influenced Shikshya's educational journey until her intermediate level, as technological advancements were minimal. The classroom technology primarily consists of chalk, blackboards, and textbooks, with no digital resources available.

Dang, one of Nepal's districts, was still underdeveloped during the 1990s and in the early stages of developing technological infrastructure. Growing up in such an environment, I have felt that it has impacted Chetana's early educational life, as technological exposure was delayed, as evident from her narratives. *'... Dang was a bit of a rural area; there was no technological infrastructure in my school, so my teacher used to teach through the use of chalk and markers in the classroom.'* It can be said that she mostly relied on the teacher's handouts and textbooks and was habituated to traditional teaching methods, i.e., chalk and markers, when teaching is equated with telling, like knowledge is being poured into students and learning is equated with listening (Shal, 2016). "In traditional educational practice, the students often become comfortable with the dominant instructional method, which is teacher-directed or teacher-dependent learning" (Dahal & Bhat, 2024, p.105). She felt that teachers were irritated when she asked many questions out of confusion, which made her learning process more challenging. Like Chetana, I had experienced it too often during my schooling, when I felt like the teacher was the controller of the information and had to follow the path the teacher had shown me. Padli and Yasin (2023) stated

that if the teacher relies solely on storytelling techniques or reads aloud textbook chapters, there is a high chance student will become bored, as they cannot delve deeply, which is common in this teaching method.

Chetana added, *‘It was around 2006, I still remember I was in 10th grade, during that time mobile devices were initially launched, I was not that techno-friendly at that time. Since there was no practice in using technology for learning, I only used to refer to the teacher’s handout and read notes from the books... Later, during my intermediate level, too, I had no access to mobile devices even though I was in a hostel. So, I guess due to less media exposure, I did not have sound knowledge of searching and learning, thus, in the end, the only source of information I held was the lectures of the teachers ...’* Hu (2024) shares that the traditional classroom focuses on knowledge acquisition but highly neglects the student knowledge exploration process, which is highly reflected in the narrative of Chetana. Since she lacked technical exposure, her primary sources of knowledge were printed materials and teachers’ guidance. However, I found a shift in the teaching patterns of teachers in her bachelor days when the teacher started using technology for teaching, sharing reading materials, and communicating through social media, i.e., *‘Only during my bachelor’s days of nursing, teachers taught through the projector and showed a transparency file on the device, and before that, teachers used to teach on blackboards only.’* This gradually expanded her exposure to technology, shifting her learning patterns as it personalizes and tailors learning to students’ needs (Djibrán et al., 2024). *‘...During my bachelor days, for research data collection and fieldwork, I once moved to a remote area and communicated with my supervisor via email on my mobile device. My supervisor used to say that they had sent the email using ‘CUT PASTE HIGHLIGHT’, but at that time I did not understand properly what they meant... I reckoned at that time that it would have been easier during data collection if I had more knowledge of utilizing the mobile devices.’* Thus, I believe it has marked a turning point in her educational journey, bringing a transformative shift. From the narrative, I felt that, because she lacked ideas about using mobile devices, she regretted not having known how to use these technologies.

From Samarth’s narrative, I learned that in his school days, his routine was: going to school daily, writing notes as narrated by the teacher, whose words were considered absolute. In antiquity, the pattern of teaching and learning remained the same, passed from generation to generation. Basically, I meant it was a one-way

street. His education was shaped by a teacher-centered approach whereby textbooks and lectures dominated the classroom. The social constructivism theory stresses active interaction among teachers and other parts of the teaching-learning process rather than focusing solely on the teacher's monotony in the classroom (Saleem et al., 2021); however, teachers' lectures and textbooks were the only sources for him, thus I felt the role of the teacher was like "a sage on a stage" (Shal, 2016, p. 104). Regarding technology, computers were introduced during his school days, but access came at a price. *'There used to be cordless devices, and this device was called a PDA, but it was very costly, which cost more than a lakh. It was a mobile device with a keyboard and a small screen, similar to a computer. Speaking frankly, I used a computer only after completing my SLC degree. I still remember when I was in school, computers were introduced in Nepal for the first time, and we had to pay extra money or fees to join computer classes, which was costly for me.'* Later, after completing SLC, he took computer and bridge courses for three months. During his bachelor's days, too, the teacher followed a one-way teaching approach and failed to demonstrate how the book's content could be related to real-life situations and applied to the future. *'..... Even though I studied in the capital city of the country, Kathmandu, in my bachelor's days too, the teacher used a lecture-based method, a one-way process. Teachers didn't use any technology whilst teaching; let's just say it wasn't in practice. The teaching methodologies followed more of a traditional pattern, used boards for teaching, and failed to demonstrate the connectivity of books to real-life situations.'* I still remember, like him, I used to make most of the basic tools from borrowed textbooks and limited mobile devices. Soon after, he bought a mobile phone, but since using the internet was a bit costly, he used it only for calls and texts.

Samarth shared, *'Well, I vividly remember that day, it was nearly 25 years ago when I bought my first mobile phone, which was priced at Rs... 19,000 ... There used to be charges for incoming calls as well, so I only bought a mobile phone after NTC removed incoming charges for calls'*. Samarth attended evening classes and rarely relied on mobile devices for learning. As an IT student, he relied heavily on computers and laptops for network-related projects, which required high-performance laptops for simulation. *'.... I had used mobile devices for accessing the learning materials provided by teachers, for instance, I used to read the text of books in audio form through an Android app...'* He used mobile devices to access the learning materials provided by teachers, for instance, listening to audiobooks via an Android

app and searching for basic ideas of the topics. This can be termed self-directed learning, which is linked to internal learning and growth processes as well as to external influences experienced through instruction (Dahal & Bhat, 2024).

Lakshya grew up in an era when technology was just being introduced into education. He still remembers the day when his school introduced computer classes, and he was fortunate to access computer technologies by paying extra charges. He shared, *‘It was around 2000A.D., our school brought computers and launched computer classes. I must say I was very lucky and I was extremely excited too; I got the privilege to work with computers, as it was still rare in those years.’* Apart from computers, he often used his parents’ mobile phones for gaming. From Lakshya's narrative, I have observed that early exposure to technology in his educational life has given him more opportunities. He reflected, *‘During those days, there used to be a pager for sending and receiving text messages, and only my elder brother had a mobile device. I always relied on teachers for teaching content, and I did not have the habit of searching for it online. I had dial-up devices and had to load a balance of certain Mbps, but since I did not have sound knowledge of how to use search engines, I did not practice it much.’* Though internet facilities were available, he had to use dial-up connections, which were slow, data was limited, and there was no proper search engine; thus, online learning was infrequent. Thus, the only source of information was the teacher's content, which was often monotonous, and learners were passive, which are aspects of behavioral learning theory (Saleem et al., 2021). Often, it was followed by rote memorization and different types of assessment. In my classroom, too, teachers stood at the front, delivered their content while I scribbled notes, and rarely showed any curiosity. I asked him whether he doubted this learning process was a setback for his future, and he smiled and replied, *‘I used to wonder at times whether the monotony of this kind of rote learning, lectures, memorization, and tests was enough or there was more to education than this. But often these thoughts were lost.’*

In his bachelor's days, he used to carry simple mobile phones with small screens; the OS (Operating System) was not advanced, and functionality was limited, so they did not support surfing the internet. Like Lakshya, I too used to carry a mobile phone that had a small screen, no internet connection, just enough for making calls and texting. Even though there were limitations at that time, I still felt like it was a significant tool. As the years progressed, he learned the importance of learning by

searching, as in his programming subject, he had to search various types of code for his projects.'...*Later, during my bachelor's, I started learning code by searching for resources; the practice was still in progress... thus, cyber cafes became my primary source for accessing online content. During those days, the internet was a bit costly, so I used to use it rarely at home for important purposes rather than for learning. If I need to use the internet, I have to visit Cyber Pay hourly and search for the content of whatever inquiry is in my mind related to learning...*' Teaching methods also started to change, as the teacher had upgraded the technology to a projector to teach in the classroom and used to share content through Yahoo and Google sharing, which made learning easier. It is believed that learning can be greatly enhanced when innovations take into account the characteristics of the new technology, the pedagogical design, and the context in which learning is taking place (Firmin & Genesi, 2013).

Technology has become an inevitable part of educational life, which has been influencing various aspects of learning. Indeed, I too felt that from the narrative of Lakshya as he started collecting necessary reading materials from Google in his bachelor's days, well, this can be pointed out as a turning point in his learning journey.

Born and brought up in Kathmandu, the capital city of the country, Gyan had the privilege of accessing technology at a very young age. His narratives take me back to my journey, where computers were more familiar to me than mobile devices. He used computers both at school and at home. Talking about the pattern of teacher pedagogy, it was a teacher-centric approach being the ultimate source of knowledge; his narrative supported, *'I had to buy many books as per subjects, and if I had to gain new knowledge or ideas, then I had to repurchase new books, which was kind of troublesome as per the syllabus and content...*' I remember sitting in the classroom, flipping through specific books and copying notes much like Gyan mentioned. He rarely had the opportunity to explore beyond the textbooks. *During those times, desktop computers were common, and there was no mobile device technology for searching for content. Later, mobile devices were launched, but they were not as advanced as they are now, as Java-based mobiles for searching and exploring were not available, thus mobile phones were only used for incoming and outgoing calls.'* During that time, dial-up devices were costly, and the only mobile devices available were keypad phones with antennas, which often led to connectivity issues. I asked Gyan since he accessed Mobile devices and computers at a young age, which benefits

his learning process. He reflected, *‘During those times, we did not have much practice referring to search content online through a web portal and learning. There was no proper search engine or any kind of AI tool. The network connectivity was limited and very costly, which has made mobile devices and computers impractical for learning.*

‘Over time, Gyan’s reliance on mobile devices gradually increased as he realized that they are not just for communication but also for self-directed learning and exploration. In his bachelor’s days, he began using technology to meet the requirements of his subjects, and even his teachers encouraged him to learn to use these tools so he could benefit in the long run.

Learning takes place through a variety of methods and at varying levels (Saleem et al., 2021). From Shanti's narrative, her learning process suggests she is a passive learner. Her classroom followed the singular teaching approach (Hu, 2024), i.e., the teacher is at the center, the teaching process focuses on integrity and system, and the students have very little space to think. *‘.... I used to rely on textbooks for reading content. During exams, I had to photocopy notes from photocopy centers; we were forced to read in such a way.’* Shanti’s experience mirrors Samarth’s, as she began using mobile devices after SLC. Initially, she started with a keypad phone with minimal features. Rarely did she go online to access reading materials; most of the time, she relied on the teachers' guidelines. *‘I only used to go cyber with my friends, mostly for using social media or if I had to complete assignments where I had to search online.’* My learning also relied heavily on the teachers and printed materials, just like Shanti. It wasn't until after she earned her bachelor's degree that she started using mobile devices for educational purposes. She adds, *‘During the initial days of my bachelor's, I started using mobile devices for learning to refer to the website that colleagues and teachers suggested.* During her bachelor's degree, teachers began using technology to teach various IT subjects, giving students more practical exposure.

Thus, when a teacher uses technology whilst teaching, it helps capture students' interest, motivating them and leading to better results without external control or stimulation (Padli & Yasin, 2023). In Shanti’s case, too, she used to learn by exploring. As her main agenda was to use mobile devices for inquiry-based learning, this type of learning encourages students to take ownership of their learning (Smallhorn et al., 2015). As she entered her Master's program, the increased workload made it difficult for Shanti to take physical classes every day; thus, she became over-

reliant on mobile devices for easier access to learning. *'... You know how we used to study before, going to school and college every day, and now the time has advanced to the point where we can even attend classes online from anywhere. However, because I am busy at work, I cannot afford to go to college every day; thus, using mobile devices is much easier. I attend classes online, no need to attend physical classes, and I also take notes online through my mobile.* 'Since she mentioned that technology is used in her Master's classes, it has great potential to transform the learning environment from a teacher-centered to a student-centered classroom, which is the demand of today's learning environment (Firmin & Genesi, 2013).

Redefining Learning in the Mobile Technological Era

Shikshya's learning methods changed when she started using mobile devices for learning. Her university education was different from her school education. It was rooted in conventional methods of teaching practices, such as memorization, tests conducted at times, and a teacher-centric approach. The constructivist philosophy discourages memorization of others' ideas and definitions and always encourages learners to explore on their own (Saleem et al., 2021). *'After completion of my school studies, I shifted to Birgunj to complete my further studies, but to my surprise, the teacher used Hindi language but I was comfortable as I understood the language and knew how to talk and speak as well ...* 'She then recalls her educational journey of bachelor's days; she shared that the teachers had started using technology, i.e., projectors for teaching, which was innovative during those periods, *'For my bachelors, I moved to Kathmandu where teachers used technology for teaching i.e. projector, I found it completely new and innovative as I saw it for the first time. My schooling and intermediate level were completed in different languages, so it was initially difficult for me to cope with the new environment. In those times, I used to refer to Hindi YouTube channels as I found it easier to understand. I even used to download online books instead of printing them to read offline. I also searched for teaching videos online and referred to those that taught in a much easier way. Since I didn't have a laptop, I used my mobile phone instead.'* Additionally, on the recommendation of friends and teachers, Shikshya started downloading books online. Though she was aware of technology from the outset, her initial exposure was limited, and she faced difficulties using mobile devices in the early phases, but gradually learned and upgraded.

Shikshya added that due to her busy schedule, i.e., because of work and family commitments, she didn't attend Master's classes, where mobile devices came in handy. *'I have a 2-year-old daughter, and I work as well, so it has become extremely difficult to manage time... I could not attend physical classes for my master's degree as classes are always in the morning. So, my only source of information is mobile devices on which I have become very dependent.'* She browsed the internet for course content, so she became reliant on mobile devices to construct knowledge. From Shikshya's narrative, I found that she applied the principles of social constructivism, specifically active learning (Akpan et al., 2020). Using mobile devices, she has engaged in self-learning by exploring. Shikshya shared that she often referred to online videos, downloaded solutions in PDF format from Google, and practiced the numerical subjects accordingly, which made her learning journey much easier. *'On YouTube videos, while watching content videos, I prefer seeing the comments section. I know many of us do the same (smiling), which clears up any doubts. At times, I even add comments in the comments section, and I see my friend's comments as well, which is indeed helpful.'*

In early 2020, the COVID-19 virus spread globally, and several nations faced lockdowns. I recall how many businesses were closed, we had to work from home, and all educational institutions were temporarily closed. In this phase, digital technology, i.e., mobile phones, became a constant companion to people like us (Matthes et al., 2024). During the pandemic, Shikshya revealed that she had the opportunity to take online classes because mobile devices were available, as physical classes were temporarily suspended. She added, *'During COVID, there used to be online classes using the Zoom app, and the teacher used to share all the necessary content online. At that time, I had online classes in the morning, which were convenient for me and lasted about 2 hours... I used to manage my time. I was thankful that I got a chance to attend online classes; moreover, the teacher used to provide reading materials and necessary materials to ease our learning process.'* From the narrative, I conclude that she has been active in her studies through mobile devices, such as during the COVID-19 pandemic, when she took online classes and constructed knowledge through exploring, i.e., active learning, a perspective of social constructivism.

Chetana had to keep up to date and inquire about different terminology while completing her studies in nursing. Though she had started using mobile technology,

she did not have sound knowledge of searching and learning. Along with communication features, she was amazed by how mobile devices can be beneficial for learning. Thus, through the assistance of colleagues, along with referring to the notes provided by the teacher, she started exploring mobile devices, which helped her during exams and cleared her doubts, unlike waiting for the teacher's guidance. *'Since I am a nursing student, I have to look up different terminologies while studying, which are mostly health- or medical-related. I used to search and learn by surfing Google, downloading books and reference books via links provided by the teachers through mobile devices.'* It aligns with the device learner aspects of the FRAME model as learning is a continuous process that involves exploration and discovery, and it can occur within and outside formal educational institutions. Chetana started her teaching career in 2014 after completing her bachelor's degree. Since she grew up studying the notes and references provided by teachers, her teaching practices followed the same pattern: giving lectures using a projector for PowerPoint presentations. During COVID-19, lockdowns were enforced in many parts of the world, including Nepal. And I still remember how, along with many others, I was forced to stay in the house, and how many schools and colleges were closed (Katsumata et al., 2023). Thus, the pandemic, i.e., COVID-19, changed her teaching pedagogy. She reflected, *'During the COVID pandemic, our institutions started searching for alternatives to teaching as colleges were forced to be closed for certain periods. But for how long?? So, seeking alternatives, we switched to laptops and mobile devices for continuing classes.'*

At first, Chetana was completely stunned by how a small, handy device, i.e., a mobile phone, could be very advantageous in the learning process. This confused me, so I asked her again whether she had ever used mobile phones during her studies for learning purposes. She added, *'As I said earlier, I didn't have sound knowledge of using Mobile devices for learning purposes until the intermediate level. I learned how to search for content and clear my doubts while studying by exploring, and at times, I even downloaded textbooks and reference books. Most of the time for college work, such as during data collection and fieldwork research, I had visited remote areas where I communicated with my supervisor through email on mobile devices only due to connectivity issues...'* From her narrative, I learned that she was limited to exploring and learning through Mobile devices, however after being a teacher she learned that through mobile devices we can perform different educational activities

such as creating Google Classroom, uploading reading materials in the educational sites or Moodle, live streaming or taking online classes, checking the assignments, and giving them feedbacks as well. Gradually, she understood that teachers must be updated to reflect current educational standards, as they should support, guide, and monitor pupils' progress throughout the learning process (Saleem et al., 2021).

Chetana felt that for the current generation, the way of learning has been revolutionized (Dias & Victor, 2017). These mobile devices have significant potential to transform learning.

I asked her whether she was talking about technology use or the teacher's teaching methods. She responded, *'Both. During my time, I did not have access to facilities and even had to pay in dollars to download learning materials online, even though they were not available when required. I was bound to focus on the materials provided by the teachers, but now students can learn from anywhere, anytime, at their chosen university through mobile devices. Now, students can easily access reading materials and communicate with seniors, and colleagues through different social media platforms, such as WhatsApp groups, Viber groups, and Teams but back then I used to rely on Yahoo Mail, and Skype to communicate with the teachers and most of the time responses used to be late'* Al-Okaily (2013) stated shifting towards using mobile for learning purposes is not only about using the technology but it is more about approach rather than the tools. She understood the importance of project-based learning, so she assigned a variety of field-based projects to students. Social constructivism holds that when a teacher incorporates activity-based approaches in the classroom, learners' natural curiosity is awakened, which is highly fruitful during the learning phase (Saleem et al., 2021).

Samarth, as a Master's student and teacher, knew how important mobile devices are in the learning process. By 2016 A.D., various IT colleges had been established, and the scope of integrating technology into teaching and learning processes began to gain traction. This period also saw a shift in teaching methodologies, as the popularity of YouTube and other online streaming channels grew, making them the main source of educational content. Samarth added, *'Umm... Like Gurukul, students do not have to sit under a tree and read and do what the guru says; times have changed. Technological advancements have impacted attitudes and skills in learning. If I talk about how my teachers used technology, it wasn't really in practice till the intermediate level; however, they did use it at the bachelor's level. My*

teacher failed to share the connection of content with real-life context, and use technology; thus, I try to become an exemplary teacher by filling the gap of what I missed out on as a student and trying to provide facts, figures, and ways to utilize the taught content using technology.’ Initially, the teaching process was entirely verbal, and the learning process was limited to teachers' guidance, but he wanted to change the learning pattern. Thus, to change these learning patterns, he began giving practical lessons. Today, educators face a key challenge in the 21st century: how to help learners develop the skills they need to navigate complex situations and keep up in a constantly changing world.

Samarth added that he always focuses on ‘Building by Learning’. So, he focuses less on theoretical knowledge and focuses on a practical approach. He believed that if there is no practical knowledge, there is no link in his subject, specifically. For instance, as a cybersecurity teacher, he initially demonstrated to students, using a mobile device, how a website works. This illustrates how mobile devices can provide practical learning experiences for students. Previously, students had limited exposure to computer lab learning. I remembered how there used to be only one computer where we all had to take turns. This illustrates that teachers play an important role in encouraging students to become more inventive through social constructivist principles, such as the use of raw data, primary sources, and cognitive terminology, to deliver required materials (Saleem et al., 2021). Now, on mobile devices, he creates YouTube videos showing the lab setup process or uploading taught lessons, and students access the content when they need it. Dias and Victor (2017) argue that this allows a shift in the traditional model of learning, i.e., the classroom is the primary place of learning, where the teacher is the guide, followed by limited instruction.

Samarth’s methods of imparting knowledge have improved; he mentioned using an app to provide assignments and feedback, and at times assigning research topics. Heyman and Kushlev (2023) stated that reliance on smartphones became more apparent during the pandemic of COVID-19 pandemic, and people had to maintain social distance from each other. During the pandemic, physical classes were not feasible due to various safety concerns, so his educational institutions resorted to using mobile devices for teaching. Since then, the practice has continued in accordance with the college's guidelines. He adds, *‘We relied more on mobile devices during the pandemic, and even after COVID, the college has decided to continue the*

practice because if similar incidents occur in the future, it will make students more accustomed to such situations. Now, we teach online and provide them with assignments online.' Many teachers have been using technology to provide timely formative assessment feedback to students, along with encouragement, regardless of time constraints, whereas students find it easier to view their achievements, which also boosts their motivation to improve their performance (Padli & Yasin, 2023).

Lakshya had always been a diligent student who delved into textbooks and spent hours in the library, taking notes during his undergraduate years. When he joined Master's, he found out that his educational journey was entirely online. He understood the importance of online learning, which was an entirely new educational landscape for him, given his prior background, as his Master's journey was all about online education. He shared that during his Master's journey, he had become dependent on mobile devices. Whether for communication, education, or leisure, many people use mobile devices in their daily lives (Criollo-C et al., 2021). He added, *'As I am attending my classes, which are always online, I prefer taking classes through mobile devices rather than a laptop because it is more feasible and handier as well. I have started using mobile devices for learning in my Master's program. Before, I used mobile devices to look up basic ideas, but now they are an inevitable part of my learning journey. I have been doing various activities such as Reading materials availability, taking classes online in Microsoft Teams, doing Admissions, and assignments are all submitted through mobile devices, accessing content from the e-library, etc.'* The process resembles the constructivist learning approach, in which students are encouraged to apply practical methods to gain information, reflect, and discuss their work in the classroom (Saleem et al., 2021).

Lakshya's initial steps into mobile-assisted learning were just like what I did when I studied. Just like him, I have used search engines such as Google and Bing to understand any confusing terminology and new concepts. *'Though I used to search for ideas and look up different terms, I used to cross-check multiple sources, and analyze the information myself on the mobile devices...'* He spoke. *'Well, as time passed, I have started to realize that today's learning isn't static; rather, it is very dynamic, which is constantly evolving, and without technology, it is nearly impossible.'* It can be said that mobile technologies are more student-centered in the teaching-learning process; as a result, teachers act as mediators in the sharing of content and knowledge (Criollo-C et al., 2021). I questioned him if using mobile

devices earlier would have changed his learning pattern. He stated, *‘Without a doubt, my level of knowledge would have expanded if I were allowed to use mobile devices, if the learning platform was more feasible like today in those back days, I would not be in this field as I am today.... The invention of AI tools is a game changer for me, and the great part is that these are all accessible through mobile devices.’* His perspective on learning has changed through the use of mobile devices. *Previously, we had to do everything from the basics; for example, while working on coding projects, I had to search for content and fix errors, which was time-consuming. Now I can do advanced-level programming on mobile devices, using various AI tools. Errors that used to take a long time to troubleshoot are now resolved in a split second. While doing research projects as well, mobile devices have helped a lot in my research project, such as how to draft research, how to prepare the questionnaire, choosing technology for research projects...* Lakshya’s narratives reminded me of two metaphors that I use most of the time whilst describing my journey of learning, it is the Garden of Knowledge, which means reflecting on growth, and the balloon metaphor, which means gaining and developing new perspectives. *‘For me, learning has become easier, engaging, and far more efficient than I had anticipated,’* he said with a smile. I believe he acknowledged technology as a tool that didn’t just make his learning easier but indeed reshaped his identity as a learner, resonating with my belief in the transformative power of both reflection and adaptability. It can be said that mobile devices have become a valuable asset, providing comprehensive applications, support, and assistance to educational organizations (Criollo-C et al., 2021).

Gyan’s dependence on traditional methods and on teachers for everything brought back memories of my initial journey, when I was the same, following the path the teacher had led me. In his earlier phase of education, *‘I used to be dependent on teachers for everything, used to be busy writing notes, printing hard copies, and completing projects through the limited resources or whatever was available. It became like a habit, and I was very comfortable with that.’* Furthermore, while listening to the narrative of Gyan, I felt the world of technology was less advanced than it is today. Back then, there wasn’t anything like DSL, ADSL, or mobile Internet; there was only dial-up service, which was extremely slow and tiring (Pradhan, 2025). He shared (giving a nostalgic smile), *‘There used to be dial-up devices, which were mostly used in those days. The kinds of mobile devices that were trending in those days were nothing like what we are used to now. The slow 2G internet caused*

connectivity issues most of the time, so thinking about using mobile devices and learning was out of my mind... However, if I speak of today's learning habits, it has been changed as my dependency on mobile devices has brought transformation in ways of learning.'

Though the learning pattern was the same at the bachelor's level, a turning point came during his engineering projects, when he was forced to look beyond textbooks. *'During my engineering studies, I had to work on different projects, and the only source of information was books, which were often very insufficient,'* He explained. *'So, to start with, I started in a very basic way, I used Google to explore and learn by searching through websites and blogs. My project focused on Radio Frequency Identification (RFID), and I used mobile devices for research. I still remember spending hours on search engines like Google and Microsoft Bing, which used to take hours to find the required content and tutorials. It became my primary tool for research whenever I needed quick support and access to generate ideas and solutions.'* However, he had problems understanding the various technical aspects of RFID systems. *'For instance, one has to have a deep understanding of different terminologies such as RFID tags, readers, and how backend systems communicate, which I did not find in books; I had to watch countless YouTube tutorials and even refer to different forums where people discussed and provided solutions to similar projects. The mobile device was very helpful.'* Technology had advanced during Gyan's master phase, which eased his learning process. It is said that in the self-directed learning phase, the student becomes more active whilst constructing knowledge, whilst the teacher or facilitator takes a back seat, allowing the learner to be independent and make their own decisions (Dahal & Bhat, 2024).

As a programming student, he found difficulty with different programming subjects, so he often searched the web and downloaded notes to enhance his learning with valuable ideas. "According to the social constructivist perspectives, Learning is a self-motivated process that integrates learners' prior Knowledge into learning new ideas and concepts, building on suppositions and removing cognitive conflicts" (Saleem et al., 2021, p. 409). The advent of the internet and social media has made it easier to access a vast array of information and to connect with others around the world to share knowledge and ideas (Alam, 2023). He added, *'There have been lots of advancements in terms of technology as different tech giants have developed different technology and AI platforms, and these types of advancements have helped him in*

MPHIL now, while doing different research projects along with assignments. The MPHIL study is more research-oriented than theory-based. He found MPHIL a bit different compared with previous studies, as one has to spend more time on research. Mobile devices have been widely incorporated into the learning process (Habib, 2022), as Gyan stated that he relies on them for more than 90% of his academic learning.

I asked how Shanti's learning was in the initial days, recalling memories she shared, *'You know how studies were back then, I used to rely on textbooks for reading content and the teacher's lectures. During exams, I used to visit photocopy centers and collect notes. I felt so limited and also so rigid, and I always thought learning in this way is not effective...'* Her narrative brought me back to my memory lane, where I, too, was bound by traditional methods, likely scouring textbooks, jotting down the teacher's lectures, and always relying on handwritten notes that never seemed enough. Moreover, during those times, computers were not as popular, as buying one cost a fortune to buy a computer (Pradhan, 2025). Though Shanti carried advanced Mobile devices, she did not have a clue how to use them to benefit her learning. She followed her colleagues' advice and started using mobile devices by referring to the website's suggestions from colleagues and teachers. The use of mobile devices during the learning phase has become a recent trend in higher education, as individuals no longer need to rely on a computer to access electronic learning material. Since she was an IT student, she had to code back then, so she searched for coding content on her mobile device and successfully created a mobile photography website. In master's, the Zoom app is used for classes, for which mobile devices are used. *'If I want any kind of information, I can instantly search for it. Any piece of missing content? I can find it online in seconds. No access to study materials? I explore, collect ideas, and content, and make proper notes. That's exactly what I'm doing, apparently — it has become so much more efficient.'* I asked her to elaborate a bit, and she continued, *'In my journey of learning enhancement, I often refer to subject-wise tutorial content from YouTube. Also, there are YouTube videos of the teacher's teaching materials. It is difficult to attend classes, so it has become easier. As we cannot always attend physical classes, it is much easier for us. Listen to the recording at your convenience. Always eager to learn new content, except for the one that I already knew, I tend to explore more.'*

From Shanti's narrative, I see a vivid shift, such as from being dependent on physical resources to using mobile technology to create a dynamic, self-directed, and

personalized learning pattern, a story that connects her experience with mine. *'In my educational journey, from the first semester to my current semester, i.e., third semester, I have been using mobile devices for learning in my master's. Since I work and study, I could not attend most of my classes, so I listened to the audio recordings and used ChatGPT to learn the exact content for my studies. At the master's level, most of the time, there are online classes and listening to recordings. For learning, I prefer using ChatGPT as I find the exact content, which saves time.'* Using mobile devices has transformed Shanti's way of learning, as she can take classes easily, compared with earlier eras when there was no internet, data was costly, and she had to attend physical classes instead of online ones, and she could not collaborate with friends and teachers for knowledge sharing. For instance, students can easily access any lecture materials or search for information online to meet the required information via learning management systems, access academic databases, or refer to any website through mobile devices (Darko-Adjei, 2019). *'.... Learning has become more flexible. The recording can be listened to while coming to classes or even while working. Since we don't have much time, we have to learn the point answers to the questions; thus, I refer to the teacher's materials and ChatGPT. We also tend to share content in groups. Digital literacy has increased as we have a Google sheet where we share content through Google links.'* Social constructivism states that learners move from passive listeners to active participants and become co-constructors of knowledge, thereby shifting knowledge acquisition from classroom teachers to learners, as evident in Shanti's narrative (Saleem et al., 2021).

The era is changing, and there has been much advancement. I am amazed by how mobile devices have become advantageous and have transformed the way we approach education, increasing adaptability, exploration, and healthy habits.

Dual Edge Impacts of Mobile Devices

Mobile devices are indispensable tools for every individual, shaping how we communicate, conduct research, exchange information, study, and more. These technologies are dramatically influencing when and how students learn (Fojtika, 2016). As Shikshya's educational journey was marked by hardships due to a lack of adequate educational materials, it was evident that mobile devices were extremely beneficial for her learning. Thus, to explore further, I asked her what benefits she felt from using mobile devices for academic learning. Shikshya explained that she found a significant difference in her learning whilst using a mobile device compared with

studying without one. She added that she used to be fully dependent on teachers to answer any queries, but mobile devices have revolutionized her learning process; ‘.... *I am a very busy person: I am a mother and work, so I have to manage my work life and household responsibilities. I joined Master’s classes, but after a few months, I was no longer able to attend them. But I had to complete my course and attend exams, to support my academics, I used mobile devices to browse for the course content ...*’ She heavily relied on online materials rather than printed materials, and she preferred to use different sources. The proliferation of advancements in technology and the explosion of mobile devices have changed the style of learning, whereby learners no longer solely depend on learning materials that are paper-based (Darko-Adjei, 2019). The significant advantages Shikshya felt were an enrichment of her knowledge, ease in inquiring and resolving issues in a new way, and aid in collaborative projects. Mobile devices facilitate learning in both offline and online modes (Darko-Adjei, 2019). “Passengers on public transit systems and everyday pedestrians can often be seen reading saved material on mobile devices partly for entertainment and partly for their learning purposes.” (Lee, 2017, p. 3).

Similarly, Shikshya too stores learning materials in the form of pictures (screenshots) and books in PDF and PowerPoint formats, and reads them while traveling to the office and on the way back home during exam times. ‘*The project done through the use of mobile devices enriched my knowledge level. There were times when I needed to learn how to resolve errors and bugs during the project, and I learned new ways to do so by researching mobile devices. I also learned that Google sharing was possible, and it has greatly helped our collaborative projects.*’ Further, she added, ‘*You know it has made my life much easier as I can instantly connect with my colleagues and seek assistance in case of any dilemma or even consult with the teachers directly ...*’. As students are encouraged to be active constructors, mobile devices offer unique opportunities for learners, serving as a supporting tool and providing a realistic context in which learners can construct meaning personally (Yakar et al., 2020). I feel like having a mobile device enables students like us to carry a whole semester’s worth of learning materials, giving us the latitude to learn in any area or under any circumstances. She added, ‘*Talking about social media usage, I preferred YouTube for cooking videos and Facebook & TikTok only for refreshment purposes or during my leisure time at the office.*’ She could not concentrate for long, so whilst studying, she often used social media only for refreshment. ‘*If I had to*

choose between a laptop and a mobile device, without any hesitation, it would be a mobile device. Even if there is no net, I can use data and search for the reading materials. You know it is very pocket-friendly; I can easily carry it with me anywhere due to its portability.’ As learning activities occur through mobile technology, they can be labelled as a different form of constructivist learning, likely student-centered, problem-based, and collaborative (Yakar et al., 2020). These forms are evident in Shikshya's narratives. On the other hand, regarding distractions, mobile devices shift students' focus due to their addictive nature and the tendency to check social media platforms from time to time (Darko-Adjei, 2019). “For instance, the allure of social media platforms like Instagram, Snapchat, and TikTok can divert students' attention away from educational tasks.” (Vijayatheepan, 2023, p. 4).

I also used to be easily distracted by notifications popping up on the screen, and Shikshya, too, was no exception. When I asked, she smiled and said, *‘You know my only source of knowledge is mobile devices, so while studying, notifications often pop up from Facebook, and sometimes work-related messages pop up, which distract my mind. I could not resist, and I checked them immediately to ease my mind....’*

Vijayatheepan (2023) states that these days, mobile devices are seamlessly integrated into the fabric of everyone’s daily life, which has raised concerns regarding the health impacts an individual faces. Shikshya felt that due to her increased screen time, she had eye pain, back pain, and headaches. Thus, in this continuously evolving landscape of education and technology, an individual should be able to balance a relationship with mobile devices (Vijayatheepan, 2023). As I noted, she also talked about resolving issues, such as eye problems; she uses ray specs and walks occasionally if she feels she has been sitting in the same posture for a while. *‘.. Now, I’m using Blu-ray specs, and I walk occasionally if I feel I have been sitting in the same posture for a while. By being self-aware, I try to maintain my screen time and also prefer listening to the audio of YouTube videos instead of watching.’* Moreover, she used to uninstall apps, turn off notifications, and use a timer app during exam time for only a short period to refresh her mind. Despite a few disadvantages, she has discussed the ample benefits she has received from using mobile devices offline.

Chetana, a teacher, shared her narrative about how mobile devices have assisted her as a student and a teacher. Today, every student has access to a mobile device, and it has become an inevitable part of everyday life. Using a mobile phone to conduct research when one does not have access to a computer or laptop is extremely

beneficial (Patil & Dhanawade, 2023), as Chetana's narrative demonstrates. I deeply connect with her because I also used to collect data on my mobile phone, as it was fast and reliable. She recalled, *'When I was a student, during my bachelor's research project, I had to travel to a remote area for field work. I did not have access to a laptop, and sadly, there was no Wi-Fi either. At that time, I used mobile phones to take mobile data and collected all the field notes on my phone. Once, I had to visit a remote area while taking my regular classes. Being a responsible teacher, I did not want to miss my classes, so I made presentations on my mobile and took online classes. Students were delighted and praised me for my dedication to them.'* Mobile phones are convenient for learning new things online and are extremely helpful in upgrading students' knowledge through technology (Patil & Dhanawade, 2023).

Chetana regards mobile devices as very convenient tools, as she gets notified when students submit their assignments, shares reading materials via WhatsApp groups, and takes classes from anywhere, anytime. The same goes for students. She provides instant responses and feedback on assignments and student queries. "According to the constructivist view of learning and teaching, feedback should be given frequently. As mobile devices enable learners to communicate with peers and teachers outside the classroom, learners can give or receive feedback more frequently than in traditional settings. "(Yakar et al.,2020, p. 69). Vygotsky's theory of social constructivism holds that learners construct knowledge through interaction with more knowledgeable others, especially peers (Yakar et al., 2020). From her narratives, it is evident that students seek support from Chetana whilst studying, during fieldwork, when undertaking any kind of project, or when they have issues whilst studying. I recall instances during my Master's studies when I interacted with my peers via social media applications, especially when working on group assignments or seeking timely clarification on subjects. *'In our time, during the 1970s era, it was different from what it is now. I could only ask the teachers questions in person and had to rely on the textbook and handouts. But now, regardless of distance, students can access and communicate with various foreign professors from Nepal itself. Online resources can be accessed in real time, making it easier for students to enhance their knowledge.'* Vijayatheepan (2023) expressed that one of the key strengths of mobile phones is that students can easily access educational content at their fingertips. Chetana believes that mobile devices have changed traditional learning patterns by enabling blended learning, thereby transforming learning. Due to rapid technological advances over the

last few decades, there is a need to leverage technology across all sectors, including the education sector (Rasheed et al., 2021).

Likely, the educational system has undergone significant change, as following the traditional teaching-learning methodology is no longer convenient. She believes that students can take control of their learning in an autonomous way, with her playing the role of facilitator. The meaning of facilitator, “A facilitator is the person who assists a group of people in grasping at their common targets and in achieving them without any intervention on his/her behalf.” (Suneetha, 2020, p. 71). Chetana added, *‘Students are taking classes from different areas, Bajura, Butwal, Itahari, and Darchula. They are connected to this platform through mobile devices. For instance, even from remote areas or foreign countries, students can learn and take lessons from expert facilitators through webinars, as students are now, which I believe is only possible on mobile devices. Everything is available on mobile; thousands of books are online and accessible on mobile devices. They search for notes and keep them on their mobiles for later purposes. I have personally felt empowered and independent when my academic learning was self-paced, supported by tools easily available at my fingertips, ranging from academic articles to YouTube lectures. Mobile devices are used for digital notes, listening to pre-recorded lectures for revision, and using Google Forms, especially for online tests, which are trends in technology (Patil & Dhanawade, 2023). You know, many of my students have made PowerPoint slides using mobile-friendly software, making their learning easier, and they also work in groups when I assign them projects. Since this is the time of AI, learning through mobile devices is cost-effective, it solves the problem faced....’* Thus, learning activities powered by mobile technology can be considered constructivist, i.e., student-centered, problem-based, and collaborative (Yakar et al., 2020). Moreover, she added that she would choose mobile devices over a laptop. *In different situations, it is quite difficult to carry a laptop everywhere, but mobile phones are always with me, and I can carry them everywhere, and it does not require much space. The mobile device is pocket-friendly, and if there is no internet, I can easily get mobile data, access learning materials, and listen to online lectures... Even though technology is highly used, it has brought a paradox into the lives of students: though it is used for engaging in different learning activities, it has brought distraction to them as well (Perez-Juarez et al., 2023).* She went on to say, *‘Being a psychiatrist and a teacher, I have seen students facing mental and physical problems such as vision problems, lack*

of focus, distractions, problems in creativity, and academic performance. Students often complain about their posture, and some even say they have trouble sleeping. It is also often found that this has decreased the level of thinking skills.... ‘.

Chetana said taking online classes on mobile devices was challenging for some students, who found it difficult to communicate, lacked empathy, and felt distracted. I felt that these distractions are real, given the double-edged nature of mobile technology. The distractions are real. It is said that excessive mobile phone use has also been linked to social isolation, leading to fewer face-to-face interactions (Vijayatheepan, 2023). She shared, ‘.... *Though students open videos while taking classes, you know, in my subject, Nonverbal communication must be observed, which cannot be captured on mobile devices. Some of the students have shared that the physical classroom is more helpful as they can learn about body language for analyzing cases.*’ During the online session, she used to get confused about whether students were listening properly because, at times, they would question whether the content had already been taught. She thought the students might have found the one-way teaching monotonous, since it lasted 3 hours. Thus, to make sessions interactive, she used to conduct experience-sharing sessions whilst teaching. She says that during technical sessions, it is better to conduct physical classes rather than online classes. ‘*Now, patience is lacking in students due to the availability of mobile devices, as they have started developing the feeling “to get it as fast as possible”.* Moreover, the notification from social media applications also causes hindrance whilst taking online classes through mobile devices.’ Social media’s constant barrage, such as notifications, updates, or even messages, can easily fragment students’ attention, resulting in difficulty in focusing on their studies (Ogunbukola, 2024). In my case, too, when I used to study, I received notifications from various social media, which made it difficult to concentrate and maintain focus, especially during exam times. The long use of mobile devices has led to several health concerns, including physical discomfort, eye strain, poor posture, and sleep disturbances (Vijayatheepan, 2023). ‘*We all know that these devices emit blue rays and electromagnetic radiation, which are very harmful. Whenever screen time increases, it affects my eyes and causes fatigue. Also, I have found that they easily get irritated, as they might think they have only been using mobile phones for a short time...*’. She, too, felt it had affected the quality of life and relationships with family and friends, leading to frustration among students.

The traditional way of learning and teaching has changed through the use of mobile devices. These devices have been used to facilitate, advocate, and enhance, as well as extend, the reach of both teaching and learning (Thinley et al., 2014). These devices have introduced educational tools for today's generation, which pave the way for creativity by providing access to a wealth of resources, thereby transforming learning (Dias & Victor, 2017). In Samarth's master's journey, he felt using a laptop every time was hectic, so he has been using mobile devices to listen to audio, which allows him to multitask efficiently. In my case, too, I have relied on these mobile devices for convenience; however, I also used to question whether this ease might be affecting my depth of engagement. He shared that institutions encouraged the use of mobile devices during the COVID-19 pandemic. To keep education running during the COVID-19 pandemic, several educational institutions had to quickly adapt, leading to online learning that uses mobile technologies (Bakare, 2022). *'You know it all started during the COVID-19 pandemic, the pandemic led to the closing of all the educational institutions where attending physical classes was not feasible due to various safety concerns. Thus, different educational institutions started relying on mobile devices and laptops to continue teaching. Since then, these devices have been preferred for teaching and learning purposes in the institution where I have been teaching...'* "There is evidence that mobile devices have encouraged independent learning, making it easy for teachers to differentiate individual student needs and share resources with students and among each other." (Dias & Victor, 2017, p. 340). I relate to Samarth's appreciation for the convenience that mobile devices offer, especially for multitasking and instant access to learning resources.

Samarth, being a teacher, felt that students now have direct access to information and can easily communicate with their teachers and peers to gather it with the assistance of mobile devices. It is believed that even mobile devices can be treated as MKO (More Knowledgeable Others). As per Herath and Wanasinghe (2023), MKO is traditionally an older person; however, it can also be colleagues, younger people, and even devices such as computers and mobile phones (Herath & Wanasinghe, 2023). This truly encourages active learning in students. Social constructivism is considered one of the deep approaches, characterized by an orientation towards sense-making, the construction of personal understanding, and active learning (Marzouki et al., 2017). *'In today's context, every student has mobile devices at their fingertips, and they take them everywhere with them. So, whenever*

required, they can quickly access information or conduct research without opening a book by searching online on their mobile devices. The more they research, the more they learn. Instead of writing it on paper, the students are using mobile devices to take notes on what they have researched, which I gave them a day prior...

“Productivity applications help students and teachers put together professional-looking documents, presentations, and spreadsheets no matter where they are.” (Dias & Victor, 2017, p. 340).

Mobile scaffolding is the provision of support via mobile communication, i.e., once students master the task or concepts, scaffolding is removed (Hayes et al., 2006). Samarth scaffolds students so they get the boost they need to complete the assigned task. In Samarth's case, he uses Teams on mobile because it is convenient for assigning assignments and taking online classes, since opening a laptop every time can be troublesome. At one of his colleges, he uses an Android app called Vednam to monitor overall student progress and provide learning content. If a student feels confused, they seek support immediately through communication. *‘Let’s say, for instance, I use the app to alert the students about the upcoming content in the classroom, monitor the attendance of the students, provide assignments, and give marks to the students. Students can check their progress online and access learning materials on mobile devices. I often share learning content in the form of videos, PDFs, and research tasks, and students access them through the app, where they are instantly notified. It has made their learning much easier and saved them time. Providing feedback, too, has been much easier as I can give it without waiting for classes. ‘These mobile learning applications empower both educators and learners to communicate with each other from anywhere and at any time (Hakim, 2024). This shows device learner aspects of the FRAME model, as the participants utilize Vednam, a mobile application facilitating the teaching and learning process, and he usage it for guiding overall academic activities of students. When I asked Samarth further about the advantages, he added, ‘Everything is possible through mobile devices. Students can learn at any time and from anywhere, and use what they have whenever required through mobile devices. Since many students could not attend class, they preferred online classes. So, for this very purpose, many of the students were found using Teams on mobile devices, and it has always provided a platform to be used for discussion.’ Hakim (2024) states that a mobile device comprises an operating system and that the phone can be a learning tool. So, I asked if mobile*

devices were used for projects in his Cybersecurity subject, and he stated, *‘Few projects could be conducted through mobile devices. For instance, network discovery and probing, i.e., collecting responses through different requests, to manipulate any device and hack it. Since mobile devices have been upgraded a lot, there will be more discoveries of the projects that are feasible.’*

When students use mobile devices during online classes, many cannot stay engaged as long as they do in physical classes. During online classes, he always doubted whether the students understood the taught content, were listening actively, or not. Though the video was on, he could not make proper eye contact. He always wondered if students joined classes only for attendance. Social media has revolutionized how we communicate and gather information, but its effects on learning methods have long been debated (Fadillah & Purnawarman, 2024). So, I asked if he felt that social media had an impact on his students. He says, *‘While taking online classes, students get easily distracted by social media’s notifications, so I believe delivering learning content online through mobile devices is quite challenging.... You know, at times there is no response from students when called upon, so I could not figure out if they are listening to me, or playing games, or watching movies.’* So, Samarth concluded that, like physical classes, online classes are a bit less interactive, but if students genuinely wanted to study, they could learn online as well. This narrative reminds me that, for authentic learning, key ingredients such as human-to-human connection, non-verbal gestures, and dialogue are hard to replicate on a screen. He added, *‘The main challenge I have found in students is distractions. For instance, students are scrolling through reels on social media, watching movies, or playing games, and they tend to lose track of time, just as when we go to a shopping mall: the lights make it difficult to tell if it is day or night. When they are watching reels, I do not find it productive, and it also does not contribute to their learning. This distraction can significantly impact their educational progress. Doing big projects on mobile devices is also difficult due to the lack of resources available on mobile devices.’*

Samarth further shares that many students are more addicted to mobile devices, and even when they try to access the educational content he shared, they might get distracted by Anime, games, Netflix, and social media. I have felt that, even though mobile devices enable learning, if not used properly, they can lead to unproductive paths, such as excessive social media use or unnecessary multitasking.

“Some psychologists, of recent, have issued cautions that cell phone users face the risk of being addicted to their phones. “(Ifeanyi & Chukwuere, 2018, p. 292). Samarth felt that students who have been using mobile devices continuously for a long time have also created a more monotonous environment for themselves. Since his subject is more practical, using mobile devices for conducting projects is not feasible, as they are not compatible with practical tasks. *‘In my classes, students are allowed to use mobile phones, so at times I find them verifying what I’m teaching, and at that time they miss the content that I am teaching, which is also a loss to them. They cannot directly answer the question when asked, as they are too dependent on mobile phones for everything.’* Even the mere presence and visibility of a mobile phone with internet connectivity attracts students’ and many adults’ attention, diverting focus in class (Ifeanyi & Chukwuere, 2018). I agree with Samarth; even mobile devices can be powerful tools for learning; however, rather than replacing critical thinking and practical engagement, they should complement fields such as cybersecurity, where hands-on experience is crucial. He further added, *‘Being a cybersecurity person, one should not be fully dependent on gadgets like mobile devices...’*.

Lakshya stated that using mobile devices for learning purposes has increased students’ engagement. Mobile devices enable individuals to store, process, and retrieve information from anywhere and at any time (Toperesu & Belle, 2018). “As mobile connectedness continues to spread across the world, the value of employing mobile technologies in the arena of learning and teaching seems to be both self-evident and unavoidable” (Hakim, 2024, p. 16). Lakshya reflects that using mobile devices has transformed his learning genre in many forms. I felt a strong connection with Lakshya's perspective on how mobile learning devices have reshaped traditional educational practices. *‘My pattern of learning has changed, I no longer have to rely only on hardcopy or printed notes, rather it has been replaced with soft copy. Having a mobile phone is like having a teacher 24 hours a day. I can communicate with them whenever I need assistance through mobile devices, I can search content on YouTube for more information, and search on Google for multiple solutions which are offered by experts.’* In my case, too, I have shifted from reading printed notes to digital materials, which were more accessible and very interactive when needed. Through mobile learning, many users can easily access diverse learning content, regardless of location, at any time, with engaging illustrations (Hakim, 2024). I asked how his studies were before using mobile devices, and he reflected, *‘My learning perspective*

has changed through the use of mobile devices. As I have already stated, my learning patterns were discussed in the early conversation. He continued, 'I had studied programming subjects in my Master's, and I had to study many programming subjects. For Visual C, I used to refer to books and depend on my teacher to solve queries. Previously, I had to do everything from the basics; for example, while working on a coding project, I had to search for content and fix errors, which used to consume a lot of time. Now I use AI tools like ChatGPT, which provide a base and let me do advanced-level programming. In case I need to find any errors or troubleshoot, I can simply refer to these AIs, and they will help me out within a split second. For different courses, I depend on AI, and talking about websites, I refer to Stack Overflow and w3schools, which are easily accessible through mobile phones.'

According to constructivist theory, learners construct knowledge through interaction, and this self-directed learning empowers them. As per Roy and Gandhimathi (2025), Self-directed learning develops when learners acquire the necessary skills and attitudes, including self-reflection, self-control, and effective communication.

Since Lakshya is enrolled in a Master's degree, classes are mostly online. He felt that it had saved him time and maintained balance in his work-life. He mostly engages with his teacher and colleagues via various social media applications, sharing reading materials, holding group discussions, and keeping up to date on the current status of his classes. These devices make it easy to update the required materials as soon as they become available, so learners can use the latest materials (Toperesu & Belle, 2018). He says, *'Since my classes are online, using mobile devices has eased the process of learning. Often, I am at work only during class hours, and I attend classes on my mobile device. You know, teachers are only available for a certain time, but mobile devices are available twenty-four hours a day, like a teacher. I often communicate with teachers through social media, WhatsApp.'* In the Technology Enhanced Learning environment, the scaffolding approach assists learners by providing an agent or tool that enables them to complete complex assignments without this assistance (Mikic, 2022). Lakshya shared that he often contacted his teacher via WhatsApp for his research projects because he had no idea how to start. Since mobile devices are owned by every individual, they are ideal for delivering individualized instruction or advice to learners (Hayes et al., 2006).

Moreover, social media encourages students to access vast amounts of information, engage in discussions, and collaborate on projects, enriching the learning

experience (Fadillah & Purnawarman, 2024). He shared, *‘To do my research projects, too, I was dependent on mobile devices. I had very little idea of research, so I had to contact the teacher frequently via WhatsApp. For instance, I used to ask for very basic ideas, such as: how to lay the groundwork for the research, how to structure the body of the research, how to prepare the questionnaire, which technology to use for the research, and many more. While this mobile device does facilitate learning, it can also lead to a path of distraction, especially in the classroom, lowering the academic performance of students (Son-Allah, 2017). Lakshya, too, has felt certain disadvantages which he shares. ‘.... It is like human behavior: if we see any catchy content or videos, we tend to spend time on them for a while. ‘Since he is using these devices for learning, at times work messages also cause disturbances. He shared,’ Because of my work schedule, I have to give more remote support even at home, which comes even during learning time, so it causes distractions. Sometimes, even during my online classes, I get disturbed. Often, I focus on entertainment rather than learning, which is a significant disadvantage. ‘*

Some people believe that social media acts as a mode of distraction; as it offers enormous content such as interactive visuals, which plays a role in diverting students' attention away from their original intent of using the social media applications in class while shifting their focus to different unfruitful channels (Nema et al., 2023). So, I asked how social media has distracted him from his studies on mobile devices. Lakshya shared that he usually gets lost in time while using these applications. *‘Sometimes during online class, notifications pop up, and I decide to check them instantly, and I get lost. I tend to spend more than. umm ... roughly, it might be one or two hours, as I don’t know the time zone. On an IT team, I often receive messages from the office that divert my attention. ‘In recent years, the world has undergone a digital transition, so the regular tasks of people’s daily lives have become entwined with technology (Roy & Gandhimathi, 2025). Mobile phones are one example of IT (Information Technology) that has become an important asset for most people, especially students (Son-Allah, 2017). Like Lakshya, I have encountered similar challenges: mobile devices offer numerous educational benefits, but they can also become sources of distraction.*

Gyan feels that using mobile devices has transformed his learning patterns. Mobile devices have become an important tool for discovery and creativity (Onyema et al., 2019). He shared that the teacher was the only person who shared the

information, as he used to depend on teachers for everything, taking handwritten notes on their lectures and doing further study. I recall those days when teachers were the primary source of knowledge, followed by handwritten notes from lectures and various textbooks. Most educators still use Behaviorist methods, i.e., a teacher-centered approach in which knowledge is transmitted through lectures, seminars, presentations, and various kinds of exercises (Marzouki et al., 2017). He reflected, *‘In our old days, I had to buy many books according to subjects, and if we had to gain new knowledge or ideas, then we had to buy new books again, which is kind of troublesome as per the syllabus and content. I search for complex content across different AI-based applications, including Co-Pilot, Gemini, and ChatGPT. In my MPHIL study, I take notes on mobile phones.’* I asked how mobile devices benefited his learning. He added, *“Mobile phones have become an integral part of my learning. As you know, knowledge can be gathered instantly, which makes you independent and promotes self-learning. I often access the web through mobile devices and book online courses.”* Listening to Gyan’s narrative made me reflect on my journey, where I was very hesitant to explore beyond the taught lectures, as I feared I might not understand or that I would burden myself. Mobile devices offer long-term convenience for learning, enabling learners to accumulate a wide range of resources and knowledge (Miertschin et al., 2017).

For active learning, new technologies are a real support, enabling everyone to access a multitude of knowledge and information (Doinea et al., 2017). He believes mobile devices have increased his credibility in acquiring knowledge. He adds, *“I had to listen to the teacher and follow his guidelines, but now I can take whatever courses I need through the use of mobile devices. I even pay a certain amount to take the academic courses for my research purposes.”* Mobile handheld devices are widely used by distance learners for lifelong learning, which can occur at different places, e.g., homes, workplaces, on the train, etc., whenever there is internet access (Eom, 2022). He felt, *‘Using mobile devices is better than laptops because laptops are quite difficult to carry; however, mobile devices can be carried easily in pockets, and if there is a connectivity issue, one can easily connect through mobile data and search for relatable content.’* Accessing the internet, one can get information about anything at any time from anywhere, in a few seconds, and it propagates very swiftly around the globe (Rather & Rather, 2019). Along with ample advantages, these devices also have disadvantages. Gyan felt that at times, mobile devices have brought confusion

due to multiple answers in different search engines, and figuring out the correct one is a bit challenging. He says, ‘... *One must use self-judgment while addressing those questions despite multiple solutions. I carefully gather all the information and make decisions appropriately by going in depth...*’ Using a Mobile phone has now been increasingly associated with different health risks (Mani, 2019). Gyan too felt that it had caused health issues, including poor eyesight. ‘*Sometimes screen time increases, which has blurred my vision, causing eye problems. I feel a bit monotonous, too. So, I try to maintain screen time as much as possible.*’ He believed that because people are addicted to mobile phones, they tend to become angrier when someone tries to start a conversation. The approaches, such as critical thinking and creativity, have decreased. He shares, ‘*Due to dependency on these devices, it has affected the thinking process, the way I used to think before, and learning is affected... In terms of social media, I use LinkedIn, Facebook, and YouTube for learning and entertainment purposes. Though I search for skill enhancement content, sometimes my mind gets diverted.*’ Well, I can say that Gyan’s narrative made me realize that mobile technology is not our enemy, but rather a mirror reflecting how we decide how to use it.

Technology has had a profound impact on education, along with changes in how we communicate, engage in social activities, learn, and enjoy ourselves (Doinea et al., 2017). In the 1990s, the World Wide Web was introduced, followed by the development of various mobile technologies in the twenty-first century, as the use of computer-based mobile devices for providing learning experiences to learners has expanded beyond the classroom (Miertschin et al., 2017). From Shanti's narrative, it is evident that her learning became much more fruitful when she began using mobile devices. Using mobile technology in education is changing the paradigms of when, where, and how information and knowledge can be accessed and transformed (Doinea et al., 2017). She shares, ‘*In a second, I can have access to ample information from different experts from anywhere and at any point in time. Since I have the habit of exploring while learning, I come across different terminology that I do not know, or, let’s say, to understand the meaning of anything, the easiest way is to look it up on my mobile devices...*’ Baldwin and Ching (2020) note that many students find mobile devices convenient for certain online learning activities or tasks.

As Shanti is a Master's student, she mostly attends online classes. Being a housewife and a worker, it is very difficult for her to attend classes every day. She added, ‘.... *My college is in Kumaripati, and it is very far from where I live. Attending*

classes every day is a bit difficult for me, so instead of going to class, I always listen to the class recording. It is readily available anytime, anywhere, and I can access it while traveling from home to the office and vice versa. I even listen to recordings at the office during exam time. Her narrative reminds me that learning flexibility is a necessity for most of us navigating our complex lives. I asked how mobile devices are useful during her projects. She replied, *‘Mobile devices are very useful for projects; I can grab the required information swiftly and troubleshoot the issues faced. The teacher only used to guide briefly, and mostly I had to do it on my own. During my bachelor’s studies, I used mobile devices to search for solutions to programming issues. As you know, books and teachers’ knowledge are not enough to debug them.* ‘In those times when traditional classroom lectures were not enough, I too used to turn to mobile devices to explore more to bridge the gap. The social constructivist pedagogy values learners’ contributions to their learning.” (Morchid, 2020, p. 267). The narrative makes clear that, for social constructivists, teaching doesn’t always control a passive audience of learners by repeatedly instructing them on how to complete different controlled tasks, which shapes distinct competencies (Morchid, 2020). She has been dependent on mobile devices to shape her learning journey at her bachelor’s level. Mobile devices helped Shanti to solve real-world problems, or let’s say, practical problems related to learning through YouTube videos. Most of the videos she referred to were of the teacher’s tutorial. *‘...I often refer to the comments on the chat box of the YouTube videos. Most of the time, someone else has already asked the question I have in mind, and it has already been answered. Also, the videos contain detailed information that clears my doubts.* From this narrative, it can be concluded that Fox (2019) stated digital collaboration cannot be limited by time and place, as students can interact and appreciate diverse viewpoints, be it within national borders or international borders, which may be different from their own. Mobile technologies could be used to implement active learning strategies, likely inquiry-based, situated, and case-based, which prepare students to address differences in this global society (Fox, 2019).

I asked whether mobile devices have transformed her learning process. She answered (smilingly), *‘Without a doubt, mobile devices have brought transformation in my learning, as learning has become more flexible. In earlier eras, i.e., the 1980s, the internet was limited, and data was costly, so I had to attend classes in person, but now I can easily take online classes on mobile devices. Even collaborative activities*

or discussions about certain issues with friends and teachers are possible. Today, if I have any issues, I do not have to wait until I attend class; I can communicate with teachers from anywhere. Easy access to information has broadened my knowledge level, too, as I don't have to be a bookworm.' With the assistance of these mobile devices, students can easily ask questions to the teacher or other respondents, based on their subject matter or related to any issues, while on transit or from any location, through media such as calls, text messages, or chat (Onyema et al., 2019). Using mobile devices for academic learning has helped me push past my boundaries, as I can collaborate with experts across countries, connect with different mentors instantly, and stay updated on current global dialogues.

Most respondents use their mobile phones for over 5 hrs. daily, mostly for social media and communication (Salepaki et al., 2025). *'Certainly, when I use mobile phones while learning, there are many times when I get distracted. I always assure myself that I will use mobile devices for only a short time, but I often get lost and end up using them for more than an hour. Often, my mind gets diverted towards social media, and I do not keep track of the time or how much I spend on it. You know, most of the time I watch reels on Instagram, and I become addicted to this sometimes.'* Likewise, I too intend to have a quick look at social media that turns into more than an hour of scrolling. The social networking sites lead to different problematic usage behaviours, likely compulsive checking along with extended screen time, leading to disruption in daily routines, impacting mental health (Salepaki et al., 2025). Shanti has also felt serious health issues due to this addiction. *'I refer to 'thuprai.com' to buy books online, and I read them through my mobile phone. Working on the computer all day at the office and reading books on a screen can sometimes reduce my concentration, causing eye pain and headaches.'* If smartphones are used for excessive periods, it brings physical and psychological effects such as poor body posture, eye strain, and also some mental health issues, anxiety, and depression (Salepaki et al., 2025).

Reflections on Chapter

I have analyzed participants' narratives according to the themes generated. After analyzing participants' responses, I consider mobile devices an empowering tool that extends beyond communication. As many of them shared, they grew up in chalk-and-duster classrooms with limited technological exposure, followed by teacher-centric classrooms. However, when they began using mobile devices at the university

level, they felt less restricted, more empowered, and became more independent learners. Though these device usages were empowering, due to the small screen size, participants faced health issues, felt dizzy, and had posture problems. Also, due to multiple resources, they often get confused about following the solutions. So, irrespective of disadvantages, these devices act as a great supporting tool that enriches learning and helps in fostering twenty-first-century skills.

CHAPTER VI

ROLE OF MOBILE TECHNOLOGY IN STEAM APPROACHES: INTEGRATION AND FUTURE PERSPECTIVES

This chapter presents the lived experiences of university students, showing how mobile devices have influenced the STEAM approaches through a narrative inquiry research design. This chapter addresses the second research question, and the themes are: Bridging Theory and Practice through Mobile Devices in STEAM Disciplines, Integrating Mobile Tech in STEAM Approaches, and Mobile Devices and the Next Generation of Education. Through narrative analysis, this study shows that mobile devices have acted as a helping hand to students in terms of performing inquiry-based learning, performing collaborative activities, doing hands-on activities, and many more. Moreover, in the future, integrating mobile devices in the educational sector can bring more flexibility, increased digital literacy, and inclusive innovation. Thus, from these narratives, I believe mobile technology did not just act as a learning aid but has served as a transformative force that has reshaped modern-day education.

Bridging Theory and Practice through Mobile Devices in STEAM Disciplines

STEAM is an integrated approach to learning across various disciplines, i.e., science, technology, engineering, arts, and mathematics. This interdisciplinary approach's main purpose is to provide students with a comprehensive understanding by connecting theoretical knowledge to real-life contexts, i.e., through practical application. (Pant et al., 2024). Basically, scientific competency is specifically focused on experimental activity (Gallego & Márquez, 2018), and a technological education encourages computational thinking (Ruiz et al., 2019). Education in engineering and mathematics inspires students to develop or upgrade skills relevant to developing and creating solutions for solving real-world problems (Yakman & Lee, 2012) and art advances to design from an open perspective to improve creative and innovative thinking (Liao, 2016). As the usage of mobile devices has increased exponentially, there has been an increase in the adoption of these devices for both formal and informal education. Khaokhajorn et al. (2020) stated that the different tools of mobile technologies, such as tablets, PDA (personal digital assistants), and smartphones, are utilized by consumers for processing and storing information from everywhere, at any time, by anyone. This led to the mobile learning principle, which

has been recognized as a pedagogy to support the learning of Science, Technology, Engineering, and Mathematics (STEM) (Khaokhajorn et al., 2020). In such a scenario, mobile devices play an important role in bridging the gap between STEAM education and creating meaningful learning experiences for the students.

Shikshya's educational journey reflected how the use of mobile devices has transformed her from being a dependent learner to an active knowledge constructor. Interpreting through the lens of Science, Technology, Engineering, Arts, and Mathematics (STEAM), her journey reflected a meaningful learning experience. In STEAM education, along with upgrading the students' knowledge and skills in science, it provides an approach that facilitates twenty-first-century skills such as critical thinking abilities, creativity, and problem-solving skills (Kashaka, 2024). Throughout her educational journey, I have seen that her activities comprise scientific thinking processes, such as inquiry, observation, and problem-solving. While learning through YouTube videos or through online resources, she explored multiple explanations, even compared solutions, and used the comment sections to clarify her doubts. She shared, *'By using mobile devices, it was easier for me to learn through YouTube and by searching on Google. Especially while using YouTube for learning purposes, I preferred the comments section because there were helpful comments that assisted me in clearing my doubts. In case of coding as well, I had to experiment by referring to the codes available online and upgrade myself.'* This solely reflects informal scientific inquiry, as it is evident that her learning is driven through questioning, self-exploration, and is based on evidence. Talking from a technology perspective, mobile devices were her sole tool to access multiple applications, such as YouTube, for collaboration, Google for accessing Stack Overflow or Google Docs, taking screenshots, and downloading PDFs or PPTs for learning. Using mobile technology for learning enhances the learning results and increases the motivation and interests of the students (Khaokhajorn et al., 2020). Connecting with my own experience, I often use mobile phones for carrying out the activities she has mentioned, *'I often take screenshots of necessary information on my mobile phone. Normally, I use Google Docs to share the contents and work, and I often collaborate with friends through mobile-based applications such as WhatsApp, Google Docs...'* This connects with social constructivism theory as learning occurs through interaction with others. Connecting with the FRAME model, i.e., device aspect, the device accessibility and portability aided her in making learning more flexible and

personalized, mainly during the COVID-19 pandemic and personal reasons such as pregnancy. From an engineering perspective, to complete her final projects and group-based projects in programming, she used to rely solely on mobile devices. STEAM education aids in improving students' abilities to express difficult ideas, improve creative thinking, and, through artistic components such as designs, visual arts, and performance, link scientific principles with the experience of humans and culture (Meepat et al., 2024). She demonstrated engineering design thinking skills by identifying a problem, designing a solution, and implementing it to solve the problem faced during her learning phase. Engineering is about science-based research and developing specific designs along with solving problems in real-life contexts (Hıdıroğlu & Karakaş, 2022). *'Understanding coding and applying it is hard, so I had to learn how to resolve any errors and bugs encountered during the project. I used these devices to resolve the issues faced while researching and frequently referred to a search portal called Stack Overflow.'* Integrating arts can foster problem-solving and critical thinking skills when situations are uncertain and ambiguous; in the arts, it is required as it leads to inspiration for creating ideas, expressing, feeling, or interpreting an artwork (Kashaka, 2024). Since she completed her intermediate level in Hindi, initially in her bachelor's career, she used to refer to Hindi language content to enhance her understanding level. She added, *'I used to refer to Hindi YouTube channels initially because it was easier for me to understand the reading materials in such a way....'* Also, since the internet provides a pool of information, using the right solution from these sources was tough; she managed to do it innovatively through mobile devices. This behaviour shows her creative and adaptive nature, which is central to the arts. Meepat et al. (2024) stated that mathematics is the language that connects all the STEAM areas as it offers fundamental abilities for analysing data, solving problems, understanding patterns, and relationships. Shikshya's engagement with numerical subjects, formulas by referring to PDFs or searching online in both bachelor's and master's, highlighted the importance of mobile devices in shaping and supporting mathematical understanding and problem-solving.

Chetana's experiences as a teacher and a student show a transition from a traditional, limited-resource environment to a more integrated, mobile-supported one. STEM is the purposeful integration of various disciplines to solve real-world problems involving forming all four disciplines, such as science, technology, engineering, and mathematics, into one unit (Khaokhajorn et al., 2020). Through the

framework of STEAM, from a science perspective, as she is a teacher of psychology, whilst teaching students, she shared different perspectives which align with experimenting and engaging in activities that are case-based and purely based on behavioural analysis. She narrated, *‘During field visits, the students often had to collect the data from patients, and getting the right data from patients was not easy, so they had to try out different alternatives of collecting the data, and for suggestions, they used these devices...’* This showcases how she has used mobile devices for inquiry and evidence-based outcomes. In my MPhil as well, I often follow the same pattern of exploring content from different webpages and choosing the right one that fits the outcomes. When technology is integrated into STEM education, students get opportunities to engage in practical applications of both scientific and mathematical concepts (Khushk et al., 2023). In STEAM, technology is about devices or applications that support learning. In technology, she is dependent on mobile devices for various digital platforms, likely for conducting online classes via Google Classroom or Teams, and for providing teaching and learning materials through Moodle or social media applications such as WhatsApp. She shared, *‘I often use WhatsApp for getting details of fieldwork or seminar-related work on my mobile, and at times they email me too... I get notified on a mobile phone for the updates on Moodle, and I check them and give feedback as well....’* This has facilitated creating flexible, easily accessible, and interactive learning environments for teaching and learning processes. I also felt that using mobile devices in learning has created flexibility in learning. When she used to be a student, she used to write down all the important notes on her phone. She said, *‘During my research projects I often had to visit remote areas, so while collecting data I used mobile phones because it was much easier and time saving...’* Engineering is about designing, testing, and implementing it. The way she has organized her classes or has troubleshooted the problem faced during the digital teaching process shows engineering-oriented ways of problem-solving and design thinking. Talking about the arts dimension, Chetana gives field work and conducts seminars through her students, and often she finds students depending on these devices. In the arts, creativity and exploration play an important role (Kashaka, 2024). *‘While conducting seminars, the students had to do it differently every time with different lecturers, and in each process, they are using mobile devices, and often they share ideas in WhatsApp groups which I am also a part of...’* In STEAM education, mathematics is taught not in a vacuum but rather connected with

different disciplines such as science, engineering, technology, and the arts to show its relatedness in practical contexts (Meepat et al., 2024). Furthermore, to make students understand better the terminology used in her subject, she often integrates various statistical tools, teaches about IQ measurement, and motivates them for analytical reasoning. She shared, *'You know, teaching by integrating mathematical tools, it is much easier for students to grasp the content.'* This highlighted mathematics' role in data interpretation and advocating for informed decision-making processes.

Samarth, being involved as a cybersecurity teacher, has assigned many integrated projects through mobile devices, which indeed resulted in remarkable outputs. From his narrative, it was evident that through the use of mobile devices, he had connected with the STEAM framework. In STEAM, science is about observing, questioning, and experimenting. The students do experiments of hit and trial and observe whether the output of it suits the desired results or not. Connecting with science, the subject of cybersecurity itself involves inquiring, experimenting, and providing logical reasoning. He shared that with the help of mobile devices, students explored concepts and conducted projects such as projects for conducting tests on wireless networks and frequencies, and any cyber threat-related projects. *'Ummm I have given a few projects that could be conducted through mobile devices, such as network discovery and probing, i.e., collecting responses through different requests, to manipulate any device and hack it.'* This also resonates with social constructivism theory as the participant became an active learner instead of a passive learner. In the technology component, mobile device usage is strongly evident. When the students are provided access to cutting-edge technology and tools, it can help in fostering creativity, developing innovation, and upgrading problem-solving skills, which are important for success in the STEM fields (Khushk et al., 2023). For carrying out academic activities and monitoring students, he relied on mobile apps of the college for conducting classes online, feedback, checking on students, and providing real-life examples through mobile phones, which has facilitated learning beyond the classroom walls. He said, *'Using the mobile-based applications, I monitor overall student progress, provide learning content, check their assignments progress online, and provide feedback accordingly... I also use this app to alert students about the topics to be discussed during upcoming classroom interactions.'* And from a student's perspective, *'Instead of writing notes on paper, the students are using mobile devices to take notes of what they have researched.'* Talking about my own educational

journey, I often used to bookmark certain journals and websites so that I could use them later in my studies. He shared, *'I believe in learning by building,'* which encouraged him to conduct hands-on activities, and assist students to explore real-world cyber cases by providing them with case studies that connected with real-life context that reflects engineering thinking. Thus, through mobile devices, the learners get engaged in the process of problem-solving, debugging the issue, and developing iterative design processes for better results. Meepat et al. (2024) stated that in STEAM education's engineering projects, it motivates teamwork, fosters critical thinking abilities, improves the iterative design process, and aids students in grasping the link between theory and practice. This also links with social constructivist theory, as learning occurs more in collaboration. He said, *'Once I gave a project on how a popular website was hacked, they had to analyse on their own, and while analysing, they had to do a step-by-step process, and for analysis, they used mobile phones.'* The arts dimension emerges through his creative pedagogical strategies. In art education, critical thinking, creativity, and inquiry-based learning have become the main themes due to their deeper interconnectivity (Kashaka, 2024). He narrated, *'I want my students to be competitive and to be able to address the challenges faced. So, I always come up with new ideas to make them work in innovative and creative ways...'* So, he prefers case studies, providing informative short videos through mobile devices, and, as the subject demands to be creative, he encourages students to think outside the box and present diverse perspectives. In my master's as well, the teacher used to provide us with case studies where we had to relate the scenario practically and complete the assignment accordingly. Furthermore, whilst teaching, he often integrates risk analysis, ways of interpreting data, and different cryptographic concepts, highlighting the role of mathematics in supporting both analytical reasoning and decision-making within the cybersecurity context. For instance, *'While debugging the cyber threat issues, students often have to go through deeper analysis, and they take assistance from mobile devices...'*

Interpreting Lakshya's learning journey shows how his dependency on these devices has made his learning process easier and constant. From his narrative, it is evident that his academic learning practices were aligned with STEAM components. Meepat et al. (2024) stated that science is about encouraging research and experimentation, which helps students in developing critical thinking skills, asking questions, and investigating answers to the ongoing practical concerns. Talking from

science perspectives, for choosing the right research methodologies, searching for relatable research topics, he had used mobile devices as he had to experiment with new methods to make research better. He shared, *'During my master's I had to conduct various group projects and activities related to research, which made me conduct inquiry, question myself and try new perspectives...'* This type of learning reflected a curiosity-driven learning. Also, talking about technology, it is strongly evident from his reliance on mobile devices, be it for searching content on search engines, using AI applications, or referring to mobile applications for accessing the required content, completing assigned assignments, and also enhancing research efficiency. Technological tools, such as mobile phones, mobile devices, tablets, laptops, or any kind of personal computers, are considered a new approach to the educational paradigm that influences learning, performance, and promotes motivations to learn (Khaokhajorn et al., 2020). Here, the technology acts as MKO as it aids in receiving and exploring the required content in an easier way. He shared, *'You know, while going home or coming to the office, if anything comes to mind related to my study, I often jot them down on my phone and read them and inquire about them later in my free time. I often bookmark many sites on my phone, so it becomes easier when accessing content later....'* Since he has to do research projects a lot, his dependency on these mobile-based digital tools, gathering ideas from multiple sources, and engaging collaboratively with peers through mobile-based applications such as WhatsApp to seek solutions in innovative ways, aligns with the arts dimension. *'I have a WhatsApp group where we discuss our ongoing projects, brainstorm for the group projects, discuss research topics, and try to complete the assignment in time. In the group, we often share knowledgeable information.'* Here, I can relate to Lakshya, as during my MPHIL studies too, I often have to collaborate with peers to complete my projects or group work. It is said that creativity plays an important role in supporting inquiry-based learning and influences exploratory implementation of art in the learning process (Kashaka, 2024). His constant way of inquiring, exploring, and completing the assigned projects uniquely connects with enhancing creativity.

Gyan's academic journey reflected a shift in his learning patterns from being dependent on mobile devices to shift towards a research-oriented and self-directed learning process. When science is combined with other disciplines, it aids students to grasp scientific ideas in a better way and grow in capacity in different scenarios

(Meepat et al., 2024). In the Science domain, it is all about experimenting and implementing. Mostly for programming and research-related projects, his constant involvement in using mobile devices demonstrated inquiry-based exploration, leading to analytical thinking. If I look back at my studies of bachelor's and master's, I too have followed the same path of using inquiry-based learning and solving my assignments analytically. Meepat et al. (2024) stated that through the use of digital tools, software, or any kind of technological resources, students can replicate or simulate experiments, model intricate systems, and take part in projects that require both technical and artistic abilities. He shared, *'During bachelor's, the practice of using Google and learning was very limited However, I used to search online for the codes because textbooks possessed limited knowledge I had to experiment on my own, and in the process, I used mobile devices...'* His participation in technical projects through the use of mobile devices shows the technology and engineering aspects. He added, *'Mobile applications such as WhatsApp, ChatGPT, Gemini, I made the most out of it... Sometimes I have to watch YouTube videos too. To carry out all these activities, I refer to my mobile phone...'* Engineering acts as a bridge between systematic planning, fundamental knowledge, and technological development through designing (Hıdıroğlu & Karakaş, 2022). Activities such as developing RFID-based applications and troubleshooting the errors while coding and debugging, for storing data or seeking solutions for designing the projects, listening to audio and video, were all conducted through mobile applications. He shared, *'I have created a project called 'Student Information System', which is both web and mobile-based. This application contained details of the student's information, examination, attendance, and performance reflected in the dashboard. For the project, I had to refer to online sites to generate as much information as possible....'* Moreover, since the programming projects required algorithms, the use of machine learning and numerical facts highlights mathematical aspects in analysing and structuring the data. Students acquire knowledge of both mathematical and scientific ideas to generate creative and worthy goods or systems (Meepat et al., 2024). He shared, *'For instance, one has to have a deep understanding of different terminologies such as RFID tags, readers, and how backend systems communicate, numerical calculations which I did not find in books... I had to watch countless YouTube tutorials and even refer to different forums where people discussed and provided solutions to similar projects. The mobile device was very helpful.'* This type of practice shows that for logical

reasoning to work out the programming projects, he used these devices. Art is not just about drawing or painting; it is more about creativity, storytelling, expression, and imagination. The arts inclusion with a broad as well as specific intended outcome aids in building creativity, observation skills, and various other 'soft skills' (Kashaka, 2024). *'For projects, I had to be creative, so I used to refer to different blogs that were available to generate ideas, as books only had limited ideas. To troubleshoot ideas, I generally referred to them and completed projects successfully.'* As these projects are linked with the arts, to stand out, she has completed projects in an innovative and meaningful way. Since social constructivism theory focuses on active construction of knowledge, Gyan's narrative revealed that through the use of mobile devices, through inquiry, and collaboration, he has garnered the knowledge and information for completing the projects.

Shanti's educational journey reflected a dynamic transformation, from being too dependent on textbooks for learning to using digital resources. In the science domain, students are taught and encouraged to see the natural world by studying, experimenting, and observing (Meepat et al., 2024). As science is about exploring and experimenting, her narrative shows that she loves to explore and gain new knowledge as she frequently engages herself in searching for new concepts, seeking answers independently, which shows an investigative nature and is more towards self-directed learning. She shared, *'I always try to explore more. I tend to search for content that I do not have much idea of, or gain extra knowledge...'* The technology part of STEAM education gives pupils the ways to investigate and apply ideas creatively in mathematical and scientific ideas (Meepat et al., 2024). In technology, she has been using mobile devices for accessing recorded lectures, participating in online classes, using applications for sharing information, and seeking support either in a collaborative way or using mobile-based applications. She said, *'I often screenshot contents and save the audio in my phone to use them later, I also refer to books which I downloaded online from [thuprai.com](https://www.thuprai.com) so that I can retrieve the learning resources anytime and anywhere...'* She further added, *'Since I cannot attend classes every time, I always tend to listen to the class recording. I access them while traveling from home to office and vice versa, and I even listen to recordings at the office as well.'* From her narrative, I have observed that her experiences in coding, using numerical methods, designing projects through logical reasoning, and developing web-based projects step by step illustrate engineering-oriented thinking and mathematical

reasoning abilities. Likewise, engineering in STEAM education focuses on designing, constructing, and testing processes for resolving problems (Meepat et al., 2024). In social constructivism, one has to get in-depth for collecting information, and on the internet, there are multiple resources, so the students have to actively seek solutions. She added, *'I had completed a project for a photography website. I referred to teachers' materials and codes from w3schools, which were really useful. Since making anything from scratch takes time, I had to go through different codes, hits, and trials so that I could achieve the desired results.'* Mathematics is related to reasoning ability and solving problems or issues step by step. From the narrative, I have observed that while making an application, she has gone through step-by-step processes, made sure the workflow is correct, done numerical calculations, and provided logic to make it work. For the entire process, she has used mobile devices. Additionally, this has also showcased her creativity, as creating a web page needs a lot of creative thinking to make it look fascinating. She used hits and trials, tested out different approaches, and refined output to get the best outcomes through continuous experimentation with the help of mobile devices. As it is said that through arts, students become inspired to approach problems from various angles, think innovatively and creatively, and communicate their thoughts or ideas in original and inventive ways-that is generally beyond the box (Meepat et al., 2024).

Integrating Mobile Tech in STEAM Approaches

Shikshya shared that teachers have been practicing integrated approaches since her bachelor's days. In her programming subjects, the teacher had been teaching by integrating diverse subjects. She reflects, *'If I recall now, unknowingly, our teacher was implementing an integrated approach to teaching. For instance, in an application subject, the teacher first teaches how mathematics is used while making an application through the use of formulas and algorithms, through science, how it can be logically integrated, and through human resources, how the application is to be understood from different perspectives of the people....'* This indicates that the teacher is adopting a facilitator approach rather than a disseminator of information, which aligns with the social constructivist approach to teaching, as per the author Lev S. Vygotsky (Negi, 2023). Today, mobile devices have become a complete set, whether in terms of apps, assistance, or support for different educational organizations (Criollo-C et al., 2021). Shikshya added that mobile devices were used for inquiry-based learning, knowledge construction, project-based learning, and collaborative

learning. Different mobile devices offer fascinating features, functionality, and applications that motivate learners to explore ideas through inquiry by connecting to the internet, aid critical thinking, and engage in collaborative activities and discussions (Onyema et al., 2019).

Mobile devices facilitate inquiry-based learning, which has personalized Shikshya's learning experience; for instance, *'I usually prefer taking screenshots of reading materials or of solutions from Google so that I can use them later when I am offline or if I have to read while traveling. As I have an Engineering background, I find formulas in Finance subjects difficult, so most of my screenshots are of them. Since there are many ideas and ways of providing solutions to the problems on the internet, I collect them all and modify them in my own way, and learn.'* She has enhanced her knowledge by seeking answers to her queries whenever and wherever she is. It is said that inquiry-based learning holds great potential to increase students' engagement, collaborative activities, and active participation in learning (Onyema et al., 2019). Mobile devices have enhanced her digital literacy and aided her knowledge construction. She recalled, *'During my bachelor's days, I often used to take online courses in PHP and WordPress from online sites through mobile devices and have earned certificates online. I didn't have a laptop at the time, so I preferred using mobile devices more.'* According to the social constructivist perspectives, learning is a self-motivated process that integrates learners' prior knowledge with new ideas and concepts, refining assumptions and resolving cognitive conflicts (Saleem et al., 2021). Students usually have to access information online when they are unable to solve a problem on their own. Thus, through the guidance of mobile devices, i.e., through tutorials or mobile applications, they can grasp the knowledge that falls in the ZPD framework. ZPD (Zone of Proximal Development) is Lev Vygotsky's term that states that, while performing a series of tasks, it can be difficult for children to master them independently; however, they can learn through the assistance of others, such as teachers or friends (Wibowo et al., 2024).

However, Shikshya has felt that excessive use of mobile devices has significantly reduced students' creativity. Muller and Montag (2024) state that mobile phones suppress creativity by occupying free thought moments and stealing time from the generation or development of new ideas. She added, *'Though I am not much dependent on these AI apps, I feel using ChatGPT is like eating cooked food, I mean it provides you with answers in a bit, and one won't do any hard work. This may be the*

reason for the decline in students' creativity levels. Although I don't prefer using these apps, they have made students more reliant on them, and the habit of conducting research has declined. No exploration, no learning. I still prefer using Google rather than ChatGPT...' Whether for assignments related to engineering projects or master's projects, mobile devices have assisted her in both cases. Her project-based learning was enhanced through the facilities available on mobile devices.

Shikshya shared that through the use of mobile devices, collaborative learning was enhanced, as they often shared Google Docs, circulated notes, or read materials among themselves. This type of learning thrives when learners interact with peers or experts, such as teachers who serve as More Knowledgeable Others (MKOs). Moreover, mobile devices also serve as MKOs; they do not necessarily have to be a person; they can take the form of cultural tools such as books, articles, or journals, devices such as computers, the internet, or even ChatGPT (Stojanov, 2023). She added, *'Through social media such as WhatsApp and Viber groups, we usually make group calls and respond through messages to make discussions about presentations or any kind of issues faced. We have added teachers in the group so that we can get solutions easily....'* When students work collaboratively on projects or assignments, they tend to share information through discussion, complement each other's skills, and learn together, thereby contributing to problem-solving (Khoiriah et al., 2023).

From her narrative, it is evident that aspects of social constructivism, such as knowledge, emerge from social interaction and are collective resources shared through peer engagement rather than individually (Saleem et al., 2021). The teacher is following the facilitator approach by integrating teaching and learning. She has felt that, apart from creativity, all other aspects have improved, such as inquiry-based learning, collaborative activities, and project-based learning. Moreover, her narrative illustrates the intersection of Device, Learner, and social aspects of the FRAME model. Through mobile devices, she has accessed various mobile-based applications, which assisted in independent learning, representing the device learner intersection. Through collaborating socially, she exchanged ideas and shared experiences, which showed learner social and device social interactions.

Chetana is a psychologist by profession and teaches the Psychology subject. She has been using an integrated approach in her teaching to simplify students' learning. She added, *'I feel combining different subjects while teaching about a certain topic helps students to understand in a meaningful way. In my subject, while*

teaching different aspects of behavioral, biomedical, and societal sciences, I integrate mathematics. As there are cases of using IQ tests to determine a patient's level of intelligence to identify whether the tools used are statistically significant, understand patient behavior, and more, Chetana finds that inquiry-based learning, collaborative activities, and hands-on learning have increased, whereas creativity has decreased. Gholam (2019) states that inquiry-based learning is considered a student-centered approach, which is driven by questioning of the students and their curiosity level (Gholam, 2019). The author further notes that John Dewey, a constructivist and advocate of Inquiry-Based Learning (IBL), holds that the student's self should be engaged in the learning process. In Chetana's case, too, students who engage in inquiry-based learning increase their active participation in the learning process. In terms of inquiry-based learning, she shared, *'Today, every student has a mobile phone in their hands. Using these devices, they have increased their ability to research by referring to thousands of books online and communicating with teachers and friends whenever required, which is only feasible through mobile phones.'* Using mobile devices for learning helps access diverse learning resources through various applications and the internet (Widowati & Tyas, 2024). In terms of creativity, she has found that most students copy and paste content from Google. *'During assignments, most of the master's students use Google and ChatGPT to copy content for assignments to achieve good marks, which compromises the quality of their work, and many of them lessen their creativity level due to the use of mobile devices. It is like taking a shortcut path through ChatGPT. If the students want to make progress, they should take reference and learn by themselves; it would be great for their practical life rather than aiming only for good marks.'* Using mobile devices, as well as these social media practices of texting and sharing various multimedia content via social networking and online gaming, have been in demand these days, sparking discussion about whether students can afford the technologies for their creative learning (Ranieri & Bruni, 2013).

Collaborative learning is based on social learning theory, such as Lev Vygotsky (Chauhan, 2021). While conducting inquiry-based learning, collaborative learning can also be an important aspect, and using mobile devices for learning eases students' communication, information sharing, and working together to find answers to questions (Widowati & Tyas, 2024). raised. When I asked about collaborative activities through mobile devices, she showed me her WhatsApp and said, *'Whenever*

I give certain kinds of projects or say field work to my students, they work collaboratively, dividing the work among students. You can see here, this is a work division for conducting online seminars, one is searching for the facilitator, another manages all online work, another does Q&A sessions, and much more.' She has also found that they often share learning materials and query each other when resolving learning issues. Since communication through mobile phones is easier, it has become their guiding asset. This reflects how the students are using these devices to communicate and collaborate, illustrating the interaction between the social and device aspects of the FRAME model. It is said that a person follows a controlled ZPD process in their lifelong learning journey, and this journey progresses from seeking help from others to repeatedly indulging in self-help to develop new skills (Wibowo et al., 2025). These devices help learners connect with diverse MKOs who can also be global experts; this way promotes their knowledge construction through real-time interaction. Technology integration in education has revolutionized information access and retention, enabling greater storage capacity and more engaging content presentation (Pedraja-Rejas et al., 2024). In the early 20th century, through hands-on learning, the Progressive Education Movement developed creativity, boosted critical thinking, and encouraged collaboration (Tindan & Anaba, 2024).

Hands-on learning is a teaching approach that actively engages students in the learning process through direct experiences, such as laboratory experiments, fieldwork, and project-based learning (Laid & Adlaon, 2025). Regarding hands-on learning, she shared, *'In my subject, students often visit the field to carry out case-based work, and sometimes they conduct workshops, and they have to provide me with a video recording too. All these activities are sent through email, shared on a WhatsApp group, and uploaded to Moodle. Directly or indirectly, they are dependent on mobile devices to carry out their activities. I believe this increases hands-on activities.'* These activities help students like us to connect with real-life problems as well. The active participation of students not only enhances memory retention but also improves problem-solving and critical-thinking skills (Laid & Adlaon, 2025). On the other hand, Chetana uses mobile devices to monitor students' activities. *'I get notifications on a mobile device, and I monitor them and provide feedback or suggestions instantly so that they can utilize their time properly.'*

Samarth has been employing an integrated approach since the beginning of his teaching career. I believe that when this approach is applied in the teaching-learning

process, it simplifies understanding. Integrated learning helps students to understand the interrelationships of different curricula and how they are interconnected (Milankovic Jovanov et al., 2022). An integrative teaching approach helps students train themselves effectively by solving the problems they face and achieve deeper, systematic knowledge that can be applied in real life as well (Milankovic Jovanov et al., 2022). He shared, *'I have been teaching cybersecurity for more than three years. Teaching by integrating diverse subjects helps students understand the terminology easily. Subjects like mathematics, cryptography, science, and technology are all intertwined in my subject, which forms a comprehensive mix in cybersecurity.'* When an integrative approach is implied, it shows an active student and a teacher, rather than conveying facts or information; it is more about resolving problems, raising questions, and seeking answers actively (Milankovic Jovanov et al., 2022). This is evident from the narratives of how he motivates students to learn on their own and stay up to date. He further shared an instance in which he assigned a project to the students that required them to integrate different subjects. *'For instance, once I gave a project to students about a case where there was a theft at a bank's ATM without using a PIN or card. They were able to take money and even convert Nepalese money to dollars; thus, students had to research, identify how the theft occurred, and identify the gap.'* Through this example, he aimed to demonstrate that when students conduct risk analysis, they can integrate subjects such as mathematics, technology, and algorithms, and formulate hypotheses, among other things. These instances show the interconnected nature of various disciplines within Cybersecurity.

The current digital era is transforming the education system, primarily through ICTs to improve students' learning outcomes (Criollo-C et al., 2021). Through technology, students can easily organize study schedules, select learning materials that suit them, and actively engage in learning activities (Fajar Khoiriah et al., 2023). He shared that students mostly use mobile devices for inquiry-based learning, increased problem-solving, and improved hands-on learning; however, creativity and problem-solving decreased. It is said that inquiry-based teaching and learning are deeply rooted in social constructivism and central to curricular reform (Walker & Shore, 2015). He further shared, *'During my lecture, I have found students googling different terminology if they have not understood its meaning. In my class, students are allowed to use mobile phones or devices for a certain time, so whenever I give an assignment or teach new topics, they often explore them on their devices.'* Inquiry-

based learning encourages the students to actively seek, explore, and construct their own knowledge through the process of exploring, questioning, and investigating (Widowati & Tyas, 2024). Samarth just acts as a facilitator, allowing the students to explore on their own so they can make mistakes and learn from them. Thus, the teacher acts as an MKO for students who are scaffolders, and they tend to develop skills as needed. When teachers act as facilitators, they play a central role in helping students develop critical thinking skills and enhance their independent learning abilities as well (Cahyono & Fauzan Nastiar, 2025).

On multiple occasions, Samarth assigns projects that require students to use mobile devices for learning. He added, *'I have given a project where the students have to find out whether the frequencies clash. For this project, they used mobile phones to gather and complete the information. For instance, the 2.4 frequency band has 11 channels, so students have to inquire to understand about Wi-Fi networks, and what happens if there are other signals in the parameter.'* When students personalize their educational experience through mobile devices, it facilitates their learning; these devices help acquire and understand diverse information and knowledge, thereby improving learning outcomes (Pedraja-Rejas et al., 2024). In terms of a creative approach, Samarth felt, *'Technology has advanced rapidly, and these days, mobile devices are used by students for conducting different test case projects, which helps them to learn and improve their skills. They have been using mobile devices for testing various projects, such as finding loopholes in mobile applications, mobile apps to figure out the number of wireless connectivity devices present in a room, whether the wireless device is working properly or not, and even using smartwatches to attack the applications of mobile devices.'* When students like us are given such projects, we tend to search for ways to resolve these issues, as being new to this environment naturally raises our creativity. If ICTs are used responsibly, they enhance creativity; but when one becomes dependent and addicted, these devices become instruments of domination, leading to a decrease in creativity (Rodriguez et al., 2020). However, Samarth also felt that sometimes students' creativity levels have decreased. He added, *'Many of the students want things to happen fast, so they start depending on different AI resources. Without exploring on their own, they might just copy and complete their assignments; it is happening very often, and this will adversely affect their creativity.'*

Samarth prefers giving case studies to students so they can think hypothetically and share their ideas. Out of curiosity, they will research rather than waiting to be spoon-fed. Through these projects and case studies, students' problem-solving skills are expected to improve. Most of the time, he scaffolds the students rather than teaching them everything. Thus, this could imply that it mirrors Vygotsky's social constructivist learning theory. It is said that scaffolding empowers the learner to take ownership of their learning process. McLeod (2024) added that this generally occurs when the learner begins to internalize the strategies adopted and the knowledge imparted through scaffolding, enabling them to tackle similar tasks or challenges autonomously. As per Samarth's narrative, they are keen to research and broaden their knowledge through the assistance of MKO. Through collaboration with peers, students tend to learn from one another by constructing knowledge and solving complex interdisciplinary problems they cannot solve on their own. The students generally work in collaborative groups to identify what they need to learn to solve the problem faced (Hmelo-Silver, 2004). The author notes that psychological research and theory suggest that when students learn to solve problems, they begin to learn both the content and thinking strategies. Doing such projects also helps increase students' hands-on learning. This clearly demonstrates the intersection of three dimensions, Device, Learner, and Social of the FRAME model. Connecting socially for collaborative activities through mobile-based applications such as WhatsApp and Google Docs shows students ways of collective learning.

When students engage in self-directed learning (SDL), they apply knowledge to solve the problem, reflect on their learning, and evaluate the effectiveness of the strategies they employ (Hmelo-Silver, 2004). He adds, *'Since this is the time of IoT, every device is IoT; thus, being a cybersecurity student, one has to think outside of the box by challenging AI. Engaging in hands-on activities of this kind helps students gain practical experience and develop a better understanding of wireless concepts, which is essential for academic excellence in the 21st century. Using mobile devices for such cases is found to be extremely relevant.'*

Curriculum integration is about bringing the diverse content of various subjects together, which is traditionally considered distinct and different (Kreijkes & Grooten, 2024). In the case of Lakhsya, his narrative suggests that his teacher used an integrated approach. The author stated that to be an effective teacher, they must prepare students for the future in the 21st century (Hubert, 2021). Integrating different

subjects prepares the student for the 21st century. Since he studied programming, the approach has bridged programming subjects with real-world domains such as Accounting, Science, and Human Resources, making his learning process more practical and relevant. I asked how his teacher used an integrated approach while teaching, and he replied, *'My bachelor's was in IT, and there were many programming subjects. Well, when I think back, I remember how teachers used to integrate different subjects into programming lessons so we could understand it better and more quickly. My teacher, for instance, used to teach us the workflow of making a software application. For banking software, one must know accounts, such as how to post a voucher, an idea of journal ledger, understand human behaviour, such as how customers will use the app, if the app is related to HR, then one must understand the recruitment process, how to maintain salary, about appraisal, and many more.'* From this narrative, I believe that, through an interdisciplinary approach, his teacher simplified their learning process so that, within a short period, they could easily understand programming. These types of interdisciplinary learning make students enjoy the learning process, thereby improving engagement at all levels of learning (Hubert, 2021). He adds, *'An integrated learning approach was fruitful; it greatly benefited my programming proficiency, promoted my holistic understanding as I did not just learn concepts from books but also practiced different coding in real-life situations as well.'*

Using mobile devices for learning has become the solution to most traditional educational methods (Widowati & Tyas, 2024). Mobile devices have been considered an essential tool for many individuals, whether for communication, education, or leisure, especially among young individuals (Criollo-C et al., 2021). Mobile technologies enable Lakshya to make spontaneous inquiries, resulting in continuous engagement regardless of location or time. Among the STEAM approaches, he felt inquiry-based learning had increased. Inquiry-based learning (IBL) is a teaching approach that enhances students' learning outcomes and develops inquiry skills (Hrast & Savec, 2018). He shared, *'I cannot remember everything always, so mobile devices have become very handy. I reach out for any support required through mobile phones. We have a Master's group where information is frequently shared; e.g., if there's an issue or we need to share learning materials, we chat in our WhatsApp group. Moreover, dependability has increased in AI, too.'* I asked if there were any examples, and he elaborated, *'Especially in my master's, I have been inquiring a lot*

about my research projects. Even though I have already selected my research topic, you know, while traveling, questions or suggestions pop into my mind related to research, and I instantly search them through my mobile phone to determine if it is feasible or not.’ This type of learning assists students in assimilating information through topics by conducting self-directed investigation and progressing through several inquiry phases (Hrast & Savec, 2018). It seems like he addresses his curiosity immediately through mobile phones, which has refined his academic journey. Thus, from his narrative, I felt that his inquiry-based learning was enhanced; in his case, too, the teacher acted as a facilitator in the learning process rather than a sole knowledge provider (Hmelo-Silver, 2004).

Lakshya’s reliance on mobile devices also persists while performing group or collaborative activities. As development accelerates, innovative mobile technologies are transforming the way collaborative learning is taking shape (Gong et al., 2022). He shared, *‘Our master’s classes are almost online, and often we are assigned to different groups for class-related activities; group discussion, project groups, or for group presentations. I have observed that many of my peers use mobile devices and we complete different projects collaboratively through mobile devices...’* From this narrative, I believe Lakshya not only uses mobile devices as his learning tools but that these devices also facilitate digital collaboration, as his classes are conducted in an online learning environment with very minimal physical interaction. This reflects the intersection of social and device aspects of the FRAME model, as the participants have been using these devices for inquiring, exploring, and getting in-depth knowledge he has been using mobile devices. In group-based inquiry-based learning projects, mobile phones extend collaboration beyond the physical classroom walls, enabling even geographically dispersed learners to easily coordinate data collection, share field observations through photos or videos, and analyze the results collectively (Khaddage et al., 2011). He shared, *‘.... Since our classes are always online, teachers ask questions, we discuss collaboratively, and then provide a conclusion. We frequently collaborate on social media, and, to be frank, I prefer using mobile phones rather than laptops...’* Students mostly stay connected with their colleagues through mediums such as SMS, cell phones, Facebook, Skype, any kind of online forms, MySpace, Twitter, YouTube, Blogs, etc. (Khaddage et al., 2011). Through these mobile-supported applications, they exchange information and interact in real time. This aligns closely with Vygotsky’s social constructivist view of the ZPD, as his

narrative makes it clear that peers scaffold one another's learning. Lakshya's narrative shows that mobile devices empower learners like him to move beyond. His creativity has increased, as it is not confined to physical reading materials but also extends to digital searching. The author stated that in the 21st century, creativity and innovation have become important, especially for the development of the current information society (Anaktototy, 2023). He compared his current studies with his bachelor's studies, as in those days he rarely sought new ideas and most of the time he relied on the teacher's notes and used dongol, which had limited data. Social constructivism states that creativity can emerge through a dialogic exchange; brainstorming generates new ideas through collective meaning-making. He shared, *'I felt an increase in my creativity level. From teacher-centered learning, I have transitioned to self-exploration, which has played a central role in unlocking my creative potential. These days, if I search for content in Google, I get a wide range of answers or responses from different sites, whereas in AI, I get the exact answers, which saves time, and it is more reliable.'* Scaffolding is one of the Vygotskian concepts that focuses entirely on assisting adults (experts) with learners within their learning zone of proximal development (Al Mulhim & Mohebeldin Zaky, 2022). In the case of Lakshya, the teacher initially supervises them, and later they start learning on mobile devices. The teacher gradually reduces the support they provide to students as students become more competent on their own. From Lakshya's narrative, I conclude that his academic learning approach has undergone significant positive shifts, including creative engagement, moving from traditional physical materials to digital tools. (Darko-Adjei, 2019)

Mobile devices are a valuable asset that enables educational socialization even at a distance and promotes collaboration among students, and these days, they allow users to access content and information from anywhere and at any time (Criollo-C et al., 2021). In different academic levels, I have observed that teachers mostly use an integrated approach. The teachers, along with the theoretical connection, provided guidance on connecting with various tools and subjects, including algorithms, human resources, mathematics, and more. This approach makes the learning process easier and more practical. Gyan, too, could relate to it, as his teacher used an integrated approach. Hubert (2021) states that an interdisciplinary approach has positive effects on students' learning. He shared, *'You know, most of the teachers teach using an integrated approach by combining content from multiple disciplines to show their*

connectivity and enhance our understanding level. 'It was followed by example, he adds, 'I have chosen a trading-related research topic which studies the hike in share prices in NEPSE. Here, the teacher tried to simplify by integrating algorithms of mathematics, how machine learning models can be used, and natural factors such as political or socio-economic conditions, which may also affect stock prices, or consumer behavior, can also affect the price...' I can say that his teacher has helped him see the bigger picture through this interdisciplinary approach, which can be a key tool for solving real-world problems.

I've also noticed that inquiry-based learning has become much more prominent lately through mobile devices. Gyan often searches for information online, whether to complete assigned projects or conduct research. Inquiry generally involves learning through asking questions, which are mostly driven by curiosity or the person's interest (Walker & Shore, 2015). He said, *'I inquire and question everything that's on my mind related to academic confusion. At my high school level, I used to wait for teachers or friends to answer my doubts, but now I actively seek solutions online through my mobile phone.'* Gyan is now more dependent on mobile devices than teachers, as inquiry-based learning is not limited to classroom walls. He elaborates, *'Talking about the current scenario, I am doing my thesis, even though the teacher teaches us about Research, but it is never enough. I often search for research-relevant content online, collect literature reviews, search for calculating tools, and much more through mobile devices...'* I share the same experience; this flexibility in exploring and seeking out solutions/information through mobile technology has transformed the way I engage with research.

Mobile technologies are advancing in most higher education institutions today and are a major influence on students' collaborative learning (Gong et al., 2022). It is said that communication and collaboration are among the essential focuses for preparing students for increasingly complex life and work environments in the 21st century (Amalia, 2018). Through mobile devices, Gyan's collaborative learning has also evolved, especially in the online learning environment. He noted, *'We have peer groups where we share content more actively. These days, if we have to write reports, review literature, or share reading materials, we often upload them and discuss resources on e-learning platforms, i.e., social media applications. I find this exchange of ideas helpful and productive.'* My teacher used to say, *'We learn more by sharing...'* I think this is true: the more we share, the more we learn. Indeed, through

such online platforms, we stay connected with our peers and teachers and learn from one another, even outside class hours. In the process of collaborative learning, the role of the role is more that of a facilitator than a controller in the classroom (Amalia, 2018). From his narrative, I believe his teacher scaffolds them. Scaffolding helps learners by gradually limiting the complexity in the learning context and then removing those limits as learners gain knowledge, confidence, and skills to tackle complex concepts (Nasser Al Mulhim et al., 2022).

He adds, *‘Since our classes are online, we use Google Docs to share our ideas in the classroom and often use the Zoom app for making real-time discussions. This kind of peer learning has immensely advocated my learning journey.’* Vygotsky's theories also support collaborative forms of learning; they suggest that, in a group, members should possess different kinds of abilities so that knowledgeable peers can support less experienced peers who operate within the ZPD. However, Gyan felt his critical thinking and creativity had decreased due to greater reliance on mobile technology and AI. He said, *‘In our bachelor's days, I mostly relied on search engines only, and I had to think on my own or rely on teachers. Well, now, with one click, I get all the information, and AI applications like ChatGPT and Copilot give us answers right away. I don't have to think much or explore more. This dependency has decreased my creativity and critical thinking skills.’* I, too, agree with Gyan, as using this AI on a mobile device has led me to skip deeper analysis. “Project-Based Learning (PBL) is a method that allows students to learn through the development of different authentic tasks that result in projects by working collaboratively” (Gabuardi, 2022, p. 1). Mobile devices play a key role in shaping an individual's project-based learning experience. PBL (Project-based learning) is more inquiry-based; it consists of structured experiences grounded in the belief that learning occurs when individuals are asked to investigate the problem at hand (Fajar Khoiriah et al., 2023). Gyan shared his experience, *‘In bachelors, I was assigned different technical projects. Though teachers used to provide initial guidance, I had to research on my own, do constant hit-and-trial, and complete the projects. This is all possible through mobile devices.’* Mobile devices have created a blended learning environment outside of the classroom. In the digital era, one can easily access diverse content across borders. He adds, *‘Though I could have searched through computers or laptops, using mobile devices has saved me time. Collaborating with peers, searching for authentic content online, and learning by doing have strengthened my knowledge base. Moreover, the*

constructivist perspective holds that learners are not passive recipients of input, but rather interact and gather new information. From this narrative, I believe that his self-driven learning, which aligns with Constructivist principles, has become more flexible as he has pushed himself to be an independent learner and a problem-solver, both of which are vital to academic learning. From the narrative, it is evident that the mobile devices have been used for social connectivity, collaborative learning processes, and independent learning for actively constructing knowledge, which clearly demonstrates the intersection of device, learner, and social aspects of the FRAME model.

When I asked Shanti if her teacher has used an integrated approach while teaching, she replied, *‘Well ... yes, our teacher uses an integrated approach of teaching. It just simplifies things for us; when different interdisciplinary subjects are combined, it helps in grasping the content easily. I will give you an example, in the subject International Business, the teacher teaches us how to understand consumer behaviour for conducting business, understanding their psychology, and understanding the demand and supply of the products. ‘She shared a practical example, ‘Beauty products are hyped in Nepal, especially among girls who want to look pretty. The Korean cosmetics craze is unbelievable in Nepal, so if I were to do business, at first, I would have to understand the demand of the local market, preferences of the consumers, and how social media is affecting their behaviour. Here, subjects like marketing, psychology, and economics are all interconnected while carrying out real-life business decisions. ‘This approach imparts more practical significance to learning experiences of students as it bridges gaps between various disciplines, addresses the shortcomings of teachers' subject-specific teaching process, and fosters overall development and core literacy among the students (Li, 2023). Mobile learning is regarded as 21st-century learning, as one can learn at anytime from anywhere, and it also provides a framework for ubiquitous learning (Rafifing et al., 2025). In Inquiry-based learning, students are required to be active participants in their understanding or learning process (Feltham, 2022). Shanti emphasized that inquiry-based learning is central to her academic process, particularly when using mobile devices. Mobile learning technology allows the inclusion of several learning models, which in turn manage the students in the construction of their own learning process (Criollo-C et al., 2021). She stated, ‘When I was in college, we did not contact the teachers right away; if we had any confusion, we had to wait till classes resumed.... I had completed my bachelor’s in programming, so I had to inquire a lot*

about coding and different terminology. Though the teacher used to provide notes, it was not enough, so I used to explore on my own, do an inquiry, and learn. I did all this through mobile devices.' Thus, in student-centered learning constructivism, learners are positioned as the active participants in the process of constructing knowledge on their own (Rai, 2025). Rafifing et al. (2025) stated that student-centered approaches are different from traditional teacher-led models, as learners take ownership of their own learning process, engage deeply with the content, and develop autonomy. Now, even at the Master's level, too, she looks for a solution online by using a mobile device. *'Sometimes, I miss classes, and even if I miss classes, I can independently search for content online through the reading materials provided by the teachers,'* she added. From this narrative, I believe she goes through the cycle of questioning, exploring, and learning.

As in scaffolding, assistance is provided to students whenever required, and when the task competency increases, the level of assistance also fades gradually so that learners complete their tasks independently (Al Mulhim & Mohebeldin Zaky, 2022). In her case too, teacher used to provide her minimal support when they learned she has obtained certain level of competency. She acknowledges that mobile devices have enhanced her creativity and problem-solving skills. In the learning process, the learner actively participates in different creative activities and self-organization (Almulla, 2025). She said, *'Whenever I have doubt about anything, I immediately seek assistance through my mobile phone, it can be contacting peers or a teacher, or searching online. Asking the teachers may not be convenient every time, and they might not be available whenever I need them. Also, sometimes the required content may not be available in the notes of the teacher or the books.'* Chen and Hwang (2023) stated for collaborating with classmates, students can use mobile devices while working on projects, which develops an interactive and cooperative learning environment. She recalled how, during the time of exam preparations or if she had to solve complex numerical problems in subjects like Accounting or Operations Management, these devices had become very advantageous. She said, *'During exam time, we often used to post pictures on WhatsApp, and sometimes peers or teachers would help us out.'* Thus, I believe, these narratives reflect Vygotsky's ZPD; if learners are provided with the right kind of support and tools, they can resolve problems faced that they could not have tackled if they had to do so alone. Usually, when these mobile technologies are used in collaborative learning settings, it occurs

in both informal and formal educational settings (Jaldemark et al., 2017). Learning through collaboration is the core part of her learning experience. She noted, *‘In my Master's classes, there is an online group where we continuously share notes and information. If one of us attends class, they usually share the notes from the classroom whenever required. I believe this is collaborative learning. Sharing notes and reading materials is common among friends, and this is possible through the use of mobile devices. Though laptops can be used, using these devices is faster and easier....’* “Collaborative learning is grounded in the social constructivist theory, particularly Vygotsky's concept of the Zone of Proximal Development (ZPD), which emphasizes that students learn best when interacting with more knowledgeable peers.” (Gautam, 2025, p. 203). Collaborative learning is a common teaching technique that aligns with a constructivist approach to the teaching and learning process (Taggart & Wheeler, 2023).

I asked if this collaborative learning was fruitful for her. She shared, *‘Definitely.... You know more minds, more ideas, perspective also differs from person to person, this brings out a pool of ideas which encourages us to learn more. In bachelor's too, these kinds of activities were more common.’* She provided a concrete example: *‘Once we were assigned a project where we had to create a web page related to Travel and Tourism. We divided the work among ourselves and completed the project through research to get the best output. In this process, mobile phones assisted us in coordinating very easily...’* This reflects social constructivism, where knowledge is built through peer interaction and group problem-solving. “This theory underscores the importance of cooperative efforts in constructing knowledge rather than passively receiving information.” (Gautam, 2025, p. 200). Jumaat et al. (2017) stated that integrating technologies into the learning process has influenced students in constructing knowledge; they tend to learn with the assistance of the technologies as educational tools, and it has become central to the learning process of students.

In the case of project-based learning, Shanti felt that the use of mobile devices made her learning more convenient and productive. It is seen that project-based learning encourages student autonomy in the learning journey (Jumaat et al., 2017). *‘Like in the old days, I do not have to refer to laptops or pc, as I can complete my assignments from mobile devices right away. I mostly use the YouTube App for my academic learning. I often look into comment sections, where my questions are already answered, and these replies are really helpful. This saves my time as I do not*

have to wait for my teachers. Often, I have completed my various projects of programming projects in my bachelor's and assignments in my master's through different mobile-supported applications.' This shows device learner aspects of the FRAME model, as Shanti has been using various online platforms to resolve her issues of coding and debugging in programming subjects. When mobile devices are combined in project-based learning for accessing information and other related resources, it allows learners to engage in various experiences, such as hands-on, collaborative learning (Chen & Hwang, 2023). From Shanti's narrative, I believe mobile devices not only support project-based learning, inquiry-based learning, hands on learning but also nurture the essential 21st-century skills.

Mobile Device and The Next Generation of Education

I have noticed that, in many instances, there is exponential growth in the number of mobile device users, which has increased the dependency on technology. The use of mobile devices is gradually becoming a compelling learning tool for enhancing teaching and learning, as it enables flexible course delivery. Learners can access online learning platforms and course resources and interact digitally with teachers and peers (Darko-Adjei, 2019). Today, one cannot imagine life without a mobile phone because it has become an integral part of social life and is accepted in most professions, including education, being one of them (Ramgade & Divakaran, 2021). She felt, *'I see great potential for mobile devices, especially in the remote areas. Teachers can use these mobile devices to help students grow through learning and to educate them by advising them on useful applications.'* Shikshya noted a tremendous increase in the use of mobile devices for learning; however, many students find themselves addicted to them, often losing focus on their studies. "University students are especially heavy users of cell phones, and this has implications for learning outcomes at the tertiary level." (Ahmad, 2020, p. 27). She further explained that mobile devices have increased social addiction in new-generation students. *'Even though mobile devices are used for learning purposes, you know how people like to be social and regularly update their lives. It has become an addiction... so students must be self-aware and use these devices to enhance their studies, so they can even benefit from the latest innovations in these technologies. She shared that these devices will continue to advance, bringing innovative changes to the way we learn. 'You never know what the next changes in these devices will be. If you look at the innovation from its invention to date, there are vast differences. I could*

have never imagined learning through these devices, which is possible now...' One important feature of using mobile devices for learning is that they simplify online interaction, which is an integral part of education, allowing teachers and students to interact at any time. Thus, this simplification of interactions can be a turning point in integrating these devices into education. As a Master's student, Shikshya has felt that students like her have taken full advantage of the benefits. She also added that, since technology is changing rapidly, future advancements will transform learning, and every educational institution will include these devices in its curriculum. When designing courses, the instructor or educators must discuss and develop the learning materials to integrate these devices into the classes (Alanezi & AlAzwani, 2020).

Using mobile devices for learning and improving performance is constantly evolving, as most mobile devices have, in less than a decade, radically altered how people interact with the world around them. Chetana felt that the learning pattern had changed when mobile devices were introduced into students' academic learning journey. She added, *'Being a student and a teacher, I personally feel that these devices have changed the pattern of traditional ways of learning by making it more of blended learning. I can say that from this process of learning, it has brought transformation/ changes in learning ways.'* From my experience, too, I have felt that these devices have brought flexibility and transformed the old pedagogical practices. Mobile phones are considered a source of information and for generating references; moreover, through these devices, one can improve access to the required information, enhance academic learning, and improve problem-based learning. However, she has felt that most students are overly dependent on these devices, and, in a way, this has affected their learning process. She added, *'In the future, though it might help students to seek out their every learning problem, one must become self-aware and analyze their physical, mental, spiritual, and social aspects to be a good learner through these devices...'* Since it has become like basic tool for us, as of now rarely mobile devices are allowed in the classroom settings, so I asked what does she feel of using these devices in the classroom in the days to come, *'I believe there might be many instances of the countries where these devices in the classroom, so I believe in the future mobile devices should be allowed after the bachelor level of study in the classroom. However, certain social media applications must be restricted, and there are different educational sites which should be allowed to be used where students can engage and learn....'*

Chetana is also focused on rural areas, where students' development depends on how these devices are used. *I find a huge gap between urban and rural areas. In the future, I see these devices becoming the primary educational devices. But in such cases, the government should play an important role. The government should take the initiative to train teachers to go to those rural areas and make them aware of the benefits of mobile technologies, which can be used for learning, as everything is on mobile devices. Likely, the students should be made aware of the different educational sites or apps.* From her narrative, I have the sense that she sees the future of mobile devices flourishing mostly in rural areas. Though these devices bring ample benefits, Chetana felt that due to the challenges they might bring, they might affect certain areas. *'Having said that, there are many challenges as well, it can be uneven internet access or low rate of digital literacy, however, these distractions must be addressed so that mobile devices will be implemented equitably and effectively...'* Being an educator and psychologist, she stated *'Also in the future, many educational institutions will redesign courses for incorporating these devices in the educational sector ... Though we are being advanced and using these technologies, however, I feel that technology must not use us, but rather we should use technology by being more self-aware. 'As mobile phones are increasingly used in higher education, this signifies a paradigm shift in teaching and learning approaches.*

Samarth sees great potential in mobile devices in the educational sector, and they were used more frequently after the COVID-19 pandemic. He clarified, *'We all cannot forget the COVID-19 pandemic, which has seriously impacted all of our lives. For days, it had stopped all of our work; however, to continue our institutions, we started using alternatives such as mobile devices or laptops. 'Due to the occurrence of a pandemic situation, many of the academic institutions started relying heavily on different online learning platforms to educate and train students (Ramgade & Divakaran, 2021). Further, he said, 'These mobile devices were very helpful at that time, and it is still in practice today as well. I do not have to wait until tomorrow to give any assignments to the students. Through mobile applications, I can easily give any kind of assignments online, for instance, I can provide them with topics to discuss or do some research on a certain topic. 'Some applications allow teachers to connect with the students and can also constantly update and check the progress of students, which allows the teachers to personalize their teaching process (Ramgade & Divakaran, 2021). His ideas of providing such kinds of assignments to students save*

his and their time as students can learn in their leisure time by referring to mobile devices rather than studying through books at home. *'Furthermore, reading a textbook is simpler now as you can easily listen to the audio instead of reading it yourself while doing other work through these devices, communication ways have improved, and knowledge is upgraded...'* He feels that such activities reduce students' hardships while they look for ways to upgrade themselves through these devices. He also believes that to help students retain information for long, one should include visuals in the teaching and learning process. He is following the same practice, but in the future, he feels these devices will mostly be used to enhance such activities in classroom settings. The author stated that the Social Science Research Network revealed that there are people over 65 percent who are visual learners, thus mobile devices allow to incorporate video, which has a responsive design and indulges a series of a whole array of other visual elements (Ramgade & Divakaran, 2021).

In terms of rural areas, I asked what the future of mobile devices in these areas, He added, *'You know I always tend to research due to my own interest, and I saw that the Government normally spends less in the educational sector after the intermediate level. Based on my observations and the direct experiences of some students from rural areas, I have found that they have had difficulty adapting to the teaching and learning processes in urban areas. So, the chances of mobile devices in these areas are very minimal ...'* My take on the potential of these devices in Nepal, especially in rural areas: they truly bridge educational gaps, which should be followed by proper teacher training and awareness programs. In his classes, students are allowed to use mobile phones, which he finds distracting. The use of mobile phones in the classroom is a distraction for students, as it diminishes the classroom experience and reduces information retention. He stated *'Most of the students are using mobile phones to record the lectures or to search for new or confusing terminology. So, I do not allow them to use these devices in my classroom because they will miss out on important content.'* So, since he has already learned how these devices are used by students in the classroom, he prefers them to use their logic in learning rather than depending on these mobile devices. So, in the future too, he does not prefer students using them in the classroom. Moreover, since mobile phones have proliferated in different academic settings in recent years, new challenges are encountered by higher education institutions (Ugur & Koc, 2015). He stated, *'Since these devices are low and must be efficient, there is no harm in depending on these devices for extracting*

contents or exploring, but I want students to depend on mobile devices only 25% and learn through doing research by 75% on their own, rather than depending on the AI of mobile devices. ‘Due to the flexibility, efficiency, and low cost of mobile technologies, a very optimistic future for mobile learning (Selwood, 2017).

Apparently, mobile technology has become a very important part of our day-to-day lives, so we tend to live in a highly mobile environment (Ramgade & Divakaran, 2021). I asked whether Lakshya sees the future of mobile devices in classroom settings for learning, but he did not like using them there, finding them unnecessary and distracting. Rather than serving as a working instrument, mobile phones can act solely as a source of entertainment for students (Huey & Giguere, 2022). He replied, *‘Personally, I do not agree using these devices in the classroom setting, however, it might be possible in the future to come..... They will only be distracted, you know. Teachers are readily available in the physical classrooms at that time, and if students have any confusion or doubts, they can ask the teachers directly or discuss with friends. However, if they have queries at home in such cases, they can refer to mobile devices.’* In classroom settings, I prefer more teacher interaction and peer discussion than using these devices to learn.

I believe there are high chances of these devices’ flourishing in rural areas in the days to come, so I wanted to know his side of the story. He added, *‘You know there is lots of development in most of the rural areas as compared with the past, so I highly recommend these devices to be encouraged in rural areas as it will be advantageous. If I have to talk about network connectivity, there have been advancements in Namaste and NCELL’s networks compared to the past...’* He continued, *‘Since many of the students have to travel long distances to study, if these devices are easily available, they can connect and study more properly. I remember clearly that during COVID, Radio Nepal initiated classes, though they were one-way, and I found them very effective for students.’* After the pandemic of COVID-19, it was seen that the embracement of distance learning and technology use in the field of education is swiftly amplified, even in most of the rural areas, as the pandemic forced a prompt shift towards the realm of online education (Pandit, 2025). He felt that this could only be possible with government assistance. *‘To make this possible, the government should act as a helping hand in maintaining stable network facilities for the students of rural areas. Moreover, the teachers should provide guide the students about several beneficial sites which can be accessed through mobile devices.’*

“The use of mobile devices to support learning and performance is constantly evolving as today's mobile devices have, in less than a decade, radically altered how people interact with the world around them” (Selwood, 2017, p. 71). In my case, too, if I compare how I used to study before and now, there is a vast difference. From Gyan’s narrative, it appears he has also been dependent on mobile devices for most of his academic learning. When I asked him for his opinion on the future use of mobile devices in academic learning, he said that mobile devices will continue to offer better features, such as advanced processing power, expanded storage, improved network access, and lower costs. He stated, *‘If you look now, mobile devices have become one of the essential tools for everyone, be it for basic work or for carrying out essential tasks. During my schooling, I was not used to being dependent on these devices, but now I search for every piece of content I have doubts about. You can see the changes here itself...’* This made me realize how effortlessly we turn to our mobile devices to seek answers rather than explore ideas or concepts on our own.

The development of technologies, i.e., mobile applications, has enabled mobile devices to upgrade and personalize the way people interact with them (Selwood, 2017). He feels that, for studies these days, it is beneficial to have these learning applications, which are always being updated. Applications such as Twitter, Facebook, and Instagram are being adapted so conveniently, as it can be easily accessed through a mobile device, and along with search engines such as Yahoo, Google, and Bing have redesigned the interface which makes them fit in small screens of mobile devices and also through YouTube allows for easy and convenient uploading so that they can be easily accessible via smartphones and tablets (Selwood, 2017). However, he also cautions that, *‘Though mobile applications have eased the learning processes, but it has somehow decreased creativity and critical thinking skills of the students. So, to overcome these issues, students like us must consider this and explore on our own through research rather than always depending on AI or mobile phones.’* He has realized that doing so will make students more active, help them memorize the content for a long time, and make them more experienced. Although mobile phones support academic activities, non-academic use occasionally distracts, disrupts focus, and leads to procrastination while studying or during class time. I asked for his opinion on the future use of these devices for learning in rural areas. Pandit (2025) found that the digital divide in Nepal's remote regions remains a significant obstacle. They added, *‘There is a digital divide in Nepal; certain parts*

have more access to mobile devices than others. Regarding technological facilities, they are less common in urban areas. So, I believe the government should play a major role in refining facilities, such as computing resources, network connectivity, fast internet, cyber infrastructure, and mobile device availability. Through this student can search content online and study countless learning materials....'

He further added, *'Certainly, there will be lots of technological changes in the future. I see great potential in these devices in the educational arena. Back then, the concept of AI was not in practice, but now AI has taken the market, and there is more scope for AI. These changes will eventually bring many changes in learning through the use of mobile devices.'* It is evident that learners, teachers (instructors), and educational institutions have become more aware of the benefits of using mobile devices in learning; thus, the next step will be to make a greater investment and conduct research into the development of pedagogy and software (Selwood, 2017). The current generation of students has already shifted to using mobile technologies for academic and deep learning, including devices such as mobile phones, tablets, and mini laptops, at a very rapid pace (Ramgade & Divakaran, 2021). Many of the students like us are comfortable using mobile phones for learning, as we always carry them with us 24/7. Shanti's stories also resemble me, as the narratives unfolded. She reflected, *'From being too much reliant on different bulky books and hard prints ... and now depending mostly on these mobile devices for all of my academic learning needs, it feels completely different now...'* The author stated that mobile technology has the capacity to replace burdensome resources, including textbooks and any paper-based learning materials, and the visual aids provided (Ramgade & Divakaran, 2021). This is clearly evident in Shanti's narratives. Selwood, (2017) stated mobile technology has changed the whole scenario of our life today with the help of text messages information and any updates can be send directly to students especially for distance education or who are usually busy in business or due to job requirements it is very easy to communicate the information to the students which can be relevant with assignment or submitting assignments, information related to them results, changes in syllabus or any kind of cancellations. Shanti, too, gets notified in similar ways. Since we are becoming too dependent on these devices, I asked her for her views on the future of mobile devices. She added, *'We are more reliant on these devices for everything, be it for updating on news, or work life, and more for learning. Moreover, most notices or updates are sent to us via text message.'*

I also did not use to attend classes sometimes, as some days it used to be online only, which used to make my work simpler...’She continued, *‘This has increased screen time as we often have to study online due to our online classes, even though it is not like physical classes. Very often, I get distracted due to notifications from different applications. ‘Khatiwada (2025) stated that in higher education, students are expected to focus on learning and prepare for their future careers; however, the accessibility of mobile phones has made it harder for students to remain attentive in the classroom. Though she felt that these devices can be used more in the future in the academic areas, she personally felt that, ‘In my case, I have felt that online learning often decreases teacher interaction. ’ I asked about rural areas, ‘Mobile devices’ future is bright in rural areas especially for university students. Though mobile devices are not readily available, if they get a chance to use them, they bring ample benefits. Issues of road structure come as the main hindrance while attending physical classes, poor economic conditions...’* The author also stated that economic limitations prevent many families from affording devices and internet access. She again added, *‘Thus, I firmly believe that the government and educational institutions should play a key role. If the government makes internet services accessible to all and considers people's economic conditions by launching a campaign or scheme that allows students to buy mobile devices at a lower cost, teachers should be provided with training...’* However, awareness and motivation are lacking in some communities to prioritize digital education, as they are highly influenced by traditional views on education and technology.

Even though mobile devices can cause health issues such as pain and headaches, and can sometimes be monotonous, they have many advantages that enhance students like us in the learning field. *‘There are chances that the student will be able to learn through the mobile games as well, which might be possible now also, but I do not have much idea.’* The author stated that there are serious games, it is a software games that are mainly intended for a purpose rather than only for entertainment purposes (Selwood, 2017). She further added, *‘Technology has already been updated, and there are continuous advancements. If you compare devices from this era with those from the 2000s, you can see vast differences. So, in the future as well, there will be many innovations that are beyond our imagination...’* She felt that these mobile devices empower students like us, and that there will be more projects based on them. In the future, both the process of learning and teaching will

increasingly move outside the classroom and into the environment learners have chosen, whether in the real or virtual world or a combination of the two (Selwood, 2017).

Reflections on Chapter

The mobile device is considered a great tool that facilitates the STEAM disciplines. It supports multiple applications, such as audio, video, pictures, PDFs, and social media applications, which aid in connecting theoretical learning with practical implications. It empowered students like us to enrich our learning experience across different areas, including inquiry, creativity, critical thinking, and communication with MKO, which goes beyond the conventional classroom. This aligns with the STEAM philosophy. Their experiences reflected learning through assistance of peers, teachers, and devices themselves (MKO), teachers guiding them at first and letting them explore on their own (Scaffolding), Pools of resources for diverse explanations and visual or audio demonstrations, i.e., YouTube (ZPD), echoing the Social Constructivism Theory by Lev Vygotsky. I have realized that my study is not just about analyzing participants' stories but also about critically reflecting on how Nepal's educational system can evolve. This chapter made me realize that even though conventional methods may not be outdated, they are not sufficient to excel in this digital era. Thus, I believe mobile devices should not be considered distractions, but rather used thoughtfully to empower and guide learners toward more meaningful learning.

CHAPTER VII

REFLECTIONS, INSIGHTS, AND CONCLUSION

In this chapter, I have engaged in reflective analysis of my research journey. I have summarized my reflections on my study with my research participants on adopting mobile devices in academic learning and their influence on STEAM approaches. I have discussed my research issues and research agendas, articulated research questions, and constructed a methodological framework and theoretical referents that guided my research. Likewise, I have also discussed how I have addressed the research question, which framed the research issue. Lastly, I have expounded on the key insights of my research through conclusions and the study's implications, which were derived from the exploration.

Envisioning My Research Agenda

Mobile devices, especially mobile phones, have become indispensable to many of us. From basic to luxurious needs, we tend to be dependent on these devices if we cannot function without them. Moreover, it is common across all age groups, and students like us mostly use it for academic and entertainment purposes. From 2016-2018, mobile phones became a significant tool for academic learning purposes. Moreover, the academic significance of mobile devices grew after the pandemic, COVID-19. The students started relying on sharing or accessing learning materials, attending virtual classrooms, and collaborating with peers to explore learning materials. Observing such a rapid shift, I became curious about how these devices are influencing learning patterns, especially in Nepal, where technology and pedagogical practices are still evolving.

My interest in understanding how mobile devices are adopted by university students while they learn, their learning patterns, whether these devices benefit them or cause distractions, and how they can be aligned with twenty-first-century learning approaches, such as STEAM, led to the emergence of my research agenda. STEAM education was completely new to me; however, I gradually learned its core principles, approaches, and how it brings diverse subjects together. Approaches such as inquiry-based learning, problem-solving, critical thinking, hands-on learning, and creativity are in-demand twenty-first-century skills that are most essential for competence in today's market. As I explore all of this, I wonder how these mobile devices are

influencing the approaches and transforming the academic learning experiences of university students.

As a frequent mobile phone user, I often become distracted while using it for academic purposes and frequently encounter connectivity issues. Through conversation with friends, I too realized that everyone is facing the dual impact of these devices, i.e., opportunities and challenges. For instance, some found it to be a tool for increasing their knowledge level by accessing a diverse pool of resources and increased flexibility; however, some felt that it caused distraction, decreased creativity and critical thinking skills, and made them more dependent on these devices. With these reflections, I became clearer about my research agenda; they also encouraged me to dig deeper to understand how mobile devices, especially mobile technology, are shaping their identities as learners and how they are embracing challenges and getting the most out of the advantages. Thus, I aimed to explore how university students narrate their stories of adopting mobile devices in their academic learning journey and how these devices influence STEAM approaches.

Formulation of my Research Question

My experience using mobile devices for academic learning, my current academic engagement in STEAM education, and the insights I gained during my MPHIL journey have played a key role in shaping my research purpose. I had to restructure my research several times as per suggestions from different professors and my supervisor. I knew the research question must be clear and precise so that it would convey the research's purpose. Per my supervisor's suggestions, my research question should align with a narrative inquiry that captures participants' lived experiences, revealing the significance of mobile devices in STEAM education approaches. Thus, I formed the research questions that captured the essence of the participant stories.

Reflecting on my Methodological Map

I have chosen narrative inquiry as my research method and have applied social constructivist theory. I then selected six participants (four students and two teachers) for my study. I have chosen this research method to generate detailed data on how participants use mobile devices for academic learning, capturing their lived experiences through stories about their adoption of mobile devices. Through the lens of social constructivist theory, I saw how the students developed their academic learning by constructing knowledge through peer and teacher interaction rather than acquiring it individually through technology.

Due to unavoidable circumstances, such as my own semester examination and difficulty managing time with the participant due to their work overload, the data collection process has been delayed. However, I was able to collect the data on time due to constant dedication, and my participants were also very cooperative. Despite their hectic schedule, they openly shared their experiences and clarified anything I did not understand. After collecting data, transcribing it is another challenge. I had to generate applicable themes that suited all the participants. It took me days to come up with an appropriate theme as per the narrative thematic analysis. I often cross-checked to make sure I was not off track. Thus, with my supervisor's guidance, by referring to relevant literature, aligning with the adopted theory, revising, and revisiting the collected data, I was able to address the purpose of my study.

Responding to My Research Question

This section addresses the research question outlined in Chapter I. I have created two research questions, and the data were collected from narratives of six participants. Thus, I have responded to the set research questions as follows:

Early Experience with Mobile Devices and Their Influence on STEAM

Approaches

With the guidance of the research questions, I began by asking about their prior experience with technology and how it was. As we know, these technologies took more than a decade to be fully established in many educational institutions. To talk about my own experience, I completed grade six in one of the remote areas of Udayapur District. We used to have only one computer, and we took turns using it for an hour on a computer-related subject. Likely, I felt the same way about my participants, Shikshya and Chetana, who were from a remote area; thus, having a chance to use this technology was out of the question, because during the 1980s, those places were still in the early stages of development. However, Gyan, Lakshya, and Shanti were able to use computers during their early schooling years because they lived in the capital city, Kathmandu, and had the privilege of access to technology. In the Samarth case, their school had computers, but they were allowed to use them only occasionally. After completing school, they were able to use computers and mobile phones for very limited periods. However, they didn't use these devices for learning purposes. Only after enrolling at the bachelor's level did Shikshya, Chetana, Gyan, and Shanti start using these devices for academic learning, which was a beginner phase for them, as they had no prior experience with such devices. Lakshya and

Samarth used these devices in their Master's studies and only occasionally during their Bachelor's studies. Though search engines were not fully explored during that period, they began to learn to search first and to see connections among them, which helped them in their academic learning journey.

Shikshya felt that, having learned Hindi at an intermediate level, she initially found it difficult to learn; however, she used mobile devices, which eased her learning journey. For her, this device has solved most problems and increased her learning flexibility. It was a similar case for Chetana, Shanti, and Gyan, who also found transformation in their learning process. They have completed a few projects using mobile devices, such as web-based projects, designing an application (e.g., the Students Information System), and creating a photography webpage. Chetana and Samarth, being teachers, have taken full advantage of devices; they assign work, grade it, update students, and provide reading materials. Since Lakshya's classes are online, from conducting presentations to submitting assignments, coordinating with teachers and friends, he is too reliant on mobile devices. From their narrative, it can be concluded that these devices have made them independent learners, active learners, and learners who learn by sharing. They also shared about distractions, such as all participants feeling that they had caused health issues, including headaches and eye strain from the small screen size of mobile phones, and that they had gotten lost in time due to the continuous use of social media while reading. Teachers felt that students mostly skip lectures, diverting their minds to entertainment rather than studying, and that students prefer isolation when they can use these devices.

Through this research, through my second question, I wanted to examine how STEAM approaches such as creativity, critical thinking skills, hands-on learning, and inquiry-based learning were affected, as the adverse use of these devices has impacts on every aspect. From the narrative of the participant, it is evident that the mobile device is one of the tools that enhances the STEAM disciplines. I asked for their opinions on the integrated learning approach. When I asked each of them about this terminology, they started sharing their experience. As Shikshya, Lakshya, and Gyan have a programming background, the teachers simplified the process for them by integrating subjects relevant to the application-making process, making it easier for them. In the case of Samarth and Chetana, as teachers, they felt that following this teaching approach helped students grasp the content more easily. They felt it had increased students' content retention. Shanti felt these approaches were being used in

her master's classes. As learners and educators, Samarth and Chetana felt that students have gradually decreased their creativity, as they are often found copying exact content from the web or from AI, such as CHATGPT. However, they have felt that their inquiry-based, hands-on, and problem-solving abilities have increased as students tend to communicate with teachers and colleagues, explore on their own, refer to different tutorial videos on YouTube, seek support and guidance when issues arise, and complete projects using devices. In the case of Shikshya and Gyan, both felt their creativity and critical thinking abilities had decreased due to greater reliance on these devices. For project-based, hands-on learning, all participants felt it had improved, as they could see differences in learning outcomes. Thus, I conclude that mobile devices have significantly increased inquiry-based, hands-on, and project-based learning, but they have also affected creativity and critical thinking skills. Moreover, ZPD, Scaffolding, and MKO were also practiced, as all participants engaged in active learning and most constructed knowledge individually and through peer, teacher, and mobile device collaboration.

Conclusion

Apparently, we live in a rapidly changing society, with digital technologies influencing how we all operate and learn. My study examines how technology is shaping learning and its influence on twenty-first-century skills. My study provided important findings on how mobile devices, especially mobile technology, influenced academic learning and STEAM approaches. The findings showed that mobile device usage flourished after the COVID-19 pandemic, with a shift towards digital learning. As reliance on mobile devices increased, students' engagement in academic learning improved. The study highlighted the dual impacts of the device; it brought flexibility, eased access to a pool of resources, provided opportunities for communication, and received instant support from MKO. On the other hand, challenges such as health issues, digital distractions, and technological instability persisted. Apart from this, I have also noted that they have recognized the importance of self-discipline and mindful engagement while using such technologies so that the challenges do not distract them. Moreover, the device, learner, and social components of the FRAME model highlighted that mobile devices enabled learners to construct knowledge collaboratively, leading to an enhanced learning process.

Mobile devices served as a powerful tool for effectively supporting STEAM (Science, Technology, Engineering, Arts, and Mathematics) disciplines. The students,

rather than taking technology for granted, have used it wisely and actively to construct knowledge, sought multiple perspectives, and nurtured themselves by taking responsibility for their own learning. Teachers practiced scaffolding and ZPD techniques, which helped students use technology more efficiently. Further, people and mobile devices can be considered MKO, as they hold a wealth of information and act as guidance providers. According to my study, mobile devices are considered a student's academic companion, as they play a significant role in shaping approaches such as inquiry-based learning, peer collaboration, problem-solving, hands-on learning, and expanding learning horizons. They are motivated towards self-directed learning and have been empowered to enlighten themselves through digital support or by exploring diverse perspectives. However, the findings suggested that creativity and critical thinking skills will be diminished if these devices' use becomes consumption-oriented rather than inquiry-driven. As unknowingly many are becoming dependent on these devices, it has slowly started impacting their creativity and critical thinking skills, as the way we used to study before has been completely changed in a digitally mediated environment.

My study concludes that mobile devices can be considered a powerful pedagogical tool whose efficacy depends solely on how learners and educators position themselves in insightful, intentional, or socially interactive learning practices. My final thought is that technology itself is just a tool; what truly matters is how learners use it. This makes the context meaningful in demonstrating how technology can enhance learning!

Implications

My study, which examines the learning process of university students using mobile devices, yields important findings with significant implications for curriculum makers, researchers, policymakers, and educators. The study also provides insights into transforming students' learning patterns and educators' pedagogical approaches.

For Policy Makers

The stories highlighted how technology has driven student learning. It was observed that using technologies while learning has enhanced their knowledge and made them indispensable tools. Thus, policymakers should consider this and encourage educational institutions to embed technology, especially mobile devices, to further strengthen STEAM pedagogical approaches and lead to multidisciplinary learning. The remote region lacks the necessary infrastructure, including affordable

devices, stable internet, and teachers with limited digital competency. Thus, policymakers should reduce such gaps, initiate schemes to facilitate the affordability of devices and data packages, and train teachers accordingly, ensuring equitable student participation.

For Educators

Though educators have transformed their practice from teacher-centered to student-centered, this shift must be given importance. As mobile devices have brought autonomy to students, resulting in independent learning, educators must integrate new practices that involve device use, such as specific project types, and encourage the use of collaborative platforms. Students reported that, due to information overload, it took them time to evaluate the information; in such cases, educators must guide them on how to verify sources and evaluate content. Though these devices can be distracting, educators can creatively design mobile-integrated tasks that draw their attention to meaningful learning.

For Researchers

For researchers, this study can serve as background for related research. In Nepal, future research can identify gaps in the usability of learning devices across urban and rural areas. Furthermore, this research is expected to provide vision and encouragement to explore further pedagogical approaches using mobile devices for academic learning (Mikic, 2022).

Journey of Transformation

Reflecting on my journey illustrates a roadmap of my personal growth. Coming from a different academic background, i.e., from IT, and stepping into STEAM education was like entering a completely new world. The STEAM education introduced me to a broader environment, and initially, understanding new topics or terminologies took more effort. Here, I was expected to think creatively, generate design ideas, and sometimes even interpret artistic or human-centered perspectives, and the learning was more interactive, collaborative, and student-centered. Concepts didn't always have a single "correct" answer. This expanded from a single lane of thinking into a wide intersection of ideas. Initially, I felt this shift was overwhelming.

Over time, I embraced this as an opportunity for growth, transforming myself from a technically focused learner into one who began applying knowledge in creative, meaningful ways in real-world contexts. Mobile devices have played a very crucial role in helping me navigate this transition. As I am a very shy person, I often

held back during classroom discussions in both online and physical sessions, questioning whether my opinions or ideas were worth sharing. During this process, the mobile device became a significant tool for enhancing my learning process. Since the terminology was new to me, I used to access different resources, such as research and Google searches, to explore concepts at my own pace before entering the classroom for brainstorming or interactions. I used my mobile phone to quickly access explanations to explore and understand different perspectives. This helped me compare different ideas and validate them against my level of understanding, which slowly reduced my hesitation to speak and helped me move beyond my comfort zone. Now, I can say that mobile phones have become my academic companion, as they have also allowed me to connect learned theory with practice, seek ideas beyond the classroom, and engage more confidently in both online and physical learning spaces. I perceive this as a meaningful transformation in my academic learning journey because, as a newcomer to this form of education, adapting to it was very challenging. This also highlights how using mobile devices in academic learning can empower students like us to build confidence and improve clarity in our learning.

Participants' narratives reveal a transformative shift from being a passive knowledge recipient to a learner who is more focused, self-directed, and likes to gather information collaboratively. Using mobile devices for academic learning was once beyond imagination. As the participants were accustomed to traditional forms of learning, they initially experienced a dilemma when using mobile phones, as they offered a pool of information that could be either useful or burdensome; however, over time, through mobile phones, they started exploring, engaging, and questioning their practices independently. Though using these devices was not always beneficial, it affected their academic process directly and indirectly. However, instead of taking these devices for granted, they used them to their full potential, which resulted in increased confidence, critical thinking skills, problem-solving skills, and more. Thus, I must say the participant's journey not only reflected a change in their learning strategies but also a shift in their identity as a learner, i.e., from being a dependent receiver to an active learner and an active knowledge constructor in a technology-integrated, holistic STEAM learning environment.

REFERENCES

- Acharya, U. (2009, June 22). *Online media in Nepal: Short history*.<https://ujjwal.com.np/2009/06/22/online-media-in-nepal-short-history/>
- Adjei, N. D. (2019). The use and effect of smartphones in students' learning activities: Evidence from the University of Ghana, Legon. *Library Philosophy and Practice (e-journal)*.<https://digitalcommons.unl.edu/libphilprac/2851/>
- Ahmad, T. (2020). Student perceptions on using cell phones as learning tools. *PSU Research Review: An International Journal*, 4(1), 25–43.<https://doi.org/10.1108/PRR-03-2018-0007>
- Akpan, V. I., Igwe, U. A., Mpamah, I. B., & Okoro, C. O. (2020). Social constructivism: Implications on teaching and learning. *British Journal of Education*, 8(8), 49–56.<https://doi.org/10.37745/bje.2013/vol8no8pp4956>
- Al Mulhim, E. N., & Mohebeldin Zaky, Y. A. (2022). The influence of e-scaffolding sources in a mobile learning environment. *Electronics*, 11(14).<https://doi.org/10.3390/electronics11142172>
- Alam, M. A. (2023). Connectivism learning theory and connectivist approach in teaching and learning: A review of literature. *Bhartiyam International Journal of Education & Research*, 12(2), 1–15.
- Alanezi, Y. H., & AlAzwani, N. S. (2020). Future of mobile learning during the COVID-19 pandemic. *Journal of Education and Practice*, 11(12), 113–121.<https://doi.org/10.7176/JEP/11-12-13>
- Alessa, I. A., & Hussein, S. (2023). Using traditional and modern teaching methods on the teaching process from teachers' own perspective. *Route Educational & Social Science Journal*, 10(2), 66–75.
<https://doi.org/10.17121/ressjournal.3332>
- Alismaiel, O. A., Faura, J. C., & Al-Rahmi, W. M. (2022). Online learning and constructivism theory. *Sustainability*, 14(18).
<https://doi.org/10.3390/su141811134>
- Al-Okaily, R. (2013). Mobile learning and BYOD. *Learning and Teaching in Higher Education: Gulf Perspectives*, 10(2), 1–17.
<https://doi.org/10.18538/lthe.v10.n2.141>

- Amalia, E. R. (2018). *Collaborative learning: The concepts and practices in the classroom*. Open Science Framework. <https://doi.org/10.31219/osf.io/xn67>
- Amir, R., Mohd Jelas, Z., & Rahman, S. (2011). Learning styles of university students: Implications for teaching and learning. *World Applied Sciences Journal*, 14 (Special Issue of Innovation and Pedagogy for Lifelong Learning), 22–26.
- Anaktototy, K. (2023). Promoting creativity and innovation in the teaching and learning process. *Edu Sciences Journal*, 4(1), 59–66. <https://doi.org/10.30598/edusciencevol4iss1pp59-66>
- Ansari, M. R., Rahim, K., Bhoje, R., & Bhosale, S. (2022). A study on research design and its types. *International Research Journal of Engineering and Technology*, 9(7), 1132–1135. <https://www.irjet.net/archives/V9/i7/IRJET-V9I7216.pdf>
- Ayer, M. S., & Thakur, R. N. (2019). A study on effects of mobile phone uses on academic performance of undergraduate students – with reference to Kathmandu Valley, Nepal. *LBEF Research Journal of Science, Technology and Management*, 1(2), 133–150. <https://www.lbef.org/journal/1-2/download/1-2-133-150.pdf>
- Azizan, S. A., & Shamsi, N. A. (2022). Design-based learning as a pedagogical approach in an online learning environment for science undergraduate students. *Frontiers in Education*. <https://doi.org/10.3389/feduc.2022.860097>
- Bakare, O. D., & Oguntuase, M. O. (2022). COVID-19 and education: Effects of integrating mobile devices with undergraduate learning process. *Library Philosophy and Practice (e-journal)*. <https://digitalcommons.unl.edu/libphilprac/6966/>
- Baldwin, S. J., & Ching, Y.-H. (2020). Guidelines for designing online courses for mobile devices. *TechTrends*, 64(3), 413–422. <https://doi.org/10.1007/s11528-019-00463-6>
- Barrett, M. S., & Stauffer, S. L. (2009). Narrative inquiry: From story to method. In M. S. Barrett & S. L. Stauffer (Eds.), *Narrative inquiry in music education* (pp. 7–17). Springer. https://doi.org/10.1007/978-1-4020-9862-8_2
- Bhandari, L. P., Dahal, N., Awasthi, J. R., & Dhungana, S. (2025). Technology-mediated task-based language teaching: A systematic review. *Cogent Education*, 12(1). <https://doi.org/10.1080/2331186X.2025.2560051>

- Biedenbach, T., & Jacobsson, M. (2016). The open secret of values: The roles of values and axiology in project research. *Project Management Journal*, 47(3), 139–155. <https://doi.org/10.1177/875697281604700312>
- Boyraz, S., & Ocak, G. (2021). Connectivism: A literature review for the new pathway of pandemic driven education. *International Journal of Innovative Science and Research Technology*, 6(3), 1122–1129.
- Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology: Vol. 2. Research designs: Quantitative, qualitative, neuropsychological, and biological* (pp. 57–71). American Psychological Association. <https://doi.org/10.1037/13620-004>
- Brenda, M., & Portelli, J. P. (2004). Engagement for what? Beyond popular discourses of student engagement. *Leadership and Policy in Schools*, 3(1), 59–76. <https://doi.org/10.1076/lpos.3.1.59.27841>
- Butina, M. (2015). A narrative approach to qualitative inquiry. *Clinical Laboratory Science*, 28(3), 190–196. <https://doi.org/10.29074/ascls.28.3.190>
- Cacciattolo, M. (2015). Ethical considerations in research. In M. Cacciattolo, *The praxis of English language teaching and learning (PELT)* (pp. 61–79). Sense Publishers.
- Cahyono, D. (2025). The role of the teacher as a facilitator in the learning process: A review of educational psychology. *International Journal of Teaching and Learning*, 3(1), 205–212.
- Carter, C. E., Barnett, H., Burns, K., Cohen, N., & Durall, E. (2021). Defining STEAM approaches for higher education. *European Journal of STEM Education*, 6(1). <https://doi.org/10.20897/ejsteme/11354>
- Chandrappa, P. K. (2018). Connectivism as a learning theory for the digital age. *ADHYAYAN: A Journal of Management Sciences*, 8(1), 37–47. <https://doi.org/10.258357/Adyn-16>
- Chaudhary, G. (2025). *Lived experiences of INGO professionals toward community transformation: A narrative inquiry* [Unpublished master's thesis]. Kathmandu University. https://elibrary.ku.edu.np/bitstream/20.500.14301/502/1/Govinda%20Chaudhary_Print%20version%20%202025%281%29.pdf

- Chauhan, S. P. (2021). Technology supported classroom for collaborative learning. *Interdisciplinary Research in Education*, 6(2), 55–64.
<https://doi.org/10.3126/ire.v6i2.43542>
- Clandinin, D. J., & Huber, J. (2010). Narrative inquiry. In B. McGaw, E. Baker, & P. Peterson (Eds.), *International encyclopedia of education* (3rd ed., pp. 436–441). Elsevier.
- Clandinin, J. (2006). Narrative inquiry: A methodology for studying lived experience. *Research Studies in Music Education*, 27(1), 44–54.
<https://doi.org/10.1177/1321103X060270010301>
- Constituent Assembly Secretariat (CAS). (2015). *The constitution of Nepal*. Ministry of Law, Justice and Parliamentary Affairs.
https://constitutionnet.org/sites/default/files/nepal_constituton_2015_24_sep_2015.pdf
- Criollo-C, S., Guerrero-Arias, A., Jaramillo-Alcazar, A., & Lujan-Mora, S. (2021). Mobile learning technologies for education: Benefits and pending issues. *Applied Sciences*, 11(9). <https://doi.org/10.3390/app11094111>
- Curriculum Development Centre (CDC). (2007). *National curriculum framework for school education in Nepal*. Government of Nepal.
- Cypress, B. S. (2017). Rigor or reliability and validity in qualitative research: Perspectives, strategies, reconceptualization, and recommendations. *Dimensions of Critical Care Nursing*, 36(4), 253–263.
<https://doi.org/10.1097/DCC.0000000000000253>
- Dahal, A., & Bhat, N. (2024). Self-directed learning, its implementation, and challenges: A review. *Nepal Journal of Health Sciences*, 4(1), 105–112.
<https://doi.org/10.3126/njhs.v3i1.63277>
- Dahal, N. (2017). *Understanding and usage of questioning by mathematics teachers: A narrative inquiry* [Unpublished master's thesis] Kathmandu University.
https://elibrary.ku.edu.np/bitstream/20.500.14301/365/1/UNDERSTANDING_AND_USAGE_OF_QUESTIONING_BY_MATHEMATICS_NIROJDAHAL-MPhil%20Dissertation.pdf
- Dahal, N. (2023). Ensuring quality in qualitative research: A researcher's reflections. *The Qualitative Report*, 28(8), 2298–2317. <https://doi.org/10.46743/2160-3715/2023.6097>

- Dahal, N. (2025). Qualitative data analysis: Reflections, procedures, and some points for consideration. *Frontiers in Research Metrics and Analytics*.
<https://doi.org/10.3389/frma.2025.1669578>
- Darko-Adjei, N. (2019). The use and effect of smartphones in students' learning activities: Evidence from the University of Ghana, Legon. *Library Philosophy and Practice (e-journal)*. <https://digitalcommons.unl.edu/libphilprac/2851>
- Dawadi, S. (2020). Thematic analysis approach: A step-by-step guide for ELT research practitioners. *NELTA Journal*, 25(1–2), 62–71.
<https://doi.org/10.3126/nelta.v25i1-2.49731>
- De la Cuesta-Benjumea, C. (2011). Reflexivity: A critical issue in qualitative research. *Enfermería Clínica*, 21(3), 163–167.
<https://doi.org/10.1016/j.enfcli.2011.02.005>
- Del Campo, J. M., Negro Núñez, A., & Nunez, M. (2012). The history of technology in education: A comparative study and forecast. *Procedia – Social and Behavioral Sciences*, 69, 1086–1092.
<https://doi.org/10.1016/j.sbspro.2012.12.036>
- Dhital, H. (2018). Opportunities and challenges to use ICT in government school education of Nepal. *International Journal of Innovative Research in Computer and Communication Engineering*, 6(4), 3215–3220.
<https://doi.org/10.15680/IJIRCCCE.2018.0604004>
- Dias, L., & Victor, A. (2017). Teaching and learning with mobile devices in the 21st century digital world: Benefits and challenges. *European Journal of Multidisciplinary Studies*, 7(1), 339–344.
- Djibrán, A. K., Subiyanto, P., Wakhudin, & Rahayu, N. S. (2024). Transforming education in the digital age: How technology affects teaching and learning. *Jurnal of Pedagogi: Jurnal Pendidikan*, 1(3), 122–131.
- Doinea, M., Batagan, L. M., & Iancu, B. (2017). Active learning: A new paradigm in mobile education. In *Proceedings of the International Conference on Informatics in Economy* (pp. 45–52). Bucharest, Romania.
- Emma, L. (2024). *The role of learning styles in effective teaching and learning*. ResearchGate.
https://www.researchgate.net/publication/385553766_The_Role_of_Learning_Styles_in_Effective_Teaching_and_Learning

- Eom, S. (2022). The effects of the use of mobile devices on the e-learning process and perceived learning outcomes in university online education. *E-Learning and Digital Media*, 20(3), 241–258. <https://doi.org/10.1177/20427530221107775>
- Fadillah, R., & Purnawarman, A. (2024). The use of cell phones in accessing social media by students during the learning process in English classroom. *Tarbiyah: Jurnal Ilmiah Kependidikan*, 13(2), 333–344. <https://doi.org/10.18592/tarbiyah.v13i2.14398>
- Fajar Khoiriah, U., Virgy Afiffah, A., Amanda Putri, F., Fauziati, E., & Maryadi. (2023). Knowledge construction process in English language learning: Vygotsky's social constructivism perspective. *Jurnal Filsafat, Sains, Teknologi, dan Sosial Budaya*, 29(4), 512–521.
- Fallas Gabuardi, V. M. (2021). Project-Based Learning: boosting 21st century skills. *Estudios*, 43, 340–419. <https://doi.org/10.15517/re.v0i43.49335>
- Fatimah, A., Santiana, S., & Sulastri, F. (2021). Learner's experience on the use of mobile devices for autonomous listening: A narrative inquiry. *Journal of Language and Linguistic Studies*, 17(2), 814–825. <https://doi.org/10.17263/jlls.903375>
- Feltham, L. A. (2022). Inquiry-based learning for primary virtual classroom. In R. Power (Ed.), *Integration of instructional design and technology* (pp. 27–33). Power Learning Solutions. <https://idandtech.pressbooks.com/chapter/inquiry-based-learning-for-primary-virtual-classroom/>
- Firmin, M. W., & Genesi, D. J. (2013). History and implementation of classroom technology. *Procedia - Social and Behavioral Sciences*, 106, 1603–1611. <https://doi.org/10.1016/j.sbspro.2013.10.089>
- Fleming, J., & Zegwaard, K. E. (2018). Methodologies, methods, and ethical considerations for conducting research in work-integrated learning. *International Journal of Work-Integrated Learning*, 19(3), 205–213.
- Fojtik, R. (2017). The use of mobile devices in education. *New Trends and Issues Proceedings on Humanities and Social Sciences*, 3(3), 41–47. <https://doi.org/10.18844/gjhss.v3i3.1521>
- Fox, E. M. (2019). Mobile technology: A tool to increase global competency among higher education students. *International Review of Research in Open and Distributed Learning*, 20(2). <https://doi.org/10.19173/irrod1.v20i2.3925>

- Gallego, D. E., & Márquez, F. (2018). *Inquiry as a strategy for STEAM education*. Portal de la Educatividad de las Américas.
<https://recursos.educoas.org/publications/inquiry-as-a-strategy-for-steam-education>
- Gautam, K. R. (2025). Students' perceptions of collaborative learning and its impact on academic achievement. *Journal of Musikot Campus*, 3(1), 200–210.
<https://doi.org/10.3126/jmc.v3i1.81221>
- Georgieva, E., & Georgiev, T. (2007). Methodology for mobile devices characteristics recognition. In *Proceedings of the 8th International Conference on Computer Systems and Technologies (CompSysTech, 2007)* (pp. 1–6). Association for Computing Machinery. <https://doi.org/10.1145/1330598.1330674>
- Ghimire, P. R. (2024). *Information and communication technologies in education: A review of school education sector plan for Nepal (2022/23–2031/33)*.
- Gholam, A. (2019). Inquiry-based learning: Student teachers' challenges and perceptions. *Journal of Inquiry and Action in Education*, 10(2), 112–133.
<https://files.eric.ed.gov/fulltext/EJ1241559.pdf>
- Gong, X., Kannan, S., & Ramakrishnan, K. (2023). Impact of mobile technology on collaborative learning in engineering studies. *European Journal of Educational Research*, 12(1), 397–406. <https://doi.org/10.12973/eu-jer.12.1.397>
- Goud, M. A. (2014). Mobile devices overview. *International Journal of Computer Science and Informatics*, 4(2), 30–34.
<https://doi.org/10.47893/IJCSI.2014.1171>
- Guarino, N., Oberle, D., & Staab, S. (2009). What is an ontology? In N. Guarino, D. Oberle, & S. Staab (Eds.), *Handbook on ontologies* (pp. 1–17). Springer.
https://doi.org/10.1007/978-3-540-92673-3_1
- Habib, M. (2022). Adopting and adapting mobile-based learning as an innovative trend in English language teaching. *International Journal of Novel Research in Humanity and Social Sciences*, 9(3), 8–11.
- Hakim, F. (2024). Practical model of mobile learning applications. *International Journal of Mechanical, Electrical and Civil Engineering*, 1(3), 13–22.
<https://doi.org/10.61132/ijmecie.v1i3.17>
- Hayes, P., Weibelzahl, S., & Hall, T. (2006). Mobile technologies in education: Ubiquitous scaffolding and support for undergraduate students. In *Proceedings of the IADIS International Conference on Mobile Learning* (pp.

- 308–311). IADIS International Association for Development of the Information Society.
- Heflin, H., Shewmaker, J., & Nguyen, J. (2017). Impact of mobile technology on student attitudes, engagement, and learning. *Computers & Education*, 107, 91–99. <https://doi.org/10.1016/j.compedu.2017.01.006>
- Herath, H. M., & Wanasinghe, W. M. (2023). Patterns of adolescent students' use of mobile phones for educational activities. *Eureka: Journal of Educational Research*, 2(2), 69–77. <https://doi.org/10.56773/ejer.v2i2.21>
- Hernández, M. P., & Alvarado, J. P. (2023). The importance of considering different learning styles in students of English as a foreign language. *Revista Ensayos Pedagógicos*, 18(2), 1–14. <https://doi.org/10.15517/rep.18-2.16>
- Heyman, J. L., & Kushlev, K. (2023). Did smartphones enhance or diminish well-being during the COVID-19 pandemic? *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2023.1094196>
- Hıdıroğlu, Ç. N., & Karakaş, A. (2022). Transdisciplinary role of technology in STEM education. *Malaysian Online Journal of Educational Technology*, 10(4), 276–293. <https://doi.org/10.52380/mojet.2022.10.4.413>
- Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16(3), 235–266. <https://doi.org/10.1023/B:EDPR.0000034022.16470.f3>
- Hrast, S., & Savec, V. F. (2018). ICT-supported inquiry-based learning. *World Transactions on Engineering and Technology Education*, 16(4), 398–403.
- Hu, J. (2024). The challenge of traditional teaching approach: A study on improving classroom teaching effectiveness based on secondary school students' psychology. *Lecture Notes in Education Psychology and Public Media*, 50(1), 213–219. <https://doi.org/10.54254/2753-7048/50/20240945>
- Hubert, C. (2021). *Interdisciplinary learning and the effects on students* (Master's thesis, Northwestern College). NW Commons. https://nwcommons.nwciowa.edu/education_masters/284/
- Huda, N., Fransiska, F. W., Mokodenseho, S., Tabilantang, B. H., & Mokodompit, A. (2024). The influence of STEAM education on students' interest in technology at middle schools in Indonesia. *Journal of Learning and Educations*, 2(1), 50–62. <https://doi.org/10.58812/esle.v2i01>

- Huey, M., & Giguere, D. (2023). The impact of smartphone use on course comprehension and psychological well-being in the college classroom. *Innovative Higher Education*, 48(3), 527–537. <https://doi.org/10.1007/s10755-022-09638-1>
- Ifeanyi, I. P., & Chukwuere, J. E. (2018). The impact of using smartphones on academic performance of undergraduate students. *Knowledge Management & E-Learning*, 10(3), 290–308. <https://doi.org/10.34105/j.kmel.2018.10.018>
- Jaldemark, J., Hrastinski, S., Olofsson, A. D., & Öberg, L.-M. (2017). Editorial introduction: Collaborative learning enhanced by mobile technologies. *British Journal of Educational Technology*, 49(2), 201–206. <https://doi.org/10.1111/bjet.12596>
- James, G. (2018). A narrative inquiry perspective into coping mechanisms of international postgraduate students' transition experiences. *American Journal of Qualitative Research*, 2(1), 41–56.
- Joshi, D. R. (2017). Policies, practices and barriers of ICT utilization in school education in Nepal. *International Journal of Eurasia Social Sciences*, 7(24), 408–417.
- Jumaat, N. F., Tasir, Z., Halim, N. D., & Ashari, Z. M. (2017). Project-based learning from constructivism point of view. *Advanced Science Letters*, 23(8), 7904–7906. <https://doi.org/10.1166/asl.2017.9605>
- Jurayeva, G. M. (2023). The STEAM educational system and its effect on educational efficiency in primary school classes. *EPRA International Journal of Research and Development*, 8(4), 112–119. <https://eprajournals.com/IJSR/article/10515>
- K. C., N. (2023). A review of the educational policies of Nepal. *Research Nepal Journal of Development Studies*, 6(1), 51–63. <https://doi.org/10.3126/rnjds.v6i1.58921>
- Kaphle, Y. (2019). *Current practices of continuous assessment system in grades 1–3 in Nawalparasi District* [Unpublished master's thesis]. Tribhuvan University <https://elibrary.tucl.edu.np/items/e5720b9e-4aa3-45f6-9ed9-9251a7667fa3>
- Karki, H. (2019). A brief history of public education, information & communication technology (ICT), and ICT in public education in Nepal. *Deerwalk Journal of Computer Science and Information Technology*, 5(1), 78–103.
- Kashaka, N. D. (2024). Arts integration in STEM education: A path to STEAM. *Eurasian Experiment Journal of Humanities and Social Sciences*, 5(3), 49–52.

- Katsumata, S., Ichikohji, T., Nakano, S., Yamaguchi, S., & Ikuine, F. (2023). Changes in the use of mobile devices during the crisis: Immediate response to the COVID-19 pandemic. *Frontiers in Psychology, 14*, 1–12.
<https://doi.org/10.3389/fpsyg.2023.1094196>
- Kemp, S. (2025, March 3). *Digital 2025: Nepal*. DataReportal.
<https://datareportal.com/reports/digital-2025-nepal>
- Kenny, R. F., Neste-Kenny, J. M., Park, C. L., Burton, P. A., & Meiers, J. (2009). Mobile learning in nursing practice education: Applying Koole's FRAME model. *Journal of Distance Education, 23*(3), 75–96.
- Khaddage, F., Lattemann, C. L., & Bray, E. (2011). Mobile apps integration for teaching and learning (Are teachers ready to re-blend?). In *Proceedings of the Society for Information Technology & Teacher Education International Conference 2011*(pp. 2545–2552). Association for the Advancement of Computing in Education.
- Khanal, B. P. (2024). Information technology in Nepal: History and current status. *Curriculum Development Journal, 32*(46), 54–67.
<https://doi.org/10.3126/cdj.v32i46.77000>
- Khaokhajorn, W., Thongsri, P., Panjaburee, P., & Srisawasdi, N. (2020). Mobile learning technology in STEM education: A systematic review from 2010 to 2019. In *Proceedings of the 28th International Conference on Computers in Education (ICCE 2020)* (pp. 314–323). Asia-Pacific Society for Computers in Education.
- Khatiwada, S. (2025). Analyzing the impact of smartphone use and mobile distraction in higher education. *International Research Journal of MMC, 6*(3), 91–114.
<https://doi.org/10.3126/irjmmc.v6i3.83027>
- Khatri, D. K. (2023). Research paradigms in English education: A brief overview. *Surkhet Journal, 2*(1), 21–29. <https://doi.org/10.3126/surkhetj.v2i1.58744>
- Khushk, A., Liu, Z., Xu, Y., & Zhang, Z. (2023). Technology innovation in STEM education: A review and analysis. *International Journal of Educational Research and Innovation, 19*, 29–51. <https://doi.org/10.46661/ijeri.7883>
- Klimova, B. (2019). Impact of mobile learning on students' achievement results. *Education Sciences, 9*(2), 90–98. <https://doi.org/10.3390/educsci9020090>

- Koole, M. (2009). A model for framing mobile learning. In M. Ally (Ed.), *Mobile learning: Transforming the delivery of education and training* (pp. 25–47). Athabasca University Press.
- Kreijkes, P., & Grooten, J. (2024). Differential effects of subject-based and integrated curriculum approaches on students' learning outcomes: A review of reviews. *Review of Education*, 12(1), 1–32. <https://doi.org/10.1002/rev3.3465>
- Krull, G., & Duarte, J. M. (2017). Research trends in mobile learning in higher education: A systematic review of articles (2011–2015). *International Review of Research in Open and Distributed Learning*, 18(1), 106–123. <https://doi.org/10.19173/irrodl.v18i1.2893>
- Laid, S., & Adlaon, M. (2025). A systematic review of innovative teaching strategies in science: Exploring hands-on learning, technology integration, and student-centered approaches. *Acta Pedagogica Asiana*, 4(2), 101–114. <https://doi.org/10.53623/apga.v4i2.645>
- Lal, S. (2025). Nepal's national education policy: Challenges, progress and future directions. *Political Science Journal*, 3(1), 74–85.
- Lee, V. R. (2017). Mobile devices. In K. Peppler (Ed.), *The SAGE encyclopedia of out-of-school learning* (pp. 496–498). SAGE Publications. <https://doi.org/10.4135/9781483385198.n177>
- Li, Z. (2023). Analysis of teaching and learning in interdisciplinary learning. *Journal of Contemporary Educational Research*, 7(12), 248–252. <https://doi.org/10.26689/jcer.v7i12.5817>
- Liao, C. (2016). From interdisciplinary to transdisciplinary: An arts-integrated approach to STEAM education. *Art Education*, 69(6), 44–49. <https://doi.org/10.1080/00043125.2016.1224873>
- Lok, W. F., & Hamzah, M. (2021). Student experience of using mobile devices for learning chemistry. *International Journal of Evaluation and Research in Education*, 10(3), 893–900. <https://doi.org/10.11591/ijere.v10i3.21420>
- Mani, R. (2019). Do mobile phones cause more harm than good? *Open Journal of Social Sciences*, 7(8), 184–192. <https://doi.org/10.4236/jss.2019.78014>
- Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers & Education*, 68, 76–85. <https://doi.org/10.1016/j.compedu.2013.04.021>

- Marzouki, O. F., Idrissi, M. K., & Bennani, S. (2017). Effects of social constructivist mobile learning environments on knowledge acquisition: A meta-analysis. *International Journal of Interactive Mobile Technologies*, 11(1), 18–39. <https://doi.org/10.3991/ijim.v11i1.5982>
- Matthes, J., Neureiter, A., Stevic, A., & Noetzel, S. (2024). “It’s too much”: Excessive smartphone use during the COVID-19 crisis, information overload, and infection self-efficacy. *Telematics and Informatics*, 79. <https://doi.org/10.1016/j.tele.2024.102119>
- McLeod, S. (2024). *Vygotsky’s zone of proximal development*. Simply Psychology. <https://www.simplypsychology.org/zone-of-proximal-development.html>
- McQuiggan, S., Rowe, J., Lee, S., & Lester, J. (2008). Story-based learning: The impact of narrative on learning experiences and outcomes. In G. Woolf (Ed.), *Intelligent tutoring systems* (Lecture Notes in Computer Science, Vol. 5091, pp. 530–539). Springer. https://doi.org/10.1007/978-3-540-69132-7_56
- Md Yusof, S. (2021). *Vygotsky sociocultural theory of child development: More knowledgeable other (MKO) and the zone of proximal development (ZPD)*. ResearchGate. <https://doi.org/10.13140/RG.2.2.35985.40804>
- Meepat, P., Kadroon, T., & Sangarwut, A. (2024). The use of STEAM education learning package to develop elementary school students’ science process skills and learning achievement of physical properties of materials. *Higher Education Studies*, 14(4), 38–46. <https://doi.org/10.5539/hes.v14n4p38>
- Miertschin, S., Stewart, B., & Goodson, C. (2017). Mobile devices and lifelong learning: The students' perspective. *Computers in Education Journal*, 8(3), 80–93.
- Mikic, V. (2022). The use of scaffolding approach in technology-enhanced learning: A literature review. In *Proceedings of the 12th International Conference on Applied Internet and Information Technologies* (pp. 124–129). Technical Faculty "Mihajlo Pupin".
- Milankovic Jovanov, J., Ivkov-Dzigurski, A., Stanisavljevic, J., & Bibic, L. I. (2022). Is the integrative teaching approach beneficial for learning? *International Journal of Cognitive Research in Science, Engineering and Education*, 10(2), 173–183. <https://doi.org/10.23947/2334-8496-2022-10-2-173-183>
- Ministry of Communication and Information Technology [MoCIT]. (2019). *Digital Nepal framework: Unlocking Nepal’s growth potential*.

https://www.digitaldevelopment.org/wp-content/uploads/2023/09/bEN_Digital_Nepal_Framework_V7.2March2019-1.pdf

Ministry of Education (MoE). (2009). *School sector reform plan (SSRP: 2009–2016)*. Government of Nepal.

Ministry of Education (MoE). (2016). *School sector development plan (SSDP: 2016–2023)*. Government of Nepal.

Ministry of Education (MoE). (2013). *Information and communication technology master plan (ICT master plan 2013–2017) in education*. Government of Nepal.

Ministry of Education and Sports (MoES). (2005). *National curriculum framework for school education (pre-primary–12) in Nepal*. Government of Nepal.

Ministry of Education, Science and Technology [MoEST]. (2022). *School education sector plan 2022/23–2031/32*.

https://moest.gov.np/upload_file/files/post/1668690227_1997409338_Nepal%20School%20Education%20Sector%20Plan%20final%202022%20.pdf

Ministry of Information and Communication [MoIC]. (2015). *National information and communication technology policy*.

<https://dhulikhelmun.gov.np/sites/dhulikhelmun.gov.np/files/documents/ICT%20policy%20Nepal.pdf>

Morchid, N. (2020). The social constructivist response to educational technology. *International Journal of English Literature and Social Sciences*, 5(1), 263–270. <https://doi.org/10.22161/ijels.51.46>

Muller, M., & Montag, C. (2024). Disentangling the link between creativity and technology use: Individual differences in smartphone and social media (over)use. *Journal of Creativity*, 34(2). <https://doi.org/10.1016/j.yjoc.2024.100081>

Nasser Al Mulhim, E., & Ahmed Mohebeldin Zaky, Y. (2022). The influence of e-scaffolding sources in a mobile learning environment on students' design skills and the technology fatigue associated with a 3D virtual environment. *Electronics*, 11(14). <https://doi.org/10.3390/electronics11142172>

Nema, P., Srivastava, R., Bhalla, R., & Chakarboty, A. (2023). Impact of social media distraction on student evaluation of teacher effectiveness. *International*

- Journal of Educational Management*, 37(1), 142–158.
<https://doi.org/10.1108/IJEM-10-2022-0389>
- Neumann, L. (2020, September 3). *Empirical research – Characteristics & advantages*. BachelorPrint.
<https://www.bachelorprint.com/methodology/empirical-research/>
- Ogunbukola, M. (2024). *The role of social media in education: Distraction or educational tool*. ResearchGate.
- Oguntuase, M. O., & Bakare, O. D. (2022). COVID-19 and education: Effects of integrating mobile devices with undergraduate learning process. *Library Philosophy and Practice*, 2022, 1–15.
- Okesina, M. (2020). A critical review of the relationship between paradigm, methodology, design, and method in research. *IOSR Journal of Research & Method in Education*, 10(5), 57–68.
- Onyema, E. M., Anthonia, U. O., & Deborah, E. C. (2019). Potentials of mobile technologies in enhancing the effectiveness of inquiry-based learning approach. *International Journal of Signal Processing*, 2(2), 64–71.
- Padli, I. N., & Yasin, R. M. (2023). Challenges of technology integration in teaching history and its relationship with student motivation. *International Journal of Academic Research in Progressive Education and Development*, 12(4), 1845–1857. <https://doi.org/10.6007/IJARPED/v12-i4/19537>
- Panasan, M., & Nuangchalerm, P. (2010). Learning outcomes of project-based and inquiry-based learning activities. *Journal of Social Sciences*, 6(2), 252–255.
<https://doi.org/10.3844/jssp.2010.252.255>
- Pandit, S. P. (2025). Access and challenges to use online learning materials in higher education students at remote areas of Nepal: A case study in Bajura. *Journal of Jayaprithvi Multiple Campus*, 1(1), 90–102.
<https://doi.org/10.3126/jjmc2.v1i1.81441>
- Pant, B. P., Dahal, N., Luitel, B. C., Shrestha, I. M., Manandhar, N. K., Rajbanshi, R., & Luitel, L. (2024). STEAM education in Nepal: Status, opportunities, challenges and future perspectives for nurturing 21st century learners. *Mathematics Education Forum Chitwan*, 8(1), 1–18.
- Parajuli, K. P. (2016). Mobile learning practice in higher education in Nepal. In *Proceedings of the international council for open and distance education*

- conference (pp. 41–54). International Council for Open and Distance Education.
- Patil, S. P., & Dhanawade, M. (2023). Impact of mobile phone usage on the academic performance of students. *The Online Journal of Distance Education and e-Learning*, 11(1), 733–747.
- Paudel, A. (2015). *Integrating ICT in education*. Curriculum Development Centre. <https://lib.moecdc.gov.np/elibrary/pages/download.php?ref=181&ext=pdf>
- Pedraja-Rejas, L., Muñoz-Fritis, C., Rodríguez-Ponce, E., & Laroze, D. (2024). Mobile learning and its effect on learning outcomes and critical thinking: A systematic review. *Applied Sciences*, 14(19). <https://doi.org/10.3390/app14199105>
- Perales, F. J., & Aróstegui, J. L. (2021). The STEAM approach: Implementation and educational, social and economic consequences. *Arts Education Policy Review*, 124(3), 115–126. <https://doi.org/10.1080/10632913.2021.1974997>
- Perez-Juarez, M. A., González-Ortega, D., & Aguiar-Pérez, J. M. (2023). Digital distractions from the point of view of higher education students. *Sustainability*, 15(7). <https://doi.org/10.3390/su15076044>
- Pervin, N., & Mokhtar, M. (2022). The interpretivist research paradigm: A subjective notion of a social context. *International Journal of Academic Research in Progressive Education and Development*, 11(2), 1210–1221. <https://doi.org/10.6007/IJARPED/v11-i2/12938>
- Polakova, P., & Klimova, B. (2019). Mobile technology and generation Z in the English language classroom—A preliminary study. *Education Sciences*, 9(3). <https://doi.org/10.3390/educsci9030203>
- Pradhan, A. (2025, January 5). Internet: How it really started in Nepal. *DWIT News*. <https://dwitnews.com/archive/article/internet-really-started-nepal>
- Rafiqing, N., Mosinki, J., Mabina, A., Otlhomile, B. E., & Mphole, O. (2025). Usability of mobile learning technologies in open and distance learning. *Journal of Information Systems and Informatics*, 7(1), 143–156. <https://doi.org/10.51519/journalisi.v7i1.989>
- Rai, H. K. (2018). *Use of mobile phones among M.Ed level students in ELT classes* [Unpublished master's thesis]. Tribhuvan University Central Library Repository. <https://hdl.handle.net/20.500.14540/15574>

- Rajkarnikar, R. (2025). Digitalization of public services in Nepal: An assessment of the implementation status. *Nepalese Journal of Economic Studies*, 4(1), 54–68.
- Ramgade, A., & Divakaran, P. (2021). The future of mobile learning and its implications for education. *Elementary Education Online*, 20(1), 4428–4438. <https://doi.org/10.17051/ilkonline.2021.01.481>
- Rana, K., Greenwood, J., & Fox-Turnbull, W. (2019). Implementation of Nepal's education policy in ICT: Examining current practice through an ecological model. *The Electronic Journal of Information Systems in Developing Countries*, 86(2). <https://doi.org/10.1002/isd2.12118>
- Ranieri, M., & Bruni, I. (2013). Empowering creativity in young people through mobile learning: An investigation of creative practices of mobile media uses in and out of school. *International Journal of Mobile and Blended Learning*, 5(3), 17–33. <https://doi.org/10.4018/jmbl.2013070102>
- Rasheed, M. A., Farooque, M., Khan, M. A., Ismail, M. Y., & Samee, S. (2021). *Transformation of traditional to online education system: Challenges and driving forces*. ResearchGate.
- Rather, M. K., & Rather, S. A. (2019). Impact of smartphones on young generation. *Library Philosophy and Practice*, 2019, 1–9. <https://digitalcommons.unl.edu/libphilprac/2384/>
- Rizal, F., Waskito, Anwar, M., Verawardina, U., & Rini, F. (2021). Improving the effectiveness of student learning engagement by build-up mobile learning management system (M-LMS). *Advances in Social Science, Education and Humanities Research*, 563, 112–119.
- Rodríguez, F. M., Lozano, J. M., & Pérez-Mármol, J. M. (2020). Influence of smartphone use on emotional, cognitive and educational dimensions in university students. *Sustainability*, 12(16). <https://doi.org/10.3390/su12166646>
- Roy, S. S., & Gandhimathi, S. N. (2025). Self-directed learning for optimizing sustainable language learning via mobile assisted language learning: A systematic review. *Frontiers in Education*, 10. <https://doi.org/10.3389/educ.2024.1463721>
- Ruiz, F., Zapatera, A., Montes, N., & Rosillo, N. (2018). STEAM projects with LEGO Mindstorms for primary education in Spain. In *Proceedings of the International Conference on Innovation, Documentation and Education*

- (*INNODOCT 2018*) (pp. 14–16). Editorial Universitat Politècnica de València.
<https://doi.org/10.4995/INN2018.2018.8836>
- Saha, J. (2023). Use, misuse, and abuse of ICT in Nepalese education policy: A WPR analysis. *SABHRA Research Journal of Padmakanya Multiple Campus*, 2(1), 45–56.
- Saleem, A., Kausar, H., & Deebea, F. (2021). Social constructivism: A new paradigm in teaching and learning environment. *Perennial Journal of History*, 2(2), 403–421. <https://doi.org/10.52700/pjh.v2i2.86>
- Salepaki, A., Zerva, A., Kourkouridis, D., & Angelou, L. (2025). Unplugging youth: Mobile phone addiction, social impact, and the call for digital detox. *Psychiatry International*, 6(1). <https://doi.org/10.3390/psychiatryint6010004>
- Salhab, R., & Daher, W. (2023). University students' engagement in mobile learning. *European Journal of Investigation in Health, Psychology and Education*, 13(2), 202–216. <https://doi.org/10.3390/ejihpe13020016>
- Selwood, J. (2017). Mobile learning in the classroom: Past, present, and future. *Hiroshima Studies in Language and Language Education*, 20(1), 65–78.
- Shal, T. (2016). Schools without technology? A big flat no. *International Journal of Research in Humanities & Social Sciences*, 4(8), 102–112.
- Shrestha, B. K., & Sharma, L. R. (2024). Discerning the distinctive characteristics of key research paradigms and their constituents. *Nepal Journal of Multidisciplinary Research*, 7(2), 30–44.
<https://doi.org/10.3126/njmr.v7i2.68191>
- Shrestha, M., Manandhar, N., & Joshi, S. (2025). Smartphone addiction among students of medical college in Kathmandu. *Kathmandu University Medical Journal*, 23(91), 296–300.
- Shrestha, S. (2016). *Exploring mobile learning opportunities and challenges in Nepal: The potential of open-source platforms* [Unpublished master's thesis]. University of West London. <https://repository.uwl.ac.uk/id/eprint/2962>
- Simkhada, R. K. (2023). The education system in Nepal faces various challenges and issues. *International Journal of Economic Perspectives*, 17(1), 183–188.
- Siregar, Y. E., Rahmawati, Y., & Suyono. (2023). The impact of an integrated STEAM project delivered via mobile technology on the reasoning ability of elementary school students. *Journal of Technology and Science Education*, 13(2), 410–428. <https://doi.org/10.3926/jotse.1912>

- Smallhorn, M., Young, J., Hunter, N., & Silva, K. B. (2015). Inquiry-based learning to improve student engagement in a large first-year topic. *Student Success*, 6(2), 65–71. <https://doi.org/10.5204/ssj.v6i2.292>
- Sol, K., & Heng, K. (2022). Understanding epistemology and its key approaches in research. *Cambodian Journal of Educational Research*, 2(1), 80–99. <https://doi.org/10.62037/cjer.2022.02.02.05>
- Son-Allah, M. P. (2017). *Mobile device distraction: Determinants and effect on academic performance of students* [Working paper]. Social Science Research Network. <https://doi.org/10.2139/ssrn.2938112>
- Stojanov, A. (2023). Learning with ChatGPT 3.5 as a more knowledgeable other: An autoethnographic study. *International Journal of Educational Technology in Higher Education*, 20(1). <https://doi.org/10.1186/s41239-023-00404-7>
- Suneetha, E. (2020). Role of teachers as facilitators in learning. *Research Journal of English Language and Literature*, 8(S1), 71–72.
- Supangat, & Saringat, M. B. (2020). Development of e-learning system using Felder and Silverman's index of learning styles model. *International Journal of Advanced Trends in Computer Science and Engineering*, 9(5), 6934–6941. <https://doi.org/10.30534/ijatcse/2020/236952020>
- Taggart, J., & Wheeler, L. B. (2023). Collaborative learning as constructivist practice: An exploratory qualitative descriptive study of faculty approaches to student group work. *Active Learning in Higher Education*, 26(1), 59–76. <https://doi.org/10.1177/14697874231193938>
- Taherdoost, H. (2021). Data collection methods and tools for research: A step-by-step guide to choose data collection technique for academic and business research projects. *International Journal of Academic Research in Management*, 10(1), 10–38.
- Talan, T. (2020). The effect of mobile learning on learning performance: A meta-analysis study. *Educational Sciences: Theory and Practice*, 20(1), 79–103. <https://doi.org/10.12738/jestp.2020.1.006>
- Thinley, P., Geva, S., & Reye, J. (2024). Tablets (iPad) for m-learning in the context of social constructivism to institute an effective learning environment. *International Journal of Interactive Mobile Technologies*, 18(4), 112–129. <https://doi.org/10.3991/ijim.v18i04.41230>

- Tindan, T., & Anaba, C. (2024). Scientific hands-on activities and its impact on the academic success of students: A systematic literature review. *IOSR Journal of Research & Method in Education*, 14(2), 34–45.
- Toperesu, B.-A., & Belle, J.-P. V. (2018). Mobile learning considerations in higher education: Potential benefits and challenges for students and institutions. In *Proceedings of the 14th International Conference on Mobile Learning* (pp. 35–42). IADIS International Association for Development of the Information Society.
- Tran, B. (2016). Educational experiences with traditional, online and hybrid learning environments. *Journal of Education & Social Policy*, 3(3), 60–63.
- Turner, J. R., Baker, R., & Kellner, F. (2018). Theoretical literature review: Tracing the life cycle of a theory and its verified and falsified statements. *Human Resource Development Review*, 17(1), 34–61.
<https://doi.org/10.1177/1534484317749833>
- Ugur, N. G., & Koc, T. (2015). Mobile phones as distracting tools in the classroom: College students' perspective. *Journal of Human Sciences*, 12(2), 57–64.
<https://doi.org/10.14687/jhs.v12i2.3274>
- Vijayatheepan, R. (2023). *Mobile phone access among school students: Exploring strengths, drawbacks and solutions*. ResearchGate.
- Walker, C. L., & Shore, B. M. (2015). Understanding classroom roles in inquiry education: Linking role theory and social constructivism to the concept of role diversification. *SAGE Open*, 5(4), 1–11.
<https://doi.org/10.1177/2158244015607584>
- Wang, J. C., Hsieh, C.-Y., & Kung, S.-H. (2022). The impact of smartphone uses on learning effectiveness: A case study of primary school students. *Education and Information Technologies*, 28(5), 5435–5455.
<https://doi.org/10.1007/s10639-022-11430-9>
- Waweru, T. (2025, May 29). *Mobile data statistics 2025: Global usage trends and consumption*. Tridens Technology. <https://tridentstechnology.com/mobile-data-statistics/>
- Wibowo, S., Wangid, M. N., & Firdaus, F. M. (2025). The relevance of Vygotsky's constructivism learning theory with differentiated learning in primary schools. *Journal of Education and Learning*, 19(1), 431–440.
<https://doi.org/10.11591/edulearn.v19i1.21197>

- Widowati, A., & Tyas, R. A. (2024). Mobile-based learning in science trends: A systematic review (2015–2023). *Cogent Education*, 11(1).
<https://doi.org/10.1080/2331186X.2024.2303563>
- Xi, L. (2015). *Influence of psychological, internet use and demographic factors on pathological internet use among university students* [Unpublished doctoral dissertation]. Universiti Teknologi Malaysia.
- Yakar, U., Sulu, A., Porgalı, M., & Calis, N. (2020). From constructivist educational technology to mobile constructivism: How mobile learning serves constructivism? *International Journal of Academic Research in Education*, 6(1), 56–75. <https://doi.org/10.17985/ijare.745422>
- Yakman, G., & Lee, H.-S. (2012). Exploring exemplary STEM education in the U.S. as a practical educational framework for Korea. *Journal of the Korean Association for Science Education*, 32(6), 1072–1086.
<https://doi.org/10.14697/jkase.2012.32.6.1072>