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AN ATTEMPT TO ENHANCE ICT USE IN TEACHING AT THE ROYAL UNIVERSITY OF BHUTAN

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**BY
KINLEY**

DISSERTATION SUBMITTED 2015



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DENMARK

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THE ROYAL UNIVERSITY OF BHUTAN**

by

KINLEY



AALBORG UNIVERSITY
DENMARK

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CV

Kinley received his Post Graduate Certificate in Education from Samtse College of Education (SCE), Royal University of Bhutan in 1999 and Master of Scientific Studies from University of New England, Australia in 2006. Since 2006 until the present he has been working as a Lecturer at SCE. He started as a PhD student at the Department of Communication and Psychology at Aalborg University in Denmark in 2012. In his PhD thesis, Kinley studied “Finding ways to enhance ICT integration in teaching.”

ENGLISH SUMMARY

The present study was designed to determine an effective approach to enhance the use of information and communication technology (ICT) by the faculty at SCE in teaching. The significance of technology for the teaching and learning process in the 21st century is discussed at length in the introduction chapter. Additionally, the status and importance given to technology by the government of Bhutan is described in the introduction chapter. Furthermore, the various initiatives and investment programs launched at RUB in general and SCE in particular to respond to the changing pedagogic practices in the educational arena due to the penetration of technology is discussed in depth. The discussion on this issue is extended to the literature study related to the concept of integrating ICT in teaching in higher education as contextualized to the current study. Analyzing the ICT integration in teaching attempts at RUB and SCE and then reflecting on the state of art with regards to ICT in teaching at SCE enabled the identification and formulation of the problem statement. The themes from reviewing the literature and insights from the hypothesis eventually led to the derivation of the research question for the current study. Therefore, the study attempted to find ways to enhance ICT integration in teaching by the faculty at SCE.

Activity theory is used as the overarching theoretical framework for the overall design of the study. The activity system is employed as one of the tools to analyze the data. According to Nyvang and Johnson (2004), the activity system is a strong tool when it comes to researching into the many influences on the relationship between the individual, the community, and the change processes in a web of mediating artifacts including tools, culture, and division of labor (2004, p. 66). Pragmatism had been identified as the paradigm for this research study for the following reasons: The focus of the study is on the consequences of research, finding answer to the research question, and on the use of multiple methods of data collection to inform the problem under study.

It has been argued that the dominant training and coaching model, which focuses on expanding an individual repertoire of well-defined classroom practice, is not adequate for the conceptions or requirements of teaching embedded in present reform initiatives (Little, 1993, p. 129). In this regard, Shear et al. (2011) confer that professional development is most effective when it is ongoing and that systematic change is an evolutionary process that is also ongoing. Therefore, a professional development process referred to as an intervention workshop (a one time workshop followed by a pilot study) in the current study has been implemented using the future workshop approach and participatory design methodology. The aim of the intervention workshop and pilot study was not to empower the faculty at SCE as technological experts. Rather, it was designed to

assist the lecturers in the following: To reflect on their pedagogic practices; consider the need to rethink pedagogy with ICT; enable them to realize the significance of technology in teaching in the 21st century; motivate and assist them in redesigning the lessons integrating ICT; and motivate and support the enhanced use of ICT in teaching.

During the intervention process, I played a dual role of simultaneously holding an organizational position as a faculty member as well as a more temporary inside researcher role for the duration of the PhD study. The overall findings show that the use of an intervention workshop within the future workshop framework and the use of a participatory design approach with scaffolding during pilot projects enhance the use of ICT in teaching.

DANSK RESUME

Dette phd-projekt undersøger hvordan der kan udvikles en effektiv tilgang til at styrke underviseres brug af informations- og kommunikationsteknologi (IKT) i undervisningen på Samtse College of Education (SCE) i Bhutan. Betydningen af teknologi i undervisning og læring i det 21. århundrede diskuteres indgående i introduktionskapitlet. I samme kapitel beskrives også status for informationsteknologi i Bhutan og den betydning, denne tillægges af Bhutans regering. Endvidere diskuteres indgående de forskellige initiativer og investeringer, der på Royal University of Bhutan (RUB) og mere specifikt på SCE er iværksat som svar på udfordringerne med at udvikle den pædagogiske praksis. Diskussionen af dette tema fortsættes i litteraturgennemgangen, som forholder sig til integration af IKT i undervisningen på videregående uddannelser, og perspektiveres i forhold til denne undersøgelses kontekst. En analyse af IKT-inddragelsen i undervisningen på RUB og SCE og efterfølgende refleksion over state-of-the-art med hensyn til IKT i undervisningen på SCE leder til identifikation og formulering af projektets problemformulering. Dette studie har således til formål at finde måder at styrke integrationen af IKT i undervisningen blandt underviserne på SCE.

Virksomhedsteori er brugt som den overordnede teoretiske ramme i undersøgelsesdesignet, og virksomhedssystemer er brugt som et af flere værktøjer til at analysere datamaterialet. Jævnfør Nyvang og Johnson (2004) er virksomhedssystemer et stærkt analytisk værktøj til at undersøge de mange påvirkninger af forholdet mellem individ, fællesskab og forandringsprocesser i et netværk af medierende artefakter inklusiv værktøjer, kultur og arbejdsdeling (2004, p. 66, min oversættelse). Af følgende grunde er pragmatisme valgt som det dominerende paradigme i denne undersøgelse: Fokus er på forskningens konsekvenser, på at finde svar på forskningsspørgsmålet, og på brugen af forskellige metoder til dataindsamling for at belyse projektets problemstilling.

Little (1993) hævder at den dominerende model for træning og vejledning, som fokuserer på udvidelse af individets repertoire af veldefineret klasserumspraksis er utilstrækkelig for de opfattelser eller de krav om undervisning, der er indeholdt i nuværende reforminitiativer (Little, 1993, p. 129). Shear et al. (2011) medgiver at kompetenceudvikling sker mest effektivt, når den foregår kontinuerligt, og at systemisk forandring ligeledes er en kontinuerlig udvikling. I dette projekt er der

derfor iværksat kompetenceudvikling i form af en intervenserende workshop (én indledende workshop efterfulgt af en pilotundersøgelse), hvor metoden fremtidsværksted er brugt sammen med participatory design. Målet med workshoppen og pilotundersøgelsen var ikke at styrke underviserne som teknologiske eksperter. Det var derimod at støtte underviserne i det følgende: At reflektere over deres pædagogiske praksis; at overveje behovet for at gentænke pædagogikken med IKT; at hjælpe med at forstå teknologiens rolle i det 21. århundredes undervisning; at motivere og hjælpe dem med redesign af undervisning med integration af IKT; og at motivere og støtte øget brug af IKT i undervisningen. Under interventionen havde jeg en dobbeltrolle som medlem af organisationen som underviser såvel som en midlertidig intern forsker under mit phd-studie. De samlede resultater viser at brugen af intervenserende workshop inspireret af fremtidsværkstedsmetoden og med brug af participatory design, efterfulgt af støttede pilotprojekter fremmer brugen af IKT i undervisningen.

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Marianne Geogrsen, my co-supervisor, introduced me to the art of academic writing. Co-writing papers in close collaboration with her enabled me to learn some of the fundamentals of academic writing. It was with Marianne that I made my initial steps into the world of academic work. I pay my sincere gratitude to her for enduring my ignorance and providing me with continuous academic and logistic support.

I had the opportunity to share an office space with Professor Ellen Christiansen in 2012 during the first phase of my PhD study. I come from a society where the understanding of PhD projects is not well informed and there it is often thought that the outcome of a PhD dissertation will be like a new invention, similar to Albert Einstein's. The opportunity for dialogue with Ellen helped me to understand that "becoming a PhD student is a matter of apprenticeship in the academic community and the outcome of PhD work as the ticket to the academic community"; this enabled me to come out of the "misconception cocoon" of my role as a PhD student. I am also thankful to Ellen for reading parts of my work and providing insightful and inspirational feedback and suggestions.

I would like to thank Danida for the scholarship and funding the research project; the Royal University of Bhutan for providing the opportunity to apply and benefit from the project funding from Danida; Samtse College of Education for granting study leave and allowing me to pursue the five semesters of study at Aalborg University and also letting me do the empirical work at the college; and the eLearning lab at the Department of Communication, Aalborg University, for the wonderful learning experience.

I would like to express my gratitude to the IIC-RUB research team for all the timely support and motivation throughout the entire period of my study. And special acknowledgement goes out to Pär-Ola and his family for the homey social events and memorable excursions—I will cherish all the great moments. I would like to express appreciation to my nephew Tshering Jamtsho for the continuous support rendered during this PhD journey.

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Finally, I would like to acknowledge my PhD friends for all the help (academic and personal) and for the memorable time at Aalborg.

Dedication

I would like to dedicate this monograph to my dear sons

Riggsang

and

Riggden

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CHAPTER 1. INTRODUCING THE STUDY

This monograph is a study of information and communication technology (ICT) integration in teaching by the educators at Samtse College of Education (SCE). This college is located in Samtse district, one among the 20 districts of Bhutan and one of the member colleges within the 10 constituent colleges of the Royal University of Bhutan (RUB) (see Figure 1). The main focus of the monograph is to explore, recognize, and theorize the progression in the use of ICT in teaching through an intervention workshop and a pilot study. The actual study formally began on April 1, 2012, with the lecturers of SCE as participants. The timeline for activities are outlined in a later section. The purpose of this section is to present an overview of the monograph.



Figure 1. Map of Bhutan showing the 10 colleges of RUB

Activity theory has been used as the overarching theoretical framework for the overall design of the study. The activity system has been employed as one of the main tools to analyze the data. The focus of this study is on the consequences of research and on finding an answer to the research question, which proposes to use multiple methods of data collection to inform the problem under study. Therefore, pragmatism was identified as the paradigm for this research study. A professional development process in the form of an intervention workshop, which included a one time workshop and a follow up process through pilot studies, was conducted following the principle of future workshops (Jungk & Mullert, 1987). The approach to professional development took inspiration from the participatory design methodology.

To contextualize this study situation, the processes of the study, and eventually the answers to the results of the activities, it is important that the reader understands the geographical, historical, and ongoing status of the research setting. Therefore, a presentation will initially be made on the country, the university, and in particular on the Samtse College of Education. Since, this study is situated at SCE discussing ICT and teaching, there is also a need to describe the level of technology usage and its relevance to education in Bhutan. Therefore, a narrative account on the technological milestones and history of the evolution of education will be briefly highlighted. This discussion also offers insights into the advancement of technology from an earlier time to the present.

The PhD study was nested in larger project collaboration between the Royal University of Bhutan and Aalborg University, Denmark (RUB – AAU). This project was supported by Danida, with an objective of capacity building in research at RUB during the university’s transition phase, as it has recently become autonomous. A team of researchers from Aalborg University (Pär-Ola Zander and Marianne Georgsen) in Denmark and a team of researchers from Samtse College of Education (four members) came together to undertake a research project titled “ICT Integration in Teaching and Learning across the Curriculum in the Institutions of Royal University of Bhutan (IIC-RUB).” The PhD project is nested within this group project. The PhD study is a case study on “ICT integration in teaching to facilitate learning” at Samtse College of Education. The role of the team from AAU and RUB will be disclosed as we venture into the proceedings of the study.

The study topic “ICT use in teaching to facilitate learning” is not new in the field of educational technology research. However, no extensive study on ICT integration in teaching at a higher education has been carried out Bhutan till date. The next question consequently will be what is supposedly different in Bhutan compared to other parts of the world and why. This research is not a comparative study to compare and contrast the scale of ICT integration in teaching and learning in Bhutan with other countries. Rather, the current study highlights educational technology at RUB in a broad-spectrum and within SCE specifically. The need for this study becomes implicit only after understanding the background of the country, the university, and the college. Therefore, I will make a systematic circumscription of the integration of ICT in RUB, thereby giving meaning to the current study being undertaken.

The thesis is organized into nine chapters. Besides following the format of a typical research study, the chapters are arranged systematically in the order of information progression. In other words, the chapters are linked logically in the progression of information (see Figure 2).

Chapter	Topic	Content Summary
1	Introducing the study	Introduces and presents the overview of the monograph, describes the research setting, and discusses the need for research at the study location
2	Developing an understanding of the concept related to the study	Consists of a literature review situating the current study within the body of literature; identifying or presenting the problem area; highlighting the purpose of the current study; verifying or validating the current study; and stating the research questions
3	Presenting and describing the paradigm, theoretical framework, methodological approach and methods interwoven in this research	Gives a broad overview of the concepts and discusses the context of how each is significant to the current study
4	Baseline study	Describes and discusses the purpose, process, and findings of the baseline study
5	Intervention Workshop I	Describes and discuss the purpose, process, and results of the phase I intervention workshop
6	Pilot study phase I data interpretation and analysis	Presents two pilot projects in two stages with data interpretation, analysis, and discussion
7	Intervention Workshop II	Describes and discusses the purpose, process, and results of the phase II intervention workshop
8	Pilot study phase II data interpretation and analysis	Presents two pilot projects with data interpretation, analysis, and discussion
9	Conclusions, reflections, and implications of the study	Presents the findings and conclusion, discusses the significance of the findings and implications of the methodological approach, and positions the role of the researcher

Figure 2. Table illustrating the outline of the thesis

1.1. DESCRIBING THE RESEARCH SETTING

In order to provide context for the study, this section presents background information on the country, its technological history, and the importance of technology in education for the country. An overview of the university in which the study is located is also presented.

1.1.1. GENERAL BACKGROUND OF THE COUNTRY

Bhutan is a small and landlocked country in South Asia in the eastern Himalayas and is mostly mountainous and heavily forested. Bhutan is one of the most rugged mountain terrains in the world. It is situated between China to the north and the Republic of India to the south, east, and west. It has an area of 38,394 square kilometers, with the kingdom's longest east-west dimension stretching around 300 kilometers and 170 kilometers at its maximum north-south dimension. It has elevations ranging from 160 meters to more than 7,000 meters above sea level. The population is estimated to be 720,679 (NSB, 2013). From 1907 until 2008, Bhutan had a monarchy system with the king as the head of state (bhutantimes, 2008). Bhutan had its first democratic elections in 2008, and currently Bhutan is a democratic, constitutional monarchy. The king is highly respected, loved, and regarded by the people of Bhutan.

It has been described that until the 1950s, education in Bhutan was mainly monastic. Literacy was confined to the monasteries, and many renowned Bhutanese scholars traveled to Tibet to study Buddhist scriptures. However, in the 1950s the second king of Bhutan, Jigme Wangchuck, opened the first secular schools, with both the curriculum and the medium of instruction in Hindi, a language used in India (Tshewang, 1994; CERD, 2002; Wangmo & Choden, 2011). In the 1960s, when Bhutan was giving up its policy of self-imposed isolation (CERD, 2002), other parts of the world were already experiencing what Toffler (1971) called the second wave of change in human civilization. While the first wave of change was marked by agricultural economies and settlements, the second wave witnessed the growth of industries (Whitaker, 1993). By the middle of the 1970s and 1980s, the so-called third wave of civilization was already rolling in, bringing with it microchip technology (Smith & Hatton, 1993). At that point in history, Bhutan experienced a leap from the first wave to an advanced stage of the second wave and soon plunged directly into the third wave. In spite of the early start of few schools, modern education did not yet have a sound footing in Bhutan at that time. Nonetheless, as a country desirous of modernization, Bhutan had to experience the impact of the two later waves almost at the same time (CERD, 2002). For example, factory-made vehicles invaded the dusty roads, making journeys faster and shorter. The rough-road jeeps and trucks were, however, soon outnumbered by new sedan cars. Factory-made goods became more available. No longer did people travel by mule tracks just to get a supply of salt for the year. Salt was brought to their vicinity by trucks. Eventually, the penetration of computers, telephones, and the Internet further accelerated the communication commerce systems (CERD, 2002).

CERD describes that from 1960s, under the third king, Jigme Dorji Wangchuck, Bhutan began to build its education system in earnest. Realizing that the small, isolated country needed to be able to communicate with the rest of the world, the third king made English the language of instruction (2002). This laid the foundations for the emergence of the network of primary, secondary, and post-secondary institutions that are spread across Bhutan today. At first, schools in Bhutan were few and rudimentary, and could only offer primary education. With few teachers of its own, Bhutan had to recruit teachers, mainly from neighboring India. In the early days, national and expatriate teachers alike had to endure daily hardships and make arduous journeys over treacherous mountain passes and through leech-infested jungles to bring education to the most inaccessible parts of the country (Dorji, 2003).

It is said that, with the school system still in its early stages, a number of Bhutanese students were sent to study at the highly acclaimed missionary schools in Darjeeling, India at that time. Impressed by the quality of education in these schools, the Bhutan Government asked a Canadian Jesuit, Fr. William Mackey SJ, to leave his school in Darjeeling and help set up a high school system in Bhutan. The Jesuits and nuns who came to Bhutan in the 1960s and '70s worked to establish

a fully Bhutanese school system that would strengthen the country's indigenous cultural and religious traditions while helping its people to modernize (Denman & Namgyel, 2008; Wangmo & Choden, 2011). Since then, education has contributed significantly to Bhutan's rapid development, in line with its philosophy of "Gross National Happiness." Being educated in English has enabled Bhutanese students to study in all parts of the world, earning degrees in various disciplines.

Today, the education system in Bhutan includes formal, non-formal, and monastic schools. Enrolment in the formal system begins at age six, but students can apply to the monastic schools at any age. The non-formal centers provide basic literacy skills for all ages. The government provides free education to all students until Grade 10 as well as scholarships to students who meet the requirements for higher and professional studies. The educational structure provides for 11 years of basic schooling: one year of pre-primary schooling, six years of primary, two years of junior high, and two years of high school. Students undergo an examination to move from primary to junior high and another to graduate from junior high to high school (MoE, 2014). After completing high school, entry into the various higher education programs in the country on government scholarships is based on high school academic results. Top high school graduates are also awarded special scholarships by the government to study abroad. There are different sources of funding—either external or internal funding. The ones who do not qualify in the merit ranking list either look for jobs or pursue their higher education on self-funding.

1.1.2. TECHNOLOGICAL MILESTONES IN BHUTAN

I do not assume that every reader is familiar with Bhutan. As the country remained in isolation from the rest of the world until 1961 (CERD, 2002; infoplease, 2014), a narrative account will be provided to describe the technological journey of Bhutan in the intervening years. This description is intended to familiarize the readers with the context of the current study, thereby enabling them to relate to the existing state of affairs of educational technology in the country.

The first telephone network in Bhutan was established in 1963. Since then, the telecommunication network has evolved from a physical wire network to the national digital network that is in existence today. Today, telecommunication has been given high priority in Bhutan's development plans. The first international satellite link was established in 1990 with the installation of the Earth Satellite Station and an international gateway switch in Thimphu, the capital city of Bhutan. With a fear of outside influence for years, the country remained in isolation, and it was only in 1999 that the country established its first television network and also started Internet services (BBC, 2012). By March 1999, all of the 20 district headquarters had access to telecommunication services. Since then, the information and communication technology has provided access to global information, and it

still plays an important role in the country. Nevertheless, large sections of the population have yet to adopt ICT and to appropriate it for their own purposes (NSB, 2013).

Currently, Bhutan Telecom Limited (BTL) is the principal provider of telecommunications and Internet services in the country. Besides fixed line telephones, it provides GSM Mobile services under the brand B-Mobile and Internet Services under the brand name of DrukNet. These Internet services were launched on November 11, 2003, coinciding with the fourth King's Birthday. Later, Tashi InfoComm Limited, Bhutan's first private mobile company, came into existence in October 2006. Now, B-mobile and TashiCell have their services available in all 20 Dzongkhags, and they are the leading providers of Internet services in the country. Since 2013, they have also launched and made available 3G telecommunication networks services. Besides DrukNet and Tashi Infocom, two new private Internet service providers (ISPs), DrukCom and SamdenTech, have now entered the market. Today the country has four ISPs (MoIC, Bhutan e-Government Master Plan, 2013).

According to NSB, during the period 1992–1999, the number of telephones per 100 people in Bhutan increased from 0.08 to 1.12. Since the beginning of the 21st century, when permission for using the Internet and mobile phones was granted by the government, there has been a rapid increase in the use of Internet and mobile phones (2013). Heeks (2012) reports that figures from the International Telecommunication Union indicate approximately 400,000 mobile subscriptions, with annual growth rates of more than 50%, and 14 Internet users per 100 people. As of December 2012, 78.8% of the population had subscribed to mobile phone services (MoIC, 2013). Gurung and Bhattarakosol (2014) report that the number of the Internet subscribers drastically increased from 11,886 in 2009 to 109,526 by the end of 2012 and that the Internet penetration rate achieved 22.7%. With the advent of television in 1999 and Internet in 2000, there has been a growing use of IT by the government, private organizations, and education institutions. As stated by Bon (based on an African study), the following can be said to be true for Bhutan as well: “The increased number of Internet users in the country can be considered a ‘digital indicator’ of the adoption of the ICT society, and the integration into the global networked economy” (2007, p. 123).

According to Servaes (2002), because of their diverse and pervasive impact, information and media have become integral parts of socio-cultural change by shaping and transforming values, lifestyles, and national economies as well as socio-political systems. In the BIPS policy paper (Bhutan Information and Communications Technology Policy and Strategies), it was outlined that the geographic barriers confronting Bhutan—that is, a highly dispersed population divided internally by high mountain passes—could be lessened by ICT (MoIC, 2004). According to the government, ICT could also be used to create businesses

and jobs, tap international markets, preserve and promote cultural heritage, and support good governance. In its entirety, ICT is believed to help create a knowledge-based society (RGoB, 2004). Like many other developing countries, ICTs should be aimed at harvesting the potential of ICT rather than being aimed purely at developmental impact. In general, the developmental impact of ICT in the Global South is difficult to assess as the research is still immature. Nevertheless, the research that has been done has shown that ICT deployment varies in its results and that its impact is continuously changing (Heeks, 2010). Bhutan is likely to be no exception.

It has been discussed that in Bhutan's rapidly changing socio-economic, cultural, and political scenario, information and media are already vital forces that touch all national priorities. As described above, information and media are recognized by the government as the appropriate tools to overcome the challenges posed by a rugged geography to reach scattered communities in all corners of the country and to help the nation deal with a globalized world in a new century. The Bhutanese government furthermore, expresses its expectations that information and media can play positive roles in promoting good governance through efficiency, accountability, and transparency. The government also sees a link to its promotion of the overall goals of Gross National Happiness (MoIC, 2013).

The Ministry of Information and Communications (MoIC) claims that Bhutan has made substantial progress in providing for its citizens a range of telecommunication services. Although the usage of ICT is growing fast in urban areas, Bhutan still faces challenges in ensuring that all citizens get access to ICT, regardless of where they live. According to MoIC (2004, p. 13), the following challenges still remain:

- ✓ The geo-demographic constraints, including the harsh terrain and small scattered population, hamper the roll-out of the ICT infrastructure,
- ✓ The small size of the country limits its ability to build a critical mass of ICT professionals, and
- ✓ There is low public awareness on the benefits of ICT due to a low level of IT literacy.

The so called Bhutan "e-Government Master Plan" document stated that a plan was being implemented to establish optical fibers in all 20 districts of the country and that this was scheduled to be completed by December 2013 (MoIC, 2013, p.12). Currently, the optical fibers have reached all 20 districts and 138 sub-districts (the smallest administrative units within each district), although optical fibers to four sub-districts were scheduled for completion in July 2014 (MoIC, 2014). It is mentioned in the document that the delay in rural electrification by the Bhutan Power Corporation had delayed the completion of optical fiber establishment in the four sub-districts.

MoIC (2013, p. 12) also reports the following in the document:

- ✓ 182 community centers have been established, and 131 community centers are planned to be connected with broadband Internet by June 2013.
- ✓ Computers are made freely available to some of the rural communities to facilitate learning.
- ✓ A five-year capacity building initiative called Chiphen Rigpel has been fully funded by the Indian Government.

Realizing the growth and impact of ICT around the globe, the Royal Government of Bhutan recognized ICT as an important tool to achieve its development objectives. Chiphen Rigpel, an ambitious human capacity building project designed to help Bhutan to successfully transition to a modern knowledge society, was launched on April 30, 2010 (Embassy of India, 2014). As it is a project with implications for skills development in Bhutan, it is also known as the “total solution project.” It is a Govt. of India-assisted project that was launched by the prime ministers of India and Bhutan on April 30, 2010. The project has six major components: Enabling e-Governance, Equipping Teachers, Increasing Employability, Bringing ICT to Schools, Reaching the Unreached, and Managing e-Waste. The project is expected to provide ICT skills to over a quarter of the population of Bhutan to help them to become skilled and empowered citizens of a connected and ICT enabled world. The project has set up seven teacher training labs across the country and has provided training to 4,817 teachers in the country. The project has a 34,148,700 US dollar budget spread across seven agencies (Embassy of India, 2014).

The Royal University of Bhutan (RUB) has taken a central role in developing customized and localized ICT training courses. One such training program is “Chiphen Rigpel Training Lab,” which is based in SCE. According to the coordinator of the training lab, all teachers in the Samtse district have availed training. Teachers were trained on using ICT tools such as Microsoft tools (Word, Excel, and PowerPoint), Internet browsing and searches, and email for communication and developing blogs as well as on methods for integrating ICT in the teaching and learning process.

Globally, the demand side of ICT skills and ICT-based working environments is increasing, and the culture has had impacts on parts of Bhutan. A business IT park, TechPark (TTP), was established with an objective to increase productive employment opportunities (Thimphu TechPark, 2010). It is the country’s first IT park and is located in Thimphu. The park was established on November 1, 2011, with an area covering 18 acres. In the press release document, the park was described as a project conceived by the Ministry of Information & Communications, Royal Government of Bhutan, with funding from the World Bank, to harness the immense potential of the good English speaking youth of Bhutan (Thimphu TechPark, 2010). The first phase of the project became

operational in May 2012 and comprised a 50,000-square foot IT office and data center space. Ten thousand square feet of space in Phase 1 has already been absorbed by the Royal Government of Bhutan to house the Bhutan Innovation and Technology Centre, which is an initiative to promote innovation and entrepreneurship in the country (Thimphu TechPark, 2014). In his forward address in the Bhutan e-Government Master Plan booklet, Mr. Tshering Tobgay (Prime Minister of Bhutan) stated that “The potential is boundless and is constrained only by limits of the human imagination. Bhutan has prioritized ICT as the principal enabler for a knowledge based society—a society that learns to learn, with a sound development policy inspired by the philosophy of GNH” (MoIC, 2014).

1.1.3. SIGNIFICANCE OF TECHNOLOGY FOR EDUCATION IN BHUTAN

A nation’s future will mirror the quality of her youth—a nation cannot fool herself into thinking of a bright future when she has not invested wisely in her children.

We can dream of world class IT parks, of being an international financial centre, of competing at international standards, but we must not forget that we can have none of these if our schools and colleges do not bestow such talents and skills.

We cannot face new challenges with the same tools.

—His Majesty the fifth King of Bhutan’s profound words addressed to the graduate students during the 3rd convocation of the RUB (WordPress, 2009)

These words send an important message to educators for rethinking education in Bhutan to cope with the needs of changing times.

In the kingdom of Bhutan, education holds an important place in society and is given priority in developmental activities. In recent years, the importance of technology has attracted the attention of the country’s leader, as is seen in the opening statement of the Bhutan e-governance master plan, where the Minister for Information and Communications stated that “*ICT can have an immense impact on virtually all aspects of our lives. The Royal Government of Bhutan owns this vision and declares a strong commitment to developing and implementing a national ICT strategy and action plan, based on the ICT vision*” (MoIC, 2013). The Internet, mobile phones, and online information systems have become a part of our everyday lives. With the vision of an ICT-enabled information society and with increasing digitalization taking place, the citizens’ dependence on these ICT systems and services is growing every day. Likewise, the document emphasizes ICT as an engine for social and economic transformation to empower and transform lives by

developing ICT infrastructure, creating a skilled pool of human resources and innovative industries, and empowering communities.

The potential of ICT as a tool for both learning and teaching has long been acknowledged, both in developed and developing countries. With specific reference to the educational system, the Bhutan e-governance master plan document describes the vision of introducing an ICT-integrated teaching and learning environment. It describes how the education sector will use ICT as a tool to equip teachers, educators, and students with competencies and access to a wide range of readily available ICT resources. Further, the document asserts that the application of ICT is expected to transform education practices within the country (MoIC, 2013, p. 32). The promotion of the use of ICT in education has been listed as one of the main priority areas in Bhutan. This is because the country has more than 176,647 students studying in 553 schools and 109 extended classrooms (ECRs—small primary schools in remote and rural parts of Bhutan) and are taught by more than 7,932 teachers, (MoIC, 2013, p. 34).

The use of technology in teaching in Bhutan has evolved rapidly over a rather short period of time and has become quite common in larger schools and university colleges. Both teachers and students make use of technologies for personal purposes as well as to enhance teaching and learning experiences. Technologies such as computers, projectors, Internet, laptops, and mobile phones are popularly used. However, according to Wangdi (2012), the use of ICT as a tool for teaching and learning is more prominent in colleges compared to schools. Wangdi argues that the reason for the higher usage of ICT in teaching and learning in college environments is because of the existence of adequate ICT facilities. Nowadays, technology is one of the prime factors that is influencing the atmosphere of education. Learners today are constantly exposed to technological experiences that ultimately impact the preferences of the learners' for a technology-based learning culture. Wiske argues that in order to enhance teaching and learning, it is critical that teachers understand the factors which influence the education culture (2001). Further, Wiske states that in order to fully realize the potential of new educational technologies, schools need to change assessment policies, support a teacher development curriculum, and amend goals and materials. Beetham and Sharpe (2007) claim that the technological experience of students is carried into the learning space and that this should remind teachers to be aware of the learning experiences that learners are exposed to so that teachers can create a relevant learning environment.

ICT tools have become a way of life so deeply embedded in all aspects of the lives of students that they expect their institutions to provide a continuous experience with Web access in academic life, social life, and administration (Brown, 2001). Brown also claims that students today are so engrossed with technology that they are pushing learning into new dimensions. Brown concludes that learning today is not only the learning of text but also of images and screen displays; it is discovery

learning through emergent digital libraries and Web resources, and learning has more than ever become situated in action and exploration. However, Wiske (2001, p. 5) cautions that “*a new technology will merely be used to enact traditional practices if the culture of education remains static.*” In other words, the author cautions that educators should carefully consider how to meaningfully integrate technology in pedagogy with the intent of enhancing learning. These statements indirectly claim that in the changing scenario of the learners’ world, there is a need for educators and teachers to redefine their role and respond to the changing needs of learners. Hence, there is a call for change in teaching using technology but also a need to respond to the call for a verification of the individuals’ skills and attitudes.

The realization of the importance technology in the education sector shows itself through the introduction of a course called “Postgraduate Certificate in Teaching of Information Systems” for teachers to be trained as IT teachers. Recognizing the need to incorporate ICT in the education system, the Ministry of Education initiated the program, and with assistance from the Singapore International Foundation (SIF), a nonprofit foundation—the Post Graduate Certificate in Teaching Information Systems (PGCertTIS) Workshop/Training—was initiated in the year 2000. The objective of the program was to train selected high school teachers in the field of Information Systems to be able to conduct literacy courses and handle the IT curriculum in their schools. The first training was conducted at Paro College of Education from December 2000 to January 2001 (a one-month duration) with the SIF IT Specialist Team, comprising volunteers from Temasek Polytechnic in Singapore. It was reported that the first training workshop in ICT literacy started with 25 high school teachers in a modality of one month attendance each year during the winter vacation, leading to a Post-Graduate Certificate in Teaching Information Systems in three years (Wong, 2008). From 2002 to 2005, the same course was then later continued and conducted at Sherubtse College, Kanglung. After 2005, the above-mentioned course was discontinued because the colleges of education were then ready to supply teacher graduates with IT background.

After the initiation and implementation of the PGCertTIS, the assistance and collaboration with the SIF continued with the two colleges of education (Paro College of Education and Samtse College of Education). Almost parallel to the PGCertTIS, the SIF team got involved with the two colleges for the development of two levels of modules called Functional IT and Enhanced IT, respectively. The specialist team worked with the lecturers from the Paro College of Education. The module/course was designed for pre-service teachers to prepare the trainees (only the group who opted to take the module) with sufficient skills firstly to teach computer subjects in middle and high schools and secondly to design and develop teaching materials and to teach using ICT.

The first batch of six trainees started the course in February 2004 at Paro College of Education (Wong, 2008). Eventually, in 2006 the same course was also offered at

Samtse College of Education (SCE). Wong reported that from December 2005 until February 2006, seven lecturers from the two colleges of education (4 from PCE and 3 from SCE) went to Singapore for professional development training at the National Institute of Education (NIE) in Singapore. Conversing with some participants of the training, they said that the training was mainly focused on enhancing ICT skills.

The introduction of PGCertTIS IT modules/courses and the professional development training trip to Singapore were the initial steps in the evolution of ICT in teaching and learning in Bhutan. From then onwards, numerous workshops and trainings have been held both within the country and outside its borders for the lecturers. The process and impacts of the trainings will be discussed while describing location of my research that is Samtse College of Education.

1.1.4. ROYAL UNIVERSITY OF BHUTAN (RUB)

Until 2003 all the member colleges of the RUB were under the governance of different ministries. The university came into existence only after the Royal Charter to establish a University in Bhutan was issued by the fourth King on April 18, 2003. Then, in June 2003, Bhutan launched its one and only university, the Royal University of Bhutan. One central objective of the university as stated in the charter (RUB, 2011, p. 3) is “To promote and conduct research, to contribute to the creation of knowledge in an international context and to promote the transfer of knowledge of relevance to Bhutan.”

The head of the university is the Vice Chancellor. The university has four departments, each headed by a director. RUB has 10 member colleges, which are spread and scattered across the country, and one affiliated private college located in the capital city of Thimphu. The 10 respective colleges have their own study programs, which are unique to the individual colleges. In spite of this independency in study programs, the colleges work in union in areas such as planning, resources, curriculum development, and shared costs to enhance their efficiency. As reported in the annual report at the end of the 2012 academic year, the university had 490 academic staff (teaching faculty), 465 non-academic staff (administrative and support staff), and 7400 students in total (RUB, 2013).

1.2. IDENTIFYING THE NEED FOR A STUDY AT SCE

For the empirical work, SCE was chosen as the location of the study. The reasons for this choice are that this is my home institution and that it allows easy access to the data and use the methodological approach chosen more effectively. It also allowed me to take the role of insider researcher, which has added value to both data collection and analysis.

1.2.1. DESCRIBING THE GEOGRAPHICAL, HISTORICAL, AND CURRENT STATE OF SCE

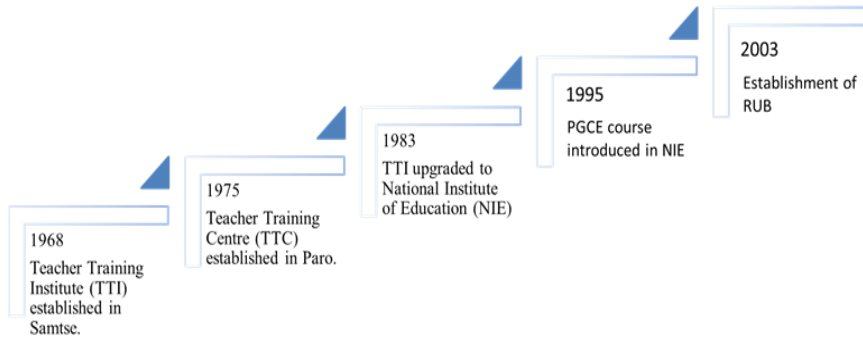


Figure 3. Historical journey of teacher development in Bhutan (adopted from MoE, 2014, p. 114)

Bhutan has two colleges of education—Paro College of Education, located in Paro, and Samtse College of Education, located in Samtse. Though similar in many ways, they are also unique in several ways due to the different programs and courses on offer as well as geographic location. Until 2003, the colleges were under the authority of the then Ministry of Health and Education (health and education are two independent ministries now). The Ministry of Education and the Colleges of Education are two interdependent entities. The ministry supplies class XII graduates from the higher secondary schools to the colleges of education for the two bachelor programs (B. Ed. Secondary and B. Ed. Primary). The B. Ed. secondary program trains teachers for middle (pre-primary–class viii) and higher secondary schools (class vii–xii) with different subjects of specialization. The B. Ed. primary provides training for teachers to teach in the community and lower secondary schools. Upon completion of the training programs, the ministry is responsible for the appointment of teachers to different schools across the kingdom.

It has been mentioned that it was during the Second Five Year Development Plan period (1966–71) that the country witnessed a rapid expansion of educational facilities and a concomitant escalating need for teachers. This necessitated the need to have a teacher training institute of its own. Hence, the Samtse College of Education was established in 1968 as the first Teacher Training Institute (TTI) under the aegis of the late third king, Jigme Dorji Wangchuck. It began with an initial enrolment of 41 students. As a TTI, it trained primary teachers for work placement within Bhutan. It awarded two-year Primary Teacher Certificates to class

ten graduates who came to be trained as primary school teachers. The institute trained and sent out as many as 999 PTC graduates (614 males, 385 females) until it was phased out in 2000 (MoE, 2014; Samtse College of Education, 2014).

The TTI was upgraded to the National Institute of Education (NIE) with the introduction of a B. Ed. Secondary course in 1983. The degree course was reviewed and revised by renowned curriculum experts from the Institute of Education, University of London, who came periodically as moderators and external examiners until the institute was able to handle the program on its own by the mid-1990s. The NIE continued to offer a Primary Teachers Certificate course until it was replaced by the Bachelor of Primary Education in 1993. The B. Ed. Primary course was launched with the aim of developing a program that would prepare a group of teachers with higher academic and professional qualifications who could teach and provide much-needed instructional leadership at the primary level. The college was renamed the Samtse College of Education along with the renaming of all the member colleges of the Royal University of Bhutan in 2008 (Choeda & Kinley, 2013; Samtse College of Education, 2014).

In the college strategic plan, it has been reported that the college has thus far trained well over 3,781 teachers (999 PTC, 1,027 B. Ed. Secondary, 631 B. Ed. Primary, 713 PgDC, and 411 part-time B. Ed. Primary). The college is now one of the premier educational institutions in the country, providing training courses to primary, secondary, and postgraduate teachers. It also caters to a number of part-time programs at the B. Ed. primary and postgraduate levels. The spirit of the college is guided by its high-reaching vision and mission and set of core values (Samtse College of Education, 2014). The vision of the college as enshrined in its strategic plan is “*to be the center of excellence in teacher education.*”

In its mission, the college is committed to

- ✓ Preparing competent teachers for secondary/primary education through full-time and part-time programs;
- ✓ Preparing teachers to be role models in the society;
- ✓ Providing continuing professional development programs for library, laboratory, and counseling services;
- ✓ Preparing competent tertiary educators; and
- ✓ Carrying out research to enhance quality teaching-learning and address socio-economic concerns.

The following courses are offered by the college (Samtse College of Education, 2014):

1. Bachelor of Education (B. Ed.) Secondary: The Bachelor of Education (B. Ed.) program of the College of Education has been designed in accordance

with the larger goals of the Royal Government of Bhutan. It aims to prepare teachers who will be able to teach secondary school students from grades 7–10. The students study a total of 40 modules during the 4-year period with a semester of teaching practice. They specialize in teaching two subjects (e.g., Math and Physics) for grades 7–10. The course is very intensive in nature and requires students to gain both a theoretical and a practical grounding.

2. Bachelor of Education (B. Ed.) Primary: This program is also a 4-year program, and its main aim is to prepare teachers to be able to teach primary children from grades PP–6. The course is offered through two different modes: full-time and part-time. Full time is on-campus course offered to pre-service teacher while the part-time course is offered to in-service teachers who wish to obtain a B. Ed. degree, the minimum qualification required of a teacher in Bhutan. All the modules are theory-based with practical implementations and logically spread within the structure for a sound and logical progression from modules being built on learning developed in earlier modules. Students in this course also have an opportunity to take up one semester teaching practice.
3. Post Graduate Diploma in Education (PgDE): The PgDE course initially started as the Postgraduate Certificate in Education (PGCE) in 1995 with an aim to provide an in-country professional course for secondary teachers. The course was later changed to Postgraduate Diploma in Education (PgDE) in 2009 and began to offer one subject of specialization beginning in 2011. The main aim of the PgDE Program is to train secondary school teachers who capable of teaching a subject of specialization from grades 9–12.
4. Postgraduate Diploma in Guidance & Counseling: A two-year postgraduate diploma in guidance and counseling was launched as a part-time program beginning in 2011 for in-service teachers. The full-time course was launched 2013. It is an award-winning “in-service” program. As a part-time time program for in-service counselors, it places emphasis on self-reflections, insights, and applied practices. The development of counseling skills is systematically emphasized as an important part of the program.
5. Postgraduate Diploma in Higher Education (PgDHE): The 2-year postgraduate diploma in higher education was launched in 2014. It is basically designed to prepare newly appointed assistant lecturers for university teaching.

The college education system is distinguished by a combination of research-led teaching, a vibrant curriculum, and the use of technology. The curriculum is carefully structured in line with current modules used in primary and secondary school education. Academic units engage in continual review and evaluation of the curriculum as they assess its effectiveness in meeting traditionally accepted

standards, the degree to which it is informed by current developments within the discipline, and its potential for addressing new areas of study. When planning curriculum changes, academic units are made aware of the required internal and external reporting procedures.

SCE (2014) reports that the general student body has a high opinion of the courses offered in the college—they find the curriculum to be challenging and the learning demanding, and the final year graduates feel confident to teach in schools; Currently, the opinions of students are received via different channels, such as the following: All academic board meetings and activities have student representatives who can voice their views and concerns, at the end of every academic semester all students provide feedback on the respective module they have attended via a structured survey questionnaire using virtual learning environment (VLE), and an event is organized for the graduating students by the respective programs for receiving feedback on the overall course.

The current course structure allows a lecturer-student contact time of four hours a week for every module of one-hour duration for each session time. Under this arrangement, students are given ample time and opportunity to engage in an independent research study as set by the lecturers. Students may also make reflections on their learning as well as engaging in face-to-face tutor-led learning programs. Recently, faculty members have started to use VLE as one of the modes of delivery. The college strategic plan document states that the college believes in a cooperative approach focused on student-centered learning (SCE, 2014).

SCE is located on a grassy slope from where one can take contemplative view of the mighty Indian plains. It spreads over a total campus area of 25.72 acres of land. The college currently has a total number of 56 full-time lecturers teaching a variety of courses, as well as a music instructor and a sports coach. The non-teaching personnel consist of four library staff, nine technical staff, twelve administrative staff, and twenty one support staff (Samtse College of Education, 2014). SCE was elected as the primary location for this PhD study based on two aspects: Firstly, it is one of the foremost teacher education colleges in the country; secondly, it is a suitable working station for the researcher, enabling both study participation and design.

1.2.2. INSIGHTS ON SCE'S JOURNEY IN THE IMPLEMENTATION OF ICT

As mentioned previously, a number of the SCE lecturers have attended professional development or training on ICT since the year 2000. Moreover, three of the lecturers had the opportunity to visit Singapore for training in 2005 for duration of three months, and another group (four lecturers) for a week in 2009 (Wong, 2008). With regard to the first training trip, Wong (2008) reported that the lecturers

received training on preparing multimedia materials with using Macromedia Flash to create animations, editing pictures with Adobe Photoshop, Creating webpages with Dreamweaver, and Principles of programming—Java Script Language. In his report, Wong also claimed that the lecturers underwent a steep IT learning experience, going from not knowing anything about computers to being able to design webpages. Further, he mentioned that teacher educators moved from learning in a conventional teacher-centered environment to learning in a more collaborative environment. This, Wong reports, was achieved via group work activities and the use of project-based teaching, exploratory methods of learning, and constructivist approaches (2008).

Though this collaboration and assistance from SIF has enabled the initiation of the use of technology, conversely, the claim is overstated. I joined the Samtse College of Education as a lecturer in 2006 during the same period when the module on Functional IT was implemented. Since then, sporadic workshops and trainings in the college have focused on familiarization with ICT tools and skills with experts from Singapore, India, and Sri Lanka, as well as Bhutan. Firstly, as a direct recipient of the training, I have not experienced advanced enlightenment in terms of knowledge, nor did it have great impact on my teaching. Secondly, as a member of the college, upon interaction with my colleagues and observing their practices, significant changes in teaching with use of ICT was not visible.

It was described earlier that eight lecturers from the two colleges of education (4 lecturers from PCE and 4 lecturers from SCE) received an opportunity to visit Singapore in 2009. The Singapore International Foundation (SIF, 2009) in their news forum reported that

The Bhutanese lecturers aim to implement strategies that support IT integration into their colleges' curriculum. Selected by their respective colleges to form a critical mass of leadership needed to promote the use of IT, these lecturers were chosen for their leadership qualities and active involvement in shaping the roles and responsibilities necessary for greater ICT integration.

The purpose as reported is very novel and promising for the college. On the other hand, similar to the training objectives, the realization of the goal still remains vague.

Though no proper studies have been done on the impacts of the training, from what has been observed, the training has not given rise to any changes in practice on the use of ICT in teaching by the faculty. Therefore, the current study is designed to find strategies for enhancing the use of ICT by the faculty in their teaching. On this note, it will be interesting to verify whether the following aspects are truly in effect:

“Teacher development is considered especially productive when teachers are in charge of the agenda and determine the focus and nature of the programming offered.” (Ball, 1996, p. 2)

“Teachers’ own personal and professional histories are thought to play an important role in determining what they learn from professional development opportunities.” (Wilson & Berne, 1999, p. 175)

After considering my observations on the visible results of the training and its impacts in the college and reflecting on the lines of the above statements, as well as becoming a bit curious with regards to the selection of individuals for training courses abroad, I conducted an informal interview with a human resource (HR) committee member of SCE on the regulations/policies for training opportunities. The HR committee member was little vague in his response; for example, he stated *“till now I haven’t seen any policy as such, and I am sure that nomination is done based on the related field.”* Further, he added that

We ask the interested staff to apply for any training/workshops; thereafter HR committee meets, discusses, and makes awards based on how often they attend training/workshops abroad, considers the most eligible candidate based on the relevancy of the course, and looks at likelihood of an individual to contribute back to the organization.

Inquisitively, some important questions could be raised here in terms of whether the right individuals are receiving the opportunity for trainings or if consistent selection procedure is used.

Mostly, the workshops and trainings held at SCE have been dedicated either to equipping lecturers to teach modules on ICT or to developing knowledge on the use of ICT. There have been no formally organized professional development activities on how to use technology for teaching and learning purposes except for a very few in-house professional development programs conducted for a 1–2 hour duration. It has been specified that learning isolated skills can have little impact on classroom practices if training courses do little to help teachers transfer these skills to classrooms (Brown & Ritchie, 1991; Granger et al., 2002; Abuhmaid, 2011).

Neeru (2009) proclaimed that extraordinary alterations have taken place in the Bhutanese society due to the impact of rapidly growing technological interventions. The delivery mechanisms and content of education in general, and higher education in particular, have been highly influenced and are under transition. The evolving impacts of technological penetration have greatly affected the higher education system in Bhutan. Therefore, the introduction of ICTs at RUB will have profound

implications for the whole education process and practices at RUB, and especially at SCE as the foundation of innovative pedagogic practices. SCE has grown exponentially in recent years to meet the demands of producing quality teachers and further by being stimulated by rapid advancements in ICT.

As we begin to discuss the term “Information and Communication Technology” in regard to SCE, I will present a definition in context of what it means at SCE. Mondal and Mete (2012) defined ICT as an umbrella term that includes any communication device or application, encompassing radio, television, cellular phones, and computers and network hardware and software and the various services and applications associated with them, such as videoconferencing, e-learning, and distance learning. Similarly, the same meaning connotes at SCE when we use the term ICT. Here the discussion is not on one specific type but a range of components within the sphere of technology. Mondal and Mete also remark that when technologies are used for educational purposes, namely to support and improve the learning of students and to develop learning environments, ICT can be considered as a subfield of Educational Technology. Cross and Adam (2007) stated that today ICTs—including laptops wirelessly connected to the Internet, personal digital assistants, low-cost video cameras, and cell phones have all become affordable, accessible, and integrated in large sections of the society throughout the world. This statement to a large extent has also become true at SCE.

Cross and Adam (2007) indicated that conventional teaching-learning processes are undergoing a paradigm shift, and the focus of instruction is now on education programs/practices that promote competency and performance. The “call of the hour” is the need to provide education for everyone, anywhere, and anytime. Lifelong learning has become the driving force to sustain in the contemporary competitive environment (Neeru, 2009). The benefits of ICTs in education systems have long been recognized, promoted, and implemented in the education systems of many countries around the world. Keogh (2001) outlined the timeline on the implementation of ICT in education by countries representing different continents, as follows: Ireland initiated in the 1960s and launched in 2000, Finland 1994, United Kingdom 1995, Portugal 1998, Canada 1999, United States of America 2000, Australia 1999, Japan 1994, Pakistan 1998, and Kenya 1996. From this we can infer that around the globe technology has taken its spot in the field of education before the dawn of the 21st century.

ICT has an unusually short history in Bhutan. Likewise, at RUB, the attempt at the implementation of educational technology is quite recent. A policy for all RUB colleges to use a virtual learning environment (VLE) was formally launched in April 2011 (Kinley, Zander, Georgsen, & Choeda, 2013). Guri-Rosenblit defines VLE as follows: “*Virtual learning refers to immersive or simulated learning scenarios where the learner participates as an actor. These educational forms can be utilized for learning at a distance but are not necessarily synonymous with it.*

Many web-based activities are seen as complements to real-time or face-to-face activities in the regular classrooms” (2009, p. 6). Though the formal launching in the RUB colleges did not occur until 2011, at SCE the initiation of the use of ICT as a tool to improve teaching and learning began much earlier in 2004. At SCE, ICT was first utilized to support distance education programs. Jamtsho and Bullen (2007) reported the circumstances surrounding the introduction of ICT in teaching and learning at SCE.

Jamtsho and Bullen (2007) described that in 1995 SCE amplified its regular campus-based programs with a distance teacher education program (DTEP) for the in-service teachers to upgrade their qualification from Primary Teaching Certificate (PTC) to a Bachelor of Education (B. Ed.) degree. Cross and Adam (2007) defined distance education as a type of education where students work on their own at home or at the office and communicate with faculty and other students via email, electronic forums, videoconferencing, chat rooms, instant messaging, and other forms of computer-based communication. The DTEP at SCE was a 5-year version of the 3-year Bachelor of Education for Primary Teachers (BEDP). The program was introduced to cater to DTEP students when they were off campus and lived in different parts of the country. The means of communication with regards to administrative support and information dissemination functions as well as for some academic support; for example, for discussions of students’ study-related problems, telephone was the only available option. Online, collaborative learning interaction between students and lecturers through synchronous and asynchronous interaction modes were then introduced in order to enhance the quality of the teaching and learning process. In 2003, an open-source learning management system, Moodle, was installed on SCE’s server. In November 2004, a group of DTEP lecturers were trained in developing online support for their print-based modules. By 2006, most of the DTEP tutors had been introduced to the key issues related to developing online support and the use of Moodle™. LMS training was first conducted for the faculty and then for the students.

All the initiatives described had a noble intent. It will be interesting to know what happened afterwards. For example, as mentioned earlier, I started teaching at SCE in 2006 and was involved in teaching a module for the DTEP program for two years (2006 and 2007). I do agree with what has been stated in terms of training on the use of Moodle™ during the planning period before the teaching began. A module handbook was pre-printed and kept ready for distribution to the students after registration during the residential school period. The teaching was then done using chalk boards and overhead projectors with content drawn from the module handbook. Thereafter, on-campus (during the residential school period) or off-campus (at all other times), printed or hand written assignments were submitted in person or posted via mail. There were neither written policy guidelines from the college nor any specific instructions from the DTEP program managers on why,

how, what, or when Moodle™ should be used for the delivery of the assigned module.

WBL Consultants Reid and Cano (2005, p. 21), in their report on ICT at RUB, affirmed that “*At present the University has no overall policy for the introduction or implementation of on-line learning, neither for the use of VLEs, nor for their procurement and support.*” In the executive summary, while describing the current state of the integrated IT-based teaching system, they reported that the university was in the process of acquiring significant numbers of personal computers, but that they are often just used to replace typewriters and fax machines. Keogh indicated that Finland, who implemented ICT in education in 1994, then had an exceptionally high level of IT and telecommunications penetration and expertise but no clear statement of strategy as to how to redress the information society strategy in 1996 (2001, p. 230). Similarly, Reid and Cano also claimed that, according to their observations and discussions with RUB senior managers and academic and administrative staff, the value of the information was not clearly recognized. They made recommendations to the university on the need to develop a clear strategy on how to integrate the information system into its various educational modalities.

The challenge of developing a system that is flexible and dynamic so as to holistically integrate information technology into the management and delivery of learning programs can be daunting. Nevertheless, SCE has progressed well in terms of material resources. For example, an IT building was constructed in 2010 with support from the Helvetas Swiss Interoperation, a Swiss association for international cooperation. The college initially had 45 computers for student use, and now it has 100, providing a ratio of one computer for every 10 students. The bandwidth initially was 512 Bps, but was then upgraded to 2 M Bps and then 3 M Bps and currently has 10 M Bps. The classrooms are also connected with LCD projectors. All lecturers have either a desktop computer or laptop connected to the Internet. Fifty percent of the students and 100% of the teaching members own private laptops and mobile phones. Besides cable-connected Internet, the college also provides wireless connectivity in the academic zone and student hostels. An added resource from Bhutan Telecom is that since 2014, Samtse, like other parts of Bhutan, has had connection to 3G networks. Despite moving this far with resources in a short space of time, neither at RUB nor at SCE is there any written policy framework or guidelines on ICT in general or for ICT for teaching and learning.

The college management has made attempts in propagating the need to use online teaching in addition to face-to-face teaching when opportunities arise. Further, the IT department in the college provided sporadic workshops on the use of VLE. Therefore, the situation relates to the one described by Mondal and Mete (2012) in that their findings show that ICTs in higher education are being used for developing course material; delivering content and sharing content; improving communication between learners, teachers, and the outside world; creating and delivering

presentations and lectures; academic research; administrative support; student enrolment; etc. Guri-Rosenblit also stressed that though digital technologies have penetrated higher education in various domains, they have in many cases done little to change the pedagogic fundamentals of the learning/teaching practices (2009, p. 16). Trucano (2005) also reported that teachers most commonly use the new technologies for administrative tasks, such as record keeping, lesson plan development, information presentation, and basic information searches on the Internet but overall are less competent in using the technologies compared to their students. On this note, I infer that SCE is not a standalone institution with regards to the integration of ICT in teaching/pedagogy at the current stage. Understanding the constraints on integrating ICT into the education system therefore provides an opportunity to research strategies to progress from the current situation.

Altbach et al. (2009) described that around the globe during the last decade, the presence of these technologies within tertiary education has expanded exponentially and touched virtually all dimensions of the higher education enterprise, presenting the sector with an enormous range of opportunities along with some significant challenges. Though at SCE, such experience with technology, the trends described by Altbach et al., has emerged only recently. SCE envisages itself to be one of the premier institutes in the region, providing secondary teacher education in order to adapt to the changing times. SCE also claimed that the ICT explosion does hold the promise of breaking down barriers of time, space, and privilege; lowering costs; and enabling collaboration and creativity in teaching, learning, and research. Further, Guri-Rosenblit argued that ICTs have had an extraordinary impact on everything from teaching and learning; institutional management, administration, and finance; to external relations; library services; research production and dissemination; and student life (2009). Getting central with the role of teachers, Guri-Rosenblit highlighted that teachers in both developed and developing countries “remain central to the learning process” (2009, p. 36).

To effectively harness the potential of the new technologies, teaching staff require support, training, and guidance to learn new skills and determine how best to incorporate technology into teaching strategies. In Bhutan, SCE could be considered a primary location where reform in teaching and learning via the incorporation of effective ICT strategies may take place. New measures of student performance would entail new ways of teaching and professional development for teachers (Wilson & Berne, 1999, p. 173). It has been cautioned that technology is moving so quickly that trying to keep abreast of the wave from a planning and policy perspective is challenging, and the future will be an increasingly complex space in which success will consist of embodying and addressing such complexity gracefully (Guri-Rosenblit, 2009, p. 5). The call of the hour for SCE is to pave ways for measures to address the arising stimulus of technology.

At SCE, there have been parallel and simultaneous attempts to provide infrastructure development, skills advancement, and the integration of technology with pedagogy, with an overall aim to harness knowledge in a way befitting 21st century education. However, this is an agenda with many challenges. Foremost is the difficulty in attempting to change teaching practices and cultures. There is still a long way to go before all teachers find the use of ICT in teaching easy and natural (this is further discussed in a later section on the results from empirical studies). It is therefore important to focus on, and address the requirements for, successful integration of ICT into existing teaching practices. Besides the obvious aspects of access to resources (knowledge, equipment, and infrastructure), the desired development also requires competence building in several interrelated areas: learning design, technology (ICT), teaching and learning, materials or artifacts used in teaching and learning, and organizational development.

Being a resident of Samtse and a member of the SCE teaching community has led me to wonder if the following assumptions are also prevailing at SCE. The adoption of the new technologies is perceived by many teachers to be a risky innovation, if not an intimidating change, and therefore quite often faculty members in many higher education institutions are not keen on participating in online initiatives (Abel, 2005; Guri-Rosenblit, 2004; Kurtz, 2008; Zemsky & Massy, 2004a; Zemsky & Massy, 2004b; Trucano, 2005 in Guri-Rosenblit, 2009, p. 20). The context in which teachers work is believed to affect what they can do (Ball, 1996, p. 501). The shortcomings in the integration of ICT in teaching at RUB in general and SCE in particular as described has provoked and inspired me to explore methodologies that would respond to the needs that have been spelled out through this discussion.

CHAPTER 2. DEVELOPING AN UNDERSTANDING OF THE CONCEPTS RELATED TO THE STUDY

A review of previous studies related to the topic of my research is prepared to create an evaluative report of the previously conducted research, which will enable an increase in the breadth of knowledge in existence with regards to the current topic of study. Additionally, the purpose is to make the readers understand that the current study is not a replication of the previous studies, but rather a response to the gaps being highlighted by others' research in the same field. Furthermore, the literature review will enable a formulation of the purpose of the study and develop the research question. In the following section, I will discuss the central concepts for this study, namely ICT, pedagogy, motivation, and attitude, which have all influenced the way we have framed the survey and interviews.

2.1. UNDERSTANDING THE MEANING AND SIGNIFICANCE OF ICT INTEGRATION

Until now and moving forward throughout the description and discussion, there has been and will be constant use of terms like “technology,” “ICT,” “integration,” and “ICT integration.” Therefore, it has become necessary to define these terms in the context used in this research. Information and communication technology (ICT) has been defined in different ways related to how people want it to be used and understood. However, only those definitions and statements that connote the use in the current study will be captured and discussed. According to Pelgrum and Law (2003), “information and communication technology” was first termed by the United Nations in 1992 and was then used as an expression for “Internet service,” media, “telecommunication,” and “network-based information services.”

Zuppo (2011) has argued that the acronym ICT (or ICTs) is used differently in education, including benchmarks of digital literacy, economic sector definitions and regulations, information technology disciplines, socioeconomic development, and governance. Further, Zuppo stated that “*the span of definitions within each type of application across the globe can vary widely, however, the primary definition of information and communication technologies revolves around the devices and infrastructures that facilitate the transfer of information through digital means*” (2011, p. 13). Similarly, Lloyd deliberated that “*the technologies could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the Internet, local networking infrastructure, and videoconferencing*” (2005, p. 3). According to Lawless and Pellegrino (2007),

technology resources include computers and specialized software, network-based communication systems, and other equipment and infrastructure. Likewise for the current study, different service facilities such as cell phones, laptops, and LCD projectors are included in addition to the ones spelled out in the definition.

Lloyd defined ICT integration as a “*range of learning environments, from a stand-alone computer in a classroom to a situation where the teaching is done by the computer through pre-packaged teacher-proof courseware*” (2005, p. 4). Furthermore, the concept of technology integration has been defined as the “*incorporation of technology resources and technology-based practices into the daily routines, work, and management of schools*” (NCES, 2002, p. 75; Lawless & Pellegrino, 2007, p. 577). “*To integrate is to seamlessly combine components, parts, or elements into a complex but harmonious whole*” (Lloyd, 2005, p. 5). It has been stated that, like the ability to learn literacy from the classroom, “*technological fluency*” can be achieved if technology is “*integrated into the classroom environment*” (Davis & Shade, 1999, p. 225; Lloyd, 2005, p. 5). Wims and Lawler proclaimed that the “*appropriate use of ICT could enhance many aspects of life in developing countries and that specifically in the area of education it has the potential to create student-centered learning*” (2007, p. 7).

2.2. THE NEED FOR RETHINKING PEDAGOGY WITH ICT

In the following, I briefly introduce the state of the art in regards to educational change and rethinking pedagogy for 21st century teaching. The reasons for rethinking pedagogy in the digital age have different sources of origin and relate to various aspects of education. I will mention only two here, namely 1) the development of ICT and its potential as a tool for learning and teaching and 2) the emerging consensus regarding the importance of so-called 21st century skills. These two issues are in a way intertwined, as the following discussion will reveal.

As recent as just a decade ago, it was declared that teaching is becoming one of the most challenging professions in our society, where knowledge is expanding rapidly, and much of it is available to students as well as teachers at the same time (Perraton, Robinson, & Creed, 2001 in Jung, 2005, p. 94). The rapid development of technology has made teaching even more complex and challenging today. Darling-Hammond and McLaughlin stated that the “*Educational reform agenda requires most teachers to rethink their own practice, to construct new classroom roles and expectations about student outcomes, and to teach in ways they have never taught before—and probably never experienced as students*” (1995, p. 597).

Brown and Duguid (1996) predicted that higher education will change with changing technology and that the building technological infrastructure will be of crucial importance. The penetration of information and technology has prompted the education system to learn and adapt to the opportunities created by the

technology (Beetham & Sharpe, 2007). Beetham and Sharpe (2007) mention that currently, technology is used most commonly for purposes like improving the quality of lecture presentations, making lecture notes available for students online, and for access to digital resources and discussions online. Likewise, even at SCE, if we look into the practice today, even though technology has evolved enormously, its utilization in teaching has not progressed much compared to how it existed a decade ago. McConnell argue that *“the advent of electronic communications, the web and the internet and associated learning technologies have produced a climate in which e-learning is seen as a means towards improving higher education teaching and learning”* (2006, p. 8).

Over the years, we have seen a paradigm shift in the nature of knowledge availability and nature of learning. In the view of Arunachalam, there is an enormity of information movement through the network; a massive increase in the numbers of users with access to the Internet; and the democratization of information creation through personal webpages, podcasts, and wikis (1999). Robin (2008) argued that students now are not only gathering information, but also creating it. The need for ICT does not limit itself simply to the process of acquiring an education but also spills over into life post-education. For example, Beetham and Sharpe (2007) claim that the information economy today demands that job seekers have information literacy as a core requisite rather than just a stable body of knowledge. Holliman and Scanlon (2004) point out that one of the positives about using ICT is that it provides a wide range of communication in the teaching and learning process and is not limited to the classroom but rather extends to the global world. However, the authors caution that teachers should implement ICT only after drawing evidence from the growing body of research on the effectiveness of using ICT to facilitate learning. Holliman and Scanlon indicate that *“it will be the teachers’ role to align pedagogic strategies with ICT to ensure all the learners get most from the technology facilitated approach”* (2004, p. 2).

In the times of today, we cannot elude the fact that ICT has penetrated and influenced all work settings. It is an accepted phenomenon now that ICT has infiltrated into every aspect of our daily lives and has become a significant tool for processing information. On a similar note, Pedro et al. (2004) state that ICT has to be applied in education as a “new society requires new skills.” They also argued that we are being encompassed by ICT in our daily lives and that it has now become an important tool to process and harness information and knowledge. Furthermore, Pedro et al. point out that there should be *“...a quest for quality learning for which the schools should profoundly revise present teaching-practices and resources to create more effective learning environments...”* This point is also made in a series of recent publications addressing the so-called 21st century skills (see Dede, 2009 for a comparison of descriptions of skills). Lloyd has stated that ICT integration enables teachers *“to improve and increase the quality, accessibility and cost-efficiency of the delivery of education”* (2005, p. 1). Whims and Lawler asserted that ICT, if used

appropriately, can change the conventional teaching practice in which the teacher serves as the source of information and students as passive recipients. With ICT, students can take dual roles—that of information consumers as well as producers (2007, p. 7).

We see that the teacher-centered role on providing information is now getting transformed into a more student-centered, interactive form of teaching and learning. The technological influence and how students learn today strongly indicates a need to rethink teaching and learning. Motivation to change will be stimulated if positive changes in learning are known to happen with the innovation of ICT in teaching. In other words, if there is adequate evidence and sufficient examples known to implementers about enhanced student performance due to use of ICT in teaching, it will encourage the teachers to rethink teaching and learning with technology. This is rather encouraging because studies on the impact of ICT in education have claimed that *“the use of ICT in education can increase students’ motivation and deepen understanding, promote active, collaborative and lifelong learning, offer shared working resources and better access to information, and help them to think and communicate creatively”* (Jonassen, 2000; Webb, 2005 in Jimoyiannis & Komis, 2007, p. 150). Similarly, McConnell contended that *“new information and communication technologies offer the potential of enhancing learning and teaching opportunities and of broadening the scope and availability of learning resources”* (2006, p. 28).

For the purpose of this research, an attempt is made to combine experiences and knowledge from studies of the situation in both developing and developed countries. Thus, it becomes clear that some of the critical issues in the integration of ICT into teaching and learning practices are the same in different parts of the world. At RUB, the use of ICT as a tool to improve learning began in the year 2004, when ICT was first utilized to support distance education programs in SCE (Jamtsho & Bullen, 2007, p. 149). Gradually, the VLE Moodle was implemented; and at present, the use of the VLE is gaining popularity. Resulting from staff training in ICT, teachers are now moving towards the integration of ICT in their teaching practices. Dirckinck-Holmfeld outlines four generations of VLE (2002, p. 40) as follows:

- A. First generation VLE—asynchronous, text-based, written mode of communication and learning
- B. Second generation VLE—communication is still asynchronous; however, texts are now potentially multi-modal and hypertextual
- C. Third generation VLE—synchronous communication
- D. Fourth generation VLE—exists at the research level, integrates virtual reality techniques

Dirckinck-Holmfeld claims that until now, the focus has been on the development and implementation of some basic first and second generation VLE tools and proposes to progress to the third and fourth generations VLE in the future (2002, p. 51). This situation reflects the state of VLE usage at SCE and also reflects the intent of the current research.

2.3. HIGHER EDUCATION AS A VEHICLE OF CHANGE

Educators and researchers need to accept the fact that the Internet has truly altered how knowledge is communicated in higher education. In most parts of the world today, the presence of ICTs has expanded exponentially and touched virtually all dimensions of the higher education enterprise. Communication via email and online social networking spaces has taken prominence, and often these channels provide avenues for academic collaboration and joint research. Reading materials have gone massively online; for example, today we have widespread access to electronic journals and e-books. With the advent of technology, the role of the university has itself become more complex, where the task of university personnel has changed from that of information providers to providing assistance in the construction of information, and teaching and learning have moved from the center of academic life toward the margin (Altbach et al., 2009, p. 17). Altbach et al. also contend that economic, technological, and scientific trends directly affect higher education and are largely inevitable in the contemporary world (p.23). Further, they argued that the knowledge and graduates universities produce are directly and intimately connected to the global knowledge economy.

Therefore, universities need to prioritize teaching and student learning with the evolving global trends and remain dynamic. Pedro et al. argue that schools are information and knowledge handling institutions; therefore, ICT should be fundamental management tools on all levels of an educational system, from classrooms to ministries (2004, p. 1). On this note, we will have to then ask: who is studying in the school? Who manages the school in the process of information and knowledge processing? And who produces these individuals? The obvious answer is that it is students, who are taught by the teachers, and the teachers are in turn trained by the teacher educators. The ultimate conclusion we can now draw from this argument is that teacher educators have a primary role in the implementation of ICT in teaching, which consequently will impact the nation's education system.

Altbach, Reisberg, and Rumbley (2009) in the executive summary of their report state that the traditional university will be rendered obsolete by information technology, distance education, and other technology-induced innovations. They contend that the role of higher education as a public good continues to be fundamentally important with the academic transformation taking place in the 21st century due to the technological invasion of the global world. They position higher education to support the knowledge economy as well as to provide the knowledge

necessary for the social mobility and economic progress essential to societies across the globe. Further, they claim that it is not possible for higher education to opt out of the global environment since its effects are unavoidable (p. 7). Khan and Kamarul argue “*teacher education programs need to adapt to rapid changes of new technologies and stay aligned with the contemporary era*” (2013, p. 210).

According to Jung, “*due to expansive progression in ICT, teacher training institutions worldwide are undergoing a paradigm shift in content and delivery*” (2005, p. 94). The need for ICT integration in teacher education is great compared to any other institution because, in addition, in enhancing its own teaching and learning, it also has the role of preparing and inspiring teachers in preparing to use ICT in their teaching endeavors. It has been proclaimed that “*teacher education institutions and programs must provide the leadership for pre-service and in-service teachers and model the new pedagogies and tools for learning*” (UNESCO, 2002, p. 13). Likewise, the AACTE committee on innovation and technology argues that “*with the emerging 21st century technologies as tools for learning, teacher educators must evolve toward preparing pre-service teachers to teach in ways that help them guide their students in learning with appropriate technologies*” (2008, p. 219).

2.4. CHALLENGES IN INTEGRATING ICT IN TEACHING

Several authors have expressed the view that ICT can improve education in general (e.g., Dawes 2001 in Bingimlas, 2008; Zander & Georgsen, 2013). The ways to achieve the expected improvements are dealt with by many researchers and practitioners alike. In his paper on the integration of ICT into teaching, Wang (2008, p. 411) says: “*Numerous design models are currently available to help teachers integrate ICT...*” into their teaching practices. Dawes gives the examples of frameworks such as ASSURE (Analyze learners; State objectives; Select media and materials; Utilize media and materials; Require learner participation; Evaluate and revise) and ICARE (Introduce; Connect; Apply; Reflect; Extend). Wang also provides a generic model of ICT integration in which “Pedagogy,” “Technology,” and “Social interaction” form three components. These three components form a triangle to show their inter-relationship and the support they can provide for each other.

However, studies on the practice in schools and universities in different parts of the world have shown that integration of ICT is a complex and demanding process. To describe and conceptualize what is required from teaching professionals in the 21st century, the concept of Technological Pedagogical Content Knowledge (TPACK) has been developed (Mishra & Koehler, 2006; Koehler & Mishra, 2008, 2009). The concept is widely used by researchers, practitioners, and policy makers to describe and discuss the forms of knowledge required for the use and integration of ICT in teaching practices. In TPACK (see Figure 4), the three overlapping elements,

Content, Pedagogy, and Technology, lead to four forms of knowledge, which need to be understood as both interrelated and context-dependent. Good teaching with ICT requires an understanding of how technology relates to pedagogy and content, and how the introduction of technology alters both content and form.

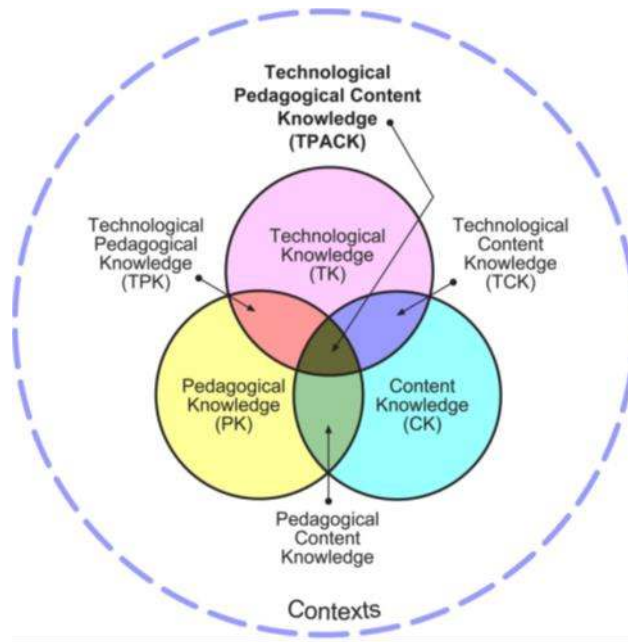


Figure 4. The TPACK framework and its knowledge components (adopted from Koehler & Mishra, 2009, p. 63)

Jones (2004) outlined the following factors as limitations to the successful integration of ICT in teaching:

- ✓ Level of confidence in using technology,
- ✓ Amount of access to ICT,
- ✓ Availability of technical support,
- ✓ Inadequate equipment/resources,
- ✓ Lack of time,
- ✓ Resistance to change, and
- ✓ Inappropriate professional training/development.

Ertmer et al. (2006, p. 2) classified the barriers into two primary categories: extrinsic (first order) and intrinsic (second order). Lack of resources, adequate training, technical support, and time are listed as extrinsic factors, and teachers' beliefs, visions of technology integration, and views of teaching, learning and knowledge are identified as intrinsic factors. Likewise, a similar classification is

also being made by other researchers, where they determine that there are two orders of barriers for the successful integration of ICT. The first order barriers are referred to as missing or inadequate resources such as equipment, training, and support. The second order barrier is the teacher's core belief against the use of ICT (Fullan, 2007; Donnelly et al., 2011).

In the following, I will present and discuss some of the prominent factors, both extrinsic and intrinsic, that impact the successful integration of ICT in teaching. The discussion will encompass general issues as well as factors that are integral to the study location.

2.4.1. LEVEL OF CONFIDENCE IN USING TECHNOLOGY AND ITS IMPACT ON ICT INTEGRATION

At SCE, skill and confidence with technology and further the competence of integrating technology with pedagogy could be assumed to be one of the inhibiting factors of integrating ICT in teaching by the faculty. According to Jones, most teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of students who perhaps know more than they do (2004, p. 7). What people do is often predicted by their beliefs about their capabilities (Pajares & Johnson, 1994, p. 313). Jones stated that many of the respondents to the BECTA survey who identified their lack of confidence as a barrier focused particularly on a fear of admitting to their pupils that they have limited knowledge in the area of ICT (2004, p. 8). However, the author cautioned that the limitation does not end with just this one issue.

It has been reported that the most common causes of this computer anxiety are “*getting stuck and not knowing what to do next,*” and “*not understanding the computer jargon and the messages it gives*” (Bradley & Russell, 1997; Jones, 2004, p. 8). Jones summarized that the lack of teacher competence, or teachers' perceptions of their competence and the quality of the training they receive, is also related to the degree of confidence they have about using ICT (Jones, 2004, p. 9). Jimoyiannis and Komis (2007), in their study on ICT in education, concluded that the teachers' preparation in ICT strongly determined their level of use of ICT in teaching. Watson argued that, being unable to overcome the range of media competences, the teachers are inhibited regarding the use of ICT in their classrooms (2006, p. 206). Studies have claimed that teachers' lack of competence and confidence with technology acts as barriers to integration of ICT in teaching (Dawes, 2001; BECTA, 2004; Bingimlas, 2009).

2.4.2. THE IMPORTANCE OF ACCESS TO RESOURCES AND SUPPORT

Mumtaz summarizes that limited resources results in a lack of computer integration, which in turn results in a lack of sufficient computer experience for both pupils and

teachers (2000, p. 336). Bingimlas argues that several studies have indicated that lack of access to resources, including home access, discourages teachers from integrating new technologies into education (2009, p. 241). The question of access to necessary resources is of particular interest for developing countries, which becomes clear in a number of studies. One is an analysis of pre-service teacher education in Zimbabwe, where the authors found that “low bandwidth,” “slow internet speed,” “slow dial-up,” and “limited access” were the major constraints faced by lecturers (Chitiyo & Harmon, 2009, p. 822). The study also pointed out that, at the time of the study, none of the African universities had “adequate bandwidth.” Bingimlas (2009) discussed in the review the unreliability of the technology, such as Internet and hardware break down. Moreover, the unavailability of timely IT support during such situations causes the teacher to refrain from using technology in future teaching.

Researchers have claimed that access to resources is an essential condition for ICT integration in classrooms (BECTA, 2004; Law, Pelgrum, & Plomp, 2006; Bingimlas, 2009; Shear, Gallagher, & Pattel, 2011a). It is clear that this issue of resources is important in Bhutan as well. However, the general approach to the current research is to look for both constraints and enablers.

2.4.3. TIME MANAGEMENT

From the Gross National Happiness (GNH) perspective, time management is referred as time use; the concept of time use refers to a measure of balance between paid work, unpaid work (voluntary, additional professional work, and personal work), and leisure time (Ura et al., 2012). In the current study, I am under the assumption that at SCE, besides time constraints, not being able to manage time effectively could be a factor that has set back the faculty in integrating technology in teaching. According to Ura et al., besides the eight hours of official working time, Bhutanese people spend a fair amount of time attending and organizing religious events; maintaining social contact with family, friends, relatives, and neighbors; and watching TV (2012, p. 149). Though, designing a lesson that will use technology will require a fair amount of time, and the time frame required will differ in accordance with the local settings. The general requirement, for example, might involve planning and locating the physical resources such as computers, Internet connection, LCD projectors etc., then to look for resources online, download and practice them if one is self-confident; otherwise, it will be necessary to obtain support from experts, etc. Yet, in a Bhutanese context the issue of time could be either related to the time use for other activities or the want of time for the real lesson preparation with technology as outlined above.

From the BECTA study, Jones reported that most of the teachers, although they have the skill and confidence, they still limit using technologies in teaching because of the time requirement (2004). Further from the BECTA survey report, Jones

testified that a significant number of respondents indicated that planning to teach with ICT required more time. The respondents highlighted the following areas where time had to be spent when considering to deliver a lesson with ICT: locate Internet support for the preparation of lessons and resources, explore and practice using the technology, deal with technical problems, and receive adequate training (2004, p. 15).

2.4.4. ORGANIZATIONAL CULTURE

Currently, at RUB in general and SCE in particular, the need to integrate ICT in teaching and learning is only stated in the broad objectives, and there is no written document with a road map for implementation. While proposing or initiating change and innovation in a work culture, we need to understand that individuals will look up to the leaders for directions as to the way forward. Therefore, it is important that there should be clear objectives stated for the need to change, and further, the leaders need to be motivated about the new development so that they can then lead their work force. A study on projects to promote educational changes in America, Canada, and the United Kingdom found that one of the most fundamental problems in education reform is that people do not have a clear and coherent sense of the reasons for the educational change, what it is, and how to proceed (Fullan, 1991 in Mumtaz 2000, p. 321). In the executive summary of their report on “models of technology change in higher education,” Collis and Wende claimed that institutions that have a clear view on their mission with ICT demonstrate higher levels of ICT use (2002, p. 7). From a review of various studies, Watson reported that a lack of reflection and an online culture in an organization are issues that inhibit innovation and change in education with ICT (2006, p. 207).

Westerheijden et al. reported the findings from a study where the participants asserted that leadership involvement is important in order to get the necessary resources to build up the technological structures necessary for institutionalizing the ICT initiatives (2007, p. 422). Law, Pelgrum, and Plomp also reported that the sustainability of the ICT-related innovation is based on the presence of a supportive school environment that is characterized by appropriate administrative support from the school leadership, a sound infrastructure, and the existence of plans and procedures (2006, p. 68). Further, in another study, Pelgrum stated that sustainable development in pedagogy and ICT requires educational actors at several levels of the education system to co-create a common vision of which specific goals need to be met in order to structure the school of the future (2008, p. 68). Likewise, Nyvang and Johnson argued that leaders’ support is crucial when pursuing change activities, and only if they support such activities will the resources be supplied, thus creating the right conditions for change (2004).

2.4.5. TEACHERS' PERSONAL ATTITUDES AND MOTIVATION

Teachers' attitudes and motivation is a very important factor in handling the process of change related to integrating ICT into existing teaching practices. Ertmer et al. (2006) reported that teachers' inner drive and personal beliefs were the most influential factor in integrating technology in the classroom. They contend that the user's intrinsic factors had a stronger influence than extrinsic factors on becoming effective users of technology in teaching. Extending the reasoning on such an influence, Albaugh (1997) in Jones (2004, p. 17) explains that *"teachers are often suspicious of new claims and the implementation of new ideas without proof of effectiveness [and] teachers tend to adopt a new technology when that technology helps them to do what they are currently doing better."* According to Leach and Moon (2000), one of the "professional characteristics" that is evident is that teachers have a "passion for learning" and like "teaching the subject." The use of ICT in teaching will therefore be dependent on beliefs and values as well as attitude.

Fullan talks about personal motivation as key to change and explains it like this: *"Educational change is dependent on 'what teachers do and think'"* (2007, p. 129). In order to bring changes in teaching using ICT or for that matter any change, the attitudes and motivation level of the involved teachers will make a difference. If the teachers have a negative attitude toward change, they will not readily welcome the change. Hence, as stated in the report from BECTA: *"One key area of teachers' attitude towards the use of technologies is their understanding of whether these technologies will benefit their teaching and their students' learning"* (Jones, 2004, p. 17). Also, as mentioned by Donnelly et al., there are three key elements regarding teachers' attitude toward innovation, namely, human infrastructure (organizational preparation to support technology-integration in the classroom), technological infrastructure (availability of resources), and social support (peers supporting or discouraging) (2011, p. 1470). If adequate resources and technological support are not available, teachers will not get motivated.

"Teacher beliefs mediate their planning and classroom practices, in particular the belief about their level of ability to use ICT in classrooms" (Pedro et al., 2004, p. 18). Jimoyiannis and Komis concluded that teachers' personal beliefs and perceptions about ICT in education have great influence on the use of ICT in teaching (2007, p. 15). Mumtaz (2000) discussed that teachers who value ICT highly and perceive it to be useful completely transform their teaching. Likewise, those teachers who are motivated and have strong commitment to their pupils' learning and their own professional development will evidently integrate computers more easily within their teaching (p. 338). No studies have been conducted in Bhutan in this context until now; therefore, it will be an opportunity to find out if a similar pattern also exists in Bhutan or if the situation is different.

2.5. APPROACHES TO ICT INTEGRATION IN PEDAGOGY

The general approach of implementing ICT in education has been very parallel across the education system globally in terms of initial infrastructure development, then training of individuals in IT skills, and finally the release of a policy by the organizational heads to implement ICT in teaching. Jimoyiannis and Komis (2007) indicated success with technology integration in the Greek education system by using the following procedure. They explain that firstly the government spent resources and time in setting up the required infrastructure, then on developing software tools and learning materials, followed by training the teachers in ICT, and finally supporting the teachers in ICT integration in teaching. McConnell claims that *“many short courses developed in the form of short courses delivered as stand alone packages, instructional system design principles, do not foster participative learning or critical, and analytical thinking”* (2006, p. 8). Further McConnell asserts that *“we need a thorough understanding of the approaches to design that sustain e-learning in ways that lead to quality learning processes and outcome”* (p. 9).

Webb and Cox (2004) describe three approaches to using ICT in teaching. The first approach is called the “integrated approach,” where teachers aim at improving students’ achievement by using ICT within the content or subject matter, enhancing the delivery of concepts and skills. Teachers focus on achieving the aims and objectives of the curriculum by reviewing the “curriculum areas.” The second approach, called the “enhancement approach,” deals with the use of ICT facilities and innovative teaching methods. A teacher may use a video clip on a topic and initiate discussion, bringing a new style of teaching. The third is the “complementary approach,” which lays stress on students “improving their class work” by allowing them to take notes and communicate with teachers using ICT. Similarly, Khirwadkar (2007, p. 95) outlines four different approaches, namely (a) the ICT skills development approach (aimed at providing skills and training), (b) the ICT pedagogy approach (focused on pedagogy, where teachers design lessons making use of appropriate ICT tools that will help fulfill learning outcomes), (c) the subject-specific approach (embedding ICT within subjects), and (d) the practice-driven approach (focused on the practice of using ICT).

2.6. DEVELOPMENT OF TEACHERS’ COMPETENCES FOR USING ICT THROUGH PROFESSIONAL DEVELOPMENT

“No reform can improve schools if the people in them are not armed with the knowledge and skills they need” (Darling-Hammond, 1999, p. 29). The process of ICT integration is a complex one, and many sources can be found which add to its understanding. The importance of having the right skills is mentioned by Wang: *“Effective integration of ICT into teaching and learning is becoming an essential*

competency for teachers” (2008, p. 411). This is supported by Almadhour, who states that “*Having ICT in education does not automatically ensure that high quality effective teaching and learning will take place; the teachers’ role is all important here in terms of perspective and skills*” (2010, p. 6). In a study conducted in African universities, it was revealed that lecturers did not use ICT for instructional purpose as they lacked the relevant skills and knowledge (Chitiyo & Harmon, 2009, p. 819). Whether using technology in teaching and learning will make a difference will be determined by teachers’ competence, which is in turn dependent on training and self-exploration and how it is used by the teachers (Robin, 2008). Likewise, Wilson and Berne stated that “*new measures of student performance would entail new ways of teaching. Professional development is the key to reform*” (1999, p. 173).

Ball (1996, p. 2) cautioned that “*changes do not happen overnight or simply as a result of deciding to teach differently.*” Therefore, we need to accept that change is a journey and that professional development is one of the means to the dynamics of change in the education. Similarly, Uslu, and Bumen argued that integrating technology into teaching cannot be achieved overnight (2012, p. 15). They said that teachers will have to undergo a series of training processes to achieve the successful integration of ICT into teaching. According to Peeraer and Van Petegem (2012), professional development has been recognized as the most preferred approach for ICT integration by many researchers. Until now, the practice worldwide when new ideas, skills, and policies are to be implemented in the education system, professional development becomes a requisite to empower teachers. Guskey stated that “*every modern proposal to reform, restructure, or transform schools emphasizes professional development as a primary vehicle in efforts to bring about needed change*” (1994, p. 2). Both Guskey (1994) and Vrasidas and Glass (2004) posit that in the education reform process, professional development for teachers is a significant element in supporting change. The benefits, according to Lawless and Pellegrino, are that teachers who attend professional development programs have higher levels of skill with technology and integration, increased confidence in their abilities, and a greater appreciation for the uses of technology as a teaching tool (2007, p. 600).

According to Little (1993), professional development is an activity that is intended partially or primarily to prepare paid staff members for improved performance in their present or future roles. Guskey explained that “*professional development programs are systematic efforts to bring about change in the classroom practices of teachers, in their attitudes and beliefs, and in the learning outcomes of students*” (2002, p. 381). In other words it can be interpreted as an approach in education to improve teaching. Conveying information and providing ideas and training in skills has been the traditional practice of professional development (Ball, 1996). Borko (2004) claims that professional development assists teachers in enhancing their knowledge and developing innovative pedagogic practices, which in turn enable

them to participate effectively in the process of educational reform and change in classroom practices.

Lawless and Pellegrino state that professional development is a critical activity for ensuring that teachers keep abreast of the changes in the educational settings, become familiar with new methods of teaching in the content areas, learn how to make the most effective instructional use of new technologies for teaching and learning, and adapt their teaching to the needs of the learners (2007, p. 575). Gallimore et al. (2009) also asserted that professional development is a crucial component in nearly every modern proposal for educational change and improvement. However, Guskey has discussed that although professional development intends to bring about positive change in the teachers' beliefs and performance, the outcomes of professional development are not always as expected (2002). He states that the results of a professional development activity also depend on the procedure through which it is carried out.

Pianfetti (2001) proposed the following key points for professional development to be successful: 1) the ability to encourage and motivate teachers to collaborate with their colleagues, 2) access to resources and administrative support, and 3) the development of a community of teachers using technology. According to Vrasidas and Glass (2004), professional development for teachers is successful when teachers seize opportunities to share knowledge, learn from peers, and collaborate on real-world projects. They also believe that the failures of past professional development have been caused by a mostly top-down approach to professional development (from policy makers to teachers), and thus they recommend ensuring collaboration among all stakeholders in professional development programs.

It has been claimed that good professional development is both situated in teachers' everyday practice and distributed among learners and teachers and their physical, socio-political, and historical worlds (Vrasidas et al., 2010). Mumtaz claimed that *"teachers who regularly participate in professional interactions and activities beyond their classroom teach in ways that differ from those of teachers who have minimal contact with their peers or profession"* (2000, p. 324). Furthermore, it has been found that professional development opportunities alone were not sufficient in promoting reform. The synergistic effect of providing training along with longer term support for teachers that yielded the most successful results (Cole et al., 2002 cited in Lawless & Pellegrino, 2007, p. 575).

Pianfetti (2001) cautioned that rather than investing in hardware and software, investment should be made in the digital literacy of educators, which is consequently indicated in the need of professional development for pre- and in-service teachers. Pianfetti defines digital literacy as the *"ability to learn, comprehend, and interact with technology in a meaningful way"* (2001, p. 256). In order to create meaningful learning experiences and prepare students for jobs in the

technology world, it is very important that teachers be digitally literate. Still, Pianfetti states that “*teachers in general have less need to teach about computers and a greater need to use technology as a learning tool that is integrated routinely into classroom practice*” (2001, p. 256). Pianfetti also believes that professional development on technology use in teaching and learning has had little success because the focus has been more on technological skills and less on integration. This conclusion is supported by a number of newer studies from all over the world.

Through various studies (particularly Luckin et al., 2012; also Koehler & Mishra, 2008), it has been elucidated that the correlations between the use of ICT in education, teachers’ ICT teaching skills, and students’ learning outcomes are very complex. It is highlighted by several sources (e.g., Mayer, 2010; Davidsen & Georgsen, 2011) that it is more likely that the technology in itself (in terms of IT, digital learning resources, and digital infrastructure) does not create learning, but rather the way learning takes place. In several studies of ICT use and its value in teaching and learning, it is pointed out that the skills of the teachers are extremely important (UNESCO, 2003; Wagner et al., 2005; EVA, 2009; Shear et al., 2011b). There are several reasons to focus on teachers’ competence and freedom of action in relation to the development of teaching methods, learning activities, and materials. Many sources (Shear et al., 2011a; Stiegler & Hiebert, 1999; Schibeci et al., 2008; EVA, 2009) agree that work-based learning has the best effect in this area.

A long-term project called “Innovative Teaching and Learning” (Shear et al., 2011a, 2011b) has carried out observations of teaching practices in seven countries in order to identify and describe how innovative teaching (with ICT) is developed. The study of teaching practices also aimed at finding out what the prerequisites are for innovative teaching. First of all, it turns out that it is very rare to find schools where innovative teaching frames the general picture. Innovative teachers are found to be islands around the schools and not connected to each other. Among the schools characterized as innovative in the study, there are a number of common characteristics. Firstly, more innovative teaching happens when teachers collaborate. Collaboration is defined as sharing experiences of good teaching. Also, the provision of mutual support is important. The study finds that initiatives for innovative practices should not come from above; however, management must ensure that the framework for development is in place, highlight it when it happens, support and use front runners to inspire others, and create opportunities for teachers to participate in the collaborative development of innovative education.

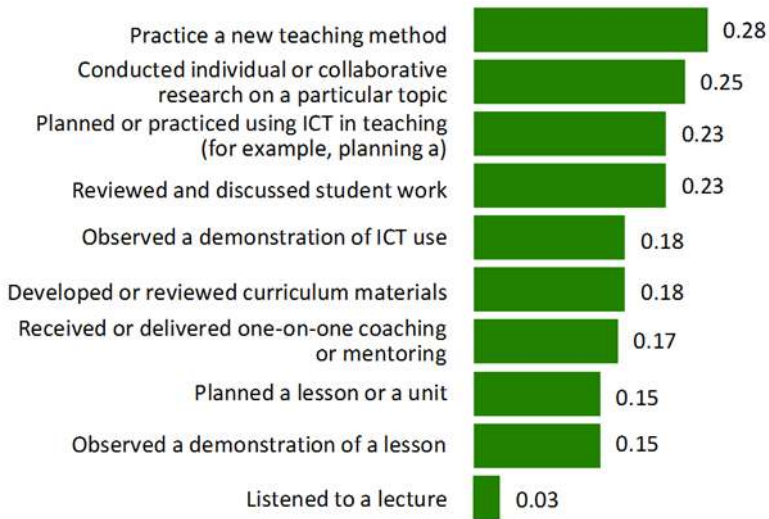


Figure 5. Illustration showing a measurement of the activities that contribute most to teachers' skills (Source: Shear et al., 2011a, p. 22)

To identify what skills and form of competence development are needed to further the integration of ICT into the teaching within an institution, a clear understanding of the approach to the development of ICT-based teaching is needed.

I shall briefly mention three main paradigms here, which I believe have different organizational impacts and consequences: instructional design, curriculum development, and learning design. Very briefly, instructional design is characterized by the use of experts in content, pedagogy, and technology, which means that the instructional design process does not necessarily involve the teachers at the institution in question (for an introduction to instructional design, see Merrill et al., 1996). Curriculum development (at least in the American tradition as described in Westbury, 2002) is often associated with a managerial approach to the development of teaching, meaning that the planning of specific activities, the implementation of curriculum, the development of tests, etc., all follow from a larger (often national) framework for the educational system in question. Again, this means that the room for the influence of teachers in specific institutions is very limited. Both instructional design and curriculum development most often entail working within a given framework, set requirements for content, etc. and thus leave little room for teachers at a given institution to define the core elements in their own teaching. Although there are clear advantages to a centrally developed approach, there is also a loss of freedom for teachers, and there is a missed opportunity for capacity building at the institutional level when it comes to designing teaching with ICT.

In order to effectively influence the development of ICT-based teaching and learning, institutions need to have faculty members who are competent in this regard. It is suggested by BECTA (2004) that teachers receive pedagogical training rather than training on the use of ICT tools, which is supported by Gomes, who claims that the obstacles to the use of ICT include the “lack of training in digital literacy and lack of pedagogic training” (cited in Bingimlas, 2009, p. 239). Balanskat and Blamire state that the professional development provided to teachers should address their “learning needs” (2007, p. 240). The question of how to build this competence is at the heart of the matter, and the current research project at RUB also attaches great importance to this. A leading researcher in e-learning and learning design, Grainne Conole, has proposed that teachers new to e-learning design need guidance and advice from experts, experienced peers, and from users to take advantage of the affordance of the new technologies and make pedagogically informed decisions (Conole, 2010).

2.7. NEED FOR RETHINKING PEDAGOGY AT SCE

According to Little, “*teacher educators need to teach in ways so that the student teachers become an important component of the pedagogy of teacher education*” (1993, p. 29). Little also discussed that educational research is constantly placing emphasis on the standards of teaching and teacher education. I have discussed in detail the evolving trends in learning and the need for change in teaching. These indications signal that teachers’ pedagogic practices need to evolve with the changing dimension of the global educational practices influenced by the penetration of technology. Pedler posited that “*those unable to change themselves cannot change what goes on around them*” (2011, p. 67). In response to this, Little claims that educational reforms have taken somewhat different patterns of development in different countries, but there are important similarities that are visible across nations and cultures (1993, p. 9). The similarities here include professional development as the key to reform.

Shear et al. (2011) argued that teacher educators need to teach using the methods and approaches that they encourage their student teachers to use (p. 31). They also discussed that teacher educators are constantly faced with finding a balance between responding to student teachers’ real need to develop their skills in teaching and empowering them to be active learners and developers of their own teaching (p. 35). In other words besides empowering the student teachers with pedagogy, teacher educators also need to create a stimulating teaching atmosphere to deliver their content effectively. Additionally, the researchers mentioned that if the teacher educators aspire to help the students, then it calls for the teacher educators to develop themselves. Further, Shear et al. specified that teacher education has to start looking into the practice with new eyes and find ways of creating learning about teaching opportunities for the student teachers that are meaningful in their development as professionals (2011, p. 39). A quote from the editor reads, “*There*

can be no learning without action and no action without learning” (Revans, 2011). Likewise, I propose there will be no change without action. Thus, this study proposes an action to initiate change in teaching using ICT.

2.8. SUMMARY AND PROBLEM FORMULATION

The introduction and literature review chapters have presented an overview of the ICT situation in Bhutan with some highlights of the global account. The advantage of educational technology has been illustrated throughout the discussions, emphasizing the enormous potential of ICT to transform education with specific reference to teaching. Though the current study is localized to SCE, it intends to produce generalizable knowledge with regard to strategies that will enhance the usage of ICT in teaching, which will be applicable to other colleges of RUB, to higher education in the region, and also to higher education globally where there is an attempt to enhance the usage of ICT in teaching. In the introduction, a narrative account was given on Bhutan with regard to the evolution of ICT and the current state of ICT. This was done to provide the readers information regarding the fact that Bhutan has been a late starter to harness the potential of technology, and though has not managed to reach the same platform of practice as rest of the world, it has not remained too far behind, either. Additionally, the introduction described the strategic attempts Bhutan has made to integrate ICT in society. Furthermore, the discussions presented the various attempts RUB, as the only university in the kingdom, has made and those that SCE, as one of the leading teacher education colleges, has made in transforming the teaching and learning situation with integrating technology.

The government has invested money and resources in sending people for training on ICT within the country as well as outside the country. Moreover, the government has brought in experts from outside to impart training to the people. The faculty of SCE is one of the beneficiaries of such opportunities, as has been highlighted in earlier discussions. Unfortunately, the impact of such trainings has never been studied and has remained undercover regarding what has happened to the individuals after the training. Besides taking advantage of the exposure and training opportunities, at the implementation level, as discussed in earlier sections, the practice of the lecturers in terms of teaching with the use of ICT has not exhibited any dramatic changes. A vibrant ICT teaching culture does not yet exist according to my observations.

While discussing the factors that may create barriers to the integration of ICT in teaching, a description of both the intrinsic and extrinsic factors that would act as barriers was presented. We have seen that the competence and confidence of the teachers in terms of technology either enhances or limits the use of technology in teaching. It has been noted that the faculty at SCE have taken advantage of opportunities in skills training both in and out country—which leads to the

assumption that skills should not be a major limiting factor for the faculty. However, it has been observed that the level of skill and its use differs amongst the faculty, yet a majority of the faculty regularly use tools such as Microsoft office for personal and professional work. Most use social networking sites such as Facebook, Skype, Yahoo Messenger, Google Chat, etc. They also use the Internet to browse for teaching resources and information gathering, read online newspapers, and read other people's blogs, and some participate on online discussion forums. Further, pictures and videos are either downloaded or uploaded. And all use email to communicate. But, unfortunately the use is limited to personal purposes and has not been transferred into teaching by all.

We have seen in our previous discussion that lack of resources and technical support can also be a limiting factor to the use technology in teaching. I have presented the resource situation at SCE from the infrastructure, to hardware, to Internet bandwidth. Though the Internet connection is not very stable, it goes down only for a period of the time, and there is never a long blackout period without connectivity. The college has three IT support persons available on call when assistance is required. Therefore, the resource constraint is there as in any institution, but it cannot be assumed to be the core limiting factor to the use of technology in teaching. According to Kleiman (2000, p. 7),

The key determinant of our success will not be the number of computers purchased or cables installed, but rather how we define educational visions, prepare and support teachers, design curriculum, address issues of equity and respond to the rapidly changing world.

We have also seen in our discussions that time management and teacher attitudes present barriers to integrating technology in teaching. It will be difficult to claim any conclusion here without an empirical basis; however, we can assume these are also possible limiting factors at SCE.

In the previous discussion (see section 1.1.5), there was a theoretical claim made on the grand success of integrating ICT in teaching and the innovative change in pedagogy in Bhutan (Wong, 2008). But, from a practical stance, it seems that although there is the possibility of skills up gradation in computer use and some enhanced use of technology for teaching and personal purposes by the participants, success has not been fully achieved as stated by Wong. In other words, being a member of the same community, reflecting on my own competence and practice, and also observing that of my colleagues, I have seen that no drastic change has occurred in technological use in teaching and learning at SCE. It is an accepted phenomenon that professional development is the key to innovating reform. In the literature review section, we discussed the significance of professional development in line with rethinking teaching with technology. Similarly, all SCE's faculty has

taken advantage of the professional development experience within the college, and some have outside the college. According to Little (1993), some of the factors that have led to unsuccessful professional development programs include the design of the professional development being dominated by policy considerations, failure to create conditions for teachers to collaborate with the wider professional community, many short-term trainings for teachers where they are simply passive recipients of information, and a fast-paced implementation of the innovations. At SCE, when training opportunities are made available by sponsors for training abroad, the faculty members have little choice as to what areas they will be trained in; rather, the decision is based on the priorities of RUB/SCE. However, as of late, the internal professional development activities that happen within the college are being determined by the faculties according to their needs. RUB has made large investments in professional development activities for the faculty, but unfortunately the physically visible impacts are minimal.

The Royal University of Bhutan envisions producing graduates as global citizens, which means producing graduates who can either obtain enrolment in universities internationally or who should be employable globally. RUB also envisions attracting international students to study at the RUB campus. At both RUB and SCE, the objectives are to harness the potential of technology to attain the goals stated above as well as to enhance teaching and learning. VLE was launched with the novel purpose to respond to the university's visions and the needs related to the changing times. But unfortunately, neither RUB nor SCE has outlined a road map for the faculty to follow. Therefore, we can hypothesize that:

- ✓ the unsuccessful attempts to integrate ICT into teaching at SCE could be related to the design of the professional trainings,
- ✓ faculty are not motivated enough by the positive impacts of ICT in teaching and learning and the need for change, and finally
- ✓ a strategic road map is needed to enhance the use of ICT in teaching by the faculty at RUB.

It has been put forward that schools should profoundly revise the present teaching practices and resources to create more effective learning environments and improve life-long learning skills and habits in their students. The teacher educators are the producers of teachers for teachers, and the agenda for rethinking teaching learning will be befitting if it begins from the source (Pedro et al., 2004, p. 1).

Scholars have used different titles for educators in higher education, such as teachers, academics, faculty, tutors, and lecturers. Likewise, the term professional development has also been used varyingly, such as teacher development, staff development, and faculty development (Dart & Boulton-Lewis, 1998; Shannon & Doube, 2004; Steinert et al., 2006; Chotto, 2010). Similarly, for the current study I

have used terms such as teacher educator, faculty, tutor and lecturer for the teacher and have used the term students and student teachers for the learners.

2.9. PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

According to Tshering “*the Bhutanese education system needs reform and increased relevance if it is to meet the specific human resource and development requirements of the country in a globalized economy*” (2014, p. 18). As has been elaborated in the two previous chapters, the penetration of information and communication technology is creating new ways and opportunities to design innovative environments to support learning. The point of departure for this study is supported by the view that digital technologies have the potential to support and shape a pedagogy that is more active, participatory, personalized, flexible, and inclusive (Laurillard, 2008 in Lai, 2011, p. 1268). The teaching and learning situation at SCE needs to be responsive, relevant, and progressive in order to keep up with the changes. Educational technology and, more specifically, the use of ICT in teaching have gained popularity in the educational arena. Bhutan and particularly SCE is no exception and has experienced the penetration of technology, and the college has been making attempts to get into the race of educational technology’s influence. The faculty in the college has been making attempts to align teaching with using technology for quite some time now.

There is no evidence that research in such areas has been carried out in the college, so this is a pioneering work at SCE. However, similar research has been carried out in other parts of the world—see, for example, the works of Leung (2004), Chotto (2010), and Gyamfi (2014); Chotto’s study had a similar agenda, and to a certain extent the methodological approach was also similar to that of my study, yet Chotto’s study focused on the core theme of professional development with a community of practice framework and used design-based research as the methodology for the study. Further, the research participants comprised university teachers with regional representation. In Gyamfi’s study, he focuses specifically on implementing blended learning to support the delivery of a specific subject and has included a student group as well lecturers as participants in the study. Moreover, the methodological approach he used for his study is action research. Leung’s research is on the “effects of professional development on primary school teachers” in the integration of ICT in teaching in Hong Kong,” and used participatory action research as its core methodology. On the other hand, this current study is designed on a smaller scale, focusing on only one university college, and it has a narrow focus, but an in-depth study and participatory design has been employed as the methodological approach.

Following on the concept of rethinking pedagogy with ICT, the study takes view of the fact that students today are so engrossed with technology, living in a virtual ocean of audio, video, and text content and pushing learning into new dimensions

(Brown, 2001, p. 80; Pence, 2009, p. 107). Pence states that “when students in a classroom have instant access to the worldwide web, the teacher must take new roles” (2009, p. 106). The rationale for this study therefore is to explore strategies to enable enhanced ICT usage in the teaching by the lecturers at SCE. Additionally the study seeks to identify trends in ICT integrated teaching at SCE.

This study has taken motivation from the literature on barriers to ICT integration in teaching and rethinking pedagogy for the digital age, which calls for understanding the multifaceted concerns that need to be addressed in order to implement ICT-integrated pedagogy. This research can contribute immensely to the professional development field aimed at ICT-integrated pedagogy. The purpose of the study is to

- ❖ Investigate how a participatory design approach to professional development within the framework of “future workshops” can address the issue of enhancing ICT usage in teaching at SCE.
- ❖ Contribute knowledge to the field of educational technology and professional development by researching how professional development through a user-centered approach can become a transformative strategy for enhancing the use of ICT in teaching.

The study is not intended to be exhaustive but rather a point of departure for exploring strategies to enhance ICT integration in teaching at SCE. It will also subsequently create a road map for ICT-integrated pedagogy at RUB in general and SCE in particular. The focus of this study is underpinned by the proposition of conducting a baseline study, conducting an intervention workshop, and providing support during the implementation of ICT in teaching.

Finally, the study is intended to find answers to the following research questions:

- I. How can professional development assist lecturers in rethinking and redesigning their teaching using ICT at SCE?**
- II. What are the impacts of professional development through a participatory design approach initiative on the integration of ICT in teaching?**

The following secondary questions are used, which will derive answers to the main research questions as well as guide the study:

1. What is the stand with regards to resources, support, skills, and attitudes for ICT integration in teaching at SCE?
2. To what extent is ICT integrated into the pedagogy?
3. How do 21st century skills apply to teaching and learning at SCE?

4. Do the lecturers/lecturer experience progression in the use of ICT in teaching after participating in the workshops and scaffolding, support, and motivation from the researcher during the pilot study process?
5. What are the limiting conditions that constrain the enhanced use of ICT in teaching at SCE?
6. What problems or concerns do lecturers identify in relation to the integration of ICT in their teaching?
7. What are the implications of ICT use in teaching at SCE?

2.10. UNDERSTANDING THE CRITERIA FOR VERIFYING THE CURRENT STUDY

The current study is a scholarly work with the intent to contribute practical knowledge to the society and the scholars of social science. According to Nachmias and Nachmias, *“the ultimate goal of social science research is to produce a cumulative body of verifiable knowledge, a knowledge that enable us to explain, predict, and understand the empirical phenomena that interest us”* (2002, p. 8). Except for the survey tool administered for the baseline study, a qualitative research method had been prominently used for the current study. Kvale describes qualitative research as an approach to understand, describe, and sometimes explain a social phenomenon “from the inside” in a number of different ways: analyzing the experiences of individual or groups, analyzing interactions and communications, and analyzing documents” (2007, p. X). Kvale states that *“in modern social science, the concepts of validity, reliability, and generalizability have obtained the status of scientific holy trinity”* (1995, p. 20). According to Creswell and Miller (2000, p. 125), qualitative researchers bring to their studies three different lenses towards validity, a lens established considering:

- The people who conduct: duration of the time spent in the field by the researcher,
- Participants in the study: considering the importance of checking how accurately participants’ realities have been represented in the final account
- External readers and reviewers

Golafshani contended that in qualitative research, reliability depends on the researcher’s skill and credibility, and validity is dependent on the research methodology employed by the researcher (2003, p. 602). According to Kvale, validity is whether a study investigates the phenomena intended to be investigated. In essence, validation depends on the quality of the craftsmanship of an investigation (1995, p. 27).

The current study is located in the realm of “professional development and educational technology” as the study is focused on finding ways to enhance the use of ICT in teaching by the faculty at SCE. The overarching framework for the study

is based on activity theory and activity systems. The professional development activity is designed using inspiration from the concept of “future workshops.” A Participatory Design (PD) methodology approach will be the guiding principle for the future workshop process. During the process of designing and implementing the strategy for the change process, it is assumed that changes will occur in the individual use of ICT in teaching amongst the faculty. Strategies will be designed to overcome the barriers of ICT usage in teaching, eventually raising the level of usage. Though the study does not aim to immediately change the practices, the prototypes will show pathways for initiating and managing ICT implementation practices for the organization in long run.

According to Spinuzzi, participatory design is still a relatively young approach, and at present it is more of a research orientation than a coherent methodology; thus, it hasn't developed evaluative criteria to the same level as that of experimental studies (2005, p. 169). Spinuzzi (2005) outlined three criteria for designing PD research projects to have internal integrity, namely: Quality of life for workers, Collaborative development, and Iterative process.

2.11. CONTEXTUALIZING AND AFFIRMING THE VALIDITY FOR THE STUDY

In the following, I present a narrative account in two layers with an objective to validate the current study from a qualitative study point of view and participatory design approach.

2.11.1. VALIDATING THE STUDY WITH QUALITATIVE CRITERIA

The present study was designed to determine an effective approach to enhance the use of ICT in teaching by the faculty at SCE. A systematic approach was employed in conducting the current study. Prior to commencement of the intervention activity, there was a need to find out the current state of the situation in the study location. For this reason, a baseline study was carried out through a survey and focus group interview. The survey tool was piloted before administering the actual survey, and the focus group interview was conducted adapting to the procedure formulated in Kvale (2007). Using several kinds of methods and data, including both quantitative and qualitative approaches, strengthened the study (Patton, 2002 cited in Golafshani, 2003, p. 603).

The intervention carried out followed the established “future workshop” framework procedure in two stages. The findings from the first stage allowed for the modification of the procedure in the second stage, in essence “building” the approach. The workshop proceedings along with the follow-up events (pilot projects) are described in detail, targeting both the readers and individuals who

would want to use the model in similar contexts. As an interaction design researcher, I was part of the design team as a designer and a researcher. I had the dual role of simultaneously holding an organizational position as a faculty member and a more temporary researcher role for the duration of my PhD study. I was working as an insider researcher—an internal researcher. Through the lesson redesign process, in order to ensure that the new design meets the needs of the participants and is usable, the participants, as end-users, were actively involved in developing their own design, and the researcher took a peripheral position as a facilitator and observer.

Silverman accords that in a qualitative study, for reliability, the categories of events or activities have to be listed, and low inference descriptions have to be used (2011, p. 37). Wearing two hats on the same issue, I assume subjectivity and bias cannot be fully avoided. Utmost care was taken to achieve a low degree of subjectivity during data collection and analysis. Triangulation is typically a strategy for improving validity and reliability (Golafshani, 2003, p. 603). It has been argued that *“Triangulation has risen an important methodological issue both in naturalistic and qualitative approaches to control bias and establishing valid propositions because traditional scientific techniques are with this alternate epistemology”* (Mathison, 1988 cited in Golafshani, 2003, p. 603). Further, it has been stated that validity and reliability can be achieved through eliminating bias and increasing the researcher’s truthfulness through triangulation (Denzin, 1978 cited in Golafshani, 2003, p. 604). Factual observation with description were evidenced by recording videos and taking photographs of the real events. The focus group interview and semi-structured interview were predominantly used for data collection to understand the lived experiences of the subjects. As another tool for triangulation, a survey was also administered for the baseline study to get the general picture of the study location.

Denzin and Lincoln stated that qualitative researchers display a wide range of interconnected interpretative practices, always hoping to get a better understanding of the subject matter at hand (2005, p. 3). Pragmatism had been identified as the paradigm for this research study due to the following reasons: The focus of this study was on the consequences of research, on finding answers to the research questions, and on the use of multiple methods of data collection to inform the problem under study. For the data analysis, I had three sources of inspiration: hermeneutics (Prasad, 2002), activity theory (Engeström, 1987), and the so-called SAMR model (Puentedura, 2006). Employing these approaches I assume surges the accountability of the researcher and the current research. According to Golafshani, (2003), reliability and validity are conceptualized as trustworthiness, rigor, and quality in qualitative research.

Activity theory has been used as the overarching theoretical framework for the overall design of the study. Text data were interpreted using the hermeneutic methodology. The activity system was employed as one of the tools to analyze the

data. The activity system enabled me to illustrate the actual event in a given situation, reducing the subjective view. Similarly, the SAMR model assisted in displaying the types of technology used for the given situation, and the levels were categorized depending on how the model was used for which a detail description is written while describing the lesson in the analysis. The hermeneutic circle was used extensively in the transcription of the texts in regards to moving from pre-understanding to understanding and then reflecting on the pre-understanding. The hermeneutic concept of looking at parts to get the meaning of whole and vice versa was also employed in the interpretation and analysis of the empirical data.

The interview transcripts have retained their original form, and reconstruction was only done for grammatical errors; no attempts were made to change the meaning. Therefore, the issue of validity and reliability has been considered all through the study, as described above. Overall, the current monograph offers a detailed and rich description of the study process regarding how different theories are integrated in the pursuit for the research goal. Systematic effort has been made to arrange the information in a logical sequence.

Though the current study is confined and positioned in a particular setting, I propose that the “generalizability” (Kvale, 2007) of the methodological approach and findings will be applicable in any study related to ICT integration in teaching. I cannot make bold claims; however, the judgment of its usability in other contexts and situations will be up to the readers and researchers to decide. Toward the end of the monograph, I present the significance of the findings in specified categories.

2.11.2. VALIDATING THE STUDY WITH PARTICIPATORY DESIGN METHODOLOGY CRITERIA

Quality of life for workers: PD is meant to improve workers’ quality of life in terms of both democratic and functional empowerment (Spinuzzi, 2005, p. 169). In the current study, the workers or users are the faculty members of SCE. In this particular study, I would like to caution the readers that the concept of “empowerment” does not relate to providing skills or to working against the organizational policy. The context of empowerment here relates to functional empowerment, an approach to overcome one’s own barriers to ICT integration in teaching. An exploratory exercise was conducted to find out the users’ state of practice with ICT in teaching and their limitations. In the next step, an intervention workshop was designed and conducted. The workshop was initiated by activating the minds of the users in regards to the need for rethinking pedagogy with ICT, illustrating the benefits of using ICT in teaching, and demonstrating examples of how ICT usage in teaching can be enhanced with the skills they already possessed. The designer/researcher here developed and implemented strategies to overcome the limitations of ICT use by the faculty for their teaching and enable them to enhance ICT usage in teaching and eventually change their practice. Empowerment

here is raising the faculty's teaching practice on the platform of ICT-integrated teaching.

Collaborative development: PD is not a “listening tour” in which researchers hear the concerns of the users, then go away and design a solution; rather, it is a situation where the users are included as co-designers and co-researchers (Spinuzzi, 2005, p. 170). After the activation event, we (myself: the researcher/designer and the users: the faculty/lecturers) came to a mutual understanding on the need to enhance the usage of ICT in teaching at SCE. During the intervention workshop designing activity, the participants worked in groups and were actively involved in redesigning their own lessons. The researcher positioned his role as a facilitator by guiding them through the procedural steps in redesigning. The researcher and users worked very closely during the pilot project, where the researcher provided motivation and support to the users during the planning of the lesson as well as some feedback during and after the lesson presentation, allowing the user to reflect and plan future lessons.

Iterative process: This requires a series of opportunities to sustain continuous member check by ensuring continual participation, revisiting stages, and sustained reflection by the users on their implementation (Spinuzzi, 2005, p. 171). The following chart (Fig.6) illustrates the iterative process carried out for the current study.

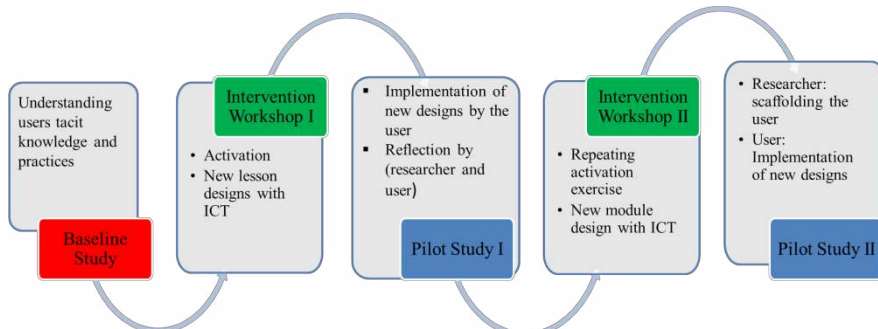


Figure 6. Illustrating the whole research approach to demonstrate the iterative process criteria in PD

CHAPTER 3. PRESENTING AND DESCRIBING THE PARADIGM, THEORETICAL FRAMEWORK, METHODOLOGICAL APPROACH, AND METHODS INTERWOVEN IN THIS RESEARCH

In this section, I present a broad overall overview of the methodological approaches used in the current study. Additionally, in later sections some specific descriptions of the methodology are discussed to provide context for some of the sections wherever it is required. The framework for the presentation of this section is inspired by Crotty (1998), where he indicated and explained that there are four elements that must structure any research proposal: methods, methodology, theoretical perspective, and epistemology. Crotty, in Creswell and Clark, described the following four elements: At the broadest level are the issues of philosophical assumptions (paradigms—world view), such as the epistemology behind the study or how researchers gain knowledge about what they know; the philosophical assumptions, in turn, inform the use of the theoretical stance that the researcher might use; the stance then informs the methodology used, which is a strategy, a plan of action, or a research design; finally, the methodology incorporates the methods, which are techniques or procedures used to gather, analyze, and interpret the data (1998, p. 38; 2011, p. 67).

Moving forward with the inspiration from the design of four levels for developing a research study from Creswell and Clark (2011), I derived a design (Fig. 7) to interpret and explain the elements of the methodology for my study. The proposed design is contextualized by the research title, research problem, and research questions for my study. Several theoretical communalities between pragmatism and activity theory have been suggested. According to Miettinen, (2006) both appreciate context over foundation, both recognize the primacy of the idea of practical activity and the changing nature of reality instead of trying to study fixed permanent essences in the world, and both are committed to the practical transformation of the world.

Inspired from Creswell and Clark (2011), I have developed a model of how I conducted my research, and also an interpretation of how I understand the context

of the theories applied in this research. Further, the illustration is also intended to give the readers clarity on the overview of my methodological and theoretical approach.

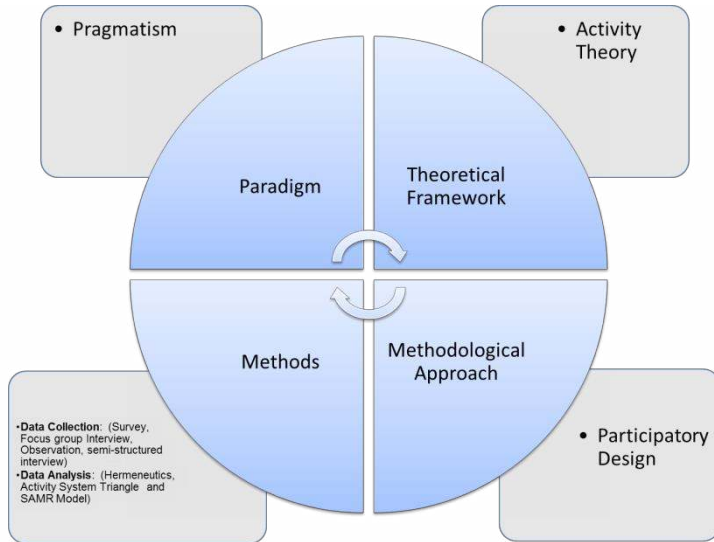


Figure 7. Four categories for developing a research study (Source: adapted from Creswell & Clark, 2011, p. 68)

This is just the overview. In the following, I present a description of the individual concepts and explain how each relates to my current work.

3.1. PARADIGM

According to Creswell and Clark, philosophical assumptions are sets of beliefs or assumptions that guide inquiries, and the term used to describe these assumptions is “world view,” which is synonymous with the term “paradigm” (2011). A research paradigm influences the way knowledge is studied and interpreted. Patton (1990) explained paradigm as a world view, a general perspective, and a way of breaking down the complexity of the real world. Likewise, Lincoln and Guba define a paradigm as a “basic belief system or world view that guides the investigator” (2000, p. 105). A paradigm is thus the identification of the underlying basics used to construct and conduct a research study; it guides the selection of the tools, participants, and methods used in the investigation. With reference to Guba and Lincoln (2000), Creswell (2009) calls the term “worldview” for paradigm and describes it as “a basic set of beliefs that guide the action.” Mertens defined paradigm as “a way of looking at the world, and it is composed of certain philosophical assumptions that guide and direct thinking and action” (2010, p. 7). A

paradigm is thus the identification of the underlying basics used to construct and conduct a research study; it guides the selection of the tools, participants, and methods used in the investigation.

The concepts of paradigm are referred to in various ways by different authors, for example: “knowledge claims” (Creswell, 2003), “models” (Silverman, 2000), “research philosophy” (Saunders, Lewis, & Thornhill, 2000), or “epistemology” (Ritchie & Lewis, 2003). Crotty defined epistemology as a theory of knowledge embedded in theoretical perspective that informs the research as either objectivism or subjectivism (1998). Theoretical framework is sometimes referred to as the paradigm and influences the way knowledge is studied and interpreted (Mackenzie & Knipe, 2006). According to Mertens (2010), the oldest paradigm for educational and psychological research is the positivist paradigm, and the second to enter the research world was the constructivist paradigm, which was then followed by the transformative paradigm, and the pragmatic paradigm is the most recent addition as a philosophical base for some mixed methods. Table (8) displays four of the major paradigms, along with a list of the variety of terms used to describe each of them (Mertens, 2010, p. 8).

Post-positivist	Constructivist	Transformative	Pragmatic
Experimental	Naturalistic	Critical theory	Mixed methods
Quasi-experimental	Phenomenological	Neo-Marxist	Mixed models
Correlational	Hermeneutic	Feminist theories	Participatory
Causal comparative	Symbolic interaction	Critical race theory	
Quantitative	Ethnographic	Freirean	
Randomized control trials	Qualitative	Participatory	
	Participatory action research	Emancipatory	
		Postcolonial/indigenous	
		Queer theories	
		Action research	

Figure 8. Table illustrating the labels commonly associated with different paradigms (Reproduced from Mertens, 2010, p. 8)

Mertens stated that the lines between the four major paradigms in the research community are not altogether clear. However, she mentions that, to guide their thinking and practice, the researchers should be able to identify the worldview that most closely approximates their own research projects. Following is a summary of the features of the main paradigms as they are categorized by Mertens (2010, p. 11).

Basic Beliefs	Post-positivism	Constructivism	Transformative	Pragmatic
Axiology (nature of ethical behavior)	Respect privacy; informed consent; minimize harm (beneficence); justice/equal opportunity	Balanced representation of views; raise participants' awareness; community rapport	Respect for cultural norms; beneficence is defined in terms of the promotion of human rights and increase in social justice; reciprocity	Gain knowledge in pursuit of desired ends as influenced by the researcher's values and politics
Ontology (nature of reality)	One reality; Knowable within a specified level of probability	Multiple, socially constructed realities	Rejects cultural relativism; recognizes the various versions of reality are based on social positioning; conscious recognition of consequences of privileging versions of reality	Asserts that there is single reality and that all individuals have their own unique interpretation of reality
Epistemology (nature of knowledge; relation between knower and would-be known)	Objectivity is important; the researcher manipulates and observes in a dispassionate objective manner	Interactive link between researcher and participants; values are made explicit; created findings	Interactive link between researcher and participants; knowledge is socially and historically situated; need to address issues of power and trust	Relationships in research are determined by what the researcher deems as appropriate to that particular study
Methodology (approach to systematic inquiry)	Quantitative (primarily); interventionist; decontextualized	Qualitative (primarily); hermeneutical; dialectical; contextual factors are described	Qualitative (dialogic), but quantitative and mixed methods can be used; contextual and historical factors are described, especially as they relate to oppression	Match methods to specific questions and purposes of research; mixed methods can be used as researcher works back and forth between various approaches.

Figure 9. Table illustrating the basic beliefs associated with the four major paradigms (Reproduced from Mertens, 2010, p. 11)

According to Mertens, the positivist paradigm posits that the social world can be studied in the same way as the natural world and that explanations of a casual nature can be provided (2010). It has been claimed that “*scientific knowledge is utterly objective and that only scientific knowledge is valid, certain and accurate*” (Crotty, 1998, p. 29; Mertens, 2010). The positivist paradigm considers the researcher and the participants in the study to be independent (Lincoln & Guba, 2000). Further Creswell and Clark (2011) contended positivism as being often associated with quantitative approaches and that researchers make claims for knowledge based on determinism or cause and effect thinking, reductionism by narrowing and focusing on select variables to interrelate, detailed observations and measures of variables, and the testing of theories that are continually refined.

The basic suppositions of the constructivist paradigm are that knowledge is socially constructed by people active in the research process and that researchers should attempt to understand the complex world of lived experiences from the point of view of those who live it (Schwandt, 2000; Mertens, 2010). Weber argued that the constructivist paradigm claims that some or all of the objects, concepts, or truths of the world are determined to at least some extent by the minds that experience them (2010). According to MacKinnon and Scarff-Seatter, constructivism is a learning or meaning making theory where individual create their own new understanding based

upon the interaction of what they already know and the phenomena or ideas with which they come into contact (1997, p. 52). Richardson explains constructivism as a descriptive theory of learning and not a prescriptive theory of learning. In the interpretivist/constructivist paradigm, the intention of the research is to make sense of the meanings others have about the world (1997, p. 4). Likewise, Creswell stated that in the constructivist approach researchers focus on the processes of interaction among individuals and on the specific contexts in which individuals live and work, and recognize that the researcher's own background shapes their interpretation (2003). Additionally Creswell and Clark (2011) elaborated that constructivism is typically associated with qualitative approaches and works from different world views. The understanding or meaning of phenomena formed through participants and their subjective views make up this world view.

It has been discussed by many researchers that the transformative paradigm directly addresses the politics in research by confronting social oppression at whatever levels it occurs (Oliver, 1992; Heron & Reason, 1997; Mertens, 2010). Mertens describes that in transformative paradigm, though reality is constructed within a historical and social context, yet they are more focused on power relations. Mertens also stated that "*transformative researchers consciously and explicitly position themselves side by side with the less powerful in a joint effort to bring about social transformation*" (p. 21). With a basis from Mertens et al. (1994), Mertens indicated the following four characteristics of the transformative paradigm (2010, p. 21):

- ✓ It places central importance on the lives and experiences of the diverse group that traditionally have been marginalized (i.e., women, minorities, and persons with disabilities).
- ✓ It analyzes how and why inequities based on gender, race or ethnicity, disability, sexual orientation, and socioeconomic classes are reflected in asymmetric power relationships.
- ✓ It examines how results of social inquiry on inequities are linked to political and social action.
- ✓ It uses a transformative theory to develop the program theory and the research approach. A program theory is a set of beliefs about the way a program works or why a problem occurs.

Creswell and Clark (2011, p. 69) stated that transformative paradigms or participatory worldviews are influenced by political concerns and that this perspective is more often associated with qualitative approaches than quantitative approaches to research. According to Mertens, the transformative paradigm arose practically because of dissatisfaction with the dominant research paradigms and practices and because of the limitations in the research associated with these paradigms, which were articulated by feminists, people of color, indigenous and postcolonial people, people with disabilities, sexual disorientation, and others who have experienced discrimination and oppression, as well as by those who advocate

for social justice (2010, pp. 21–22). The transformative worldview also known as participatory action, which is focused on bringing change in practices, and participants are considered as collaborators in the research (Creswell, 2003).

Pragmatism has been identified as one of the paradigms that provide an underlying philosophical framework for mixed method research (Tashakkori & Teddlie, 2003 in Mertens, 2010, p. 35). Mertens claims that the evolution of pragmatism began when early pragmatists and philosophers rejected the scientific notion that social inquiry was able to access the “truth” about real world solely by virtue of a single scientific method (2010, p. 35). According to Maxcy (2003), pragmatism is divided into the early period from 1860–1930 and the neo-pragmatic period from 1960 onwards to the current time. Creswell and Clark contend that pragmatism is typically associated with mixed methods research. The focus is on the consequences of research, on the primary importance of the question asked rather than the methods, and on the use of multiple methods of data collection to inform the problem under study; thus it is pluralistic and oriented toward “what works” and practice (2011, p. 69). Tashakkori and Teddlie (1998) stated in Biesta (2010, p. 96) that the “*Paradigm of pragmatism can be employed as the philosophical underpinning for using mixed methods & mixed models.*” Biesta also claims that the pragmatic approach allows one to choose a combination or mixture of methods and procedures that works best for answering the research question (2010).

Researchers in the pragmatic paradigm argue that in order to appreciate the meanings and validity of ideas, it is necessary to understand the difference they make in practice, and this meaning is always related to the context where the action takes place. This line of thought follows John Dewey’s pragmatic rule: “*In order to discover the meaning of the idea, ask for its consequences*” (Dewey, 2004, p. 94). Creswell has stated that the pragmatic paradigm is concerned with solutions to problems—with “what works” (2003). According to Biesta, one of the central ideas in pragmatism is that engagement in philosophical activity should be done to address problems, not build systems (2010). Gimmler (2005) argued that rather than solving the old problems, pragmatists pursue the strategy of putting the whole paradigm aside and opening the prospect of new suggestions and concepts. She discussed that Pragmatists are interested in how human artifacts like architecture, communications technologies, or medical technologies influence our everyday life. Further, she stated that both John Dewey and Richard Rorty emphasize the anti-authoritarian function of pragmatic theory as being merely an instrument for better human practice and not an end in itself. Dewey (1938) described that understandings of everyday life are a creative laboratory in which we try to solve problems, and creativity is situated on the social level of joining and building free associations as well as on the technological level of finding new solutions for better living conditions.

According to Creswell, pragmatism is not committed to any one system of philosophy or reality. Pragmatist researchers focus on the “what” and “how” of the research problem (2003, p. 11). Early pragmatists “*rejected the scientific notion that social inquiry was able to access the ‘truth’ about the real world solely by virtue of a single scientific method*” (Mertens, 2005, p. 26). Mertens argued that while pragmatism is seen as the paradigm that provides the underlying philosophical framework for mixed methods research, some mixed methods researchers align themselves philosophically with the transformative paradigm (2005, p. 26). It may be said, however, that mixed methods could be used with any paradigm. The pragmatic paradigm places “the research problem” as central and applies all approaches to understanding the problem (Creswell, 2003, p. 11). With the research question “central,” data collection and analysis methods are chosen as those most likely to provide insights into the question, having no philosophical loyalty to any alternative paradigm. Similarly, Patton (2002) stated that methods should be decided by the purpose of the research.

As discussed above, some additional significant characteristics of using the pragmatic approach are as follows: It provides the freedom to choose methods of research that are seen to be most appropriate for studying the phenomenon at hand (Mertens, 2010). The “*Pragmatic approach allows a number of projects to be undertaken without the need to identify invariant prior knowledge, laws, or rules governing what is recognized as ‘true’ or ‘valid’; only results count*” (Maxcy, 2003; Mertens, 2010, p. 36). Maxcy (2003) in Mertens (2010) said that effectiveness is to be used as the criteria for judging the value of research, rather than correspondence of findings to some “true” condition in the real world. The pragmatic approach does not put emphasis on the nature of reality and objective truth; rather, it emphasizes what difference it makes. Pragmatism allows the researchers to choose the method that works best for answering their research questions (Johnson & Onwuegbuzie, 2004).

Johnson and Onwuegbuzie (2004, p. 15) stated that today’s research world is becoming increasingly inter-disciplinary, complex, and dynamic. Therefore, many researchers need to complement one method with another, and all researchers need a solid understanding of the multiple methods used by other scholars to facilitate communication, to promote collaboration, and to provide superior research. Pragmatism helps to shed light on how research approaches can be mixed fruitfully. Johnson and Onwuegbuzie contend that the consideration and discussion of pragmatism by research methodologists and empirical researchers will be productive because it offers an immediate and useful middle position philosophically and methodologically (2004, p. 16)—the significance being that it offers a method for selecting methodological mixes that can help researchers better answer many of their research questions.

According to Gimmler (2005), the action approach of pragmatism helps to understand everyday life as the realm for integration and tradition as well as for innovation. She states that from the pragmatic point of view, actions in everyday life are creative in adapting to a given situation, and they are creative in changing contexts and situations and rebuilding the social structure anew. Actors shape activity in the ways technologies are used and implemented. The current research aims to construct knowledge through an action (the intervention) to generate knowledge; thus, the empirical work attempts to better understand how university teachers can be supported in the process of transforming teaching practices and which contextual factors support or hinder this transformation. This research study is informed by the pragmatic paradigm, because it is oriented to real-world practice. However, it also has influences from the constructive paradigm. Many of the ideas of pragmatism have common features with activity theory. The program of “transcending the dualisms” between thought and activity, theory and practice, and facts and values has much in common with the theoretical aims of activity theory (Engeström & Miettinen, 1999, p. 5).

3.2. THEORETICAL FRAMEWORK

The theoretical background for the study of learning comprises experiential learning theory (Kolb, 1984). John Dewey’s model of learning will be the guiding framework, as described by Klob—for example, the learner receives feedback during the learning process from an observer, and thereby the learning transforms the impulses, feelings, and desires of concrete experience into higher-order action (1984, p. 5). Activity theory is used as the main theoretical framework for the empirical study and analysis of the actions. It has been stated that sociocultural theory/activity theory, a new orientation, was a model of artifact-mediated and object-oriented action (Vygotsky, 1978, p. 40; Engeström, 1987). And further, the study is inspired by Vygotsky’s zone of proximal development: “*it is the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers*” (1978, p. 86). The study also has aspirations stemming from Wenger’s social constructivist theory, where learning is understood as a situated activity which requires active cognitive as well as practical participation by the learner (1998).

Activity theory is a commonly accepted name for a line of theorizing and research initiated by the founders of the cultural-historical school of Russian Psychology—Vygotsky, Leont’ev, and Luria—in the 1920s and 1930s (Engeström & Miettinen, 1999, p. 1). They describe that in the post-World War II decades, activity theory was mostly developed within the psychology of play, learning, cognition, and child development. By the 1980s and 1990s, activity theory research had become broader and encompassed such topics as the development of work activities, the implementation of new cultural tools such as computer technologies, and issues of

therapy. Further, they also stated that two approaches close to activity theory are Wertsch, Rio, and Alvarez's (1995) sociocultural theory of mediated action and the theory of situated learning by, and legitimate peripheral participation of Lave and Wenger (1991). Both approaches were inspired by Vygotsky's work, and they share activity theory on mediation of human action by cultural theory. The theory of legitimate peripheral participation depicts learning and development primarily as a one-way movement from the periphery, occupied by novices, to the center, inhabited by experienced masters of the given practice.

Holzman (2006) uses the term "activity theory" to cover a wide variety of approaches inspired by Vygotsky's cultural-historical activity theory and socio-cultural psychology, as stated in Sannino, Daniels, and Gutierrez (2009). Sannino, Daniels, and Gutierrez contend that activity theory involves the researcher throughout the course of development, stagnation, or regression of the activities under scrutiny as well as in the activities of the research subjects. They also argued activity theory to be a practice-based theory, grounded in practice both theoretically and concretely. Further, they stated that the nature of activity theory relies on establishing a bridge between theory and practice. Vygotsky's simple triangular representation was successfully used as a basis for making the distinction between object and tool. According to the explanation provided by Engeström (2009a, p. 304), activity theory is a theory of object-driven activity. Objects are concerns; they are the generators and foci of attention, motivation, effort, and meaning. Through their activities, people constantly change and create new objects. The new objects are often not intended products of a single activity but unintended consequences of multiple activities.

Engeström (1999f, p. 6) presented the three generations of activity theory as shown in the following:

Vygotsky's idea of mediation, which was crystallized in Vygotsky's (1978, p. 40) triangular model of "a complex mediated act," is commonly expressed as the triad of subject, object, and mediating artifact. In summary, the first generation of activity theory and the foundational ideas of Vygotsky were the historical nature of human psychological functions, where the use of signs leads humans to a specific structure of behavior that breaks away from biological development and creates new forms of a culturally-based psychological process (Vygotsky, 1978, pp. 39-40) and the concept of the zone of proximal development.

Leont'ev (1981, pp. 210–213) showed how the historically evolving division of labor has brought about the crucial differentiation between an individual action and a collective activity. This was to overcome the limitation of the first generation of activity theory, where the unit of analysis remained individually focused.

The third generation of activity theory needs to develop conceptual tools to understand dialogue, multiple perspectives and voices, and networks of interacting activity systems (Engeström, 1999f, p. 6). Furthermore, in the later publications, Engeström stated that the third generation of activity theory expands the analysis both up and down, outward and inward. He explained that in moving up and outward, it tackles multiple interconnected activity systems with their partially shared and often fragmented objects. And in moving down and inward, it tackles issues of subjectivity, experiencing, personal sense, emotion, embodiment, identity, and moral commitment (2009a, p. 308).

Further, Engeström (1999f, pp. 6–7) described in the “developmental work where research as agenda of application,” the following key points:

- The object-oriented and artifact-mediated collective activity system is the prime unit of analysis in cultural historical studies of human conduct.
- Historically evolving inner contradictions are the chief sources of movement and change in activity systems.
- Expansive learning is a historically new type of learning which emerges as practitioners struggle through developmental transformations in their activity systems, moving across collective zones of proximal development.
- The dialectical method of ascending from abstract to concrete is a central tool for mastering cycles of expansive learning.
- An interventionist research methodology is needed which aims at pushing forward, mediating, recording, and analyzing cycles of expansive learning in local activity systems.

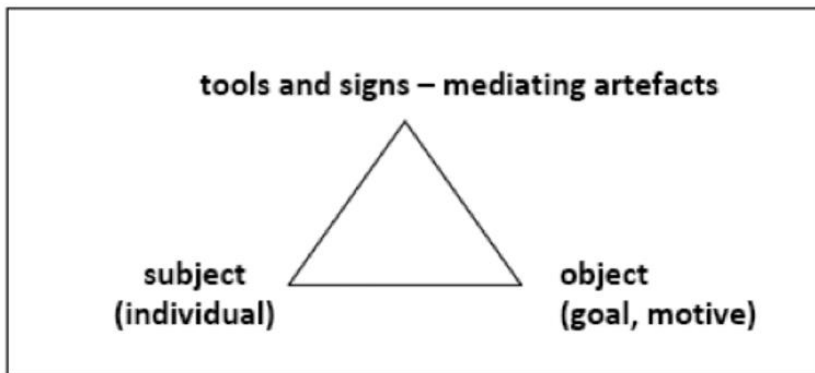


Figure 10. Basic structure of activity based on Engeström (1987, p. 59) and Vygotsky (1978, p. 40)

Leont’ev (1978, p. 52) pointed out that the concept of object is already implicitly contained in the very concept of activity; there is no such thing as objectless

activity. An entity of the outside world becomes an object of activity as it meets a human need. This meeting is “an extraordinary act” (Leont’ev, 1978, p. 54). In this constructed need-related capacity, the object gains motivating force that gives shape and direction to activity. The object determines the horizon of possible actions. The subject constructs the object; objects are constructed and invested with meaning by means of cultural tools. Such mediating tools operate not separately but in complex constellations we call instrumentalities. Emerging new objects call for and generate new instrumentalities. The tools function is to serve as the conductor of human influence on the object of activity, it is externally oriented, it must lead to changes in objects, and it is a means by which a human external activity is aimed at mastering and triumphing over nature (Vygotsky, 1978, p. 55). According to Leont’ev, object is the “motive”; it is somehow out there a “societal force” not present within an individual.

Engeström (1996b, in 1999f, p. 7) recommended the reconceptualization of development along three parallel lines, as illustrated in the following:

- ✓ Instead of just benign achievement of mastery, development should be viewed as partially destructive rejection of the old;
- ✓ Instead of just individual transformation, development should be viewed as collective transformation; and
- ✓ Instead of just vertical movement across levels, development should be viewed as horizontal movement across borders.

On the concept of vertical development, he explained learning and development as a vertical process aimed at elevating the human upward to higher levels of competence. Further, he added that the expansive learning cycle begins with individual subjects questioning the accepted practice, and it gradually expands into a collective movement or institution. The concept of “third space” has been suggested to account for similar events in classroom discourse, where the seemingly self-sufficient worlds of the teacher and the students occasionally meet and interact to form new meanings that go beyond the evident limits of both (Gutierrez, Rymes, & Larson, 1995 in Engeström, 1999f, p. 8).

Activity theory sees construction more broadly; people construct their institutions and activities above all by means of material and discursive object-oriented actions. Any local activity resorts to some historically formed mediating artifacts—cultural resources that are common to society at large.

Engeström and Miettinen (1999, p. 10) discuss that activity theory recognizes two basic processes operating continuously at every level of human activities—internalization and externalization—where internalization is related to the reproduction of culture and externalization is related to the creation of new artifacts and makes transformation possible. They said that today, externalization, the

transformative construction of new instruments and forms of activity at collective and individual levels, has become an equally central theme of research.

According to Sannino, Daniels, and Gutierrez, activity theory seeks to analyze development within practical social activities, and activities transfer social conditions, resolve conditions, resolve contradictions, generate new artifacts, and create new forms of life and the self (2009, p. 1). They also stated that the identity of activity theory stands on the ability of those who work within this framework to establish fruitful connections between the classic heritage of the theory, present societal challenges, and orientations towards future. Activity theory has the conceptual and methodological potential to be a path breaker in studies that help humans gain control over their own artifacts and thus over their future (Engeström, 1999a in Sannino, Daniels, & Gutierrez, 2009, p. 11).

Learning by expanding can be defined as a “thoroughly mastered learning activity” (Engeström, 1987, p. 210). Expansion is the result of a transition process from actions currently performed by individuals to a new individual way (Sannino, Daniels, & Gutierrez, 2009, p. 13). According to Virkkunen, expansive learning is a complicated historical process involving the transforming of an institutionalized form of practice (2009, p. 151). Virkkunen also mentions that the expansive transformation of an activity system may comprise several smaller cycles of expansive learning through which partial solutions are created. Likewise, Engeström, Rantavuori, and Kerosuo state that expansive learning is a theory evolved within the cultural historical activity aimed at explaining and guiding collective transformation efforts in organizations and work places (2013, p. 82). Further, they state that activity is the molar unit of human conduct—a relatively durable collective and systematic formation directed toward an object and motive which are usually difficult to articulate for individual participants. They claim that activity is realized by means of actions and that each session of the change lab process is aimed at fostering some specific expansive learning actions. Learning activity or expansive learning is the entire process of ascending from abstract to concrete and is the mastery of expansion from actions to new activity (Engeström, Rantavuori, & Kerosuo, 2013, p. 82). They claim that ascending from the abstract to the concrete is achieved through specific epistemic or learning actions. The theory of expansive learning is the backbone of a formative intervention toolkit called the Change Laboratory (Engeström, 1996b; Engeström, 2007; Engeström, 2011 in Engeström, Rantavuori, & Kerosuo, 2013, p. 82).

The zone of proximal development, abbreviated as ZPD, is a concept introduced by Vygotsky and later used as an important theme within the concept of activity theory by Engeström. According to Engeström (1987), ZPD is the zone between the actual developmental level a learner can attain on her/his own and the possible zone of developmental level that the learner can attain with the assistance of others. The zone of proximal development characterizes the following process: “in activity-

theoretical terms, activity systems travel through zones of proximal development, a terrain of constant ambivalence, struggle and surprise” (Engeström, 1999c, p. 90). Engeström (1987) argued that learning is embedded in transformations in activity systems; the driving force of learning does not come from pre-set ideas but from the need/contradictions in the present activity. It is claimed that the process of expansive learning should be understood as the construction and resolution of successively evolving contradictions in the activity system (Engeström, 1996b, p. 12)

According to Engeström (2000), new forms of work organization increasingly require negotiated “knot working” boundaries. The progressive transformation of pedagogic practices at SCE and the emerging teaching practices with an attempt to use technology could be considered as knot working. The term knot working is explained as follows: “*the notion of knot refers to rapidly pulsating distributed and partially improvised orchestration of collaborative performance between otherwise loosely connected actors and activity systems*” (Engeström, 2000, p. 972; Engeström & Sannino, 2010, p. 13). Engeström explained that the locus of initiative changes from moment to moment within a knot working sequence: “*knot working is a longitudinal process in which knots are formed, dissolved, and re-formed, as the object is co-configured time and time again, typically with no clear deadline or fixed end point*” (2000, p. 972). The object and motive give actions their ultimate continuity, coherence, and meaning, even when the ostensible object of many actions does not coincide with the object of the overall activity (Engeström, 2000). He claimed that motive is embedded in the object of the activity. In activity theory, deviations from standard scripts are called disturbances (Engeström, 1996b, 2000). Engeström stated that while the object and motive give actions coherence and continuity, contradictions keep the activity system in constant instability (2000).

Contradictions in any situations stimulate the need for change and transformation. A Change Laboratory is typically conducted in an activity system that is facing a major transformation (Engeström, Rantavuori, & Kerosuo, 2013, p. 81). The authors described that change laboratories are also conducted as boundary crossing laboratories, with representatives from two or more activity systems engaged in collaboration or partnership. In the current study, activity theory is used as a theoretical framework to understand the activity systems and the contradictions within the activity systems. According to Nyvang and Johnson, an activity system is a strong tool when it comes to researching into the many influences on the relationship between the individual, the community, and the change processes in a web of mediating artifacts, including tools, culture, and division of labor (2004, p. 66). The activity system describes the process of the intervention phases, and it will interpret and analyze the data from the intervention process.

3.3. METHODOLOGICAL APPROACH

In the 1970s, a rationalistic tradition embedded in computer system development did little to give workers a voice in putting forth their own ideas when trying to agree on the introduction of new technology. Then in the 1980s, projects initiated in Scandinavia focused on the design of new kinds of computer support using skill and product quality to push computer system design more toward a users' perspective (Bødker, Grønbæk, & Kyng; 1993; Bødker, Grønbæk, & Kyng; 1995). Participatory design (PD) has its roots in the Scandinavian tradition (Schuler & Namioka, 1993; Greenbaum & Kyng, 1991) and is an approach which involves all stakeholders in the process and procedures of design. Participatory design is a set of theories, practices, and studies related to end-users as full participants in activities leading to software and hardware computer products and computer-based activities (Greenbaum & Kyng, 1991; Muller & Kuhn, 1993; Schuler & Namioka, 1993; Muller & Druin, 2013). The essence of PD is about empowering the users and developing communication and collaboration amongst designers and users. It attempts to actively involve all stakeholders in the design process in order to ensure that the product/outcome meets the needs and expectations of all. It focuses on the process and procedures of design and not so much on the appropriateness and perfection of the design (Schuler & Namioka, 1993). Schuler and Namioka state that PD represents a new approach toward computer systems design in which the people defined to use the system play a critical role in designing (1993).

What is participation? Participation is a process in which two or more parties influence each other in making plans, policies, or decisions (Mumford, 1993). Mumford described participation as a valuable educational experience, which provides understanding and knowledge that can assist an organization to effectively realize its objectives or, alternatively, that such knowledge will enable any bargaining that takes place with all interest groups operating from an informed position (p. 153). Greenbaum and Kyng defined "users" as the people who use computers (1991). Further, they stated that "user participation does not mean interviewing a sample of potential users or getting them to rubber stamp a set of specifications. It is rather the active involvement of users in the creative process we call design" (p. 8).

Allen states that "*Participatory design is designed to address many of the inadequacies of engineering and cognitive science perspectives. It has strengths of examining technology in real world practices*" (1993, p. 243). Allen also advocates that PD is and has been designed as a method primarily for fine-tuning specific technological tools for particular work. According to Kensinger and Blomberg, PD is a maturing area of research and an evolving practice among design professionals (1998). Further, they state that PD researchers explore conditions for user participation in the design and introduction of computer-based systems at work. Participatory design emphasizes a tradition of user participation in workplace

decisions in improving the quality, productivity, and satisfaction related to computing systems (Ehn, 1998; Muller, 1993; Suchman, 1993). With the concept of PD from computer systems designs contextualized to teaching and innovation, I propose that rethinking pedagogy as parallel to computer designs and the teachers could be considered to be the users or participants. The researcher becomes the designer when s/he introduces innovation to pedagogy. Greenbaum and Kyng explained that in PD, participants are invited to cooperate with researchers during the innovation process. The participants are involved during all stages of the innovation process, such as during initial exploration (problem definition), planning intervention, development and implementation, and finally for evaluation (1991). The users act as fully empowered participants in the design process of participatory design. Participatory research emphasizes an engagement or involvement of the research with the “researchers” rather than the classical role of researcher as observer. It is a move from the conservative product-oriented paradigm to a user-oriented and process-oriented paradigm (Muller, 1993). User participation provides the opportunity to affect decisions about systems that will later impact users’ work lives.

Schuler and Namioka mentioned that a partnership between implementers and users must be formed and that both must take responsibility for the success of the project. The solving of problem does not remain the responsibility of the expert/researcher; rather, both should jointly venture for success (1993, p. xii). Bravo (1993) states that participation is the key element in democracy and that PD supports democracy in a way such that people who are affected by a decision or event (e.g., a new innovation such as ICT integration in teaching) should have an opportunity to influence it. Bravo further elaborated that user involvement and iteration are generally acknowledged to be more critical to success in software design than adherence to conventional design paradigms. Participation, if it happens with influence from external agents without the users, becomes weak; therefore, participation involving decision making is important for the successful implementation of new practices. According to Emspak, the designers and users communicate as equals and then actually effectuate a decision. It places the needs and abilities of the user at center stage (1993, p. 14). *“The democratic ideal is a beautiful human invention: Every human should have the right to participate equally in decisions concerning his or her life”* (Ehn, 1993, p. 42). Democracy is a freedom from the constraints of external forces.

Participatory design raises questions of democracy, power, and control at the work place. Participatory work involves the skills of both users and designers. Expert design strategies where readymade design ideas and concepts are provided directly to the users have too often turned out to be failures in terms of the usability of the resulting system (Ehn, 1993). An important consideration during intervention programs involves professional development activities. Usability includes the accessibility of the system through interaction with the system interface and the

structure of the system that supports users' work flow and work activities (Holtzblatt & Jones, 1993). Participatory design places its ambition on democratization, the relationship between user participation in the implementation, and the broader pursuit of work place democracy (Clement & Besselaar, 1993).

Merely good intentions on the part of the developers does not ensure successful cooperation. Structures and processes in a development organization have a large impact on the conditions for user participation (Grøobæk, Grudin, Bødker, & Bannon, 1993). Bødker, Grønbæk, and Kyng outlined the following obstacles: resources, workload, time, and the beliefs of the institution to be tackled and education and assistance from a variety of experts to be provided while embarking upon the participatory design approach (1993). They also state that success is dependent on participants being able to take an active part in design and on setting up situations where they can act according to their own interests and rules, not simply according to those of their managers. Clement and Besselaar stated that "*Participatory design is a complex process involving technology and multiple levels of organization*" (1993, p. 7). They also mentioned that PD is dependent on specific organizational contexts and that in an organizational setting, the involvement of users and all stakeholders is important if the process is to flourish.

Holtzblatt and Jones (1993) propose contextual inquiry as a process that is administered before the implementation of the intervention workshop—a technique that fosters participatory design. They claim that the technique contributes to initial design concepts by providing an understanding of the nature of the users' work through inquiry with users, or, in other words, it is used to develop an understanding of the status of the users in terms of skills and resources. The understanding is then used to design a support model that supports users' work. Further, Holtzblatt and Jones emphasized that design is always a matter of seeing possibilities within constraints. In addition, Greenbaum and Kyng described that the future workshops (intervention) technique uses a specific method to help people brainstorm about their current practices and its shortcomings and then to find possibilities for future alternatives (1991). These views can be connected to Dewey's following philosophical statement: "*the central problem of an education based on experience is to select the kind of present experiences that live fruitfully and creatively in subsequent experiences*" (1938, p. 28).

Allen stated that "*new technologies are transforming the work of individuals and organizations throughout the world*" (1993, p. 248). Since the early days of participatory design, computer-based systems have become increasingly more integral parts of people's work lives (Kensing & Blomberg, 1998). Greenbaum and Kyng conjecture that computer systems are tools and need to be designed to be under the control of the people using them and that in the design process, significant consideration has to be given to the issue of how computers are used in the context of the nature of work in an organization (1991). According to Muller

and Druin (2013), people need different design identities and their relationship to the design task and its social or organizational setting, such as; users, local managers, and policy makers. Taking into account the social and organizational setting at SCE, the end-users in this context are the faculty, and the design is pedagogy in the context of 21st century teaching and learning. Therefore, the new innovation is integrating technology with teaching with an objective to foster or facilitate learning. Greenbaum and Kyng (1991) described that there are two paradigms of software practices: 1) product-oriented, which is focused on the computer artifact as an end in itself, and 2) process-oriented, which is focused on the human work process with the computer artifact as means to a human goal.

It has been addressed that new technologies have become so complex that ordinary users will have to modify those technologies in order to “domesticate them” and make them fit for use (Muller & Druin, 2013). This view can be interpreted similar to technology integration by not adopting it fully but rather adapting it in the context of the situation as a key message to be considered in the process of intervention implementation. Participatory design entails collaborative partnerships and the co-construction of knowledge in the analysis and co-construction of change in social practices (Gregory, 2003). Gregory further added that participatory design practitioners create new hybrid spaces to encourage innovation and to support creativity in envisioning future practices (2003). Likewise, it has been claimed that PD has often emphasized change—change in technology, change in working practices, and change in working relationships (Gregory, 2003; Muller & Druin, 2013).

Greenbaum and Kyng stated that “the process of reframing, or seeing things in new ways, is useful for presenting our ideas about experiencing the present and envisioning the future (1991, p. 16). According to Muller and Druin (2013), PD workshops are usually held to help diverse parties communicate and commit to share goals, strategies, and outcomes; they usually introduce novel producers that are not part of conventional working practices, and they take people outside of their familiar knowledge and activities. A proposal for “future workshops” was made earlier by Kensing and Madsen (1991)—derived from Mullert and Jungk (1987)—which is a technique meant to shed light on a common problematic situation to generate visions about the future and to discuss how these visions can be realized.

After our discussion of what participatory design is and also highlighting the importance of participatory design, it now provides an opportunity to discuss why and how participatory design is being used. The focus of the research is on pedagogical design with the concept of how to enhance the use of technology in teaching by the tutors to enhance learning and ultimately fit the philosophy of 21st century teaching. With inspiration from participatory design as a third space in HCI (Human Computer Interaction) which has been defined by Muller & Druin (2013) as a hybrid space between technology developers/researchers and end-users. It has

been explained that “a key PD principle is to bridge and blur the user-designer distinction from both directions through a mutual learning process” (Titlestad, Staring, & Braa, 2009 in Muller & Druin, 2013, p. 13). The third space will preserve the situated nature of each participant’s own world while creating a common space for mutual learning, creation, and problem solving (Warr, 2006, p. 2). The third space in the current research is created during the intervention workshop and pilot study where the participants/users come face to face with the researcher/designer during the workshop meeting.

The approach to working with the third space is also inspired from Spinuzzi’s PD methodology outline (2005). According to Spinuzzi, three basic stages are present in almost all participatory design research (2005, p. 167):

- 1) Initial exploration of work: Designers meet the users and familiarize themselves with the ways in which the workers work together.
- 2) Discovery process: Together, designers and users clarify the users’ goals and values and agree on the desired outcome of the project.
- 3) Prototyping: Designers and users iteratively shape technological artifacts to fit into the work place envisioned in the discovery process.

As discussed in the introduction, a weakness in the use of ICT in teaching has been observed because of the inactiveness of the users. However, the first phase intervention revealed positive changes in one of the pilots as an impact of the workshop. The core themes of the first phase workshop were not on skills training but rather on the following areas: Rethinking pedagogy where presentation was made on why rethink pedagogy in the 21st century the digital century.

3.4. METHODS

This study explores the status of ICT use in teaching by the college faculty. The study has applied both quantitative and qualitative methods. For the baseline study, quantitative data were collected through the use of survey questionnaires. The questions in the survey were informed by our literature study. Through the questionnaire, we collected data on the lecturers’ demography, their level of ICT knowledge and skills, the ways in which they use ICT, their attitude toward using ICT in teaching, and the factors they believe impact the use of ICT in teaching at SCE. From a total of 58 lecturers, 32 responded to the survey. Participation was purely voluntary. To collect qualitative data, a semi-structured focus group interview was conducted with six lecturers and the VLE coordinator of the college as participants. The interviewees were selected with consideration of gender representation and seniority in the college.

The survey questions were inspired by an Australian study of teachers’ ICT skills (NSW, nd) and the literature study. The following themes were addressed in the

questionnaire: Demographics, Attitudes and motivation, Personal use, Professional use, Use of VLE, Skills and competence, Professional development, Access to Internet, and Knowledge about other forms of online learning.

In addition, the interview questions were also formulated with inspiration from these themes. For analysis of the quantitative data, Microsoft excel spreadsheet was used. For the qualitative data, we carried out thematic content analysis to establish perspectives on the various views and attitudes toward the topics in question.

For the intervention workshops, three data sets were created, including photographs, posters, and video recordings of the presentations. The following methods were used, respectively: Photographs were taken to validate the process of an activity; posters were created of the new lesson designs; and video recordings were made of the poster presentations.

For the pilot study, the following methods were used to collect data: Photographs were taken to validate the process of the classroom activity; observation notes were made during the teaching and learning process of the classroom activity; written feedback was taken from the pilots; semi-structured interviews were conducted with the pilots after the teaching for both the phases; and a focus group interview was also conducted with six students. Before the start of the interview, the participants were briefed on the purpose of the interview, and general consensus was given on the use of video to record the interview.

Three methods which supplement each other to derive clarity of the empirical data are used for the analysis of the data, namely: Hermeneutics (Prasad, 2002), Activity Theory (Engeström, 1987) and Activity System (Yamagata-Lynch, 2010), and the so-called SAMR model (Puentedura, 2006; Puentedura, 2010).

Hermeneutics as an interpretative methodology for understanding texts was used as the methodological guideline for the interpretation of the transcription data to derive themes on pedagogy and core values for learning. Bleicher (1980) defines hermeneutics as the theory or philosophy of the interpretation of meaning. Prasad classified (2002, p. 13) hermeneutics into two broad categories according to how it has been used by researchers: (a) Weak sense—refers to research that may adopt any of a number of perspectives and approaches to inquiry and (a) Strong sense—refers to research that engages in interpreting texts, and for purposes of such interpretation, closely relies on the epistemological and philosophical guidelines offered by classical hermeneutic theory, philosophical hermeneutics, and critical hermeneutics. According to Prasad, contemporary hermeneutics no longer define hermeneutics as a method but rather as a comprehensive epistemology and philosophy of interpretation which are informed by such important concepts as the hermeneutic circle, the hermeneutic horizon, the non-author intentional view of meaning, and interpretation as critique (2002, p. 29).

The following important theoretical framework was considered for the interpretation of observation and interview transcripts: “*The understanding of the whole with reference to the individual parts and the understanding of each individual part by reference to the whole.*” For example, the pedagogic practice in a classroom can be understood only if we understand the actions and roles of the individuals that are present during an activity in the classroom, are familiar with the historical context of the text (presentation transcription) and the psychology of the participants (presenters); suspend unproductive prejudices in the process of interpretation; and carry out the interpretation within a relatively narrowly defined context and gradually move to higher level definitions of the context (from the key themes developing a common concept).

Although it has no substantial theoretical foundation, the SAMR model is widely used by practitioners. In the present study, the SAMR model (Puentedura, 2006) was used to portray a series of levels of incremental technology integration within learning environments and to analyze the products from the groups to identify the most dominant areas of knowledge applied in the designs (see Fig. 11).

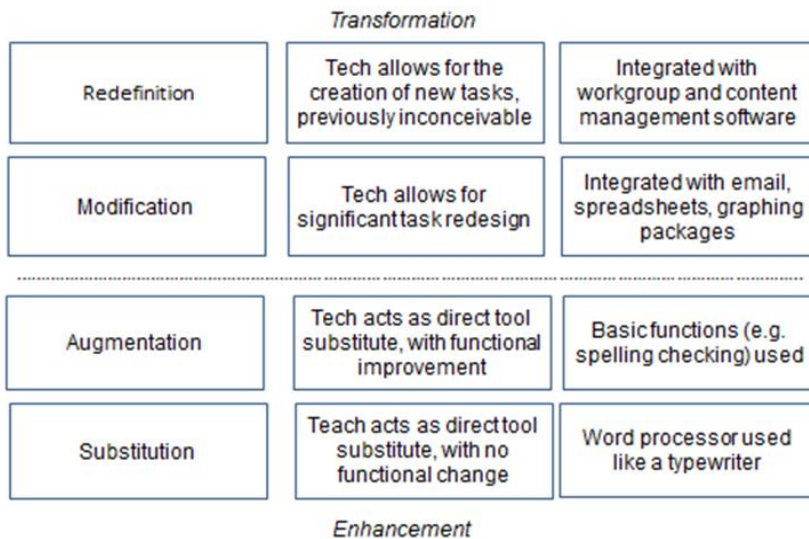


Figure 11. SAMR model describing the rationale behind the use of technology and different levels of use (Puentedura, 2006, 2010)

The SAMR model describes four levels of technology integration that increase in complexity and effect, from simple substitution which barely changes the function

to a more complex redefinition where the technology use can provide opportunities to create what would not be possible without that technology.

For data interpretation and analysis, the approach was used differently in the two stages of the intervention workshop. During the data interpretation in the Phase I intervention workshop, a direct narration of the event was given with no inclusion of my views. However, for the Phase II intervention workshop, the interpretation was not a direct narration of the activity; rather, the key actions and statements of the presenter were elaborated upon with views from the researcher. This approach was unintended but occurred as a progression of the researcher's skills in processing data.

3.5. OVERVIEW OF DATA AND ACTIVITIES

For the entire study process, the following (see Fig. 12) empirical data were collected:

Activity	Timeline	Description of the activity	Data
Baseline study	August 2012	A preliminary analysis was done to understand the stand of ICT for teaching at SCE. The initial findings of the baseline study enabled planning for the intervention workshop. Detail discussion of the baseline study is discussed in the later sections.	For the baseline study survey questionnaire administered, 58 questionnaires were distributed and 32 participated. Focus group interview was conducted, six participants (3 males and 3 females).
Intervention workshop phase 1	Mid-September 2012	The intervention workshop was designed based on the preliminary findings of the baseline study and was conducted. The intervention workshop was planned keeping in mind the responses from the survey and interview. The proceedings and findings of the intervention workshop are discussed in the later sections.	For the data collection eight video recordings of the lesson presentations by different departments, posters of lesson designs, and also photographs during the activity process were made.
Pilot study phase 1	October 2012 - November 2012	At the end of the intervention workshop in order to follow the impact of the workshop two lecturers were identified as pilots. The numbers of pilots were considered based on the researcher's available time to follow the pilots. The pilots were selected on voluntary and interest bases. The data collection for pilot study started from October 2012 for the first stage lesson and then extended to November 2012 for the second lesson. In the later sections the pilot study is being discussed in detail.	For the data collection photographs and observation notes made during two lesson observation for each of the two pilots, one semi structured interview carried with each of the pilots.
Intervention workshop phase 2	Last week of September 2013	The analysis of the data from phase 1 Intervention workshop and Pilot study assisted in planning the second phase intervention workshop. The planning of the workshop began sometime July 2013 until its real implementation in the last week of September 2013. The shortfalls from the first phase intervention workshop were considered while planning the second phase workshop. A detail description of the revised version of the second phase intervention workshop is described and discussed in the later section.	For the data collection similar like the previous workshop seven video recordings of the lesson presentations by different departments, posters of lesson designs, and also photographs were taken during the activity process.
Pilot study phase 2	November 2013 - March 2015	Similarly as a follow up of the workshop again two pilots were identified from amongst the workshop participants as second phase pilots. Amongst the two pilots, one of them was a pilot in the pilot study one; he had shown interest to continue as pilot for the second phase, the second pilot was a new participant, however similar like the first phase pilot study the participation was voluntary. The second phase pilot study was started from November 2013 and extends till March 2015. In the later sections the pilot study is being discussed in detail.	For the data collection photographs and observation notes made during two lesson observation for each of the two pilots, one semi structured interview with each pilots was carried, and a focus group interview with five student teachers (2 male and 3 female was also done).
Others	2012 - 2015	Semi structured interview carried with two lecturers who availed opportunity for IT training in Singapore, informal interview carried with the a Human Resource committee member of the college on regulations of out-country training regulations practices in the college, and informal interview carried with coordinator of the Chipphen Riggel project at SCE. Official documents such as: RUB strategic plan document, SCE Strategic documents, RUB Wheel of Academic Law where also used as data sources.	

Figure 12. Table illustrating the chronological overview of the data and activities

CHAPTER 4. DESCRIBING THE BASELINE STUDY

In the following, a narrative account will be made on the background and process of the baseline study. The baseline study has been published.¹ In order to retain flow and logical sequencing in these sections, only excerpts from the paper are presented.

In order to examine the usage of ICT in teaching by the lecturers at SCE, a preliminary investigation was carried out. The study consists of a survey and a focus group interview dealing with the broad themes of skills and competence, attitude and motivation, and access to resources and the Internet.

4.1. METHODOLOGICAL APPROACH

This study explored the status of ICT use in teaching by the college faculty. The study applied both quantitative and qualitative methods. Quantitative data were collected through the use of survey questionnaires. The questions in the survey were informed by the literature study. Through the questionnaire, the following data were collected: lecturers' demography; their level of ICT knowledge and skills; the ways in which they use ICT; their attitude toward using ICT in teaching; and the factors they believe impact the use of ICT in teaching at SCE. From a total of 58 lecturers, 32 responded to the survey. Participation was purely voluntary.

To collect qualitative data, a semi-structured focus group interview was conducted with six lecturers and the VLE coordinator of the college as participants. The interviewees were selected with consideration of gender representation and seniority in the college. Before the start of the interview, the participants were briefed on the purpose of the interview, and general consensus was given on the use of video to record the interview.

The survey questions were inspired by an Australian study of teachers' ICT skills (NSW, nd), and the following themes were addressed in the questionnaire:

- ✓ Demographics
- ✓ Attitudes and motivation

¹ Kinley, Zander, P. O., Georgsen, M., & Choeda (2013). The usage of ICT in teaching at a Bhutanese College. INTED2013 Proceedings (pp. 4126–4135). Valencia: International Association of Technology Education and Development.

- ✓ Personal use
- ✓ Professional use
- ✓ Use of VLE
- ✓ Skills and competence
- ✓ Professional development
- ✓ Access to Internet
- ✓ Knowledge about other forms of online learning

In addition, the interview questions were also formulated with inspiration from these themes. For the analysis of the quantitative data, the Statistical Package for Social Sciences (SPSS) program was used. For the qualitative data, thematic content analysis was carried out to establish the perspectives of various views and attitudes toward the topics in question.

4.2. RESULTS

Demographics and training: From a total of 58 lecturers, 32 participated in the survey, of which 24 were male and 8 were female respondents. The respondents' ages ranged from 25 to 60 years. In total, 41% of the respondents have been working at SCE for 13 years, and a few (6%) have worked there for more than 20 years. Very few of the participants have attained a Masters/Diploma/Certificate in ICT (3%), while the majority (66%) of the respondents has attended VLE and Moodle training at SCE and some training on ICT in the college. Nine percent of the respondents have participated in training abroad, and 13% indicated they had participated in training in Bhutan but outside the college. Fifty-three percent of the respondents reported that they have attended training related to ICT such as VLE and E-governance within the college in the last two years.

Motivation and attitude: To obtain a general idea of the motivation levels and attitudes of the participants, they were asked for their opinion on a number of statements regarding the use of ICT in teaching and learning. The statements were as follows:

- ✓ The development in ICT must result in a change in curriculum and pedagogy.
- ✓ Integrating ICT has enabled me to deliver my lessons more effectively.
- ✓ Teachers today need to be competent in ICT to cope with the demands of integrating ICT with content, pedagogy, and technology.
- ✓ Students' use of ICT has the capacity to strongly support student-centered learning.
- ✓ ICT provides valuable resources and tools to support student learning.
- ✓ I like exploring technology and new software and its possibilities.

There was a very strong consensus on these statements. It was found that 90–95% of the respondents either agreed or strongly agreed with them.

Familiarity with technology: The survey was carried out to find out what tools the respondents were familiar with and what they use ICT for in their personal and professional lives. We found that 90% of the respondents were familiar with desktop computers, laptops, LCD projectors, mobile phones, and television. Regarding accessibility to an Internet connection, 75% of the respondents replied that they have no Internet connection at home. Nearly all respondents reported that they are familiar with basic file handling (97%). Most (85%) also knew how to install software and how to zip and unzip files. All respondents were familiar with accessing and sending emails (with attachments), and just over 50% knew how to add a signature file to their email and how to create an emailing list. Also, the basics of Internet navigation were known to all respondents (they were asked about website navigation, basic information searches, and reading news on line). When asked about other uses of the Internet, the numbers were somewhat lower: watching movies (81%); downloading software (75%); playing games online (65%); and creating bookmarks (65%). In Figure (13) and Figure. (14) below, I show how many of the 32 respondents regularly used a number of specific tools for personal and teaching purposes, respectively.

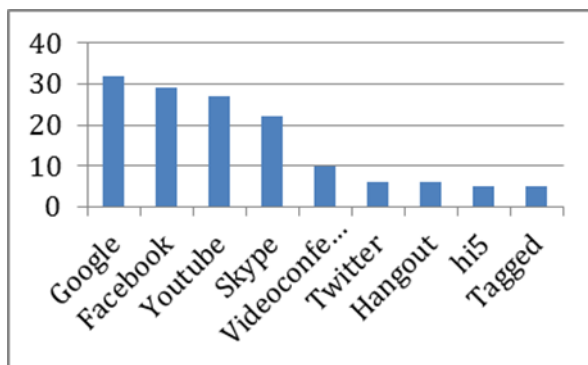


Figure 13. Tools used for personal purposes

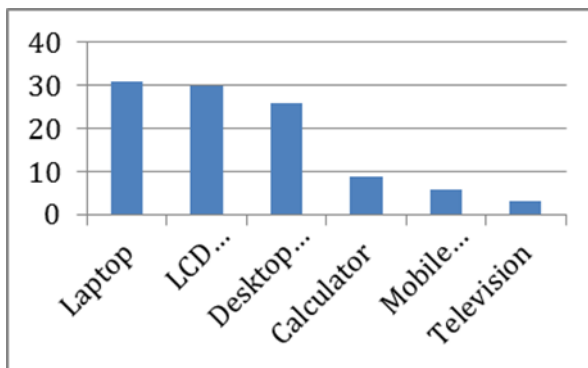


Figure 14. Tools used regularly for teaching

Additional questions regarding the variety and frequency in the use of technology for teaching purposes show that between 50 and 60% use ICT on a daily basis (specifically for the creation of materials, communication with students and colleagues, distribution of information to students, and information searches). In only two cases were the numbers for weekly use higher than those for daily use—namely, in the cases of curriculum administration (planning, monitoring, evaluation, and reporting) and professional learning. Less than 5% of the respondents indicated that they never use technology for the purposes mentioned in the survey. In total, 90% of the respondents stated that the reason for using the above-listed technologies in teaching is because it motivates student learning, it is easier and comfortable, and materials are readily available in the college.

Online teaching, purpose and frequency: Sixty-eight percent of the participants responded that they use blended (face-face and online) teaching, and 31% of the participants responded that they use purely face-face teaching.

When asked to state factors that would increase their use of ICT in teaching, the majority of respondents mentioned the requirement of stable and high speed Internet service available in the college, and most respondents also pointed to the provision of a desktop computer and LCD projector in every classroom. A few respondents indicated basic ICT courses on instructional design and efficient ICT support as a necessity to enhance the use of ICT in teaching.

4.3. DISCUSSION

4.3.1. BENEFITS OF ICT INTEGRATION IN TEACHING

The baseline study presented above indicates that the lecturers experience some benefits from integrating ICT into their teaching. Ninety percent of the respondents

gave the following as reasons for using technologies in teaching: It motivates student learning; it is easier and more comfortable; and materials are readily available in the college. In the interview, one participant said: “*It adds variety,*” and it brings variation in the “*mode of teaching*” (T1). The survey revealed that online teaching as well as face-to-face teaching with the use of ICT takes place in the college. A variety of activities are carried out in the classroom with ICT. In the interview, the lecturers gave examples of what they have been doing to create variation in their teaching methods. They mentioned “*simulation, use of animations, movie-making, and developing CDs with materials for future learning*” (T1 and T3).

One of the other benefits mentioned by some participants is saving time. One of the lecturers talked about how teaching would be more efficient with the use of PowerPoint rather than writing on the blackboard. The use of VLE also offers some advantages, the participants said. Tutors can upload resources for students, and one tutor mentioned that the VLE allows the lecturer to “*do distance learning*” (T1). This is useful in SCE, since faculty often have to leave Samtse for meetings in the capital or teaching obligations in other colleges across the country. Interaction with students can then be carried out online.

Many of the actions necessary (but not sufficient) for learning are thus carried out more smoothly with the use of ICT, such as production, modification, and distribution of teaching materials. These are the “basic blocks” that are used regardless of whether the pedagogy is based on lectures or on a “post-lecture” paradigm.

4.3.2. CONSTRAINTS OF ICT INTEGRATION

Though the lecturers in the interview highlight various benefits of using ICT in their teaching, they also identify some obstacles for further use. The major obstacle that tutors face appears to be Internet connectivity and Internet speed. When asked to state the factors that would increase their use of ICT in teaching (in the survey), the majority of respondents mentioned stable high-speed Internet. It was shown that it was considered to be more important to have Internet connectivity at the college than at home. One tutor mentioned in the interview that the ‘*Internet is very slow*’ and ‘*sometimes it is not there*’ (T4), which means there is no connectivity. From the remarks made by lecturers on the speed of Internet, it can be generalized that there is a lot of frustration about the irregular and slow Internet connection at the college. This causes practical problems for the lecturers wishing to use Internet-based resources in their teaching and makes their preparation work very time consuming. One tutor said, “*I stayed till 7.30 pm to log it but still I could not do it*” (T4), and another teacher recommended that the college bandwidth be increased. He said, “*Currently, the problem is that to download even small files takes lot of time. And out of frustration they (meaning lecturers) just give up.*” (T1).

Lack of skills is another obstacle faced by the lecturers. One participant in the interview mentioned feeling helpless when trying to find appropriate resources on the Internet: *“When we visit some websites, it is quite difficult to get the required resources. This is a challenge”* (T5). Another lecturer said, *“When we use our personal computers to show a PowerPoint on the projector and something happens like a virus... I think we need to update virus control and the college should do something about it. My laptop crashed recently”* (T2). Lecturers appear to be lacking in terms of computer skills as well as in skills for navigating and locating appropriate resources. Even though the survey shows that over 50% of the respondents have received ICT-training in the college, it seems they do not have the skills to solve the problems they face in their everyday use of ICT in their work.

Restriction in resources is another problem the lecturers face. The word resource in the present context refers to ICT tools, including Internet, mobile, LCD projectors, etc. One tutor said: *“When we have to use ICT, the resource constraint is there. We have to literally go around looking for LCD projectors, so at times we come to chalk and board (in the classroom)”* (T1). Another participant in the interview had the point of view that when resources are lacking, it affects commitment. She said: *“That is how it works, without resources; we cannot do much with our commitment”* (T6).

4.4. SUMMARIZING THE BASELINE STUDY

This study reveals that the lecturers in the college have experienced benefits as well as constraints when using ICT in their teaching. Despite taking part in trainings, they feel incapable. This shows the further need for practice with and use of ICT skills. Perhaps more importantly, this gives cause for consideration of whether the teaching staff is offered the right kind of training, which is something to be explored further in future research and planned interventions. The study also shows that lecturers use a variety of ICT tools in their teaching. In addition, there are several indications from both the survey and the interview that at least some lecturers would like to do more if the resources were available. Stability and the speed of the Internet connection as well as support at hand seem to be the most crucial issues. However, lecturers face resource constraints in terms of inadequate expertise and support, for example when equipment breaks down during class or in the middle of using VLE. The low bandwidth of the Internet is also a major constraint.

These results are not surprising for a college in a country with such a low gross national income per capita as is the case in Bhutan. A similar study in Bangladesh also reported lack of resources, low competence with technology, time constraints for planning and usage of ICT in the lessons, and absence of professional IT support as barriers to ICT integration (Khan, Hossain, Hasan, & Clement, 2012). Yet these research results are relevant for all researchers, professionals, and policy-

makers that deal with the educational technology of Bhutan. Previously, the actual situation in Bhutan was unknown, and we were left guessing whether it mimicked other countries. Taking Bhutan's several special circumstances (political, demographical, and historical) into account, such inference is highly speculative. This also includes regional meta-studies that sometimes skip Bhutan and, although the data of Bhutan do not deviate that much, Bhutan will nevertheless always be assumed to have a situation like that of the dominant actors of the region.

This study is preliminary as its data are from only one of Bhutan's colleges, and it also paves the way for a similar study at other institutions of RUB. Bhutan in its smallness can be considered a micro-cosmos. Although the data cover one college only, they capture the attitudes of most of the colleges at RUB, especially with regard to faculty mindset and the practical usage of online teaching. Furthermore, changes at only one college will lead to changes on a national level that would be very costly to experiment with in other countries.

CHAPTER 5. PRESENTING THE INTERVENTION WORKSHOP AND PILOT STUDY

In this section, a complete discussion is made for the first phase intervention workshop and pilot study, which includes a description of the background for the approach and procedure, data interpretation and analysis, and a discussion of the general findings.

5.1. DESCRIBING THE INTERVENTION WORKSHOP—PHASE I

According to Jungk and Mullert (1987), concern for the future is a necessity (p. 10). The authors further stated that future workshops could be used for designing development plans for individuals, families, or neighborhoods (p. 11). As a methodology where social imagination is evoked and put into action for the actual realization of the social imagination, the workshop method was inspired by Jungk and Mullert (1987) and the methodological procedure was also inspired by the future workshop methodology (Georgsen, Murshed, & Zander, 2011; and further by rapid prototyping and systems development workshop methodology (Nyvang & Georgsen, 2007). The future workshop concept has been used to motivate and generate a new lesson design in terms of how teachers plan to modify or redesign their lessons using ICT. It was used to stimulate and encourage the participants to think out of the box to establish change with their own innovations and ideas. A typical future workshop consists of the following phases: a preparatory phase, a critique phase, a fantasy phase, and concludes with a follow-up phase.

The workshop was organized into three steps, keeping in mind the phases mentioned above: 1) inspiration and setting the scene (the preparatory phase), 2) defining core values (critique phase), and 3) design (fantasy phase). The pilot study was conducted following the intervention workshop which encapsulated the implementation and follow-up phase. In the following, I will describe the process of the intervention workshop carried out with the faculty at SCE during Phase I. Along with the workshop proceedings; the procedural steps carried out to collect data will also be described.

The following steps were employed for the workshop:

Step 1 was a presentation by the workshop leader to all the participants in a lecture format. The issues discussed in the presentation included critical issues in relation

to ICT in teaching practices, the importance of clarifying the core values in teaching, and ways of rethinking pedagogy in line with 21st century skills.

Step 2 was a group-based activity aimed at identifying teaching values through card sorting. In the card sorting exercise, participants are asked to sort through a set of paper cards with “value statements” printed on them and pick out the ones closest to their own beliefs. The process of selecting and reducing was repeated three times, and the end result of this phase was a negotiated set of value cards (5 cards) which were of major importance to the majority of the participants. As part of the process, the participants had to explain to each other why, for example, “learner independence” was more important to them and their teaching practice than, for instance, “globalization” or “learning by doing.”

Process: The card sorting was done collaboratively, starting in small groups and ending up with the joint priority of the full group of the workshop participants. The participants were divided into groups of four and were given a number of cards to be laid out in a specific order to show which ones they find most important. After round one, the group met in groups of eight and went through the process again, and finally all the whole groups merged into one large group to achieve the final result.



Figure 15. Pictures of workshop participants during the card sorting exercise

Step 3 was the process of developing an actual design or redesign of a teaching and learning activity. In this stage, the participants in their respective subject groups focused on developing a detailed learning design or redesigning a lesson from their module based on stage 1 and the outcome of stage 2. Finally, as an outcome of their task from the workshop, each group prepared a poster for presentation at the end of the workshop (see Figure 16 for examples of posters).

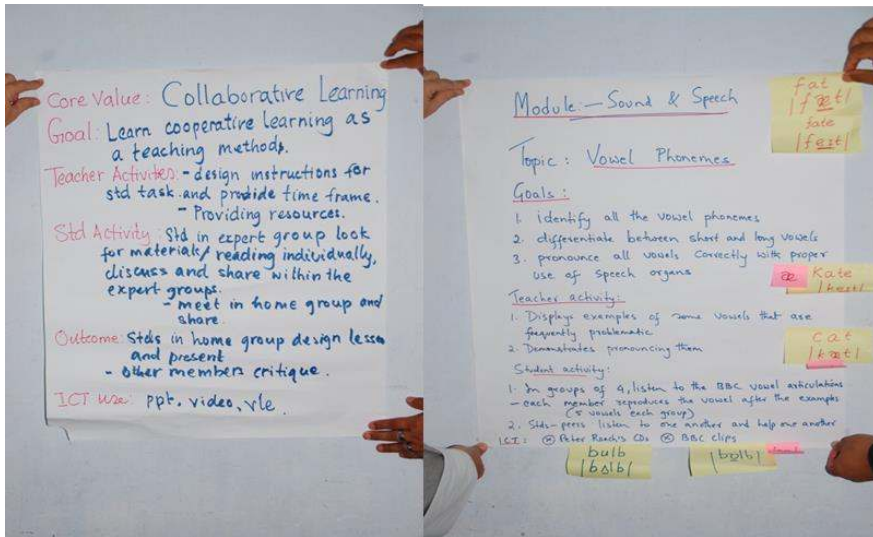


Figure 16. Samples of posters from the presentation of lesson designs

5.2. ANALYSIS OF THE INTERVENTION WORKSHOP—PHASE I

5.2.1. DATA OVERVIEW

A total of 28 faculty members comprising 6 females and 22 males participated in the workshop. Three sets of data collection tools were employed, and the details of the data contents are as follows: Videos—six subject representations (History - H, English - EN, Biology - BG, Chemistry - CH, Primary curriculum - PP, and Professional subject - PS); Posters—presentation charts from the respective subject groups on the new lesson design (eight posters on biology and two on primary curriculum); Photographs—value card sorting exercise, seven photographs

5.2.2. LIMITATIONS OF THE INTERVENTION WORKSHOP

This study pertains to the members of the teaching faculty at SCE only and does not represent all the institutions of RUB. The study due to time constraints, the study skipped two important phases before the actual intervention workshop: pre-study—no study was done on the lessons of the participants before the workshop, and this in a way makes it difficult to categorize the lesson design as a new design or a duplicate of the regular lesson. The workshop was compressed to a 5-hour duration, which also posed a limitation for a post-discussion on the individual lessons with the respective groups; this situation somehow prevented both parties (researcher and the participants) from discussing the insights of the lesson presented. Furthermore, it should be noted that this study was primarily concerned with 50%

of the teaching faculty at Samtse College of Education. Therefore, the findings from this study limit a generalization of the overall practices at Royal University of Bhutan.

5.2.3. DATA TRANSCRIPTION AND INTERPRETATION

The text interpretation was carried out under the following thematic areas: Teacher Activity, Student Activity, Core Learning Values, and Technology. This process helps to identify the core values in teaching and learning and also describes the participants' stance on the pedagogic practices. Consequently, the empirical data provide evidence describing the state of teaching and learning aligned to 21st century education. The decisions on the themes are based on the instruction guidelines provided for the new lesson design activity as well as based on the outline of the lesson presented.

In the following, I present the lesson interpretation:

Teacher action

H: Asked provoking questions. Assigned topics for group work and provided instruction.

PS: Provided instruction, monitored online discussion (VLE), provided feedback in the online discussion forum, and coordinated the overall activity.

PP: Provided information for prerequisite and possible resources in establishing an Early Childhood Care and Development (ECCD) center, guided the process by outlining the principles of setting up an ECCD Center, and created a forum to share students' work.

EN: Explained the lesson content with demonstration, organized resources, and provided instruction.

CH: Exhibited visual simulation of a benzene ring through video and created a discussion forum on VLE.

BG: Provided guidelines and instruction, created a discussion forum on VLE, organized an online (VLE) quiz and resource sharing (uploaded additional materials, pictures, video clips, animations, and e-books).

Student action

H: Engaged in group work with the respective topics assigned to them. Furthermore, students searched for answers to the question posed at the beginning of the lesson.

PS: Gathered reading materials and engaged in reading, worked in expert groups to design a lesson plan, shared ideas and information with members on the VLE discussion forum, returned to home groups with a joint lesson plan incorporating the cooperative learning strategy, gave presentations to the whole class.

PP: Prepared their own design of an ECCD center after analyzing the samples of other early learning centers, presented their design to the whole class.

EN: Listened to teacher explanations, observed teacher demonstrations, collected resources, observed and practiced pronunciation using video clips and CDs in groups.

CH: Visualized simulations of the benzene ring, engaged in reading, posted and discussed in the VLE discussion forum.

BG: Skimmed through the reading materials from the teacher and further explored the Internet and library, designed and conducted their own experiments from their learning experience, presented their results to the whole class, participated in an online quiz and discussion (VLE).

Core teaching values

H: Lifelong learning, experience-based learning, problem-based learning.

PS: Learning by doing

PP: Learning by doing

EN: Learning by doing and collaborative learning

CH: Collaborative learning

BG: Learning by doing

Technology for teaching and learning

H: Internet, PowerPoint, VLE (post group work for sharing)

PS: VLE (upload reading materials, discussion forum), Internet, PowerPoint presentation

PP: LCD projector

EN: BBC clips, Peter Rogue's CD

CH: Internet (download videos on simulation of benzene ring), software to draw benzene ring, VLE (discussion forum)

BG: Internet (resource exploration), VLE (upload reading materials, create quiz and discussion forum, share resources and findings).

The following statements from the presenters of the respective subject groups to a certain extent indicated that the group produced this lesson design with an attempt to align their practices to the 21st century teaching method:

H—"Our reproduction is basically trying to slightly modify to the 21st century mode of delivery of this topic."

PS—"Normally this particular topic is taught in the class at a stretch maybe taking one or two hours within the class itself, and in our design we are using VLE; this is a change we have brought to teaching this particular topic."

EN—"Traditionally, what we do is we use chart paper, and we transcribe these vowels there (example on the poster) and we tell them ok this is how it is transcribed and this transcription means this, and that, but with the CDs they see the native speaker pronouncing it, how she uses the various parts of the mouth, and they can practice with the native speaker together as the person demonstrates."

CH—"I always take some ball and stick model, and I say this is where the pie electrons are so they delocalized over here (action demo), and sometimes I draw resonating structures on the chalkboard and show them"; the new lesson enables them to visualize actual simulation.

5.2.4. DATA ANALYSIS

As an interpretative methodology, the following is a description and evidence of how the considerations were made during the analysis—understanding the whole with reference to the individual parts and understanding each individual part by

reference to the whole. In the following, the components within the lesson and examples within the lesson components enable an understanding of the pedagogic practices either prevailing or in the plan for change to align to 21st century teaching. For example, looking at the teacher activity, student activity, and the technology use will provide an overall understanding of the teaching learning event with regard to pedagogy practice and the level and types of technology used, or the pedagogic practice can only be understood by viewing the actions of the teacher and the students in the classroom.

Teacher action

H—The teacher presents an overview of the lesson and then asks stimulating questions to the students like: “Why Zhabdrung was successful even though he was a foreigner who came from Tibet?” “How and why was he successful in creating Bhutan as a nation state in the 17th century?” Such questions make students critically think and reflect on the situation. The lesson here illustrates a shift in teaching history through critical thinking and problem solving, not mere narration of the story. Further, the lesson also displays student-centered learning, where the teacher provides instruction and directs the students to resources; PS—This lesson exemplifies a shift in pedagogy maximizing the use of technology. For example, it has been demonstrated that the teacher monitors online discussion (VLE) and provides feedback in the discussion forum; PP—The teacher acts as a guide by providing perquisite information and possible resources in establishing an ECCD center; EN—Display examples, provide demonstration, make resources available, and provide instruction for the use of resources and group work; This lesson illustrates a learning design by doing and collaborative learning, where the teacher limits his/her role to that of a facilitator and mobilizes the resources. BG—This lesson is very similar to that for EN, where the role of teacher is that of a facilitator but has a comparatively higher level of ICT usage in teaching. The teacher provides guidelines and instruction, creates a discussion forum on VLE, and organizes the online quiz and resource sharing (uploads additional materials, pictures, video clips, animations, and e-books).

Student action

H—Reflect on the questions, work in groups with a specific topic, look for resources on the Internet and in the library, discuss in groups, present their group work to the class; PS—look for resources, read materials, work in expert groups, share ideas and information with members on the VLE discussion forum, return to home group with a joint lesson plan incorporating the cooperative learning strategy, make presentation to the class; PP—students make their own ECCD design after analyzing the samples of other early learning centers; EN—observe, imitate, practice in groups, give and receive feedback from their friends; CH—read materials provided by the teacher, explore for more information from the Internet

and library, design and conduct their own experiment from their own learning experience, and present their result to the whole class.

The researcher is a member of the same community—that is, the workshop participants; therefore, familiarity of the historical context of the text (presentation transcription) and the pre-understanding of the psychology of the participants (presenters) is inevitable.

Interpretation of the presentation was done with no distortion of the sentences uttered by the presenters, prepositions/some words were added only to provide clarity of the information the presenter conveyed. Direct quotes from the presenters were retained whenever a significant key point was raised. For example, the move for change was expressed in the following statements:

H—*“Our reproduction is basically trying to slightly modify to the 21st century mode of delivery of this topic”;*

PS—*“We want to have a shift in teaching; we believe that teaching is transmission, so here we want to have a shift in teaching focusing on the student rather than the teacher”;* *“Normally this particular topic is taught in the class at a stretch maybe taking one or two hours within the class itself, and in our design we are using VLE; this is a change we have made in teaching this particular topic”;* *“I have never done this before”;*

EN—*“Traditionally what we do is we use chart paper, and we transcribe these vowels there (example on the poster), and we tell them ok this is how it is transcribed and this transcription means this, and that, but with the CDs they see the native speaker pronouncing it, how she uses the various parts of the mouth, and they can practice with the native speaker together as the person demonstrates”;*

CH—*“I always take some ball and stick model, and I say these is where the pie electrons are so they delocalized over here (action demo) and sometimes I draw resonating structures on the chalkboard and show them. If I teach this way (visualization and simulation), I think they will definitely be very happy.”*

These statements illustrate the current teaching pedagogy of the teacher and the teacher’s desire to redesign using technology. The posters provide evidence of the presentation. These have permitted to some level the suspension of unproductive prejudices during the process of interpretation. In other words, a manipulation of the ideas has been prevented as the posters provide evidence of the transcription.

Incorporating all the points mentioned above and with reference to the core values outlined in their lessons led to the assumption that learning by doing and collaborative learning stand prominent along with cooperative learning, experiential learning, and problem-based learning and lifelong learning. This consequently provides the validity for an approach to student-centered learning. Therefore, interpretation with relatively narrowly defined context and gradually moving to higher level definitions of the context (from the key themes developing a common concept) is to an extent contemplated.

Levels of technology use in designs

In the following, the levels of technology use in the lessons are presented in accordance with the four levels of the SAMR model posters and the verbal presentations:

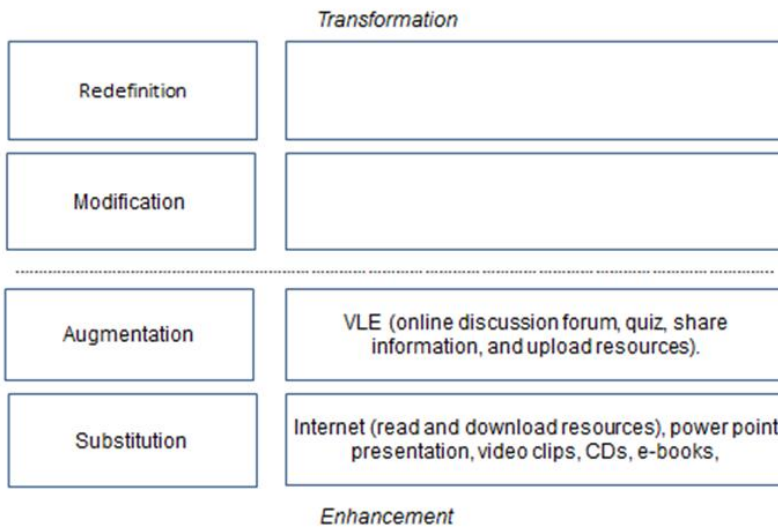


Figure 17. Analysis of designs indicating technology used based on the SAMR model

The data material from this workshop allowed me to closely study the process of rethinking pedagogy for 21st century teaching at SCE. The data also revealed the state of pedagogical practices as well as the range and levels of ICT usage in teaching and learning. Most of the lessons portrayed the role of lecturers as facilitator and guide.

For example, a presenter (PS) said:

“We want to have a shift in teaching; earlier we believed that teaching was transmission of knowledge, but now we want to have a shift in teaching focusing on the student rather than the teacher.”

This to a certain extent opens windows on the belief of the lecturers on the stance of teaching and learning—they indicated a motion for change. Besides positioning the role of tutor, the core values “learning by doing” and “collaborative learning” surfaced as prominent in almost all the lessons. A statement from a primary program presenter demonstrates the teaching and learning situation—for example:

“They themselves are engaged in setting up the environment for the children in ECCD center. Because the teacher is not actually setting up the environment, here we are just showing them the principles of setting up good learning environment.”

Likewise, in all the lessons it was shown that students are engaged working in groups (online and face to face) with the ultimate goal of producing some outcome meant to be shared with the class. The lecturer here is not central to learning but rather provides brief instruction for or overview of the lesson, shares and makes resources available for the students, guides students in their task, and provides feedback on the student activity. The learning situations from the lessons presented students as working in groups, mutually searching for information, and creating a product.

The range of ICT used in teaching was revealed from the lesson outline (poster and presentation) and using the SAMR model for mapping was done to find the level of usage. At the substitution level, the Internet was used for downloading and reading materials (text) online, VLE was used as a medium for uploading learning resources by the teachers replacing the print materials, replacing blackboards and charts PowerPoint presentations were used to share information (tutor) and findings (students), and CDs and clips replaced examples and demonstrations by the teacher—for example in EN:

“Traditionally what we do is we use chart paper, and we transcribe these vowels there (example on the poster), and we tell them ok this is how it is transcribed and this transcription means this, and that, but with the CDs they see the native speaker pronouncing it, how she uses the various parts of the mouth, and they can practice with the native speaker together as the person demonstrates.”

The next level from the SAMR model—Augmentation—is the VLE online discussion forum (post discussion, participate in discussion, and tutor feedback) and online assessment using a quiz. As mentioned by the presenter of PS:

“Normally this particular topic is taught in the class at a stretch maybe taking one or two hours within the class itself, and in our design we are using VLE; this is a change we have made in teaching this particular topic.”

These statements from the presentation convey a message on the stance of the usage of VLE for teaching and learning purposes.

5.2.5. SUMMARIZING INTERVENTION WORKSHOP 1

The findings of this intervention workshop suggest that more investment in terms of skills training, resources, and technical support is required for the innovative use of technology in the classroom. The data have been mapped with the SAMR model. The findings show that the perspective of educational technology used for teaching and learning thus far is focused on either the technology itself or the teacher’s instruction and is limited to the enhancement level.

The combined findings from analyzing both the posters and the oral presentations have shown that the drawbacks in rethinking teaching and learning with ICT relate to a lack of resources and the level of competency amongst the teachers. It was seen, however, that tentative integration for the development of the 21st century skills was incorporated in the lesson designs, based on a limited pre-understanding of the concept of 21st century teaching. To some extent, the workshop provided an awareness of the need for rethinking pedagogy for the digital age.

Overall the new lesson designs attempted to redefine the role of the teacher, by placing more emphasis on active learning and student-centered practice. The examples of such lessons were discussed earlier. Further analysis of the empirical data confirmed that to a certain degree an interventionist approach to professional development assists teachers in rethinking and redesigning their teaching using ICT. The findings of this study suggest that more investment is required for the innovative use of technology in the classroom, as was shown in the analysis using the SAMR model. In general, the current practice regarding ICT is primarily restricted to the enhancement level.

Finally, this study has provided insights into the impact of the intervention workshop, pedagogic practices, and the level of technology use. However, some of the lessons were not appropriated to the workshop goals, since even though the intended objectives were redesigning lessons incorporating ICT; some lessons had little integration of ICT in the plan. The focus was more on pedagogy. These

findings provide a guide for the planning of future intervention workshops. Consequently, this study also to a certain extent gives an opportunity to reflect on the current state of SCE in particular and RUB in general in terms of pedagogy in the 21st century digital world.

CHAPTER 6. PILOT STUDY—PHASE I: DATA INTERPRETATION AND ANALYSIS

Following the intervention workshop, two faculty members were identified as pilots based on willingness to participate. Mutual understanding and agreement was assured between the participants and the researcher on the purpose of the pilot study. The purpose of the pilots were to

- ✓ Assess the impact of the intervention workshop;
- ✓ Avail the opportunity for scaffolding and pre-discussion during planning, observation during practice, and post reflection after implementing the new lesson design; and
- ✓ Examine the practical implementation of the redesigned lessons in the real classroom setting.

Their lessons were observed at two different stages, and the data were collected as follows:

Stage One

Video recording of the teaching and learning process, photographs of the teaching event, and observation notes

Stage Two

Video recording of the teaching and learning process, photographs of the teaching events, observation notes, semi-structured interview, and reflection log from the pilot projects

Three types of methods—namely, Hermeneutics, Activity System, and the SMAR model—were used to derive clarity in the analysis: hermeneutics as an overall method to understand the context of teaching and learning and interpret the texts (interview and observation notes), activity system triangle to describe the teaching and learning activity, and the SMAR model to identify the level of technology integration in the teaching and learning. For example, the hermeneutics theme, “the meaning of a part can only be understood if it is related to the whole,” is used to explain the phenomenon and also to understand the text. Hermeneutics is used for the transcription and interpretation of the teaching and learning activity. The activity theory triangle is used to represent the components of the activity; depicting

the activity system describes the whole and the individual activity as parts. The totality of the teaching and learning process can be understood by understanding the process of teaching parts such as the lesson topic, lesson objective, teacher activity, and student activity. Likewise the components within each lesson part will give meaning to the context of the teaching and learning situation. The cycle of pre-understanding and understanding was taken into consideration for constructive interpretation. The SAMR model describes the level of technology integration incorporated in the lesson taught.

6.1. PILOT PROJECT 1—STAGE ONE

In the following, a brief narration of the event will be given, where the focus of the description will be on pedagogy and technology as per the objective of the data collection.

The teaching observation was made in a B. Ed. third-year Arts class and consisted of 37 student teachers. It was an English lesson, and the topic of the lesson was “The Beauty Industry.” The tutor had pre-assigned a group from the class to be responsible for the particular lesson topic. The group consisted of five members, and each individual had their assigned role such as chairperson, presenter, projecting the presentation, arranging resources, and communication. The tutor and myself as an observer settled ourselves in two different corners of the classroom.

The student representative, who was a group leader, also chaired the whole presentation process and opened the session with a brief recap of the previous lesson and then linked it to the current topic of presentation. She also briefly introduced what was to come in the presentations without getting into details. The individuals responsible for the presentation took the floor after the introduction from the chair. The presentation started with a PowerPoint presentation. The presentation was prepared with a maximum of pictures and very few lines of text. The pictures represented all the themes to capture a complete lesson package, including an introduction, background/history, and significance. Examples of all the themes of the discussion were also displayed with pictures.

Opportunities to break from the monotony of passive listening were provided to the audience members to express their opinion and raise questions as well as to contribute additional information to the content under discussion. Toward the last segment of the presentation, the group used mobile phones connected to speakers where the whole class could hear and listen to a person who was in another location of the campus. A phone call was made to a senior male student who had studied and completed the same topic in the earlier semester, and he was asked to share his view on a particular theme which the group later used to connect and validate their conclusion.

Finally, the chairperson invited the tutor to make an overall comment on the presentation. The lesson ended with the tutor congratulating the presenters and also adding his opinion on the presentations.

In order to get a true understanding of the teaching and learning process described above, activity system analysis is used. According to Yamagata-Lynch, activity system analysis provides new methods for researchers to extract the meaning of complex data sets in a graphic model that they can communicate with others (2010, p. X). Further, the author accounts that activity system analysis helps researchers organize their analysis with a valid framework while building reliable information about the data and minimizing the complex task of analyzing and making sense of data sets from real-world settings (p. 1). In the following, activity system analysis is used as a descriptive tool to capture the process of pedagogical change incorporated by the teacher to deliver a particular lesson topic.

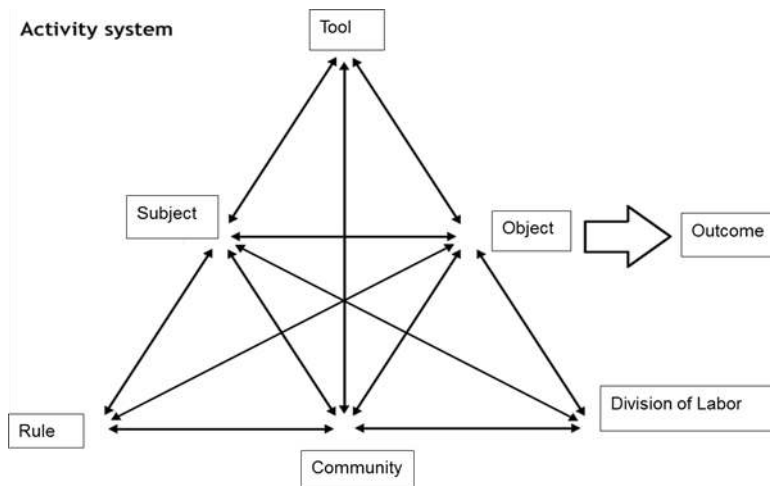


Figure 18. Engeström's activity system (adapted from Engeström, 1987)

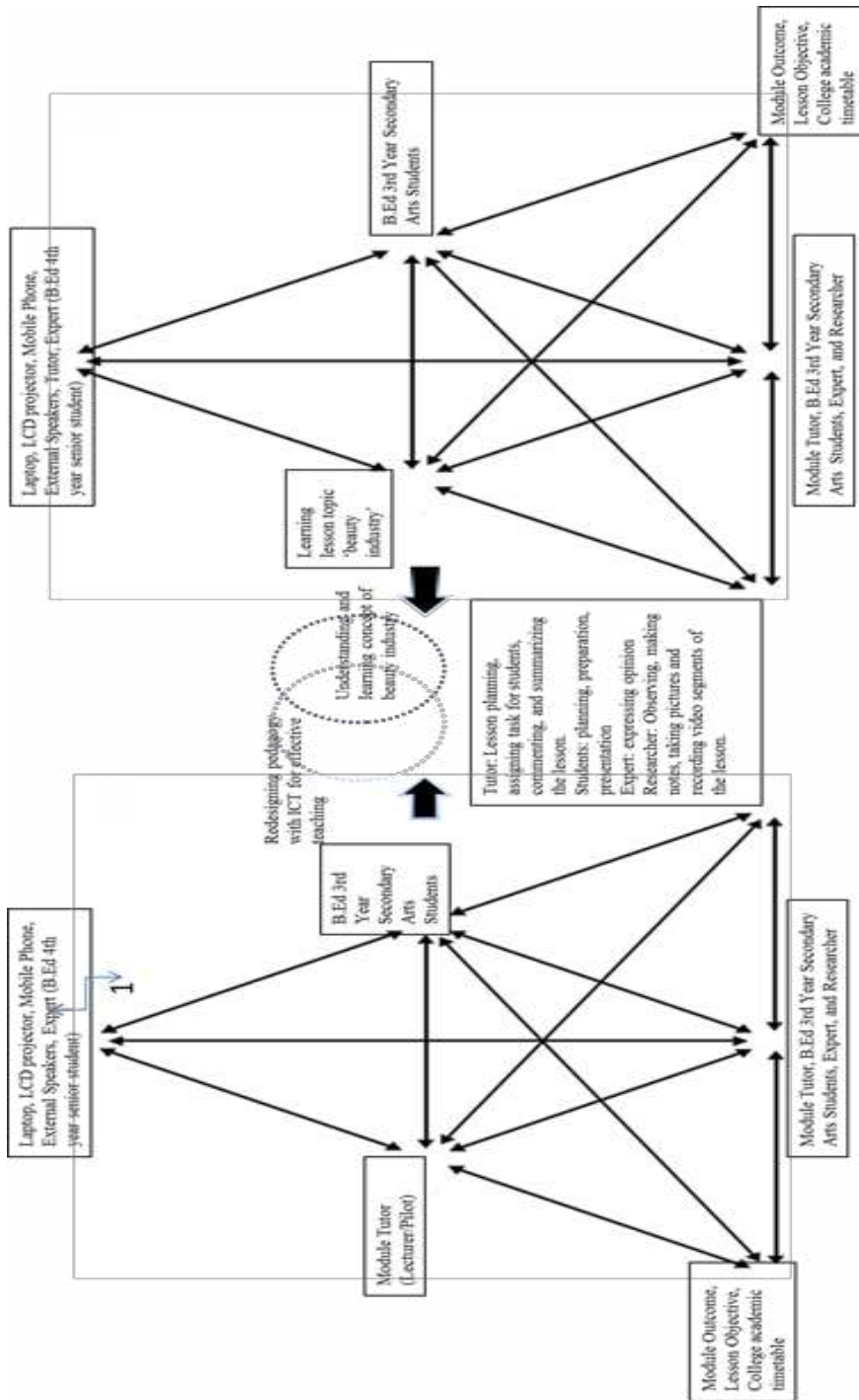


Figure 19. Activity system illustrating the teaching and learning activity

Decoding the activity system shown above (Figure. 19)

The activity system is drawn from the perspective of the researcher; therefore, in this activity system, the subject is the module tutor who engages the students (object) in an organized classroom to teach a particular concept. In the tools, both humans and technological artifacts are used as mediators in the activity, and the purpose of this activity was to learn the concept of “the beauty industry” in the context of the discipline of Arts; for this reason, it has been identified as one of the outcomes for the activity. The teaching of the lesson is guided by the general module outcome at a broader spectrum and the lesson objective at the specific; also, the college academic time table regulates the duration of the activity. Therefore, these agents function as a rule under which the activity operates in the activity system. The community listed here includes those individuals that participated while the subject engaged in this activity.

As shown in the illustration, each member in the community had their role contributing either directly or indirectly. This activity is a threefold situation with regards to the outcome. When the tutor is situated as the main subject of the activity system, his intention is to make the students learn a particular concept; and to do this, he uses tools and mediating artifacts to deliver the lesson. Therefore, the students become the objects, and the outcome is improving student motivation and enabling students to learn the concept more effectively. Also, the tutor’s agenda is to redesign his teaching and enhance the use of technology, for which the possible reasons include that he is motivated and inspired from the intervention workshop, he wishes to impress the observer; he has self-motivation to change with an ultimate intention to motivate and improve students’ understanding of the concept.

Viewing the activity from the teacher’s position, the students become the real subject in the classroom. Besides the tools and artifacts used by the teacher to deliver the lesson, for the students to learn, the teacher becomes an additional mediator tool, the object for the students is the lesson topic or concept, and the ability to learn the lesson concept becomes the main outcome for the students. Likewise, one of the main objectives of the tutor is to enable the students to learn the concept being taught; therefore, learning the lesson becomes a common outcome for both. The tutor intends to achieve this outcome by redesigning the lesson by integrating ICT with pedagogy; hence, it is another outcome for the tutor. Furthermore, the researcher, as an interventionist, scans the lesson on the level of technology use. The lesson design and the classroom event were partly influenced by my presence as an observer, as the attempt to use technology was maximized, and the pedagogy was also enhanced from that of the regular practice. Although there was no evident serious tension during the activity, I have assumed a contradiction within the tools (1), because they had mini-speakers and some students had to hold them with their hands close to the phone, and the volume was low and difficult to hear.

The teachers' role here centered on being a facilitator by providing the topic and navigating through the planning process and finally overseeing the proceedings of the classroom event. Although I couldn't locate any tension throughout my observation of this particular lesson, it is possible that there could have been some unseen contradictions. But fortunately, there were no visible signs of tension from what I observed in the activity system. However, while scanning the lesson using the SAMR model on the levels of technology use, we see that there is increased use of ICT, but the purpose for which it was used places them down at the enhancement level—thus, illustrating a contradiction between the tutor and the tools.

In the following, the levels of technological use in the lesson are presented in accordance with the four levels of the SAMR model. They were categorized based on why and how it was used during the teaching as per the researcher's observation.

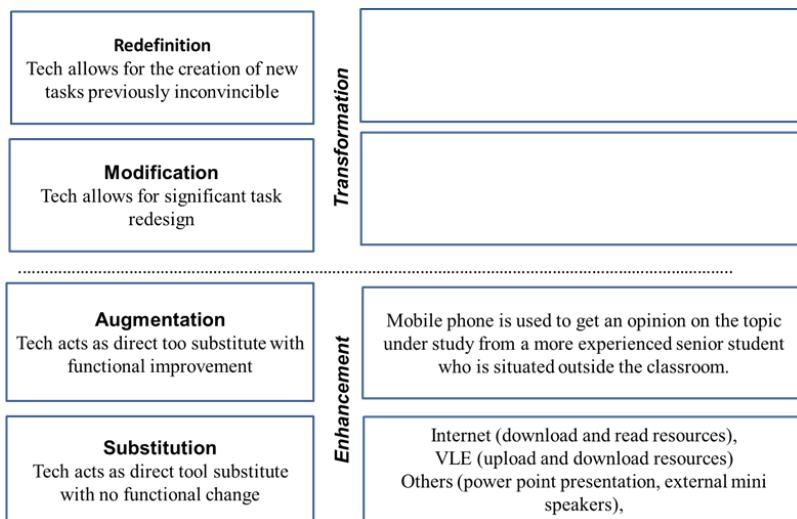


Figure 20. SAMR model illustrating the types and purpose of technology used in teaching

From the lesson narration and as illustrated in the activity system, we also see in the video (appendix) and pictures (attached) that the students' had a central role with regards to the situation in this particular scenario of the lesson. However, there is room for the tutor to upgrade the use of the available technology to progress to the transformation level. Interestingly, I made an additional observation besides the ICT and pedagogy. The class began with the whole class singing a prayer, which was very unique, compared to the regular practices in the classrooms of the college. I have been teaching at the college since 2006 and have co-taught with other colleagues, but this practice was never seen in other classes. I would say this was a local and more personalized practice for this particular tutor. Unfortunately, I have not asked him the reason for this activity. Upon random observations of his classes,

I found out that it was not just a one-time event for this particular class but rather that he uses the practice of praying before the start of his teaching in all the classes that he teaches.

6.2. PILOT PROJECT 2—STAGE TWO

In the following, a brief narration of the event will be given, where the focus of the description will be on pedagogy and technology as per the objective of the data collection.

The teaching observation was made in a B. Ed. third-year secondary science class and consisted of 21 student teachers. It was chemistry lesson, and the topic of the lesson was “chemical reactions.” As an observer, I settled in taking the back seat of the class.

The presentation started with a PowerPoint presentation. PowerPoint was used as a medium to deliver the lesson. The PowerPoint presentation slides had written concepts of the topic, definitions, and examples of the chemical reactions.

The tutor explained the contents of the PowerPoint to the students; further, she demonstrated how chemical formulas can be used via a Microsoft PowerPoint. The lecture closed with 15 minutes left of the teaching time, providing an opportunity for the students to ask questions, of which they had none, so the students proceeded with reading the content from the textbook. Throughout the lesson, the tutor’s role was limited to lecturing only and that of the students to just listening, observing, and making notes. There was no innovative use of the pedagogy or of the technology for the lesson. Overall, the teaching was teacher-centered and was focused more on covering the syllabus and not with intent to arouse interest and enhance understanding for the students.

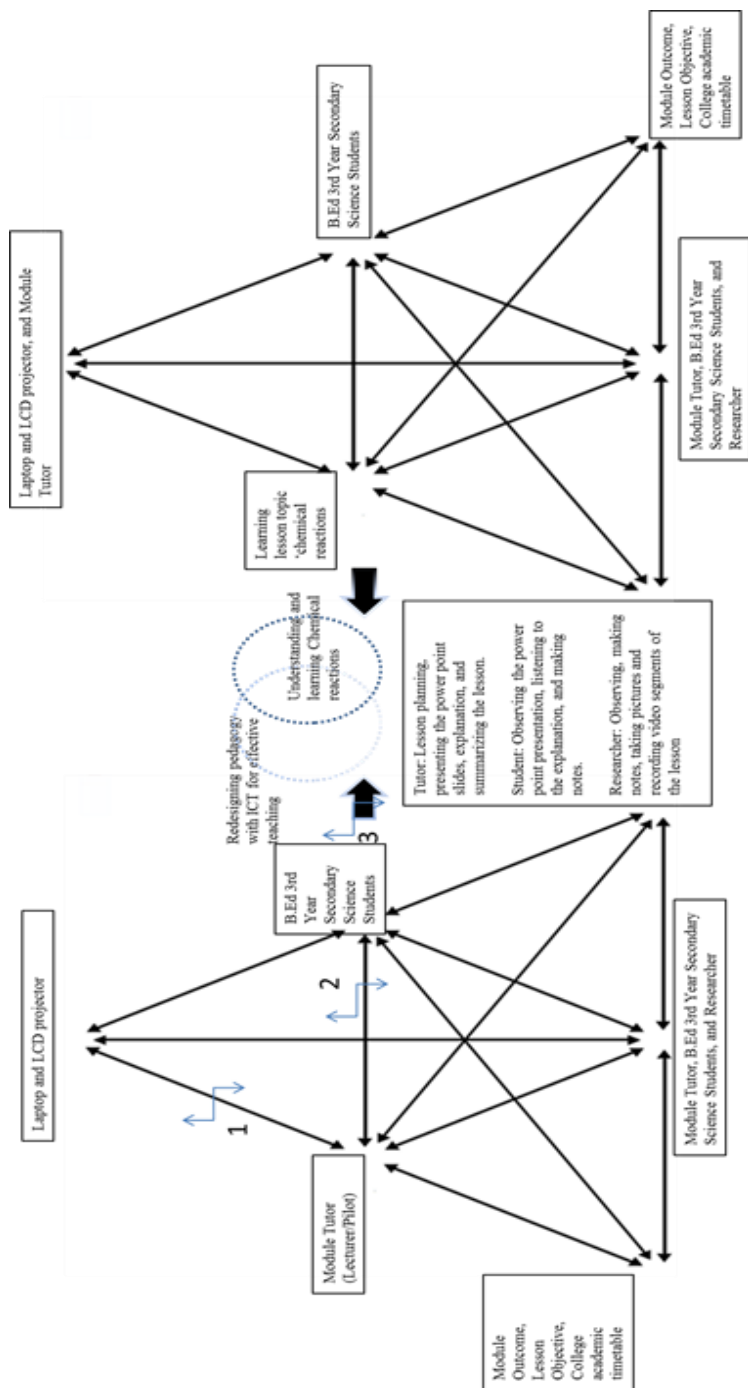


Figure 21. Activity system illustrating the teaching and learning activity

Similar to Pilot Project 1, this activity (see Fig. 21) is a twofold situation with regards to the role of subject, object, intended outcome, and mediation. From the teaching perspective in the activity system, since the tutor is engaged in an organized classroom to teach a particular concept, the tutor becomes the subject. The purpose of this activity was to teach the concept of “chemical reactions” to the students; therefore, the student teachers are identified as the object of the activity. The tutor teaches the concept using a PowerPoint presentation through an LCD projector to mediate student learning. The teaching of the lesson is guided by the general module outcome at a broader spectrum and the lesson objective at the specific; also, the college academic time table regulates the duration of the activity. Therefore, these agents function as a rule under which the activity operates in the activity system. The community listed here includes those individuals that participated while the subject engaged in this activity. As shown in the illustration, each member in the community had their role contributing either directly or indirectly. The tutor has two objectives: to make the students understand the concept of “chemical reactions” by redesigning the lesson with ICT-integrated pedagogy.

From the perspective of the learners, since the teaching is aimed at the students learning a particular concept, the students can also be seen as the main subject. Learning takes place by listening to the tutor and observing the PowerPoint presentation given by the tutor, so both humans and technological artifacts are used as mediators in the activity. The concept in the lesson topic becomes the object of learning, and the intended outcome for the students is to effectively understand and learn the lesson. Likewise, one of the main objectives of the tutor is to enable the students to learn the concept being taught; therefore, learning the lesson becomes a common outcome for both. The tutor intends to achieve this outcome by redesigning the lesson by integrating ICT with pedagogy; hence this is another outcome for the tutor. Furthermore, the researcher, as an interventionist, scans the lesson on the level of technology use.

In the following (Figure. 22), the levels of technological use in the lesson are presented in accordance with the four levels of the SAMR model. The technologies are categorized as per the researcher’s observation depending on how and why they were used during the activity.

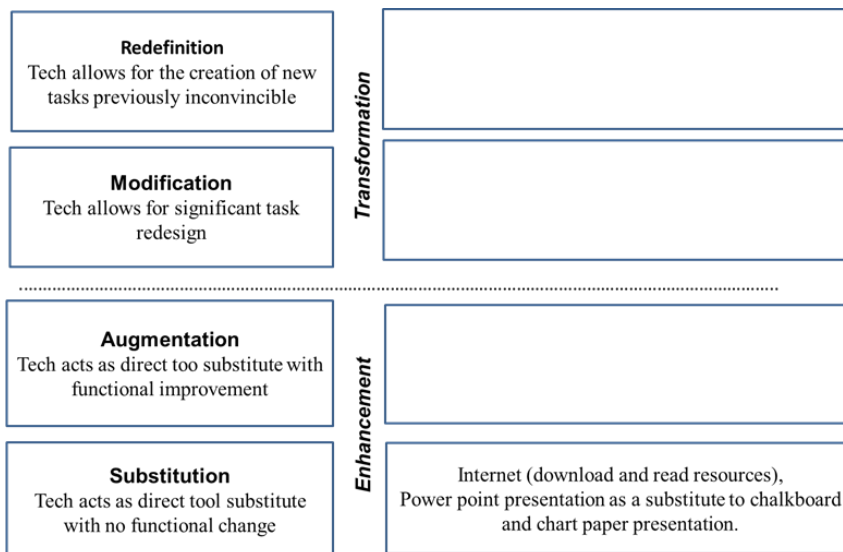


Figure 22. SAMR model illustrating the types and purpose of technology used in teaching

From the researcher’s point of view, the tutor was supposed to redesign the lesson with an enhanced use of technology, but we can see from the illustration that it has been used only at the very minimum level. Therefore, conflict or contradiction is visible between the subject and the tools (1), which directly impacts the objects (2), and eventually also influences the outcome (3).

In order to validate the observation and gain insights into the planning, activity, and the perception of the lesson, a semi-structured interview was conducted. The questions were asked on the following themes: reason for the new lesson design, individual perceptions, limitations, and future plans. The interview transcription has been retained in its original form, without distortion, so that the readers have access to the original version of the thoughts expressed in the pilots. However, a brief discussion will be made at the end of the interview segment in order to give meaning to the whole analysis of the pilot study.

6.3. DISCUSSING PILOT STUDY STAGE ONE

The activity triangle has clearly illustrated the events of the lesson. Though the analysis had no intentions to do a comparative study between the two pilots, the activity system and SAMR model have shown the difference in pedagogy style as well as the level of technology use. In the triangle activity system, though the focus is on the lecturer’s action, all the components of the activity system have been captured to give meaning to the activity. The intervention workshop has made some impacts in motivating and stimulating the mind of the participants to change their

mindset. The following expression from Pilot 1 highlights some impacts of the intervention workshop:

After the workshop, what has been lying in the mind about using ICT facilities in the classroom became awakened. In a sense I have been thinking about these possibilities, but then I never used it, in a sense I was complacent, thinking that even without using ICT normal classes are going on and the syllabus gets covered. But once somebody from outside or some external stimulus comes explaining these are the possibilities and then you rethink, ok why not let me try, that complacency is gone, and those hidden or sleeping thoughts were awakened and we were made to give a try and it worked, that is the first thing, the complacency was removed.

Pilot study 1 displayed an innovative and interesting pedagogical practice in the delivery of the lesson. Besides the workshop, it can be assumed that he had self-motivation and commitment to bring about change in his teaching practice. He uses an analogy to express his commitment; for example, he says, “*once you make a plunge then you have to swim, and once you swim you know the joys and sorrows of swimming.*” Innovatively, he indicated how mobile phones can be effectively used as a technological tool for enhancing and stimulating an effective delivery of the lesson. From his expression, he looked content with the lesson that had been delivered, and he assumed that the students had enjoyed the lesson well. From what I have observed, I also assume that the students enjoyed the lesson and probably the learning was enhanced. However, I cannot ascertain this fully because no feedbacks from the students were taken. Nevertheless, he wanted to progress further in the next lesson with another innovation. The attempt to redesign the lesson did not end with this particular lesson. He also discussed his future lesson plan; he said:

My next plan of activity for the students perhaps in the next semester is to have them establish a ‘pen-pal’ through email, and they will submit a text of their emailing; for example, it could be an essay or poem, or text of the same content that is studied in both the college.

With regards to the second pilot, though the intent and inspiration to change was expressed, she said, for example:

My thinking of pedagogy before the workshop was how to deliver my content to the students and of course keeping in mind the student’s ability and my convenience. I have been using PowerPoint presentations as they are convenient and faster. After the workshop, I started to think about technology in a better ways; instead of considering only my convenience, I could redesign my

lesson using technology. I could collaborate with students to come up with different kinds of animations, and develop some concepts in chemistry with animation.

She also stated that “*I consider the use of technology as very important aspect of my lesson, have always tried to use it in my teaching, and have been also telling students to collect relevant resources and share with the class.*” Unfortunately, minimal change has been observed in the lesson design. As described earlier in the lesson delivery, her lesson was restricted to the same old practice of just using a PowerPoint presentation. The contradictions were not physically visible; therefore, they were not captured within the activity system triangle. Though there were no strong contradictions present for this activity system, some levels were observed during the analysis of the SAMR model, and others were disclosed during the interviews with the individual pilots. Through the interview, subtle revelations were made regarding the tensions between the subject and the tools both in terms of resource availability and competence. For example, she said that “*resources had been a constraint with regards to Internet, computers, and LCD. Sometimes even when I have the resources like CDs, I am not able to use them because I am not familiar with the tools.*” Further, she also expressed the need for support both in terms of resources and skills; for example, she stated, “*the basic requirements that would trigger my use of ICT in teaching are: laptops, CDs with software tools, improved Internet access, and skills training.*” Ending the interview, she proposed to enhance her use of technology in teaching. She expressed the following:

I would definitely like to redesign my lesson incorporating technology. There is lot of advantage in using that; besides, only delivering the content, it is also important how you interact with your students. I have been talking with students, and they have expressed being motivated when technology is being used in the classroom teaching and learning.

As mentioned in the interview, Pilot 1 seemed motivated and determined to make a change in his teaching, and the attempt was exhibited in the lesson that was taught. He had changed his pedagogy and had made optimal use of the available technology for the effective delivery of the lesson. Though no interview was done with the students at the end of the lesson, nevertheless, the smiles on the student teachers’ faces, the constant nodding of their heads in agreement, and active participation throughout the lesson was evidence enough to conclude that the student teachers appreciated the new learning design. The future plans expressed by pilot 1 also indicate that he is already stimulated and is looking ahead for more innovative teaching using technology.

As mentioned earlier, the participation of the pilots in the study was voluntary. After the intervention workshop and during the observation phase, as well as during

the interview, pilot 2 expressed the inspiration she had availed from the workshop and her interest in using technology in teaching. Unfortunately, as shown in the analysis activity triangle and SAMR model, though a desire for change had been expressed, there was no change in the lesson design. Therefore, some assumptions can be made, such as—like many professional development activities—the knowledge and learning attained through the workshop dies at the end of the workshop, and/or it is dependent on individual commitment and determination.

6.4. PILOT PROJECT 1—STAGE TWO

Lesson topic: The Merchant of Venice - Shylock (caption attached)

Teacher activity: Facilitator, guide, and resource person

Student activity: Role play

The teaching observation was made in a B. Ed. third-year Secondary Arts class and consisted of 38 student teachers. The tutor had provided the concept and had written dialogues for the actors and had also assigned roles for each individual student. The students were assigned with the following tasks: actors, curtain pullers, lighting, camera man, sound, etc. The tutor initiated a shift in the design and delivery of this topic from the usual reading aloud of the texts from the text book to designing it in the form of a role play.

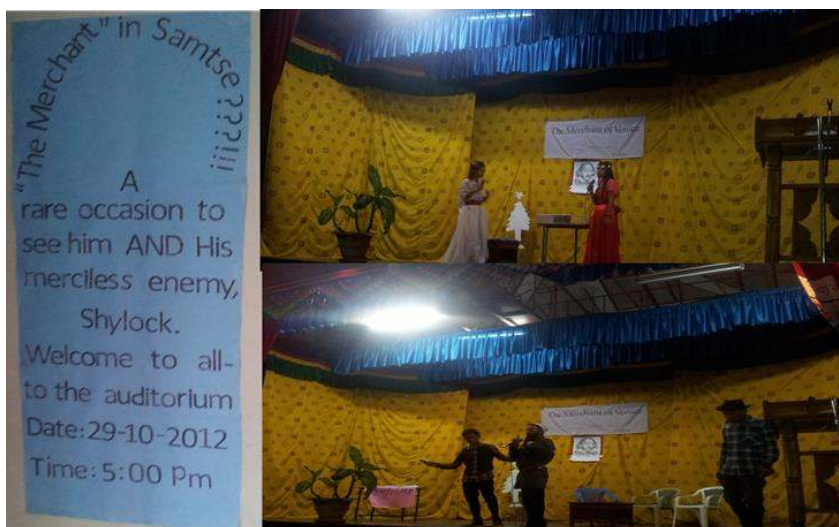


Figure 23. Picture illustrating the caption of the role play and actors staging the play

The role of the tutor was localized before the play was staged to that of planning and developing the play with the students. Important concepts like experiential learning and learning by doing were exhibited as the core learning theme. The technology used here was varied and improvised; a microphone was used as the sound amplifier as the actors communicated their dialogues on stage. Colored lighting was used to create different moods for the scenes as required by the story. A video recording of the whole play was captured by the students, which they have generously shared with me. The video could be considered an artifact produced by the group in the process of their learning which could be used by others in the future who would like to learn the subject.

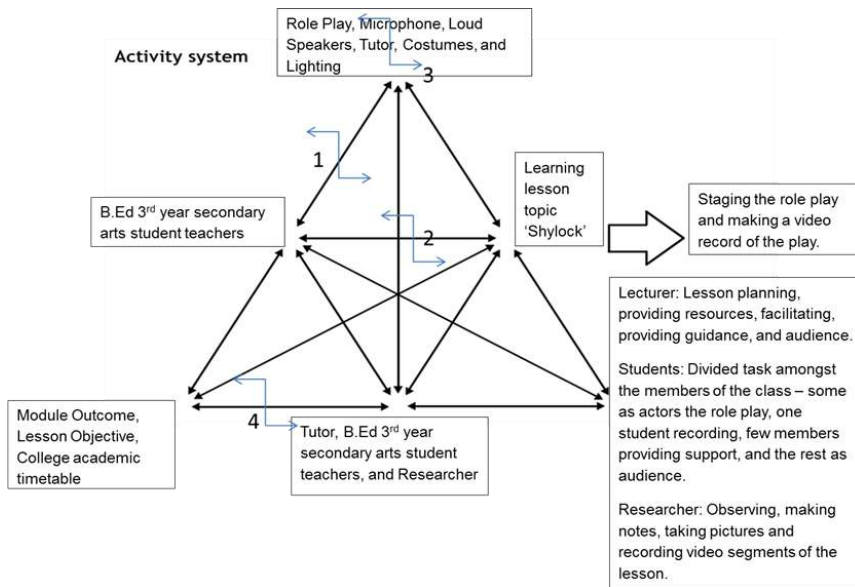


Figure 24. Activity system illustrating the teaching and learning activity

As shown in the activity system, the subject is the student teachers engaged in an organized activity to learn a particular concept. In the tools, both humans and technological artifacts are used as mediators in the activity, and the purpose of this activity was to learn a Shakespeare play enacted through a role play; therefore, it has been identified as the object for the activity. The teaching of the lesson is guided by the general module outcome at a broader spectrum and the lesson objective at the specific; also, the college academic time table regulates the duration of the activity. Therefore, these agents function as a rule under which the activity operates in the activity system. Although all the teaching is supposed to be governed by the college academic calendar, this activity happened after academic teaching hours. The community listed here are those individuals that participated while the subject engaged in this activity. As shown in the illustration, each

member in the community had a role, contributing either directly or indirectly. Since the tutor was not in picture physically during the real event, the students are situated as the main subject of the activity system, and the object and the outcome is related to the students. On the other hand, the tutor's agenda is an attempt to redesign her teaching and enhance the use of technology with the ultimate intention to motivate and improve the students' understanding of the concept. Furthermore, the researcher, as an interventionist, scans the lesson on the level of technology use.

Contradictions were visible between the subject and the tool (1), for example, since the stage where the role play was enacted was not designed and appropriated with the required equipment—the setting was improvised with what was available. The actors did not have individual microphones, which could have been clipped on their shirts to deliver the dialogue loud and clear; rather, they had to use microphones which they had to hold in their hand to deliver the dialogue, and it had to be passed from person to person. We can make two assumptions here: This is either because the college has no equipment or infrastructure to support such innovations, or there is no administrative support for such innovations. The second contradiction was between the subject and the object (2), and it was related to time management. The role play took a little longer than planned; this was mainly due to the stage setting and the equipment, which hampered the smooth flow of the role play segments. For this we can blame the unavailability of the infrastructure and the required resources, as well as to some extent the planning. Internal contradictions or primary contradictions within the tools, for example the students will not like the role play because of the constraints (3). The college academic teaching hours are from 8.30–16.30, but the role play was staged after 16.30 hours; therefore, the community of the activity system is engaged beyond the teaching hours, which would have implications on their other plans (4).

In the following, the levels of technology use in the lesson are presented in accordance with the four levels of the SAMR model. The technologies are categorized as per the researcher's observation depending on how and why it was used during the activity.

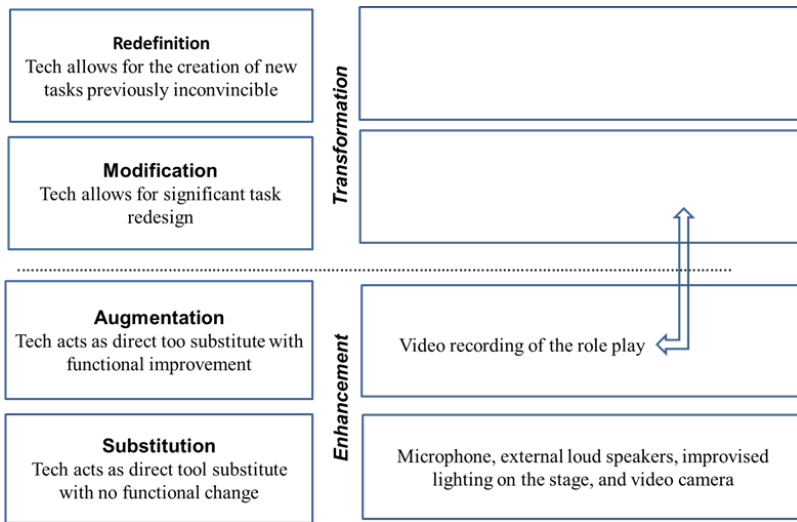


Figure 25. SAMR model illustrating the types and purpose of technology used in teaching

The illustration indicates clearly that the Internet and online teaching are not used, nor are many sophisticated technological tools used. However, through my observation, it was seen that the available tools were used very meaningfully. For example, the microphone was used to communicate the dialogue by the actors, the external loud speaker was used to enhance the volume of the sound so that all could hear the dialogue clearly, and the video recorder was used to record the entire play. Although the recorded video is placed at the augmentation level, it could be even considered to be a modification, as this artifact could replace textbooks since students could watch the video to learn this concept.

6.5. PILOT PROJECT 2—STAGE TWO

Lesson topic: Chemical reaction

Teacher activity: lecture

Student activity: listening, observing, and reading

The second lesson observed was a continuation of the first lesson. It was the same group of students with only a change in the concept—it was the same topic, but the concept was at a more complex level. Like the previous lesson, PowerPoint was used as the medium to deliver the lesson. As a change of strategy, the tutor used the blackboard to re-explain the contents from the PowerPoint. The teaching and learning situation is illustrated in the following activity system triangle (Fig. 26):

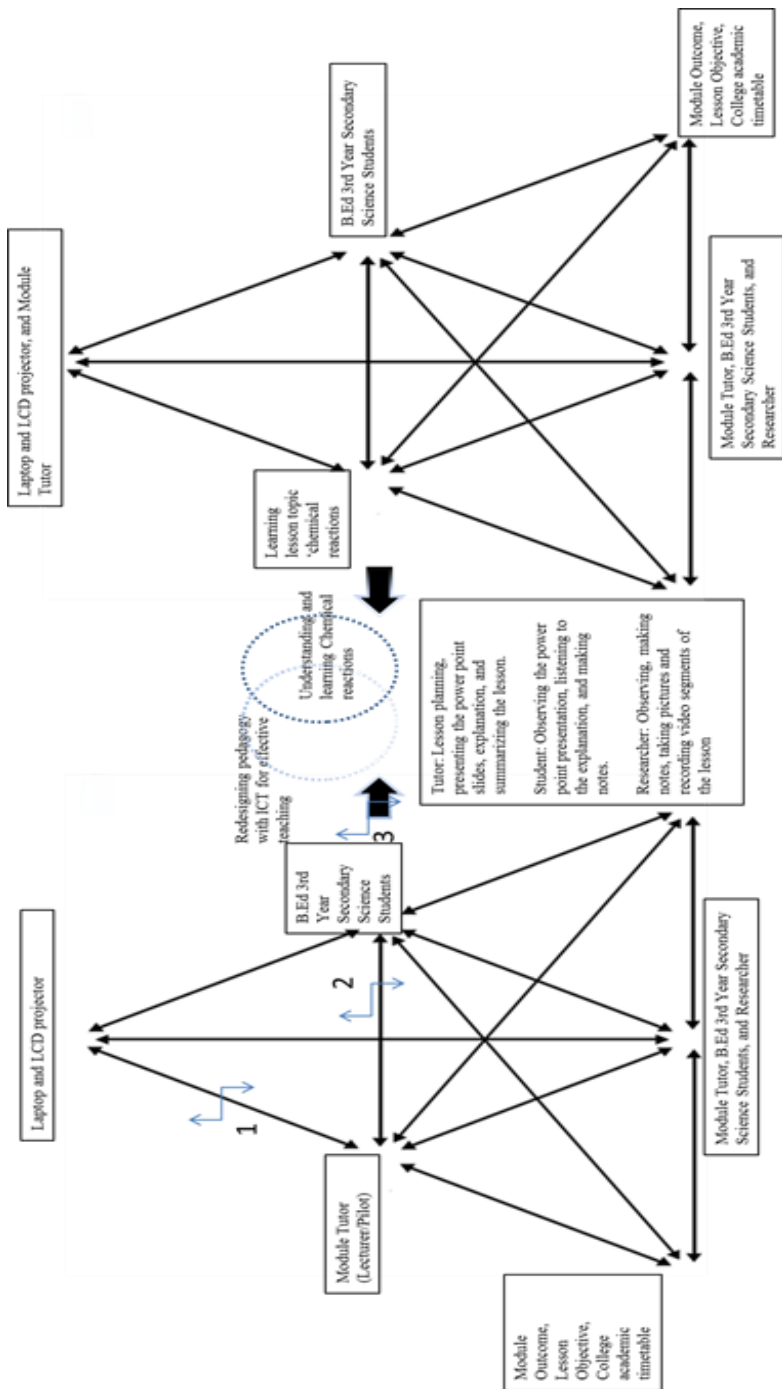


Figure 26. Activity system illustrating the teaching and learning activity

This activity system is not very different from that in Figure 21. From the teaching perspective in the activity system, since the tutor is engaged in an organized classroom to teach a particular concept, the tutor becomes the subject. The purpose of this activity was to teach the concept of “chemical reactions” to the students; therefore, the student teachers are identified as the object for the activity. The tutor teaches the concept using a PowerPoint presentation via an LCD projector to mediate student learning. The teaching of the lesson is guided by the general module outcome at a broader spectrum and the lesson objective at the specific; also, the college academic time table regulates the duration of the activity. Therefore, these agents function as a rule under which the activity operates in the activity system. The community listed here includes those individuals that participated while the subject engaged in this activity. As shown in the illustration, each member in the community had a role, contributing either directly or indirectly. The tutor has two objectives: to make the students understand the concept of “chemical reactions” by redesigning the lesson with ICT-integrated pedagogy.

From the perspective of the learners, since the teaching is meant for students to learn a particular concept, the students can also be seen as the main subject. Learning takes place by listening to the tutor and observing the PowerPoint presentation given by the tutor, so both humans and technological artifacts are used as mediators in the activity. The concept behind the lesson topic becomes the object for learning, and the intended outcome for the students is to effectively understand and learn the lesson. Likewise, one of the main objectives of the tutor is to enable the students to learn the concept being taught; therefore, learning the lesson becomes a common outcome for both. The tutor intends to achieve this outcome by redesigning the lesson by integrating ICT with pedagogy; hence, it is another outcome for the tutor. Furthermore, the researcher, as an interventionist, scans the lesson on the level of technology use.

Despite the commitment expressed in the earlier interview, no change has been initiated in this lesson. Therefore, there is still a tension between the subject and the tools. The possible assumptions are similar to what has been described before. Though a different idea for the lesson was to redesign it toward student-centered learning, no division of labor was observed. It was the teacher talking and reading aloud from the PowerPoint slides, and the students remained as passive listeners—hence, contradiction was identified between the subject and the object (2). With this tension between the subject and the object, it can be assumed that there will also be strain on the outcome; therefore, contradiction (3) was identified between the object and the outcome.

Finally, as shown in the following (see Figure 27), there has been no progression in the use of technology in teaching. It has remained stagnant and the same. The technologies are categorized as per the researcher’s observation depending on how and why they were used during the activity.

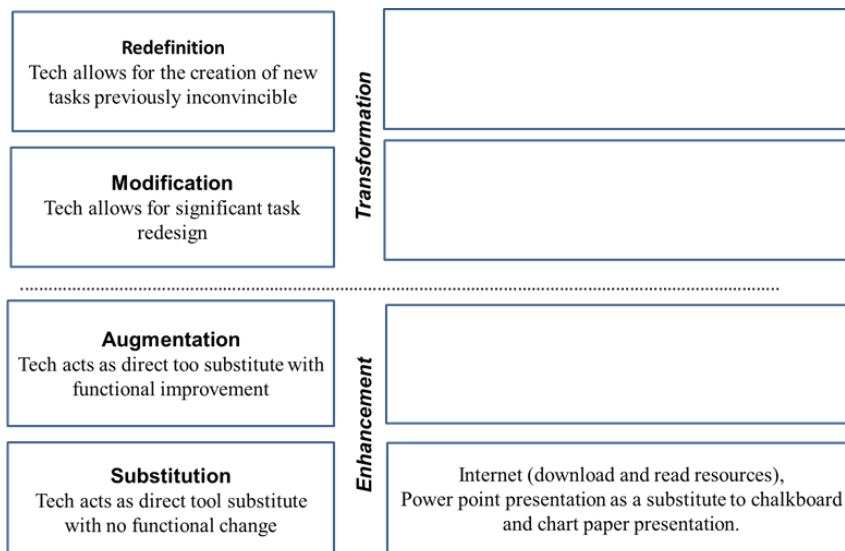


Figure 27. SAMR model illustrating the types and purpose of technology used in teaching

6.6. DISCUSSING PILOT PROJECT STAGE ONE AND STAGE TWO

From the hermeneutics theme “the meaning of a part can only be understood if it is related to the whole,” studying the sequence of the lesson flow and the pedagogy of the overall lesson delivery, Pilot 1 focused on a student-centered approach to learning in both stages. The core values of experiential learning and learning by doing are deeply reflected in the events of the second stage lesson as the students were getting “into” their roles, they had the opportunity to feel the character and at the same time learn the content.

In terms of technology use and according to the SAMR model, there is an inclination toward redefinition, where the technology use can provide opportunities to create what would not be possible without that technology. For example, photographs cannot be presented to the entire class without the use of PowerPoint media. In another format, using a mobile phone to contact a person live and allowing that person to discuss the content with the class was quite stimulating for me as an observer and also for the students, as I could see from my observation (picture attached for reference). Moving on to the second stage lesson, there was progression both in terms of pedagogy and the use of technology. The students produced an artifact, which was a video recording of their drama (role play).

With regards to Pilot 2, in both stages of the lesson, there was no dramatic display of deviating from the regular teaching practice that happens in the college. These data are included, however, to present the varied scenarios that happened after the intervention workshop.

CHAPTER 7. PLANNING & IMPLEMENTING THE INTERVENTION WORKSHOP—PHASE II

This section will open up with some discussion on the shortcomings of the Phase I intervention workshop, and then, incorporating the changes, it will set the scene for the second phase intervention. The process of the intervention workshop carried out with the faculty at SCE during the second phase will be described, along with a description of the workshop proceedings and the procedural steps carried out to collect the data.

The theoretical bases for the intervention workshop as well as the study as a whole combine frameworks from the sociocultural historical theories inspired by Vygotsky's (1978) work—a human act is not just a response (R) to a stimulus (S) but is mediated by a cultural component (X)—and theories of expansive learning (Engeström, 1987). Some core concepts of the activity theory have been considered for this phase, and thus a brief mention of the contextual concepts is presented. The overall theory has been discussed previously in Chapter 3.

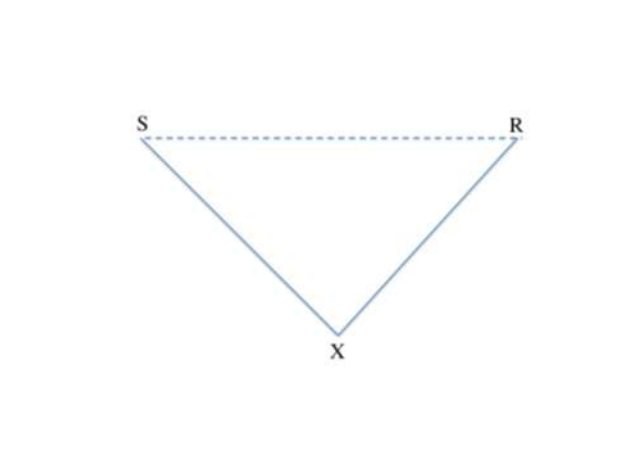


Figure 28. The structure of mediated action (Vygotsky, 1978, p.40)

Expansive learning is a joint journey across a collective zone of proximal development, where participants learn something that is not yet there (Engeström, 1987). Engeström stated that the “*expansive cycle begins with actions of questioning the existing standard practice, then proceeds to actions of analyzing its*

contradictions and modeling a vision for its zone of proximal development then to actions of examining and implementing the new model in practice” (2000, p. 960). Further, he states that expansive learning increasingly involves the horizontal widening of collective expertise by means of debating, negotiating, and hybridizing different perspectives and conceptualizations. The theory of expansive learning puts the primacy on communities as learners, on the transformation and creation of culture, on horizontal movement and hybridization, and on the formation of theoretical concepts (Engeström & Sannino, 2010).

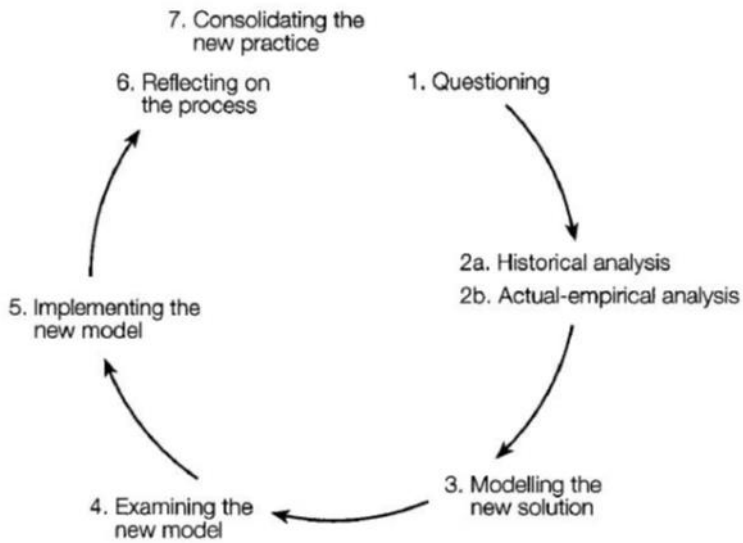


Figure 5. Expansive cycle of learning actions.

Figure 29. Expansive learning cycle (source: adopted from Engeström, 200, p. 970)

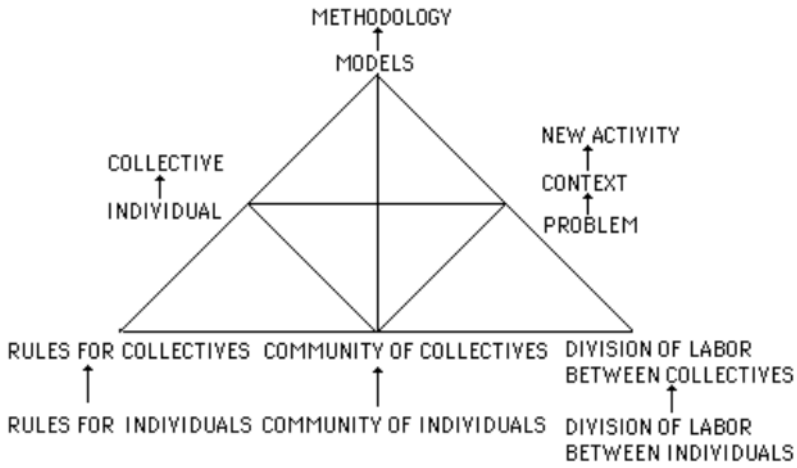


Figure 30. The structure of a learning activity (Engeström, 1987, p. 72)

Participatory design will be used as a methodological guide within the activity system on the actions between subject and object.

Participatory design as a third space in human computer interaction

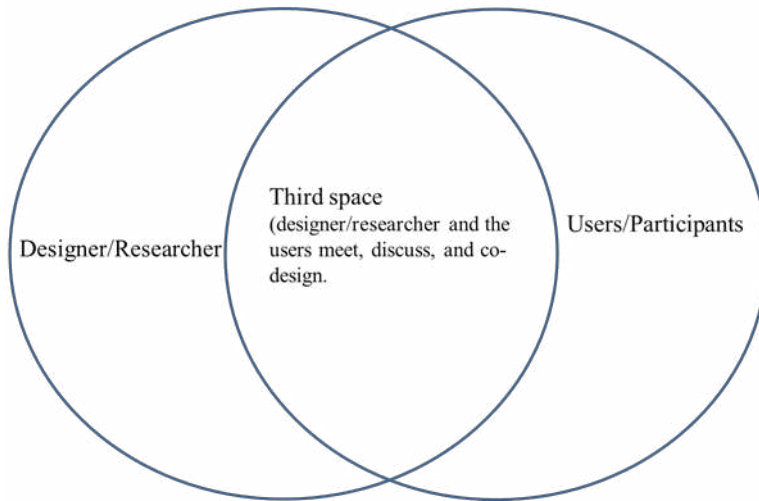


Figure 31. Illustrating the concept of third space in the context of participatory design (Adapted from Muller & Druin, 2013)

Mirror Data

The baseline study was conducted with survey questionnaires that were administered amongst the lecturers of SCE, of which 60% of the faculty participated; further, as an extension of the survey, a focus group interview was conducted with six participants. The findings from this baseline study guided the planning of the first phase intervention workshop, which was conducted at SCE, and 50% of the faculty members participated in the workshop. The workshop was designed around the concept of the need for rethinking pedagogy, and the outcome of the workshop was the production of new lesson design framed within the concept of 21st century teaching and learning. Further, as a follow-up to the workshop, two faculty members were identified as pilots for further study. The following diagram on the expansive learning cycle will outline the actions in the activity systems.

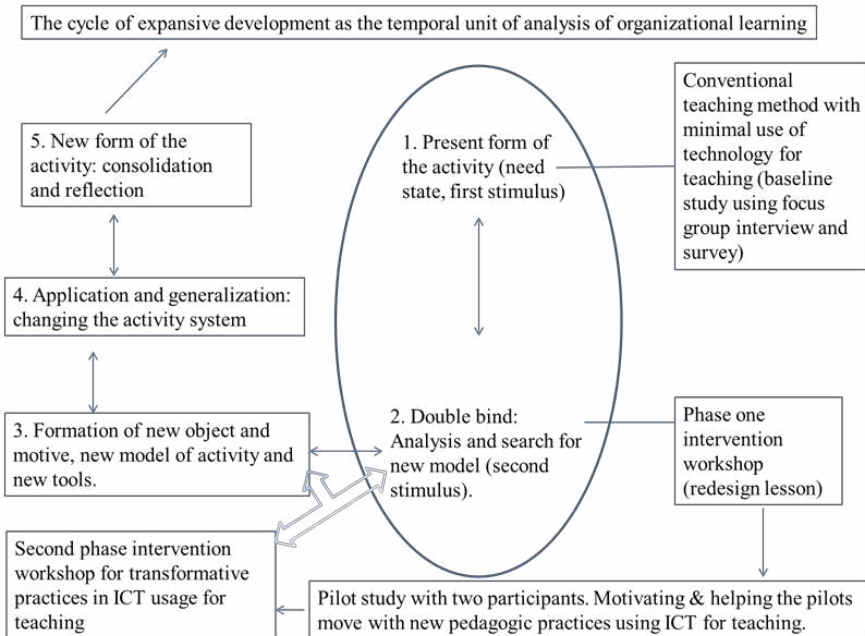


Figure 32. The cycle of expansive development as the temporal unit of analysis of organizational learning - describing the process of the activity of the current study

Rationale

The challenges for educators emerging from the major developments/changes in the world call for teachers/educators to adapt to the situation of the current paradigm. Teachers need more support to meet the demands of teaching, and they need tools to meet higher expectations (Elmore, 2002).

In recent years, the traditional literacy areas of reading, writing, and mathematics have been extended to include information and media literacy, global and economic literacy, and civic responsibility, which are all considered to be some of the so-called 21st century skills. In an extensive comparison of frameworks of 21st century skills, Dede (2009) claims that education for the 21st century should encompass the following:

- ✓ 21st century content knowledge, learning, and thinking (critical-thinking and problem-solving skills, communication skills, creativity and innovation skills, collaboration skills, contextual learning skills, information and media literacy skills);
- ✓ ICT literacy (the ability to use technology to develop 21st century content knowledge and skills); and
- ✓ life skills.

The current study has no intention to cover all the 21st century education skills; rather, it will focus specifically on ICT literacy. Regarding ICT literacy, the intervention focuses not on hands-on skills training of the software or hardware aspects of the technology but on the strategies to enhance the innovative use of ICT in teaching, aligning to the learner needs of the 21st century. The potential of ICT as a tool for both learning and teaching has long been acknowledged, both in developed and developing countries. In order to enhance teaching and learning, it is critical that teachers understand the factors which influence the education culture (Wiske, 2001).

The Royal University of Bhutan officially launched VLE in the educational programs in 2011. It also has a practice of providing sporadic workshops and trainings to teaching staff in the colleges under RUB. The overall findings from the baseline study, the Phase I intervention workshop, and the pilot project has shown that the use of ICT in teaching is still low. Some of the key findings were as follows: Besides constraints such as lack of resources, IT support, skill, and competency, one of the major drawback revealed was the attitude or mindset of the individual lecturers. Therefore, this intervention phase will have “providing motivation” and “changing the mindset of the participants” as the main focus of the intervention.

Context

The researcher is a member of the teaching faculty at the college and, in the activity system, becomes part of the subject/participants along with lecturer/lecturers. Additionally, the researcher also has the part of the interventionist, taking the role of mediation in the activity system.

Needs: Contradictions identified

I have identified and considered three contradictions within the teacher education college of Samtse: (1) Stability vs Development, Conventional Pedagogy² vs Rethinking Pedagogy, and the Reproductive/Enhancement level of ICT usage in teaching vs the Transformative level of ICT usage in teaching.

Describing the process of dealing with the contradictions

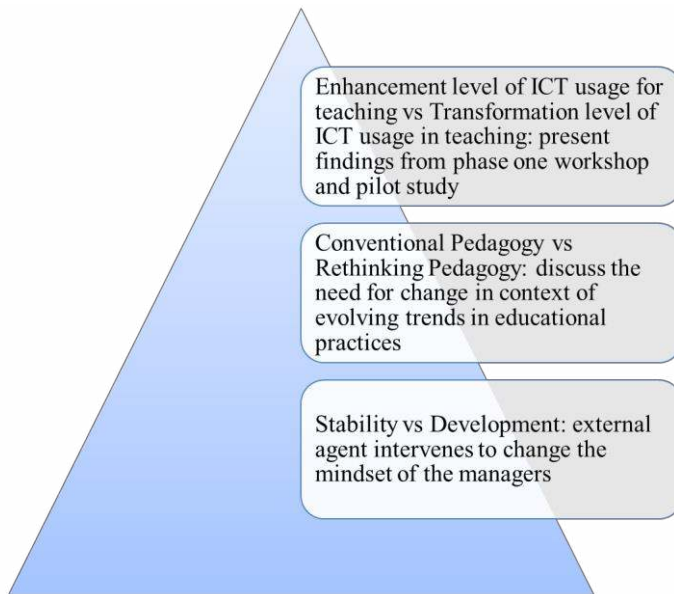


Figure 33. Illustrating the contradictions at SCE while initiating a change process through the intervention workshop

Stability vs Development: This relates to changing the mindset of the management at the college and the teaching faculty at large toward the new approach; for example, the intervention workshop serves as a means to initiate change in the modality of the teaching practices in terms of the 21st century. The existing mindset of the college management is that there is no need for the intervention workshop in

² The existing pedagogic practices, where teaching happens with teacher as the central focus and the epitome of knowledge with regard to use of technology in teaching it is a mere extension of replacing the blackboard with a PowerPoint presentation, printed handouts to PDF files online, etc. There is no innovation and modification in the use of technology.

the context of using ICT in teaching. The resistance is on the stand that the management has conception on any training related to ICT as an aspect of skill development only and believes that such development can be achieved by teaching faculty practicing on their own without an intervention workshop. To overcome this hurdle of changing the mindset of the management and pave the way to get to the lecturers (research participants), an external agent will intervene for this purpose. An instrument such as a presentation on capacity development and the role of leaders will be made to the management; further, discussion will take place with the management on the significance of the intervention workshop.

The workshop introduction will be conducted with a recap of the contents from the Phase I intervention with a discussion on the context of Conventional Pedagogy vs Rethinking Pedagogy (stepping back to the first stage of the expansive learning cycle—1st Stimuli). Moving on, a summary of the data analysis and conclusion of the first phase workshop and the pilot study will be made describing the Reproductive/Enhancement level of ICT usage in Teaching vs Transformative level of ICT usage in teaching (moving to the second stage of the expansive learning cycle—double bind). The following figure describes the interactivity system leading to the final object and the subject for the study.

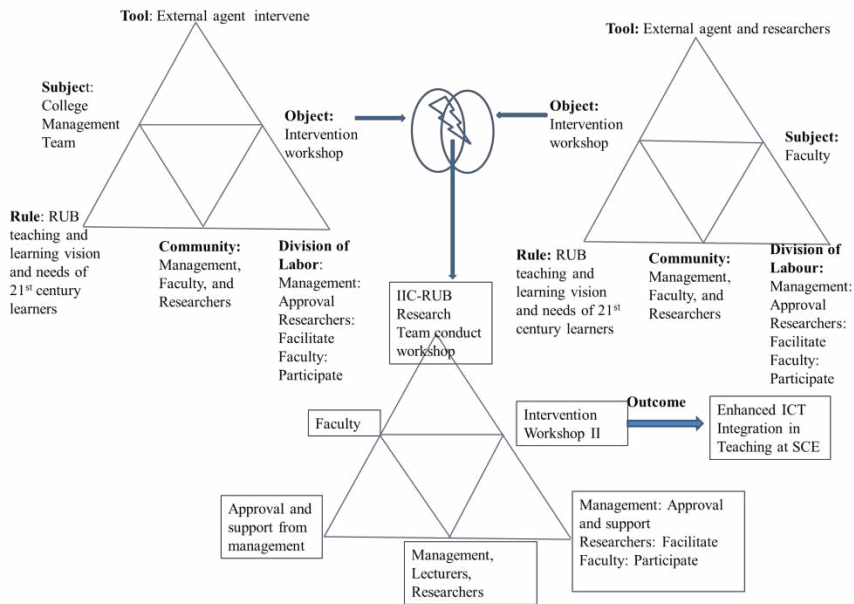


Figure 34. Overview of the activity system, starting the change with managers as subjects and intervention workshop as an object, to get to the subjects (lecturers) and the main object (ICT integration in teaching program) with the intervention workshop becoming a tool or instrument

7.1. DESCRIBING THE PROCEEDINGS OF THE PHASE II INTERVENTION WORKSHOP

A one-and-a-half-day (October 11 and 12, 2013) intervention workshop titled “Rethinking Pedagogy for 21st Century Education,” with an intentional move from the technological enhancement to the transformation level based on the SAMR model on ICT integration in teaching at Samtse College of Education (SCE) commenced on October 9, 2013. Par Ola Zander (the external agent as outlined in the activity theory triangle) made an initial presentation to the college management team in an attempt to create awareness on the need to rethink pedagogy. The ultimate goal of this presentation and discussion was to alter the mindset of the managers to think positively regarding the workshop goals and eventually support the idea of using ICT in teaching and learning.

Usually at SCE, staff development programs are proposed by the faculty members during the semester planning meeting, which happens twice in a year, one in the beginning of the first semester and one at the beginning of the second semester. In the event any staff development program proposal is made from an outside agent, prior approval has to be obtained from the head of the college. If the head of the college is in favor of the proposal, then it is discussed with the sub-heads (deans, program leaders, and heads of departments). If all are in favor, then a notification is issued to the faculty members on the details of the staff development program.

In line with the college’s practices, such a proposal was made during the planning meeting by the Lead Researcher of the IIC-RUB research group. Unfortunately for this particular intervention workshop, when the proposal was made by the IIC-RUB research team, it was not received positively by the college head. He made remarks such as, “*I don’t think our lecturers will need special training on ICT; it is a skill that they can learn themselves.*” The same comment was also made to all staff members during the planning meeting. The impact of such a comment can be well explained considering an excerpt from a national newspaper where the author states (Kuensel, 2015):

While junior officers hesitate to raise issues or debate, quite often seniors are hesitant to accept feedback, even if it well meant. Sometimes criticism, even if well intended, could be extremely personalized. Comments and suggestions on any decision could be misconstrued as a challenge of authority. This is also common among corporate leaders, who are expected to be more open to criticism and suggestion in a corporate governance environment.

Power-distance exists and is still wide in Bhutan, which is a hindrance when someone from the lower ranks initiates any change. Power-distance refers to cultural conceptions regarding the degree of power which authorities should have

over subordinates (Hofstede, 1980; Lee, Pillutla, & Law, 2000, p. 687). People who believe that superiors should have a great degree of power over subordinates are considered to be high on the power-distance orientation and people who believe that a smaller degree of power is appropriate are considered low on this orientation (Lee, Pillutla, & Law, 2000, p. 687).

Another remark was made to the face of the researcher: “*What changes have you brought with your research? I don’t want our faculty to be the guinea pigs of your study.*” These instances strongly indicate an opposition to the idea of the intervention workshop. Two assumptions can be made here: Firstly, any professional development activity that has the ICT tag relates to skills training on ICT from the perspective of the manager. Maybe all training on ICT in the past was related to skills training. I do not have sufficient evidence to prove this; however, it was highlighted in the Introduction chapter that the past professional development programs have been more skill focused. Taking a personal stand on this issue as an insider, I would like to affirm that the past trainings availed by the faculty had more to do with ICT skills training and not much on integration with pedagogy. Secondly, the head of the college was looking for immediate results or visible outcomes and was not convinced by the result of the first phase intervention workshop.

Therefore, during the planning stage of this workshop, the managers were not motivated and convinced enough to allow the intervention workshop to be conducted for the faculty of SCE. This weak support created a certain number of obstacles for the research team in planning the intervention workshop and which, to a certain extent, also resulted in the short duration allowed for the workshop. However, there were mixed responses as some faculty members wanted this intervention workshop to be conducted and others who did not support the idea. The IIC-RUB Lead Researcher made several attempts to convince the college managers of the possibility to conduct this workshop. Eventually, at a later stage, the head of the college approved the proposal. Since there had been mixed responses, the workshop participation was on voluntary basis. Twenty-nine voluntary participants registered for the workshop from a total of 56 faculty members. Therefore, in the activity system, the college management team has been identified as the subjects.

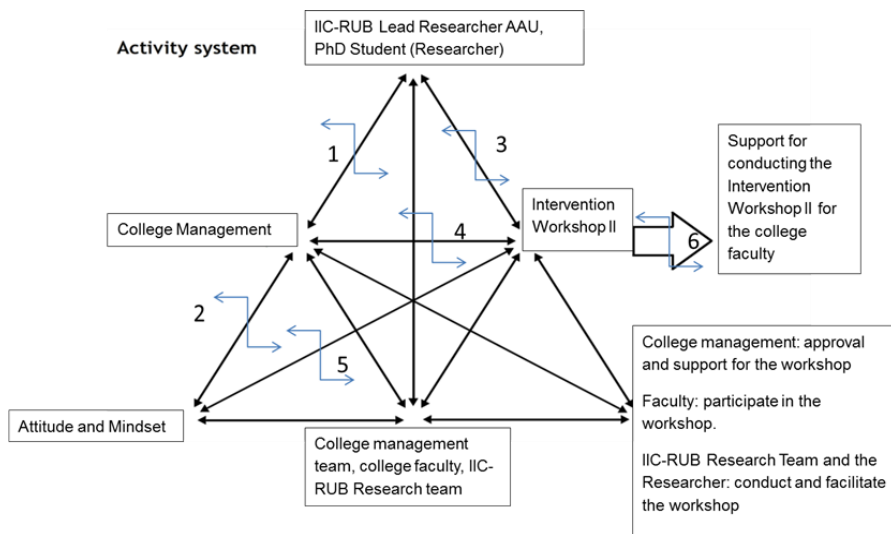


Figure 35. Activity system illustrating the events and contradictions from pre-proceedings of the second phase intervention workshop

The activity system above (Figure 35) illustrates the pre-workshop proceedings and dealing with the contradictions. I cannot say that we had total success in overcoming the tensions; however, it was a procedure that was adopted to conduct of the workshop. The contradictions were as follows: (1) between the Subject and the Mediators—getting the management team to listen to the presentation and have a discussion with the mediator; (2) Subject and Rule—making an attempt to change the mindset and attitude of the college management toward the intervention workshop by the AAU Lead Researcher and PhD student; (3) Mediators and Object; (4) Subject and the Object; and (5) Rule and the Object—the previous contradictions had naturally posed obstacles in getting the faculty to participate in the workshop; (6) it can be assumed that all the contradictions highlighted above eventually impacted the outcome.

Implementing Intervention Workshop II

On the 11th of October, a formal intervention workshop was conducted for the faculty of SCE. Although only 23 participants attended the whole-day workshop, 90% of the departments were represented, only the Biology department was missing. Not all registered participants were able to attend the full-day workshop as they were occupied with their teaching tasks and other administrative responsibilities. They apologized verbally for the inconvenience caused. The workshop was organized into the following three steps:

Activation: A short (20-minute) presentation by Kinley (PhD student) on the state of learners in the digital world indicating the need for teachers to rethink teaching for the 21st century learners. The brief lecture, titled “Rethinking Pedagogy for the 21st Century Digital Age,” was intended to create awareness on the influence of technology on learners and consequently the teachers. The presentation highlighted the current trends in teaching and learning globally.

Par Ola Zander continued as a second presenter and gave a lecture on “ICT Integration for 21st Century Skills.” As an extension from the first presentation, elaborations were made using a few examples of how ICT tools could be used in teaching. Additionally, examples of the positive and negative impacts of technology integration in teaching and learning were also made. A brief question and answer session followed the lecture.

Marianne Georgsen then introduced the participants to the concept of learning design and also described the various types of learning design. Upon familiarization with the concept of learning design, a small group activity was organized where individual participants reflected on their own teaching behavior, highlighting changes that were made to their own pedagogic practices based on an inspiration or a motivation.

Another activity was introduced where the participants were grouped according to their departments: Six groups were formed (English, Mathematics, Educational Psychology, Chemistry, Physics, and Professional Development).

The following instruction was given for the group activity:

How to structure your design process—step 1

Make an illustration of an existing module you wish to work with (general plan):

- ✓ Time and duration
- ✓ Roles of teacher and students
- ✓ Activities involved
- ✓ Use of IT
- ✓ Materials used and produced
- ✓ Most important learning goals

How to structure your design process—step 2

Look at your plan/illustration and analyze it with particular emphasis on

- ✓ What works well? Why?
- ✓ What needs to be changed? Why?

- ✓ Describe both points (add to sheet with plan)

How to structure your design process—step 3

- ✓ Discuss ideas for change in your module, and describe each one in brief—remember to take input from facilitators when relevant
- ✓ Decide which ones will go into your new design (and save the rest for future work)

How to structure your design process—step 4

Keywords/headings for describing your new design:

- ✓ Activities—who does what; when; where; with whom?
- ✓ Organization—how is the work of the students organized? Their interaction with the teacher, other students, external partners? Etc.
- ✓ Materials used? Materials produced in the module? By whom?
- ✓ Role of the teacher? Role of students?
- ✓ What is the innovation you are looking for? And how do you expect it to show itself (what changes will be visible?)

Each department's members discussed their modules and prepared a new design. Following the group work, the six departments were split into two groups for parallel presentations in two rooms with a chair in each of the rooms. Photographs of the posters were taken, and video recordings were made of the presentations (see picture). A post-workshop reflection session chaired by Par Ola Zander was held at the end of the workshop where the IIC-RUB research team members shared individual views on the following: shortcomings, successes, and identification of the pilots.

The next day, an opportunity was provided to the three selected presenters (identified as pilots), from the department of English, Psychology, and Physics, to reflect on their designs from the previous day's presentation. The resource persons interacted with the presenters in detail, giving constructive feedback on the way forward.

7.2. ANALYSIS OF INTERVENTION WORKSHOP II

A total of 23 faculty members comprising 5 females and 18 males participated in the workshop. Three sets of data collection tools were employed, and the details of the data contents are as follows: Videos—from six departments (Psychology, Professional Studies, Chemistry, English, Mathematics, and Physics); Posters—presentation charts from the respective subject groups on the new lesson design; Photographs of participants during the activity.

This study pertains to the members of the teaching faculty at SCE only and does not represent all the institutions of RUB. It should be noted that this study has been primarily concerned with less than 50% of the teaching faculty at Samtse College of Education. It has been shown that the skill and application level of ICT in teaching is varied across the 10 colleges of RUB (Choeda et al., 2014). Therefore, the findings from this study limit generalizing the overall practices at the Royal University of Bhutan.

7.2.1. DATA INTERPRETATION AND ANALYSIS

The verbal presentations from the presenters and text transcriptions from the posters were carried out under the procedural steps as per the instructions given during the start of the activity. The details of each lesson presented has been narrated to illustrate the pedagogy and ICT incorporated in the plan, as well as to demonstrate the variations in the designs amongst different groups. Through the interpretation and analysis, it can be observed that the some of the plans did not follow the procedural steps as outlined in the activity instructions. The empirical data provide evidence to describe the state of teaching and learning as aligned to 21st century education. The sequence of the departments is organized as per the sequence in which the presentations were made.

Psychology department presentation: The presentation was made on the module “Introduction to Child Development,” and the presenter said that it is a module calculated for 60 hours in a semester and taught for 5 contact hours of face-to-face teaching. The presenter proposed the following changes that would be incorporated into the module: changing the modality of the assignment to prevent plagiarism, inviting experts on child development and creating documentary and real scenario that would motivate and enhance the learning of the students, and initiating the use of a wiki page to initiate collaborative writing. The lecturer mentions the use of anti-plagiarism software, making a documentary (recording and making videos of an event), and a wiki page. The lecturer’s desire to use a documentary to capture the real learning of the students by way of inviting guest lecturers indicate the use of an ICT-supported learning environment. He shows an understanding of the potentials of an ICT-integrated approach where traditional rote learning is avoided. For example, he speaks of the current practice of assessment and states that “because when we focus on examinations, we focus on theory, and they go for rote learning and memorizing.” The verbal presentation was not very systematic, and the ideas shared were random; therefore, it can be assumed that the Psychology department group has a desire to change but has no clear visions on how to make it happen.

Professional Studies department presentation: The presentation was made on the module “Teaching Strategy,” and the presenter said that it is a module calculated for 45 hours in a semester. The presenter indicated that students are taking an active role in the teaching and learning process: “*For teachers we have information input,*

like lecturing, demonstrating, modeling, role-play and other one is facilitating, researching, evaluating, and then for students we have written discussion, planning. They are enactors; they are presenters.”

In terms of the change, the presenter mentions that lecturing will be limited and that the topic and some resources will be posted online, where students can discuss, reflect, and analyze various strategies related to a particular topic online. The presenter states, *“For change, we thought 21st century ICT based should be incorporated for a change in content; individualized strategy should be replaced because we do not find it very relevant and useful.”* Individualized strategy usually means the module has 10 listed and prescribed teaching strategy topics that have to be learned by all, which in a way reduces the scope of choosing and learning other available and relevant teaching strategies. I also have been working with this module for a long time, and teacher graduates from the field have expressed that the 10 strategies they have learned in the college are not useful in some contexts, and they have to explore on their own to meet their needs. Therefore, this proposal, if implemented, will provide an opportunity for students to break from the limitation of learning the limited strategies prescribed in the module and expose them to a larger picture of teaching strategies. The presenter also mentioned using YouTube, PowerPoint, LCD projectors, and laptops to support teaching and learning. The integrated approach, however, is not evident.

Chemistry department presentation: The presentation was made on the module “Thermo Dynamics.” The presenter said that one semester is equal to 15 weeks, with four periods in a week; then, for each module they have 30 periods for theory input and 30 periods for practical activities. The division of labor between the lecturer and the student teacher was also highlighted when the presenter said that *“In this module, the role of teachers starts with planning and assessment and facilitating students’ learning, classroom activities, and information input. Students are involved as listeners and observers in the classroom, making presentations, writing examination, and carry out practical.”* It was mentioned that in the current form of teaching they use PowerPoint presentations and VLE, and it was highlighted that in VLE they are also using the discussion forum. Further, they said that they create and use online quizzes, the Google website for information searches, and YouTube videos. The presenter mentioned that group work and PowerPoint presentations with animations works well while teaching this module. The change that the group proposed was to explore some more tools in VLE and use it for more interactive teaching and learning rather than being limited to just uploading reading resources and assignments. Though no specific examples were highlighted on how they use technology, on a general level we can assume that the group has been making attempts to use technology in teaching. Interestingly, they also proposed an online peer assessment and maintaining a learning log on VLE. On the whole, the group expressed a lot of doable and interesting ideas for change.

English department presentation: The presentation was made on the module “Academic Skills.” The presenter said that the module is spread over 15 weeks in a semester, with four periods in a week. The presenter mentioned that the teachers’ role is limited to being facilitators, and the students are the active learners. They said that a pre-developed manual is used to deliver this module and that the advantage of using the manual they said was “*because this manual contains a lot of exercises and then students are actively involved in the write up, as the main activities in the module are writing and presentations.*” As for the medium, they said that they also use PowerPoint presentations and video clips to teach this module. One positive of this module, they said, was students learning the value of academic integrity. However, the weakness of the module and the manual highlighted was that, due to the enormous amount of exercises and activities, there is no opportunity for the student to repeat and practice one a particular skill, which eventually leads to mastering none. The group felt that the module is too heavy and compact for one semester, and they expressed a need for more time. Therefore, they proposed that the module to be spread across two semesters. They said that such a proposal had been proposed to the relevant stake holders earlier but with no success. Yet they are still hopeful for their proposal will be accepted and are positive that the teaching and learning would be more enhanced.

Interestingly, the other changes that the group proposed were 1) to encourage students to bring their laptops into the classroom with network connectivity provided, so that the exercises given in the manual as well as extra exercises from the network can be done in the class, guided by the tutor and 2) establishing an academic pen-pal-ship with students of other RUB colleges, as the same module is offered to all RUB colleges, where the students can exchange emails or SMS or other ways of clarifying their questions or raising some issues. The group’s plan to use ICT such as mobile phones and laptops in the class when the teaching is going on, the academic pen-pal-ship where students exchange emails for clarification and to discuss issues, and using mobiles phones (connected to the Internet) used as resources reveals a good plan and proposal for ICT integration in the teaching and learning situation. Viewing their current practices and with some innovative visions for change as well as their detailed presentation illustrated how change could be implemented, we can assume that the group has thought deeply on the challenges and opportunities. Specifically, the presenter exhibited that he is motivated and inspired to change by enhancing the use of ICT in teaching.

Mathematics department presentation: The presentation was made on the module “Elementary Algebra.” The presenter said that the module is spread over 15 weeks in a semester, with four periods in a week. The presenter mentioned that the lecturer’s role is that of a facilitator and that usually students work either as individuals or in group. He said that the teaching and learning take place mostly working in groups and in making presentations to the class. In the verbal presentation as well as the poster presentation, the group talked about the various

ICT tools that they use and intend to use in the future; however, the ideas were very random, disorganized, and scattered. They described currently using the following for teaching learning materials: LCD projectors, a discussion forum on VLE, chalkboard, and chart paper, and further they stated using a wiki forum in future teaching.

Unfortunately, the presenter was not able to elaborate on how they use the tools in teaching; in other words, they were not able to provide specific examples of how the tools are used and will be used. This to a certain extent supports the assumption that this group either did not understand the workshop instructions, they were not motivated enough to proceed with a change, or they were lacking competence to propose a vision.

Physics department presentation: The presentation was made on the module “Electricity.” The presenter outlined that their current practice of teaching this module is through lecture using PowerPoint presentations, teaching difficult concepts through videos, and practical demonstration. They explained that though the above-mentioned strategies work well in the current teaching and learning process, they have a desire to make progress with the use of technology in teaching. For the new design, it was proposed that VLE tools like wiki, a discussion forum, and quiz will be used. Further, it was also mentioned that YouTube videos will be used in the new module design.

In the following, a representation of the workshop will be illustrated using the activity triangle, which encompasses the overall events that took place during the intervention workshop. I have integrated the six lesson designs into one activity system, as they are just proposed lesson plans for future teaching. The integrated activity system will give us a general overview of the pedagogic practice and levels of ICT use of the college faculty. Further, a summary of the levels of intended technology use in the modules as presented by the participants from the six departments is described using the SAMR model (see Figure 37).

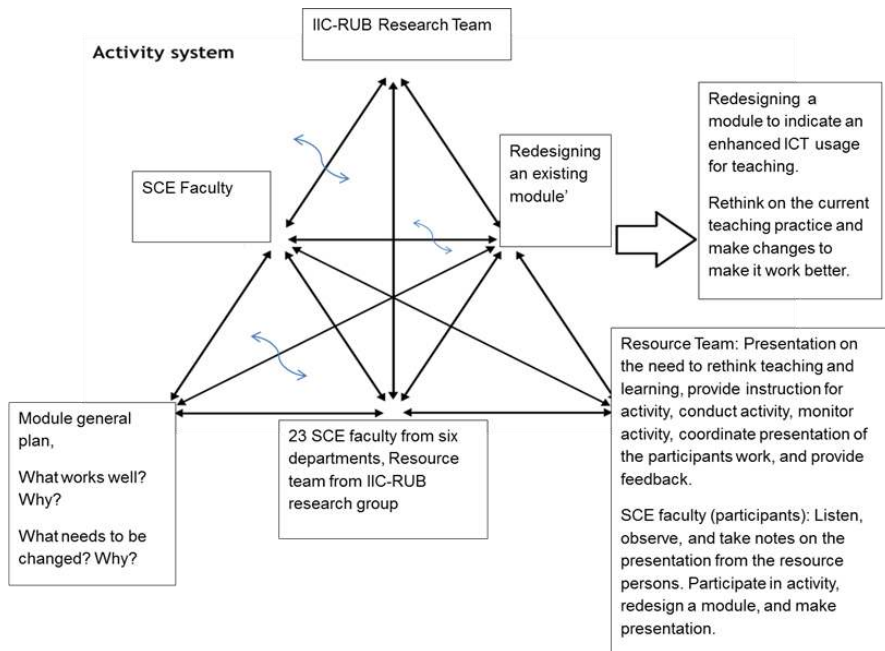


Figure 36. Overview of the activity system, starting the change with the faculty as subjects and redesigning the existing module as an object, and the IIC-RUB research team (workshop resource persons) as mediators

The SCE faculty has been identified as the subjects, as they were the participants of the workshop. Moreover, the intention of the workshop was to allow them to rethink their existing module in terms of challenges and opportunities, which eventually will lead them to redesign the way the module should be taught, with the ultimate goal being to align it to ICT-integrated teaching. The IIC-RUB research team has initiated and conducted the intervention workshop; therefore, they have been identified as the mediator/tool. The illustration also presents the other elements of the activity system. Contradictions were visible between the mediator and the subject—while working and presenting the redesigned module plan, the participants exhibited a certain amount of confusion in the task they were assigned. The outcome (poster and presentation) amongst the departments was varied; for example, some departments were very clear in their plan and presentation, and they followed the outlined rules and made interesting presentations. Unfortunately, on the other hand, some departments were confused, as was exhibited during the planning stage as well as at the time of presentation. Their plan was not very systematic, and they were also vague on the changes they intended to make to the module. Therefore, in the activity system, contradictions have been highlighted between the mediator and the subjects, subjects and object, and rules and object.

In the following, the SAMR model is presented to illustrate the levels of technology indicated to be used in the new lesson designs. The actual implementation in the future lesson is uncertain, as it is just a plan made during the workshop; never the less, this information provides insights into the knowledge on the technology tools the lecturers are familiar with or at least have some idea of the availability of these tools that can be used in teaching. I have classified “academic pen-pal-ship through email” in the modification level a move to transformation, though it could be considered as a replacement of postal communication; however, for teaching and learning, emails can provide a possibility for communication, collaboration, and information sharing instantly and more rapidly. The teaching and learning event is time-bound. Similarly, using wiki for collaborative writing, producing documentary videos, and online peer assessments redesign the teaching and learning practices.

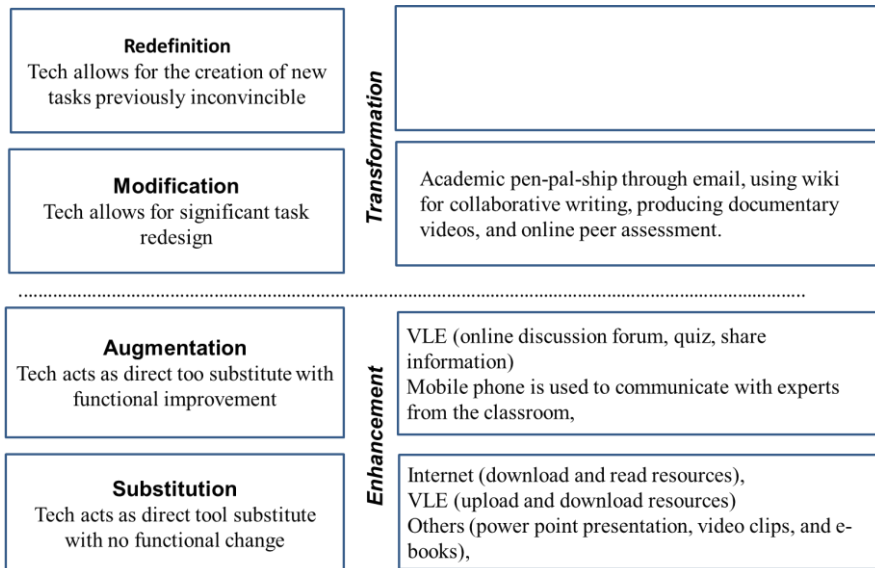


Figure 37. SAMR model illustrating a summary of the proposed types and purposes of technology used for the redesigned modules by the six departments

7.3. SUMMARIZING INTERVENTION WORKSHOP II

The combined findings from the posters and oral presentations of the workshop data have shown both positive results as well as weak results regarding ICT-integrated pedagogy. For example, there were some interesting ideas used in the new design in some department presentations, which very much relates to rethinking teaching and learning with ICT usage. However, in some department presentations, drawbacks were evident in the planning as well as in the verbal presentations, as there was no logical sequencing as per the instructions given at the start of the activity, where

they were required to organize their plan in steps responding to the questions indicated in each of the steps. Also there was no clarity as to the when, what, where, and why of the use of technology for the new design. Both in the verbal presentation as well as the poster, the ideas were random and scattered.

To some extent, the workshop created an awareness of the need for rethinking pedagogy for the digital age. Overall, the new module designs attempt to redefine the role of the teacher by placing more emphasis on active learning and student-centered practice. Further analysis of the empirical data confirmed that, to a certain degree, an interventionist approach to professional development assists teachers in rethinking and redesigning their teaching using ICT. The findings of this study suggest that more investment is required for the innovative use of technology in the classroom, as shown in the analysis using the SAMR model. In general, the current practice regarding ICT is varied amongst different individuals.

Finally, this study has provided insights into the impact of the intervention workshop, pedagogic practices, and the level of technology use. However, some of the redesigned modules were not appropriated to the workshop goals, though the intended objectives were redesigning lessons incorporating ICT, yet some modules had little integration of ICT in the plan. The focus was more on pedagogy. These findings provide a guide for the planning of future intervention workshops. Consequently, to a certain extent this study also provides an opportunity to reflect on the stance of SCE in particular and RUB in general on pedagogy in the 21st century digital world.

CHAPTER 8. DESCRIBING & DISCUSSING THE PILOT STUDY— PHASE II

The pilot study is discussed as a follow up to the intervention workshop. The process for the pilot study along with the data collection methods are also described. Following the intervention workshop, three faculty members were identified as pilots. Out of the three pilots, one of them was a pilot from phase 1 who showed interest in and motivation for continuing through the second phase. In general the selection of the pilots was based on the interest of the individual and also to some extent the quality of the presentation made at the end workshop. The three pilots, as reflected in the workshop plan, had the opportunity to ask questions, get clarification, and receive feedback on their presentation and future thoughts with the external expert the morning after the workshop. This meeting with the external expert and the IIC-RUB research team further allowed the pilots to clarify their role as pilots and also their plans. Unfortunately, due to the official resignation of one of the pilots from the college, again like the case of the previous study, the study ended up with two pilots.

The purposes of the pilots are to

- ✓ Assess the impact of the intervention workshop;
- ✓ Avail opportunities for pre-discussion during planning, observation during practice, and post reflection with the tutor;
- ✓ Examine the practical implementation of the redesigned lessons in actual classroom teaching; and
- ✓ Find gaps and opportunities with the intervention procedure, to enable application in a larger scale.

For the current phase, scaffolding was done for the pilots. Constructivist conceptions of learning assume that knowledge is individually constructed and socially co-constructed by learners based on their interpretations of experiences in the world, that knowledge cannot be transmitted, and that instruction should consist of experiences that facilitate knowledge construction (Jonassen, 1999, p. 217). According to Hmelo-Silver, Duncan, and Chinn, scaffolding makes the learning more tractable for students by changing complex and difficult tasks in ways that make these tasks accessible, manageable, and within students' zone of proximal development (2007, p. 100). Scaffolding is often distributed in the learning environment, across the curriculum materials or educational software, the teachers or facilitators, and the learners themselves (Puntambekar & Kolodner, 2005;

Hmelo-Silver, Duncan, & Chinn, 2007, p. 101). Puntambekar and Kolodner outlined the following as central to scaffolding (2005, pp. 188–189):

- a) Common goal: central to success is a shared understanding of the goal of the activity,
- b) Ongoing diagnosis: ongoing diagnosis of the student’s current level of understanding to provide appropriate support,
- c) Dynamic and adaptive support: the ongoing support leads to a “careful calibration of support,”
- d) Dialogues and interactions: to assess students’ understanding and allow students to negotiate their needs with the teacher, and
- e) Fading and transfer of responsibility: the learner is now in control and takes responsibility for the learning.

Hmelo-Silver, Duncan, and Chinn (2007, p. 100) claim that the crucial aspect of scaffolding is that the student is working within what Vygotsky called the zone of proximal development (ZPD). The Glossary of Education Reform defines scaffolding as “a variety of instructional techniques used to move students progressively toward stronger understanding and, ultimately, greater independence in the learning process” (GSP, 2015). In Sawyer’s definition, “it is the help given to a learner that is tailored to the learner’s needs in achieving his or her goals of the moment” (2005, p. 11). Sawyer further states that “effective scaffolding provides prompts and hints that help learners to figure it out on their own” (p. 11). With an attempt to implement effective scaffolding, two formal meetings were held with the pilots during which we discussed their ICT-integrated teaching plans. They were introduced to possible technological tools that could be incorporated in their lessons and also demonstrated the ICT tools they intended to use. For example, they were shown how wiki could be used for collaborative writing exercises in their teaching and maintaining their own blogs to share information with the students as well as to allow students to post questions and comments on the blog. Further they were also introduced to and orientated on the use of DropBox, Google drive, Slideshare, and various search engines. The idea of holding scaffolding meeting was implemented, as a requirement for such was realized during the earlier pilot study. The overall idea was to keep the motivation alive as well as to assist the pilots and build their confidence. Their lessons were observed at two different stages, and the data were collected as follows:

Stage One

Video recording of the teaching and learning process, Photographs of the teaching events, Researcher’s observation notes.

Stage Two

Video recording of the teaching and learning process, Photographs of the teaching events, Researcher’s observation notes, Semi-structured interviews with the pilot projects, Focus group interview with students, and Reflection log from the pilot projects.

The data analysis took inspiration from three sources, namely hermeneutics, activity theory, and the SMAR model. Hermeneutics as an overall methodology to interpret text from lesson presentations, notes, and pictures from observation and text from interview transcription; the activity system triangle describes the events of the teaching and learning situation in a particular context; and then the SMAR model is used to recognize the types and levels of technology integration for the particular teaching and learning event. For example, the hermeneutics theme “the meaning of a part can only be understood if it is related to the whole” is used to explain the phenomenon and also to understand the text. Hermeneutics is used as a basis for the transcription and interpretation of the teaching and learning activity. The activity theory triangle will be used to represent the components and activities depicting the activity system. The triangle (see Figure 18) describes the entire activity as well as the individual activities as parts. For example, the components of the activity system explain the activity and consequently provide an understanding of the teaching and learning process in a particular activity. The totality of the teaching and learning process can be understood by understanding the process of teaching parts such as the lesson topic, lesson objective, teacher activity, and student activity. Likewise, the components within each lesson part will give meaning to the context of the teaching and learning situation. The cycle of pre-understanding and understanding was taken into consideration as a precaution for any prejudice. The SAMR model describes the level of technology integration incorporated in the lesson taught, and the classification of technology in the various levels is done depending on how and for what purpose it is used.

8.1. PILOT PROJECT 1—PHASE TWO—DATA INTERPRETATION AND ANALYSIS

In the following, an interpretation of the event will be presented where the focus of the description will be on pedagogy and technology as per the objective of the data collection. Before the lesson was presented to the class, the researcher had two rounds of meetings with the pilot (tutor) and discussion was held on the topic that was to be presented.

The teaching observation was done on Thursday, November 14th, 2013, at 10.40 AM (BST) in a B. Ed. third-year Arts class and consisted of 39 student teachers. It was an English lesson, and the topic of the lesson was a study of an essay titled “New Images Bring New Values to Bhutan.” The tutor started the class by drawing the

students' attention to the task of discussion on an essay written by a female author named Sion Sian Pek Dorji. He then outlined the format of the teaching and learning that was to take place and also gave a brief background for the discussion that was to take place.

Moving on, the tutor initiated discussion by making a phone call via mobile to the author of the essay. He then let a student (a female) interact with the author. The student expressed her views, refuting the points and arguments presented in the essay. Following her, another female student expressed her view supporting the author's views on using women in advertisement. A male student was also able to participate in the conversation when he asked the author a question. The author greeted the whole class and then expressed her appreciation to the tutor on this method of teaching style. She said this is an innovative and 21st century way of teaching. The author then shared her views to the whole class. The students were listening to the author and jotting down the ideas they could glean from her. Students were excited listening to the voice of the author, as was exhibited through their facial expressions and attentiveness during the phone call.

They also appeared excited by the discussion they were having over the essay. This was quite evident in the forum discussion that the students were engaged in. There were two levels of active discussion going on: asynchronous learning in the online forum discussion that happened outside of the classroom (students participated in the discussion forum using their own free-time) and synchronous discussion by revisiting the various views in the classroom using an LCD projector. The tutor progressed to another level in the usage of ICT by initiating a discussion forum during the class, asking students to "describe the genre of the essay." Students went online using their laptops and mobile phones to participate in the discussion. All the discussion points were projected for everyone to view, and thus it was evident to all as to how many and who was participating in the discussion.

The second event was a discussion through email under an activity initiated by the tutor. The tutor had made arrangements to pair students from SCE with students from the Paro College of Education (PCE), who were studying at the same level and same module, and he called this arrangement "academic buddies." The academic buddies exchanged views regarding a particular topic via email. During the class, a student presented the email exchange he had had with his academic buddy from PCE. It was an interesting exchange of ideas, where each of them shared their understanding regarding the type of essay. The tutor asked the student how the email exchange had benefitted him. The student responded that it had helped him gain awareness about the happenings in the other college, enabled him to connect with a student from another college with the same standards and learning the same topic, allowed him to understand their similarity of opinion on the topic and the similar position on the level of learning, and finally that it had given him an opportunity to share different ideas. The tutor concluded that the academic buddy

activity puts pressure on the participant to learn along with the fact that they have to keep in mind their own image as well as the image of the institution to which they belong.

The teacher also asked students to find the meanings of unfamiliar words from the built-in dictionary in their cell phones. He also asked the students who were carrying laptops to get connected to wireless to browse for the meanings of words. The teacher highlighted the uses of ICT tools in the class. He also mentioned the changes in pedagogy that were happening using ICT. He encouraged students to use the new developments in their teaching.

The following table contains a summary of the lesson prepared by the tutor.

Activity	ICT use	Duration	Purpose
1. Talk to the author	Mobile Phone and external loud speakers	10 min	For the interaction with the author, the students prepared questions to ask to the author directly via mobile phone. Some students talked with the author and asked questions from the content of the topic, and then the whole class listens to the key messages emphasized by the author herself.
2. Follow-up discussion	nil	5 min	consolidated the interaction between the students and the author
3. Use of the discussion forum	VLE and LCD projector	20 min	The tutor had posted the points for discussion on the forum and students participated in the discussion forum, outside the class room as well as during the classroom event and the discussion was projected on the board.
4. Display of the email between SCE and PCE students	Email	10 min	The only user, though all have made email correspondence with the students of PCE, yet only one received email responses from his 'academic buddy' from PCE, and then a discussion was made on how emails could be used for academic purposes.

Figure 38. Table illustrating the lesson plan summary provided by the tutor

The teaching and learning situation is illustrated and analyzed in the following activity system triangle (Fig. 39):

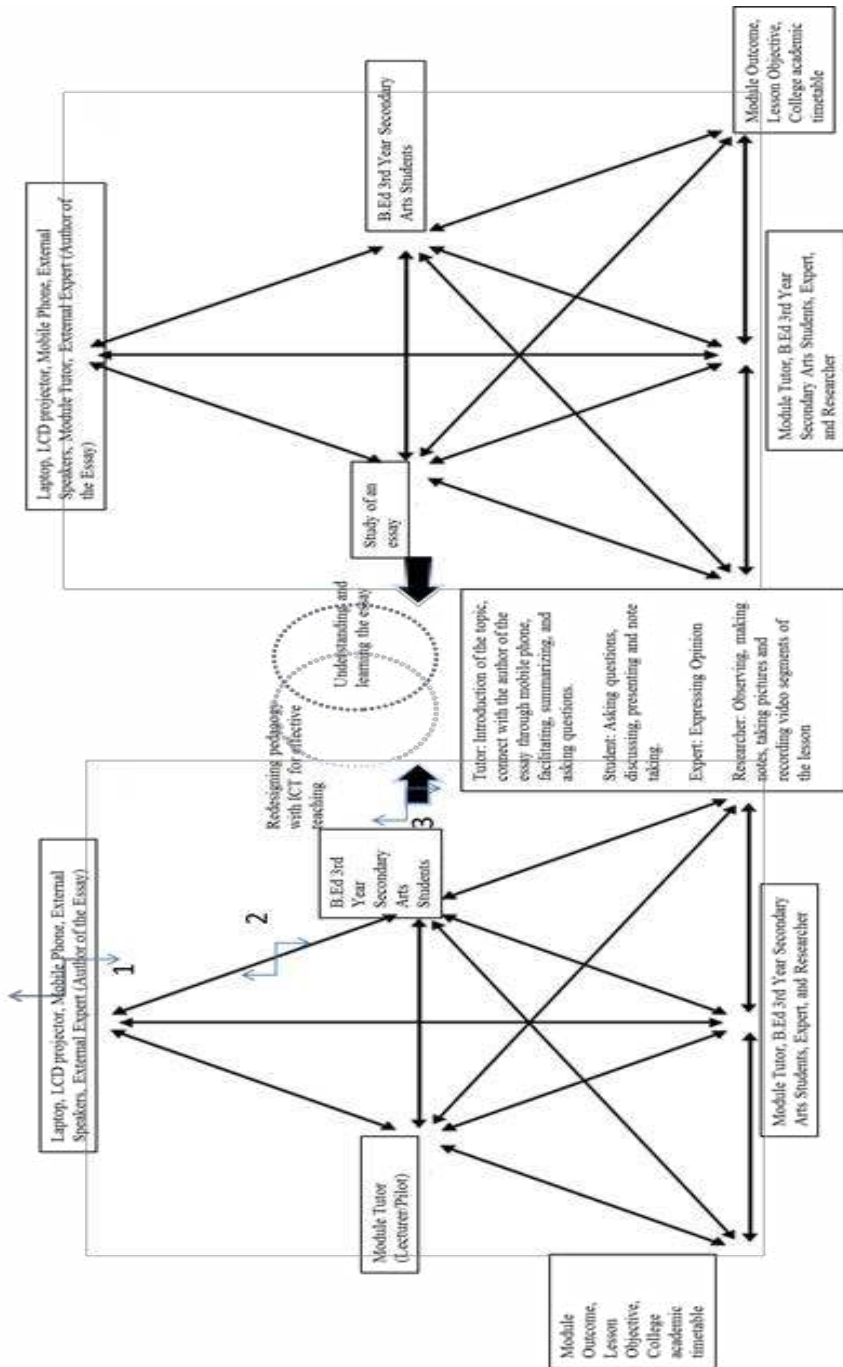


Figure 39. Activity system illustrating the teaching and learning activity

There are two activities occurring in this activity system: the tutor teaching and the students learning. In the teaching activity, the subject is the module tutor (pilot) engaged in an organized classroom to learn a particular concept. In the tools, both humans and technological artifacts were used as mediators in the activity, and the purpose of this activity was to make the students' express their opinions and understand the meaning of the essay in the context of the discipline of Arts. The main learning objective was to understand the meaning of the essay. To make the teaching effective, the tutor had redesigned the lesson using ICT as well as redesigning the pedagogy. Therefore, redesigning the pedagogy with ICT for effective teaching has been identified as the outcome for the activity. Since the outcome relates to learning, the students are the object of the activity system. The teaching of the lesson is guided by the general module outcome at a broader spectrum and the lesson objective at the specific, and finally the time frame is guided by the college's academic calendar; therefore, these are considered a rule under which the activity operates. The community listed here includes those individuals who participated while the subject engaged in this activity. As shown in the illustration, each member in the community had a role contributing either directly or indirectly.

Taking the learning activity into context, the students become the subject of the activity system. The learning happens under the same rules and within the same community. However, in the tools, the tutor becomes a mediator along with the technology and the external expert. The tutor's motive is to teach the students, and the students' motive is to understand the meaning of the essay; therefore, the essay becomes the object for the students, and ultimately their outcome is to understand the meaning of the essay. Likewise, one of the main objectives of the tutor is to enable the students to understand the meaning of the essay; therefore, learning the lesson becomes a common outcome for both. The tutor intends to achieve this outcome by redesigning the lesson by integrating ICT with the pedagogy; hence it is another outcome for the tutor.

This activity is a twofold situation with regards to the outcome. The tutor is situated as the main subject of the activity system from the teaching activity and the students take the subject position as learners. The object and outcome changes slightly in accordance with the motive of the subject. Also, the tutor's agenda is to redesign his teaching and enhance the use of technology to motivate the learners, for which the possible reasons include that he is motivated and inspired from the intervention workshop, he wishes to impress the observer, or he has self-motivation to change with the ultimate intention of motivating and improving the students' understanding of the concept. Furthermore, the researcher, as an interventionist, scans the lesson on the level of the technology use. The lesson design and the classroom event were influenced in part by my presence as an observer, as the attempt to use technology was maximized, and also the pedagogy was enhanced from that of the regular practice.

The teacher's role here is a mix between that of a lecturer and a facilitator—for example: he gave an introduction to the topic, connected the students with the author of the essay through a mobile phone, organized the session (pre-planning, during activity, and post-planning), summarized key ideas of the discussion, asked provocative questions, and oversaw the proceedings of the classroom event. From the lesson observation it can be seen from the activity pictures (attached) and also the video (appendix) that the students were actively participating. I have listed three contradictions in this activity system: (1) contradiction within the tools—though this relates very much to the college's lack of resources and infrastructure, yet it has some implications for the activity. Since there were no external speakers installed in the room, they improvised with mini speakers, which some students had to hold with their hand (see picture 40). The audio quality was not good, which impacted the object (2) and eventually the outcome (3).



Figure 40. Pictures showing the use of a mobile phone to communicate with the author of the essay

One interesting observation from this pilot project is that the teacher executed the ideas proposed during the phase 1 pilot study as well as during the intervention workshop II presentation—especially with regards to the use of email and creating the academic buddy arrangement, which he implemented in the current lesson. Additionally, he expressed his motivation to explore other tools in future lessons to make his teaching more interactive. This is evident in his interview, which will be discussed later. Further, the focus group interview with the students will also be discussed to reflect on the aspect of ICT-integrated pedagogy.

In the following, the SAMR model is presented to illustrate the levels of technology used in the teaching of the current lesson.

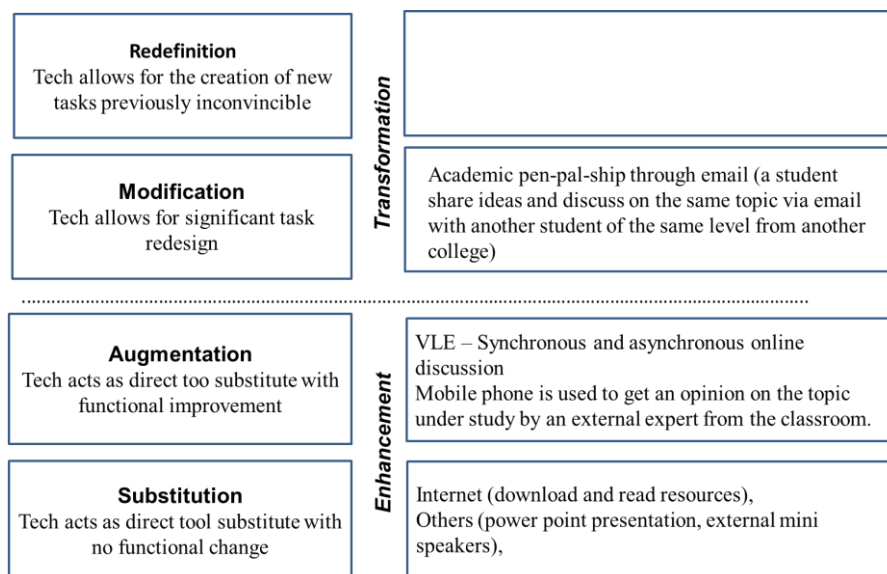


Figure 41. SAMR model illustrating the types and purpose of the technology used in teaching

The types and purpose of the technological tools used in teaching have been described in the lesson description earlier. The classification of the technology in the levels has been done from the perspective of how it was used and why it was used. For example, I have categorized the email exchange in the modification level, and the reason is the same as was explained in the earlier section. Similarly, the use of mobile phones also overlaps between the augmentation and modification levels if we consider the time constraint of the teaching and learning event (one hour for each lesson). The mobile phone has allowed the acquisition of information from an expert within the time frame of the one-hour lesson duration along with other tasks for the given time. The pilot here has maximized and improvised an innovative practice in the use of the technological resources available and has also considered his skills and the competence of the learners.

The pilot was asked what had motivated him to incorporate technology in the classroom. He responded to this question indirectly along with a bit of reflection on the lesson that was taught; he said, *“by using the three types of technology for this lesson, I found it very interactive rather than the chalk and talk lesson without using technology.”* He added that the author’s response was very interesting because it created a direct link between the students and the author of the essay. He said that his students were nervous and excited about interacting with a real author, and he mentioned that it was a new experience for those that were nominated to ask questions and also for the rest who were listening. For example, he said that *“though they were supposed to ask questions naturally through the conversation*

with the author, they were afraid of making mistakes, so they had pre-written questions to ask to the author.” The tutor assumed that it was also a first-time experience for the author to address a class of students over the phone. And this was corroborated, as the author of the essay congratulated the tutor for this innovative style and mentioned that it was her first experience with this, too.

He gave a short description of the story behind his idea of using email:

I had a pen friendship which I did in my school days between students of Bhutan and students of England with Voluntary Services Overseas (VSO) working in the school, and with the help of VSO we collected the postal addresses of students in England. And I made my students Shaba School (a middle secondary school in Paro) send letters to students in England, and students in England responded to our students, and I found that there was a visible, clear change in the interest of the students with the exchange of letters. Now fifteen years have passed by since that took place, and now it is time to do a similar kind exchange of letters through email. So then I thought of Paro and Samtse—since they are sister colleges, why not pair the students up and then try; they will be interested in exchanging ideas. This is the first time I have experimented with it, though the response was not so strong from Paro; however, we got few responses from Paro that helped in an understanding of the content.

He said that the advantage of this kind of exercise is that students can take ownership of their writing. As they write, they have to keep in mind their own image as well as the image of the institution; therefore, they are more careful during such exchanges between institutions. He mentioned that it is useful and very effective.

When he was asked on the issue of time, resources, and skills, he gave a very interesting and encouraging response,

Time, I don't think it is a big deal, of course you need to have a little extra time and effort that is there, I agree. But then the outcome, the result that you get is more rewarding, the time and effort you spend with IT pedagogy may be a little more than the usual pedagogy, but the time is worth spending.

Conversing on the issue of resources, he said that it is just a matter of planning, and with the current lesson he had no difficulties in getting the resources. Through the discussion, the enthusiasm of the students was also indicated when he mentioned that his role was just sharing with the students the list of resources required and that

it was the students who made the arrangements for the material. Also, with regard to skill, he was of the opinion that with some basic knowledge of IT skills, it requires some patience and time to explore and practice its use in the classroom. Apparently, at SCE the entire faculty has a basic knowledge of IT and is able to use the common tools (Microsoft) and networking sites such as Facebook, email, Skype, etc. Therefore, the views expressed by the pilot enabled me to assume that some level of individual motivation is required to redesign the lessons.

When he was asked the question “Did you receive any comments or feedback from your students on your IT pedagogy lesson?” he said that some students told him that it was a new experience for them, that they hadn’t experienced such throughout the entire course of their education, that they found it to be a fresh approach, and they also found that when such activities were going on there is no question of drowsiness and that all were actively involved, especially when the author was talking to them from Thimphu—that situation in itself aroused interest. He said that this expression from the students had given him more motivation to continue and enhance the use of ICT in teaching. Further he also mentioned that times have changed, technology has touched the lives of all students, and teachers cannot avoid from this change. He wanted to use the email exchange for few more lessons and then consider using wikis and blogs. All these views shared by the pilot to some extent leads to the assumption that individuals need some external motivation to trigger the thought process, which eventually will bring in change in the practices of teaching using technology.

A focus group interview was conducted with four student volunteers (2 males and 2 females) after the class. The questions were semi-structured, covering themes such as technology, its significance in their learning, and the constraints in its use. They named various forms of technology they have experienced with their tutor, such as mobile phones, laptops, LCD projectors, email, the VLE discussion forum, video and audio clips, PowerPoint presentations, and the Internet. They mentioned that it is not very stimulating and motivating for them to just watch the tutor talk and that it is more interesting when the tutor uses a variety of technology. They also valued the online teaching and learning; for example, they said:

We can share our views and invite people from other places to get connected and interact for academic purposes; we can get information quite fast as we can collect information from any place any time, and then we can come to general agreement by looking at everybody’s views online, and we enjoy learning online.

They acknowledged that they have taken a module on information technology in the college, which had given them the competence to use ICT. Further, they mentioned that besides the regular classroom online learning, they are also familiar with and use social media such as Facebook, Skype, Twitter, and blogs.

8.2. PILOT PROJECT 2—PHASE TWO—DATA INTERPRETATION AND ANALYSIS

In the following, an interpretation of the event will be presented where the focus of the description will be on the teacher action, student action, pedagogy, and technology. Before the lesson was presented to the class, the researcher had two rounds of meetings with the pilot (tutor) and discussion was held on the topic that was to be presented.

The teaching observation was held on April 3rd, 2014, in a Post Graduate Diploma in Education (PgDE) class and consisted of 36 student teachers. It was an Educational Psychology class, and the topic of the lesson was on “nature and nurture.”

The tutor had arranged a forum discussion activity on VLE, and he had participated in and monitored the discussion. During the class, the discussion forum page was projected using an LCD projector, and the tutor read out key discussion points and elaborated on them. The students were familiar with the discussion points since they posted it on VLE, so there was excitement, and they got actively involved in the discussion. The discussion was on nature and nurture—a concept where the teachers in the school are taking the role of nurturing students. Students were organized to sit in two circles (one inner and the other outer). The inner circle discussed while outer circle listened and jotted down questions and doubts. At the end of 15 minutes, the discussion stopped, and then the members of the outer circle asked questions to the inner circle members. The question and answer session was organized for a duration of 10 minutes. Then the members swapped roles in the next segment. Towards the end, the tutor took 10 minutes to summarize the key ideas of the discussion and also responded to some of the questions raised during the discussion. Finally, at the end of the class, the tutor mentioned to the students that he had initiated a collaborative writing task for the students to work in groups in a wiki forum and instructed them to participate accordingly.

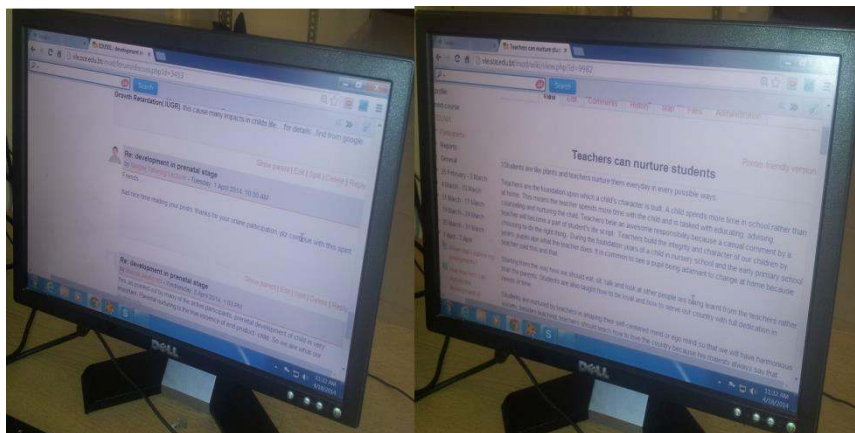


Figure 42. Pictures illustrating the forum discussion and wiki blog collaborative writing project implemented for the lesson

In a change from the previous sequence, I have moved the interview discussion ahead of the activity system discussion because contradictions were highlighted during the interview which were not visible during the activity but that had impacted the activity. For that reason, I will discuss the activity system after the interview analysis to focus on the tensions expressed by the pilot.

In the interview with the tutor, he indicated that he is motivated to use technology because it really facilitates his teaching by making things work faster and making communication easy with students. He mentioned that he got this inspiration to use technology in teaching after attending a course in the past where the resource person delivered the course using ICT. He said that the variety of ways ICT was used to make an interesting presentation led him to imagine and aspire to its usage in his teaching, too. And eventually, the intervention workshop came in as a stimulus. He made a sad facial expression and then said, *“I have many modules to teach and I’m facing problem: we do not have many people who are trained in technology-related skills, particularly the ones used in teaching, and the other limitation is my family.”* In this statement, he was referring to the additional time required while planning to teach with ICT and to the fact that he has many modules to concentrate on at the same time as well as family obligations—although the motivation is there to use ICT in teaching, it is difficult. He also referred to the lack of appropriate ICT persons to support the design and use of ICT in teaching. Further, he indicated a gap in his personal competence and skill as well; for example, he said, *“I have difficulty in installing and using software, it takes a lot of time.”* These expressions indicate a tension or contradiction with regards to time between the subject and the object, a lack competence or skills between the subject and the tools, and a lack technical support between the subject and the community.

Besides the constraints, he still indicated his motivation to use ICT; for example, he said that whenever he gets new software from friends, he explores and uses YouTube for instructions on using the software. Furthermore, he mentioned that after the intervention workshop and the meetings with the researcher and IT expert, he has initiated using the wiki tool to organize collaborative writing exercises for students to work in groups, the discussion forum on VLE is extensively used, and he aspires to learn Camtasia and use it in the future. Highlighting the need to use technology in teaching in the 21st century, he said, “*It is necessary to use technology today, as teaching is mostly driven by technology. It really makes things faster and very convenient.*” and also agreed that students today have better skills in technology than the teachers.

Towards the end of the interview, he raised an interesting and relevant issue. He stated that

One drawback here is something related to the teaching policy of the university. For instance, the policy says that we have to have certain specific face-to-face contact with students, meaning that I have to stand in front of them and lecture them. And it sometimes hinders the use of technology in teaching.

To get the message clear, I asked him to elaborate further. So if I may interpret further, he meant to say that there are still loop holes in the RUB academic policy; the academic regulation only counts the number of contact hours (face-to-face teaching), and there is no mention about the hours for online teaching and learning. He said that though the college enforces the maximization of online teaching, no time allocation is given for online teaching, which he said creates a time pressure, as the hours allocated are only for face-to-face teaching, and thus he has to give up online teaching. It can be assumed that time is one of the main issues why most of the lecturers are restrained in exploring and designing lessons with technology as it requires additional time. For example, a lecturer may use 3 hours for online lesson design and 3–4 hours of online discussion or assessment, but this is not counted in the teaching hours. The teaching hours are only considered when lecturers go to the class, stand in front of the students, and do face-to-face teaching. This policy situation could be a demotivating factor in terms of enhancing the usage of ICT in teaching.

The teaching and learning situation is further illustrated and analyzed in the following activity system triangle (Figure. 43):

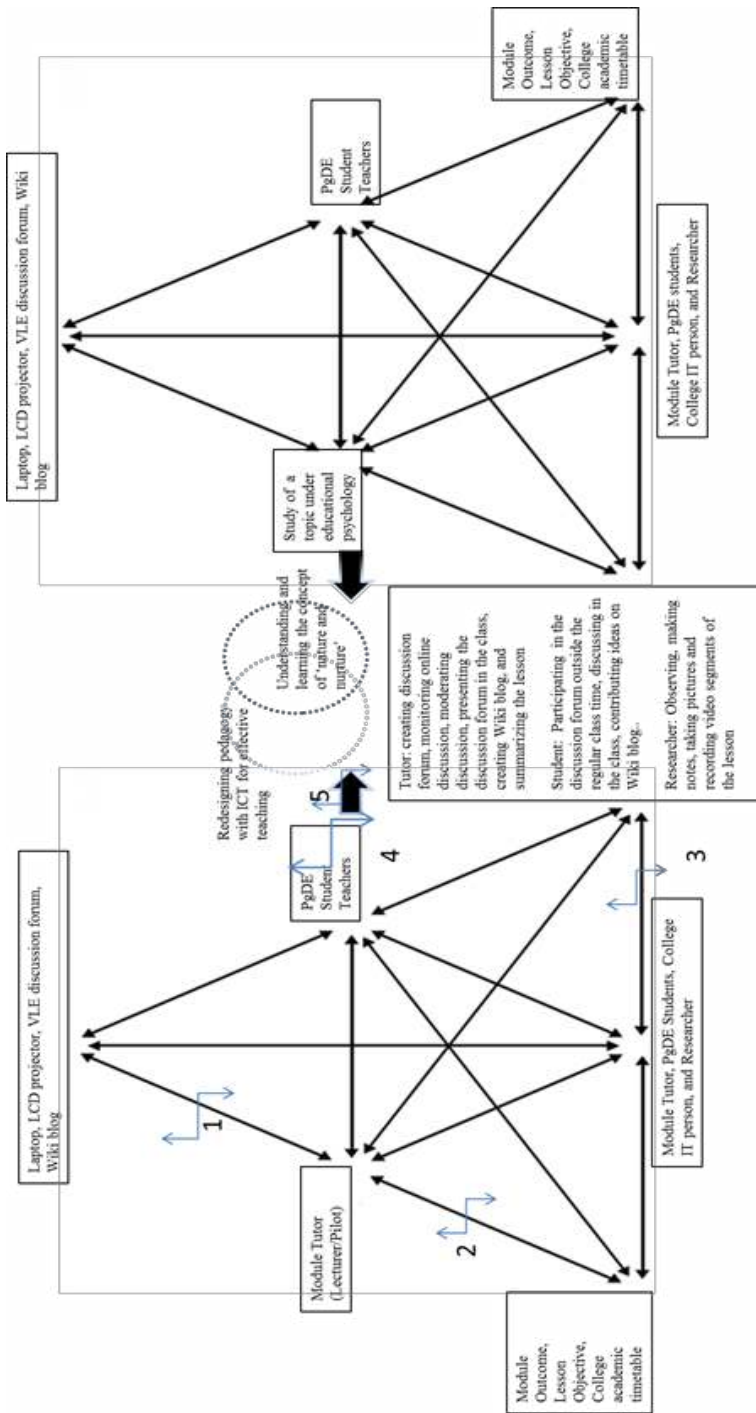


Figure 43. Activity system and the contradictions illustrated on the overall activity of teaching and learning

There are two activities occurring in this activity system: the tutor teaching and the students learning. In the teaching activity, the subject is the module tutor (pilot) engaged in an organized classroom to learn a particular concept. In the tools, technological artifacts are used as mediators in the activity, and the purpose of this activity is to make the students' learn a concept in educational psychology through discussion (online forum discussion and face-to-face discussion). To make the teaching effective, the tutor has redesigned the lesson using ICT as well as redesigning the pedagogy. Therefore, redesigning the pedagogy with ICT for effective teaching has been identified as the outcome for the activity. Since the outcome relates to learning, the students are the object of the activity system. The teaching of the lesson is guided by the general module outcome at a broader spectrum and the lesson objective at the specific, and finally the time frame is guided by the college's academic calendar; therefore, these are considered a rule under which the activity operates. The community listed here are those individuals who participated while the subject engaged in this activity. As shown in the illustration, each member in the community had a role contributing either directly or indirectly.

The contradiction indicated between the subject (module tutor) and the tools, between the subject and the rules, and between the community and division of labor has been mentioned earlier. Though no visible tensions were exhibited, the pilot expressed some of these issues as a limitation for him to incorporate ICT in teaching. The tension between the object and the tools relates to the skills and competence—he shared in the interview that he is not very comfortable and competent in using new software and tools (1). Two assumptions can be made from this issue: either he is being too modest in accepting that he has the skill, or he really is not confident in his competence. This could be because through his lesson plan, teaching, and future aspirations, the tools used and that he intends to use are not basic and could be considered to be at an advanced level of ICT usage. The contradiction between the object and the rules (2) was expressed when the pilot (subject) mentioned his want of time, which was later linked with the RUB academic policy and the teaching hours policy at SCE. This issue has been discussed in detail earlier; therefore, I will not elaborate on this item further. The tension between the community and the division of labor surfaced when the pilot stated that there are no IT support personnel to help either during planning or in teaching (3). Therefore, in the activity system, the task of the IT support personnel has been left blank to indicate that there is no contribution, which eventually affects the subject, the object, and the outcome. As a whole, all the contradictions impact the object (4) and the outcome (5).

Taking the learning activity into context, the students become the subject of the activity system. The learning happens under the same rules and within the same community. However, in the tools, the tutor becomes a mediator along with the technology. The tutor's motive is to teach the students, and the students' motive is

to learn a concept of educational psychology; therefore, the lesson concept becomes the object for the students, and ultimately their outcome is to understand the meaning of “nature and nurture.” Likewise, one of the main objectives of the tutor is to enable the students to learn the concept being taught; therefore, learning the lesson becomes a common outcome for both. The tutor intends to achieve this outcome by redesigning the lesson by integrating ICT with pedagogy; hence it is another outcome for the tutor.

In the following, the SAMR model is presented to illustrate the levels of technology used in the teaching of the current lesson.

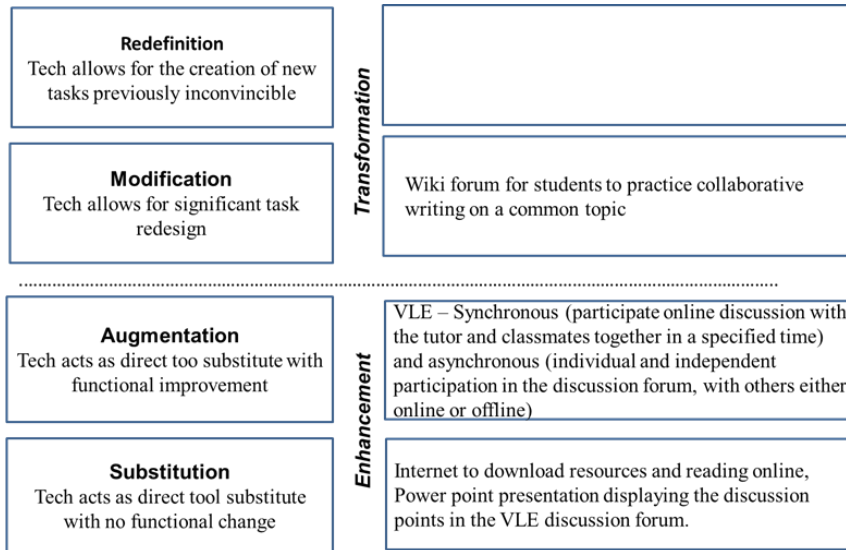


Figure 44. SAMR model illustrating the types and purpose of the technology used in teaching

The types and purpose of the technological tools used in teaching have been described in the lesson description earlier. Though not a significant move, considering types and how they were used, it should be acknowledged that the user had moved from the enhancement to the transformation level.

8.3. DISCUSSING PILOT STUDY PHASE II

The hermeneutics theme “*the meaning of a part can only be understood if it is related to the whole*” has provided an overarching framework for the analysis. Furthermore, hermeneutics as a methodology assists in unfolding the events within the teaching and learning situation and gives meaning to the overall event. Though there were some differences in the types and purposes in which the technology was used in teaching, the level of usage is very similar.

On a pedagogic stance, pilot 1 demonstrated an innovative and interesting way of integrating technology with pedagogy to teach the lesson concepts at different stages. A detailed discussion about how it was used has been given in the earlier section during the data analysis. Both during the action (lesson delivery) and during the interview, the pilot displayed high motivation to maximize the use of ICT in teaching. He had participated as a pilot for the Phase I study, continued to the Phase II study, and had been a presenter in both the phases of the intervention workshop. Following his aspirations and commitment, it is very promising to see that he had implemented what he had stated. The interview statements revealed that he was committed and motivated to incorporate technology in his teachings. Further, he also indicated that he would like to explore more; for example, in the next step, he wanted to initiate a blog for himself. Overall, we can conclude that the integration of ICT in teaching cannot be constrained by time, resources, and skills if there is self-determination and motivation.

The views from the students to a certain extent confirms that the technology use by the tutor was not limited to a one-time event during my observation but was rather a regular practice in his teaching. The positive statements from the students signify that the enhanced use of ICT in teaching motivates and improves student learning. The additional technological experiences shared by the students re-confirm the introductory statements of the learners in the digital world and a need for teaching to align with technology in the 21st century.

With regards to the second pilot, though, he expressed limitations to ICT usage in his teaching due to lack of time and skills and the regulation of teaching hours, yet he demonstrated ability in using the available tool appropriately and adequately. However, unlike the first pilot, he did not display a dynamic move in his pedagogy; nevertheless, the ICT-integrated pedagogy used was effective. Communicating with him during the interview, he was ambitious to progress in his usage of ICT in teaching, and he indicated that he looks forward to exploring and learning about other software to be used in his teaching, such as Camtasia. When he mentioned the teaching time policy as one of the barriers to his use technology in teaching, it alerted me to reflect on this issue. There are no teaching hours allocated for the use of online teaching and learning, so, in a way, you are mandated to use online learning but there is no acknowledgement if it has been used. Indirectly, this issue could be linked to “time,” which surfaces as one of the barriers to ICT integration in many contexts. The issue of time constraint as a barrier was one of the findings in the baseline study. This issue leads me to assume that besides resources and skills, this could be one of the reasons for the low ICT usage in teaching by the SCE faculty, as has been discussed in the earlier sections.

This issue can be discussed in terms of the less-than-clear college policy with regards to ICT in teaching. Since the launching of VLE, the college IT department has created individual user names and passwords for all faculty. Then it was made

mandatory for some time that every module tutor had to use VLE, but then there were/are no written policies on how much and what and to what extent it has to be used. Two to three years after the launch, the manager would quite often ask if VLE is being used for teaching and learning. Unfortunately, as expressed by the pilot, there is no official time recognized for the online teaching. There are also no guidelines developed on ICT and teaching. It could be labeled as a mandatory and simultaneously non-mandatory policy.

CHAPTER 9. CONCLUSIONS, REFLECTIONS, & IMPLICATIONS OF THE STUDY

9.1. PRESENTING THE FINDINGS AND CONCLUSIONS OF THE STUDY

To find the response to the following research questions: (I) **How can professional development assist lecturers in rethinking and redesigning their teaching using ICT at SCE?** (II) **What are the impacts of professional development through a participatory design approach initiative on the integration of ICT in teaching?**—three tiers of instrumentation have been used (see Figure 45). The current study has explored the participatory design methodology within future workshops to address the issue and answer the main research question. The findings for this study are discussed in the context of the research sub-questions eventually arriving at an answer to the main question.

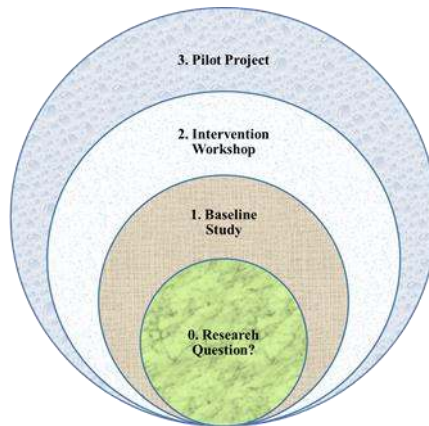


Figure 45. An illustration summarizing the study process

What is the stand with regards to resources, support, skills and attitude for ICT integration in teaching at SCE? The baseline study revealed that the lecturers in the college have experienced benefits as well as constraints when using ICT in their teaching. Despite taking part in trainings, it was found that the lecturers still face inadequacy in the skills they possess. From the survey and focus group interview, it was learned that the lecturers use and are familiar with a variety of ICT tools in their teaching. There were several indications from both the survey and the

interview that at least some lecturers would like to do more, if the resources were available. The intervention workshop analysis also indicated drawbacks in redesigning lessons with ICT related to resources and the level of competency and confidence amongst the faculty. Furthermore, two amongst the four participants from the pilot study expressed that inadequate resources, the non-availability of IT support, and their lack of competence with ICT tools limits them from enhancing their use of ICT in teaching. From these findings, it can be concluded that though the lecturers are positive about using ICT in teaching and are familiar with a variety of ICT tools, inadequate resources, unstable and low-speed Internet-connection, low confidence with ICT skills, and lack of IT support at hand seem to be the most crucial issues barring the ICT integration in teaching at SCE.

The answer to this question **How do 21st century skills apply to teaching and learning at SCE?** was captured through the lesson designs during the intervention workshop as well as during the pilot study. It was seen that tentative integration of 21st century skills were incorporated in the lesson designs, based on their limited pre-understanding of the concept of 21st century teaching as it was not spelled out clearly during the intervention workshop. Shear et al. (2011a, p. 4) listed the following as 21st century skills: Knowledge building, problem-solving and innovation, skilled communication, collaboration, self-regulation or independent learning, and the use of ICT for learning. Likewise, Bates-Tony (2015, p. 16) outlined the following skills required in the digital age society: Communication skills (social media communication skills with traditional communication skills of reading and reading), the ability to learn independently, ethics and responsibility, teamwork and flexibility, thinking skills, digital skills, and knowledge management.

The new lesson designs revealed some of the characteristics of the 21st century skills illustrated above. The lessons attempted to redefine the role of the teacher by placing more emphasis on active learning and student-centered practice. Most of the lessons displayed that the teacher is not the center of learning. According to Shear et al., student-centered pedagogies include models of teaching and learning that are project based, collaborative, foster knowledge building, require self-regulation and assessment, and are both personalized and individualized (2011a, p. 3). The pilot projects expressed student-centeredness in being project-based, collaborative learning, and individualized learning. Except for one, the rest of the pilot projects had their teaching designed where students were either involved in group work or individualized work with limited lecturing and maximum facilitation by the lecturer. Therefore, it can be claimed that with few exceptions (reference to one of the pilot studies), generally, the lesson plans and teaching were made in line with the category of 21st century skills, thus to some extent demonstrating an attempt align the teaching practices to 21st century teaching and learning as a result of intervention workshop and the pilot study.

To what extent is ICT integrated into the pedagogy? The response to this question can be derived from two occasions: firstly from the findings of the intervention workshop and secondly from the pilot study. The combined findings from analyzing the posters of the lesson designs, oral presentations by the participants, and discussions from the intervention workshop have shown that more investment is required for the innovative use of technology in the classroom, as shown in the analysis using the SAMR model. More investment by the lecturers is required in terms of their motivation and confidence in using ICT in teaching as well as a need for the college to look at the resource constraints, especially with regards to the quality of Internet as the users mostly indicated the resource constraints in terms of Internet speed and stability. In general, the current practice on ICT is primarily restricted to the enhancement level. Hence, responding to the research question of **what problems or concerns do lecturers identify in relation to the integration of ICT in their teaching?** Therefore, I would like to state that the level of ICT integration in teaching at SCE is confined to the enhancement level due to constraints in resources and lack of confidence amongst the faculty. Bandura defines self-efficacy as *“an individual’s belief in his or her capacity to execute behaviors necessary to produce specific performance attainments”* (1977, p. 191). Confidence, here, relates very much on the individual’s self-confidence in their own skills and ability with ICT which can otherwise be called as self-efficacy on ICT usage.

The question **Do the lecturers/lecturer experience progression in the use of ICT in teaching after participating in the workshops and the scaffolding, support, and motivation from the researcher during the pilot study process?** —has been indirectly and partly answered upon analyzing the workshop data and was given a complete answer through the real classroom observation during the pilot study. One of the main findings from the second workshop posters and presentations was that, in general, most of the redesigned modules had a similar types and level of technology integrated into the plans. Interestingly, some of the new module designs illustrated an enhancement in the use of ICT in teaching. The group which had enhanced ICT use in the plans had one of the lecturers as a member in their group who actually had participated in the pilot study during the first phase. The presenter indicated that what was displayed in the plan had, in part, been implemented in the current classroom teaching—not in action, though. Through the plan and presentation it was shown that some progress in ascending the level of ICT integration had occurred after the intervention process.

The pilot study provided a platform to learn the practical implementation of ICT in teaching in the real classroom situation after the intervention workshop. Following the pilot project through the process of lesson planning (scaffolding and facilitating), lesson implementation (observation), and reflection after the implementation (semi-structured interview with the pilots and focus group interview with the students) has enabled me to understand the status in practice and

thinking with regards to ICT integration in teaching at SCE. While observing the lesson, my focus was not only on whether the tutor was using ICT but how it was being used to promote learning. Scaffolding the pilots while planning the new lesson designs, observation by the researcher, and the opportunity for reflection after the implementation with the observer has shown an enhanced level of ICT usage.

The lesson observation and interview with the tutor and students indicated that the type and purpose of the technology used for the lessons were appropriate and meaningful. It has been stated that the impact of ICT can vary widely depending on its pedagogic applications (Myndigheten & Skolutveckling, 2008; Shear, Gallagher, & Pattel, 2011a, p. 4). Hence, it can be confirmed that considerations were made as to how the ICT was used and not simply whether it was used. Furthermore, it was also indicated in the SAMR model classification that the level of ICT usage has ascended from the enhancement to the modification level. Though there were variations in the practice and the views expressed by the different pilots, it has been found that the intervention workshop ignited their thoughts on rethinking pedagogy with ICT. Therefore, combining the findings from the workshop and pilot study, it can be claimed that the workshop has ignited motivation, and the scaffolding during the pilot study has reinforced the motivation and confidence, eventually enhancing the use of ICT in teaching.

What are the limiting conditions that constrain the enhanced use of ICT in teaching at SCE? Besides the constraints described earlier, the pilot studies served as stepping stones in understanding some specific barriers to and enablers of the integration of ICT in teaching by the faculty. In the following paragraphs, I present two impeding conditions over shadowing the earlier findings that has been found to be the limiting conditions of enhanced ICT usage in teaching at SCE.

Not all the pilot projects exhibited progression in the use of ICT in teaching during the process; however, contradictory results were exhibited between different pilot projects in the innovation with ICT in teaching during the lesson presentation as well as during the interview. I would like to relate this to the discussion given in section 2.4.5 on teacher's personal attitude and motivation, as the study was carried out in the same setting with the same conditions and resources, though there could be a little variation in the level of competence. Taking my position as an observer as well as an insider researcher, and reflecting the views expressed by the pilots, I believe that the intrinsic factors were more domineering than the extrinsic factors. One of the pilot participants boldly claimed that constraints like resources and time are secondary if there is personal commitment and determination.

One's own attitude and motivation is a very important factor in handling the process of change related to integrating ICT into existing teaching practices. This issue has been expressed by researchers from different perspectives contextualizing

to the intrinsic factors as follows: Teacher's beliefs about teaching and learning (Becker & Riel, 2000; Shear, Gallagher, & Pattel, 2011a, p. 4); teacher motivation and self-efficacy (Gibson & Dembo, 1984; Shear, Gallagher, & Pattel, 2011a, p. 4); and teacher attitudes towards and conflict with ICT (Shear, Gallagher, & Pattel, 2011a, p. 4). Upon making a critical analysis of the data, it has been revealed that the intrinsic factors were one of the major barriers to the innovative use of ICT in teaching. My study underscores that besides focusing on the extrinsic factors (resource, time, and skills), careful consideration should be made on working with the intrinsic factors, especially with regards to attitude and beliefs when proposing a change in educational practices in an institution through professional development.

The requirement of time while integrating ICT in teaching had been discussed earlier in the review chapter. And the want of time had been expressed by the participants during the baseline study. One of the pilots (Pilot 1: Phase One), however, stated that if you have the will, then time is a secondary issue. On the other hand, another pilot (Pilot project 2: Phase II) raised the issue of time in relation to the academic policy. He stated that teaching time is allocated only for face-to-face contact with the students, and there is no official time allocation for online teaching. Besides extra time and time management issues, the absence of time recognition for online teaching has been inferred as one of the limiting factors for ICT integration in teaching at SCE.

Finally, we turn to the main research question: **“How can professional development assist lecturers in rethinking and redesigning their teaching using ICT at SCE?”** After viewing the above conclusions, I would like to reaffirm the impact of the strategy used for the current study that has enabled me to find answers to the research questions and eventually respond to the purpose of the study. I will assert the claim with a reflection on the following two studies: Bingimlas has presented findings from various studies and discussed the lack of training and also lack of sufficient training as one of the main barriers to the integration ICT in teaching (2009). But then the BECTA study revealed that it is important to provide pedagogic trainings for teachers rather than simply training them to use ICT tools (2004). Bingimlas did not specify the meaning of “sufficient training,” whereas Becta has pointed to the importance of focusing training on how to use ICT with pedagogy as a significant factor in promoting the usage of ICT in teaching. I supplement BECTA's work by outlining the methodological approach using the future workshop methodology to conduct professional development for integrating ICT with pedagogy.

The future workshop method was not designed specifically for the purpose of professional development activity. According to Jungk and Mullert, the future workshop technique is “a kind of laboratory for social experimentation where people can try out alternate visions for the future” (1987, p. 52). Likewise, Purushothaman discusses future workshops as “a technique to reflect on a common

problematic situation to generate visions about the future and discuss how these visions can be used” (2013, p. 93). It has been used in different ways—for example introducing collaborative e-learning designs (Nyvang & Georgsen, 2007); developing e-policy in practice (Georgsen, Murshed, & Zander, 2011); and implementing change processes in empowering women through learning to use the Internet (Purushothaman, 2013). For the current study, future workshop has been used as an approach to design professional development. The positive progression displayed during the workshop and by the pilot projects shows that the intervention strategy following the future workshop technique, using participatory design methodology, and focusing the training on how to use ICT for teaching rather than ICT skills training has positive implications. Therefore, using this approach to professional development has enhanced the usage of ICT in teaching at SCE.

9.2. ADDITIONAL FINDINGS SURFACED FROM THE EMPIRICAL DATA

Through the analysis of the new lesson design posters and verbal presentations made by the participants during the workshop, it was revealed that there is a variation in the understanding and application of ICT in teaching amongst the individuals. Further, in the pilot study, it was seen that the pedagogic practices varied between the pilot projects. Pilot participant 1 from Phase I, who also participated as a pilot participant for the second phase, demonstrated a student-centered approach to his teaching, very much aligning to the 21st century teaching style as explained in earlier sections. Pilot participant 2 from the first phase pilot study had her lesson both on two stages of lesson observation teacher centered; the students had a minimal role during the lesson. Further, the second pilot participant from the Phase II pilot study, though he did not exhibit a varied nor very innovative practice of the pedagogy, he maintained a balance between the student-centered and teacher-centered approach. This finding uncovered the varying levels of pedagogic practice in the college and to a certain extent can also project the presence of difference in the understanding and utilization of 21st century skills in teaching amongst the faculty in the college.

However, it was seen that during the process of the activity and while presenting their new designs, some of the participants were confused and unclear about the task. There could be multiple reasons for this observation: vagueness of the instruction for the activity, participants did not listen to the instruction properly, first experience redesigning lessons with ICT and pedagogy, or participants only familiar with a top-down approach (experts design, develop, and present, then the participants’ role is to listen, observe, and replicate the presentation of the expert). At this stage, I cannot make definite conclusions on this observation except for the assumptions as described above.

9.3. IMPLICATIONS OF THE METHODOLOGICAL APPROACH TO THE STUDY

The participatory design approach to professional development within the framework of future workshops conducted at SCE for this study required the interplay of various agents. In the following, I will highlight some of the areas which posed as either strengths or weakness for the study.

9.3.1. OPPORTUNITIES

Since the research setting was my own home institution, I had the dual identity of a researcher and full member of the community equivalent to the participants of the intervention process. This role as an insider researcher has been an advantage in terms of the following:

Conducting interviews: Since the participants were familiar with me, they were able to communicate more openly. Due to the comfortable atmosphere during the interview, sometimes they expressed more than I remembered to ask, which allowed me to gain deeper insights into the situation.

Handling bureaucratic contradictions: Being accustomed to culture and practice in the research setting helped me to respond appropriately to the obstacles during the research process. Further, the implementation of the methodological approach was more feasible, and ultimately I had easy access to the data.

Clarity on observations and interpretations of the data: Being familiar with the context and practice had positive impacts on my interpretation and analysis. It enabled me to implement the hermeneutic concept of “pre-understanding and understanding” and getting to the “non-author intentional view of meaning” or producing and not only reproducing the texts or views of the participants and had also provided the opportunity to reflect on my prejudices, eventually deriving a certain level of clarity and enriching the interpretation.

9.3.2. CHALLENGES

Along with the opportunities mentioned above, the study has also met with some challenges in the areas highlighted below:

Time for researcher: During the follow-up of the intervention workshop (pilot studies), effective scaffolding during the planning, optimum observation of the teaching and learning process, and reflection and post-interviews with the pilots could not be maximized. Along with the role of insider researcher, I also had a teaching responsibility and had to take part in the college events. Therefore, the

amount and quality of data collection had to be compromised with the time available for the researcher.

Organizational support: The first phase intervention workshop proposal was welcomed and accepted by the college head and eventually had 60% of the faculty participating. Unfortunately, the proposal for the second phase intervention workshop had very weak support from the administration, which eventually impacted the workshop from planning to implementation. These situations should alert future practitioners to consider starting the intervention with the institutional leaders before approaching the subordinates or the actual users with the change process.

Time for the intervention workshop: On both the occasions (first and second phase workshops), we had only six and a half hours assigned in total for the information input and the activity to conduct the workshop. Starting from the introduction – activation – group activity – presentation were conducted at an accelerated phase. To some extent, the participants were rushed through the events; for that reason, they could not come up with good learning designs. Moreover, due to time pressure, there was not much room for discussion and feedback at the end of the workshop.

9.4. SIGNIFICANCE OF THE FINDINGS FROM THE STUDY

Over the years, higher education around the world has been constantly evolving due to various influences such as technology and globalization. Likewise, Pence argued that *“this is a period of broad-based change in education and society. The media are changing, the educational tools are changing, the students are changing and the tools the students need are changing”* (2009, p. 103). Further, Pence contends that *“when every student in a classroom has instant access to the worldwide web, the teacher must take new roles”* (p. 106). In other words, the teacher’s role now is not only delivering concepts but also facilitating the use of ICT for learning. Georgsen and Zander state that in the future, the education system across the world may be very different due to the current trends such as increasing number of learners, the deregulation and privatization of educational institutions, and the globalization of opportunities for learning (2013, p. 13). The need to integrate ICT in teaching has been discussed at length in the introduction chapter; the above statements are, however, being used to mirror the urgency.

In the following, I will highlight the significance at four tiers: Bhutan, the Royal University of Bhutan, the Samtse College of Education, and Social Science and Humanities scholars.

9.4.1. RELEVANCE FOR GLOBAL ACADEMICS

The current study has implemented participatory design methodology as one of the pathways for enhancing ICT integration in teaching at a higher education institution from a south East Asian developing country. The approach may be potentially applicable to any higher education institution in the region, institutions in developing countries, and any global institutions intending to enhance the use of ICT in teaching. Detailed descriptions with clarity have been given in systematic order throughout the whole proceeding of the study, making it usable for any scholar who is interested in developing more effective participatory design methods and practices to either adopt or follow parts of the process.

The methodological approach of the study is in line with the studies of Leung (2004), (Chin Jr & Rosson, 1998), Chin Jr (2004), and Hussain (2011). These studies exhibit differences in context and area of study but have used a similar methodological approach. For example, Leung's research is on the "effects of professional development on primary school teachers' integration of ICT in teaching in Hong Kong" and used participatory action research as the core methodology. Leung claims that the professional development approach used for the study raised teachers' self-efficacy and technology literacy and also moved to a student-centered teaching approach. The professional development agenda and approach and the findings from Leung's study are very similar to the current study. Likewise, Chin Jr's study focused on the integration of participatory design, ethnography, and science-based design. Chin Jr integrated participatory design, ethnography, and scenario-based design and called it as progressive design. According to Chin Jr, the application of progressive design in the development of educational technology promotes the social and cognitive development of teachers and enhances their ability to apply and incorporate educational software into their teaching. Chin Jr and Rosson also used progressive design in staged evolution of scenarios in the design of a collaborative science learning environment and called it as scenario based designs. Similarly, for the present study, I have also integrated a PD approach in the professional development aspect within the future workshop technique, although without the label of "progressive design." However, the approach connotes a similar concept. On the other hand, Hussain's study is different in context as the study is on a "participatory design project with children using prosthetic legs." However, Hussain's study relates to my study in the context of using PD in the developing country context to develop products that meet the users' needs.

My study is not a replica of the studies discussed above, nor is it a complete opposite of their studies; rather, these examples illustrate how participatory design can be contemplated for the specific purpose of the study retaining the core theme value of "the user-centered approach." This situation shows that the current approach of my study is valid yet follows a different path than the one advocated by

Greenbaum and Kyng (1991), Schuler and Namioka (1993), and Bødker, Grønbaek, and Kyng (1995). Participatory design is a set of theories, practices, and studies related to end-users as full participants in activities, leading to software and hardware computer products and computer-based activities (Greenbaum & Kyng, 1991; Schuler & Namioka, 1993) and the design of new kinds of computer support using skill and product quality to push computer system design more toward a users' perspective (Bødker, Grønbaek, & Kyng, 1995). In the current study, the focus of participatory design is to empower the users (lecturers) as ICT-integrated pedagogy designers and champions of ICT-enhanced teaching practitioners. For this purpose, participatory design approach was implemented through intervention workshops and pilot studies.

This study does not enforce the specific application of participatory design but rather promotes the application of the participatory design approach contextualized and localized in a particular situation. I cannot claim that the findings and the design approach are universal. It is possible that situational differences will invoke unique features, attributes, possibilities, and constraints. Nevertheless, the methodological approach used and findings from this study provide a point of reference from which scholars of participatory design, researchers, professional development designers, and educational technologists may pursue their own research. According to Bødker, research-based participatory design is needed to question technology to have a constructive impact on people's life with technology and argues that it is important that we do not only challenge but offer alternatives as well (2003, p. 89). The pilot projects used as prototypes for this study served to bring out concrete alternatives of prototyping in ICT integration, and they have provided specific patterns of enablers and constraints while integrating ICT in teaching. Participatory design's theme of involvement through democracy is well captured in two steps: building on users' own experiences (intervention workshop/professional development) and providing scaffolding (pilot projects) enabled the invoking by taking departure in their current practice situations (a move from enhancement ...to...transformation in ICT usage in teaching as shown in (Figure. 44).

The design of professional development being dominated by policy considerations, no enabling conditions for teachers to collaborate with the wider professional community, many short term trainings for teachers where they are kept as passive recipients of information, and fast paced implementation of the innovations (Little, 1993, p. 129).

The work I have done negates many of these mistakes, but the contribution is not merely to show that they can be negated. The point is to show HOW it can be done. This study has provided both illustrative and descriptive accounts of using the future workshop principle with the participatory design approach to professional

development while implementing new practices. The findings from this study demonstrate that using these approaches has brought about positive results. The key findings and contribution of this study will be in the following areas:

Power relations: I will not generalize the findings to the broad concept of culture and power relations; however, I have discussed in an earlier section its existence in Bhutan. The power distance discussion here is contextualized to one of the events of the study which has been presented with evidence (see 7.1). The finding reveals a strong influence of power distance in the current study location. It is well known that power relations influence any change process, the need to understand power relations in an institution when using the current methodological approach is contextualized in this study.

Personal beliefs and attitude: In the literature study (see 2.4.5), due to the unavailability of relevant sources from Bhutan, I have used this context from global studies to indicate one of the constraints or barriers to ICT integration in teaching. Though this study is done in a developing country where the infrastructure and resources are still limited, yet, it has clearly shown through the pilot study that personal beliefs and attitude is one of the most important factors in enhancing the use of ICT in teaching—consequently highlighting that intrinsic factors have a greater influence on integrating and enhancing the usage of ICT in teaching.

Scaffolding and motivation: I had the opportunity to meet and discuss with the users (pilot projects) firstly during the planning stage of their lessons, where an opportunity was created to get clarification on the technology tools intended to be used, for exposure to relevant examples of ICTs for their proposed lesson topics if they were ignorant on such, and for practice sessions whenever required with the help of an expert; secondly, during their lesson presentations I made observations of the lesson taking notes and taking pictures and video segments of the lesson; and thirdly, after the teaching, we had informal chats, and I provided my view on the lesson when asked, thereby creating an opportunity for the user to reflect. The positive result of this strategy has been evidenced in the illustrations made using SAMR model, where the user has begun moving into the transformation level of ICT use in teaching.

9.4.2. SIGNIFICANCE OF THE STUDY FOR BHUTAN

The urgency in the need for change in Bhutan with evolving trends in education due to the penetration of technology has not been openly stated in any government documents. However, indirectly, indications are made for rethinking education via other means of communication. For example, in recent years there has been many discussions at various forums (public meetings, educational conferences, social media, and local news media) on the status and quality of education in Bhutan. The changing trends in the education system and challenges on the ground of quality of

education in Bhutan have been discussed by researchers (Dorji, 2003; Schuelka, 2012). In the document Bhutan Education Blueprint 2014–2024—Rethinking Education, a need for a paradigm shift in the Bhutanese education system has been strongly addressed:

With the changing demands of the changing times, the education system in Bhutan has come under increased public scrutiny and debate for the system's inability to provide the necessary knowledge and skills to meet the new challenges. This establishes the urgency for ambitious review and reform in the education system at the earliest. (MoE, 2014, p. 11)

I will highlight some of the key areas from the document that relate to the theme of this study, which has been proposed as a trigger of change in the Bhutanese Education System:

- ✓ As a lever to propel the country forward education has always been accorded the highest priority (p. 10);
- ✓ Equip all children with appropriate knowledge, skills and values to cope with the challenges of the 21st century (p. 63);
- ✓ Intensifying efforts in educational innovation by taking advantage of new technologies (p. 18);
- ✓ The application of ICT will transform the education practices in the country by establishing a necessary platform for effective communication (p. 84).

In 2010, the Ministry of Education implemented the “Educating for GNH” program as a strategy to embrace and advance the vision of GNH through education (MoE, 2014, p. 84). The use of ICT in teaching and learning could be one of the means to infusing GNH in the curriculum. GNH is central to Bhutan’s education strategy as the government commits to ‘maximize the happiness of all Bhutanese and enable them to achieve their full potential as human beings’ (RGoB, 1999). For Bhutan to benefit the potential of ICT, the Ministry of Information and Communications outlined four broad strategies (MoIC, 2013, p. 69):

1. Strengthen the integration of ICT into curriculum, pedagogy, and assessment;
2. Provide a practice-based and model approach for differentiated professional development;
3. Recruit and regularize ICT instructors to enhance conceptual skills and develop critical thinking schools;
4. Enhance ICT provision in schools.

My study has worked within the scope of the two strategies (1 & 2) out of the four as outlined above. According to Fullan, “*systems do not change by themselves. Rather the actions of individuals and small groups working on new conceptions intersect to produce breakthroughs*” (1993, p. 11). The current study’s findings do not ascertain immediate impacts on the educational reform process; however, they provide some knowledge on the foundation for transformation in the education system with ICT integration in teaching. The trigger to change for the above aspirations can be responded by this study in two spectrums: Firstly, the individual transformation realized in terms of ICT integrated pedagogy through the process of the current study will impact the quality of the future teachers of Bhutan both in content attainment and pedagogic practices; secondly, the methodological approach and the findings from this study provide a backdrop for the Bhutanese professional development designers to use when developing a professional development program contextualized to Bhutan.

9.4.3. IMPLICATIONS FOR THE ROYAL UNIVERSITY OF BHUTAN

Georgsen and Zander state that the mission of higher education is often described to be that of a facilitator of the spread of education and a component in the skill set required for innovation (2013, p. 21). The Royal University of Bhutan being, the only university in the country, has a strategic role in all aspects of education. According to Powdyel, “*A university is the expression of the needs of a community, a society or a nation, devoted to the fashioning of its intellect*” (2005, p. 169). The need for the existence and vibrancy of a university has been envisioned in the Bhutan Vision 2020 document (RGoB, 1999, p. 21) before the launch of the present university. It has been stated as:

We must take steps at the earliest feasible opportunity to establish a national university that is not only able to meet national needs but also those of individuals from neighboring countries and even further a-field. The university should link Bhutan to the international world of learning and its establishment should be guided by the need to establish recognized Centre of excellence.

These propagations highlight the importance of the existence of the university and the dynamic role it needs to undertake. Primarily, the need of the hour is to address the evolving trends in education. This study has highlighted that the rapid penetration of technology globally as well in Bhutan and its impact on today’s learners has called for attention to rethink pedagogy with ICT. In order to meet this challenge, RUB has already taken steps with infrastructure developments and skills training of the human resource. On the other hand, the conduct of professional development with integrating ICT in teaching using a participatory design approach is unknown. Further, there has been no written policy or framework for ICTintegrated pedagogy until today at RUB. Fullan said “*Change is too important*

to leave to the experts. Every person is a change agent" (1993, p. 39). Therefore, this research finding, though from a small-scale study, can provide a base for guiding and designing a framework for ICT-integrated pedagogy by RUB (see Figure 49). On the other hand, it also provides RUB a mirror to reflect on the state of ICT in teaching at SCE for a comparative study with other colleges of RUB.

The proposed framework is a sketch and will need expansion with regards to detailed instructional steps for practical implementation, which will depend on contextualized situations. In the following, I will illustrate a few theoretical models on professional development to situate the proposed framework. Sparks and Loucks-Horsley (1989) suggest five models that are useful for accomplishing goals of staff development or professional development:

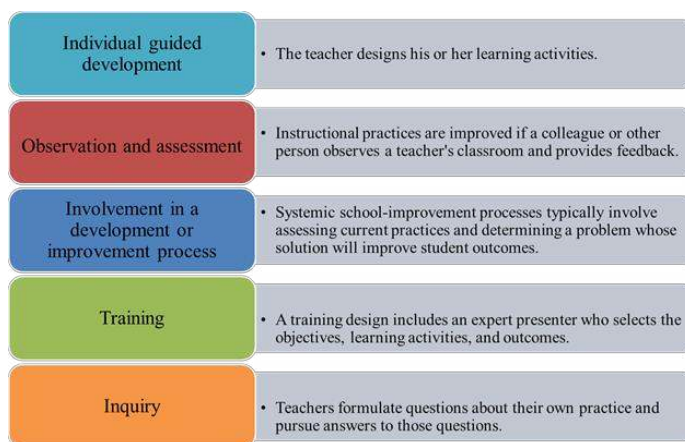


Figure 46. Sparks and Loucks-Horsley's (1989) five models for staff development or professional development

Professional development programs are systematic efforts to bring about change in the classroom practices of teachers, in their attitudes and beliefs, and the learning outcomes of students (Guskey, 2002, p. 382). Accordingly, Guskey proposed a model based on the assumption that if change in attitudes and beliefs comes first, then models are designed to gain acceptance, commitment, and enthusiasm from teachers and school administrators before the implementation of new practices and strategies (see Figure 47).

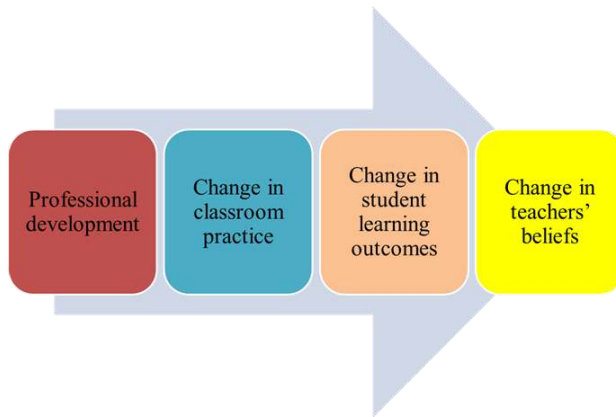


Figure 47. Professional development model for changing teachers' attitudes and beliefs (Guskey, 2002, p. 383)

Likewise, Joyce and Calhoun define professional development as formal provisions by organizations of ways of helping teachers and administrators develop a better workplace and enhance their knowledge and competence in their assigned roles (2010, p. 10). On the bases of the ways education organizations generate learning opportunities for their personnel, Joyce and Calhoun propose the following professional development model (2010, pp. 12–13):



Figure 48. Professional development model adopted from Joyce and Calhoun (2010, pp. 12-13)

The following proposed sketch is a derivative of the approach used for the current study which has produced a positive outcome. Further, it does not deviate from the five models of Sparks and Loucks-Horsley (1989), from the change in teachers'

beliefs model of Guskey (2002), or from Joyce and Calhoun (2010). Rather, it has infused the core concepts of the models and moved them from theoretical presentation to a more practical model. Additionally, it provides context on appropriating methods and methodology in different steps with a key focus on ICT integration. However, the model is not prescriptive for adoption; rather, it outlines a clear pathway for developing instruction contextualized to the needs of the practitioner.

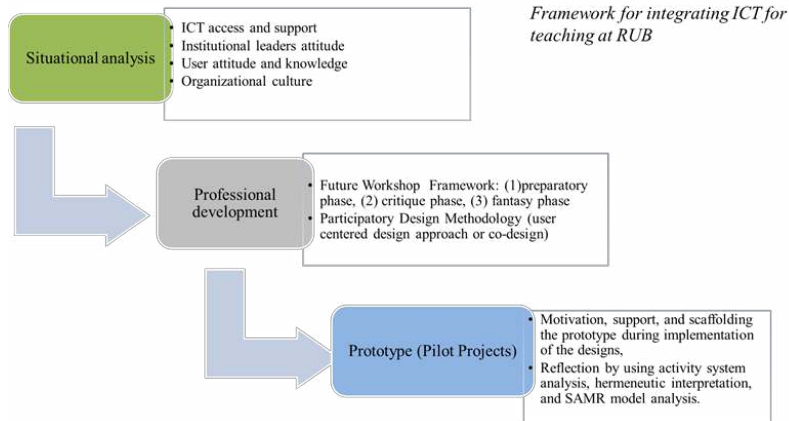


Figure 49. A sketch proposal for implementing ICT in teaching through professional development

9.4.4. WHAT ARE THE IMPLICATIONS OF ICTS IN TEACHING AT SCE?

The AACTE committee on innovation and technology argue that 21st century teacher educators need to employ teaching methods to prepare pre-service teachers toward the abilities, strategies, and ways of thinking for teaching today and tomorrow (2008, p. 219). Earlier, in the Introduction chapter, I explained that SCE is a premier teacher education college in the country, being the first teacher training college and also the only teacher training college that produces teachers for secondary and higher secondary schools. In the college strategic plan document, the vision statement ambitiously reads “*Samtse College of Education will be the Centre of excellence in teacher education*” (SCE, 2015). Unfortunately, if we look into the mission statements and the core competences of the college in the document, there is no mention of a 21st century education. On the other hand, in the Bhutan Education Blueprint document, it is outlined that “*teacher education colleges are to provide excellent content knowledge in elective subjects along with opportunities to demonstrate and practice 21st century skills and strategies*” (MoE, 2014, p. 80). Further, it has been highlighted that “the application of ICT will transform the education practices in the country by establishing a necessary platform for effective

communication” (p. 84). The college needs to relook and reflect on its existence and rethink along the lines of the latter document.

It is important and necessary for the college to understand the evolving trends and changes in the educational arena globally, consider the factors influencing the education, reflect on the teaching and learning scenarios of the present and future, and pave ways for adapting to the new paradigm. Then, the vision of the “Centre for excellence” could be dreamt; otherwise, with no strategies outlined the vision will remain just a script. Fullan indicated that “*teacher education institutions themselves must take responsibility for their current reputation as laggards rather than leaders of educational reform*” (1993, p. 6). When debates occur about the declining quality of education or when comments are made on the static education system, the eyes of the society are either on the curriculum or the teacher. As the standard of teachers is being discussed, eventually fingers will point to the teacher educators. There are no published documents on this issue, but at various forums the standards of teacher education colleges have been remarked upon when the declining quality of education in Bhutan had been discussed. Fullan said, “*Teacher education has the honor of being the worst problem and the best solution in education*” (1993, p. 5).

The present study’ findings do not have the capacity to address all the evolving trends in education and factors that relate to the 21st century nor intentions to bring in immediate reform at SCE. The use of technology has been identified as one of the 21st century skills, and moreover, I have discussed at length throughout the monograph that both globally and in Bhutan the penetration of technology and its influence on education has been massive. Therefore, the findings from this study will provide the college insights into the pedagogic practices that are prevailing; the status of ICT-integrated teaching; the enabling and constraining factors for enhancing the use of ICT in teaching; and a road map for future intervention programs.

According to Powdyel, “*the academic community, the intellect life and the love of knowledge, animate and give purpose and directions to the institutions of learning*” (2005, p. 174). In other words, he claims that the academics or faculty is more important than the formulated curriculum or the wonderful infrastructure for institutions to be progressive. Likewise, the present study has the faculty, who are end-users of technology in teaching, as the main focus of the study. SCE is a training ground for pre-service and in-service teachers, and it has been claimed by researchers that teachers teach the way they have been taught. “*If teachers-in-the-making experience ICT modeled in their preparation, they will be more likely to incorporate ICT in their classroom*” (Nyvang & Johnson, 2004, p. 72). The current study has dual empowerment: firstly, through the workshop and pilot projects, ICT-integrated pedagogic practices have been enhanced at the individual lecturer’s level, lifting them from some of the limitations like attitude and confidence through

motivation and scaffolding; secondly, there is an indirect empowerment of the future teachers, and lecturers' pedagogic practices will impact the student teachers and ultimately benefit the school education system in Bhutan. Within its small capacity, the outcome of the study has positive implications for the education system of Bhutan in responding to the evolving trends in education with the penetration of technology, thereby also making a miniature contribution at the micro level to the country's philosophy of GNH.

9.5. REFLECTING ON MY POSITION AS A RESEARCHER BASED ON THE FINDINGS AND THE METHODOLOGICAL APPROACH TO THE STUDY

Bhutan opened its doors to technology from its self-imposed isolation only in 1999—very late compared to the rest of the world. RUB was established only in 2003. Though SCE was initiated using Moodle for distance education program starting in 2004, VLE was launched only in 2011. I have discussed in the Introduction section that many initiatives have been carried out with regards to human resource and infrastructure development at SCE since 2004. But no in-depth study has been carried out to learn the impacts of the initiatives on the ICT trainings availed by the faculty and the state of the practice of ICT in teaching at SCE until now. Therefore, this study was intended to identify the trends in ICT usage in teaching and then to explore ways of enhancing the use of ICT in teaching at SCE. With a history as a late-starter in the world of information technology and its unique geographical location, the findings of this study were aimed at

- ❖ Showcasing the trends in the usage of ICT in teaching at SCE representing RUB and Bhutan and
- ❖ Developing a methodological approach and contribute it as knowledge to the social science research community and to the participatory research designers.

Therefore, initially I identified my role as a scholar, as the purpose of the study was to generate a strategy for enhancing ICT usage in teaching and contribute the new-found knowledge to other scholars in the same field.

Silverman has classified three roles of a social scientist, namely: (1) Scholars, who are liberal in their political agenda and produce knowledge for knowledge's sake protected by a scholar's conscience; (2) State Counsellors, who are bureaucratic in their political beliefs and produce knowledge to enlighten policy makers—they are also known as social engineers; (3) Partisans, who are radical in political agenda and produce knowledge to support political theory or practice—they are also known as the underdog of the organizations (2011, p. 497).

The findings from the study provided me with a new mask. With no personal intention, the findings from the study have directed me to take on the role of “State Counsellor.” As enumerated in the conclusion chapter, the study has revealed issues of concern for the policy makers to take action. Though the methodological approach chosen for this study invites me to take up the role of Partisan, I would like to state that this study had no intention of finding flaws in the initiatives of the policy makers and oppose their decisions. The findings have rather shown a win-win situation for both (organization and the employees) in which it has been shown that strategies to enhance the use of ICT by the lecturers in their teaching benefits the lecturers themselves firstly and ultimately rippling the impact of quality teaching and learning back to the organization. For example, Bødker and Zander (2015) argue that sometimes it is adequate to identify win-win situations rather than to maximize participation. Further, RUB is still in its initial stages in the implementation of ICT for teaching and learning (Kinley et al., 2013), and the insights from this study provides knowledge to refine the process.

This study applies participatory design methodology, and this section discusses the related and alternative methodologies. The intent of the discussion is to position my study from the methodological perspective. The methodological approach used and carried out for the current study bears close resemblances with design-based research and action research.

There are fundamental differences between design-based research and participatory design, despite their methodological similarities. The purpose of design-based methodology is to improve and evaluate educational practices in real context; it is a flexible but systematic process guided by theories and design principles, it is sensitive to the context, and it is based on a participatory process of collaboration between researchers and practitioners (Wang & Hannafin, 2005). Unlike the participatory design approach of co-design and co-researching, design-based research methodology is prescriptive in nature, serving as guidelines for how to implement a set of designs, and the forms of interventions vary from concrete artifacts to learning activities and curricula (The Design-Based Research Collective, 2003, pp. 5–6).

According to Nielsen, Dirckinck-Holmfeld, & Danielsen, action research is connected with underprivileged groups, and the research findings can serve as a basis for the contemplation and actions of decision makers (2003, p. 24). In this context, Ferrance defines action research as “*a disciplined inquiry done by a teacher with intent that the research will inform and change his or her practices in future*” (2000, p. 1). Ferrance argues that “*action research is not about doing research on or about people, or finding all available information on a topic looking for the correct answers*” (2000, p. 2). There are two types of action research, according to Creswell (2011)—practical action research and participatory action research. According to Kemmis and McTaggart, “*in practical action research the*

researcher address the participants as ‘you,’ the means of practice are objects of change”; participatory action research is a fourth-generation action research where there is shared ownership of research projects, a community based analysis of social problems, and an orientation toward community action (2005, p. 560).

Nielsen, Dirckinck-Holmfeld, and Danielsen contend that action research is the historical basis of participatory design (2003, p. 21). They have stated that action research projects with a focus on worksites gradually developed with the aim of empowering workers through educating union leaders. Following which a new strategy of “alternate technology” was evolved aiming at developing tools for and together with the workers to enhance the workers’ professional qualifications and living conditions. Prototyping strategies were developed and resulted in a close cooperation with users, and eventually alternate technology became a transition concept from action research. They also state that it was during this time the UTOPIA project emerged in Scandinavia (2003, p. 26). Hence, the similarities between the two methodologies are plausible.

In this study, I have purposefully positioned myself as a participatory design researcher; I positioned myself as a facilitator who attempts to empower users in making their own decisions, and to achieve the goal I attempted to ensure that I come to conclusions in conjunction with users (Spinuzzi, 2005, p. 167). Consequently, the researcher’s role was not central in presenting designed lesson models for the lecturers to implement. Instead, the researcher’s role was about displaying the various possibilities in redesigning the lesson, sensitizing the need for change, providing ideas, presenting models, and supporting the users during the planning and practicing stages and simultaneously collecting empirical information from the process.

In some cases in the field situations, there were not sufficient opportunities to implement the principles and methods in the typical level of participatory design methodology. So, one might find similarities with action research or design-based research methodology. Therefore, I accept that it is subject to interpretation.

9.6. RECOMMENDATIONS FOR FUTURE WORK

Reflecting on the shortcomings, the duration of the intervention workshop could be increased so that the participants get more time for reflection on their practices, redesigning their module, and discussion after their presentation. For more absolute validity, the number of pilots could be increased, and the cycle of scaffolding, observation, and reflection for the pilots could be increased as well.

The conflicts and contradictions that occurred relate very much to the local culture and practice. Therefore, researchers who intend to approach their study using the current methodological approach need to study the beliefs and attitudes of the

organizational leaders and their practice besides finding the trends amongst the end-users. With a similar tone, Bødker and Zander argue that when using participatory design, in order to gain influence, it is important to involve actors that are politically strong (2015, p. 18). To use PD in cultures where the power gap is wide and bureaucratic procedures are prevalent, to initiate as well as to realize some impacts on interventions involving actors that are politically strong is significant.

Changing the location of the study and conducting a similar study in another college would allow comparative findings in terms of resources, time, attitudes, and administrative support. Weak administrative support has been one of the major constraints for the current study; therefore, it will be interesting to explore further the role of administration in impacting a study using the same approach.

CHAPTER 10. BIBLIOGRAPHY

- AACTE. (2008). *Handbook of Technological Pedagogical Content Knowledge (TPCK) for Educators*. New York & London: Routledge/Taylor & Francis Group.
- Abel, R. (2005). Implementing the Best Practices in Online Learning. *EDUCAUSE Quarterly*, 75-77.
- Abuhmaih, A. (2011). ICT training courses for teacher professional development in Jordan. *Turkish Online Journal of Educational Technology*, 10(4), 195-210.
- Albaugh, P. R. (1997). *The Role of Skepticism in Preparing Teachers for the Use of Technology*. USA: ERIC.
- Allen, C. (1993). Reciprocal Evolution as a Strategy for Integrating Basic Research, Design, and Studies of Work. I D. Schuler, & A. Namioka, *Participatory Design Principles and Practices* (s. 239-256). Hillsdale: Lawrence Erlbaum Associates Inc.
- Almadhour, B. (2010). *The Integration of Information and Technology into Secondary Technology Teachers' Pedagogy in New Zealand (Dissertation for M.Ed)*. Auckland: Auckland University of Technology.
- Altbach, P. G., Reisberg, L., & Rumbley, L. E. (2009). *Trends in Global Higher Education: Tracking an Academic Revolution*. Paris: UNESCO.
- Arunachalam, S. (1999). Information and knowledge in the age of electronic communication: a developing country perspective. *Journal of Information Science*, 25(6), 465-476.
- Balanskat, A., & Blamire, R. (2007). *ICT in Schools*. Brussels: European Schoolnet.
- Ball, D. L. (1996). Teacher learning and the mathematics reforms: What do we think we know and what do we need to learn? *Phi Delta Kappan*, 77, 500-508.
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84(2), 191-215.
- Bates-Tony, A. W. (2015). *Teaching in a Digital Age*. Canada: Creative Commons.

- BBC. (11. 7 2012). *Bhutan Profile*. Hentede 27. 9 2014 fra BBC NEWS ASIA: <http://www.bbc.com/news/world-south-asia-12484025>
- Becker, H. J., & Riel, M. M. (2000). *Teacher Professional Engagement and Constructivist-Compatible Computer Use*. US: Teaching, Learning, and Computing: 1998 National Survey Report.
- BECTA. (2004). *Barriers to successful integration of ICT in teaching and learning environments: A review of literature*. Hentede 20. 1 2013 fra British Educational Communications and Technology Agency: www.becta.org.uk
- Beetham, H., & Sharpe, R. (2007). An introduction to rethinking pedagogy for a digital age. I H. Beetham, & R. Sharpe, *Rethinking Pedagogy for a Digital Age* (s. 1-6). London: Routledge.
- bhutantimes. (2008). *BHUTAN Evolving Politics*. Thimphu: Bhutan Times Ltd.
- Biesta, G. (2010). Pragmatism the Philosophical Foundations of Mixed Method Research. I A. Tashakkori, & C. Teddlie, *Sage Handbook of Mixed Methods in Social & Behavioral Research (2 ed)* (s. 95-117). London: SAGE.
- Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education*, 5(3), 235-245.
- Bleicher, J. (1980). *Contemporary hermeneutics: Hermeneutics as method philosophy and critique*. London: Routledge.
- Bødker, S. (2003). A for Alternatives. *Scandinavian Journal of Information Systems*, 15(1), 87-89.
- Bødker, S., & Zander, P.-O. (2015). Participation in Design between Public Sector and Local Communities. *7th international conference on Communities & Technologies*. Limerick: ACM Press.
- Bødker, S., Grønabæk, K., & Kyng, M. (1993). Cooperative Design: Techniques and Experiences From the Scandinavian Scene. I D. Schuler, & A. Namioka, *Participatory Design Principles and Practices* (s. 157-176). Hillsdale: Lawrence Erlbaum Associates Inc.
- Bødker, S., Grønabæk, K., & Kyng, M. (1995). Cooperative design: techniques and experiences from the Scandinavian scene. I S. Bødker, K. Grønabæk, & M.

- Kyng, *Human Computer Interaction* (s. 215-224). San Francisco: Morgan Kaufmann.
- Bon, A. (2007). Can internet in tertiary education in Africa contribute to social and economic development? *International Journal of Education and Development using ICT*, 3(3).
- Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. *Educational Researcher*, 33(3), 3-5.
- Bradley, G., & Russell, G. (1997). Computer experience, school support and computer anxieties. *Educational Psychology*, 17(3), 267-284.
- Bravo, E. (1993). The Hazards of Leaving Out the Users. I D. Schuler, & A. Namioka, *Participatory Design: Principles and Practices* (s. 3-12). Hillsdale, New Jersey: Lawrence Erlbaum Associates, Inc.
- Brown, D. L., & Ritchie, D. C. (1991). Cognitive apprenticeship: a model of staff development for implementing technology in schools. *Contemporary Education*, 64(1), 28-34.
- Brown, J. S. (2001). Learning in the Digital Age. I M. Devlin, R. Larson, & J. Meyerson, *The Internet and the University Forum* (s. 65-91). Boulder, Colorado: EDUCAUSE.
- Brown, J. S., & Duguid, P. (1996). Universities in the digital age. *Change: The Magazine of Higher Learning*, 28(4), 11-19.
- CERD. (2002). *The Call: Stories of Yesteryear*. Paro: Ministry of Education.
- Chin Jr, G., & Rosson, M. B. (1998). Progressive design: staged evolution of scenarios in the design of a collaborative science learning environment. *In Proceedings of the SIGCHI conference on Human factors in computing systems* (s. 611-618). Los Angeles: ACM Press/Addison-Wesley Publishing Co.
- Chin, G., & Chin Jr, G. (2004). *A Case Study in the Participatory Design of Collaborative Science-Based Learning Environment (PhD Thesis)*. Virginia: Virginia Polytechnic Institute and State University.
- Chitiyo, R., & Harmon, S. W. (2009). An analysis of the integration of instructional technology in pre-service teacher education in Zimbabwe. *Educational Technology Research and Development Journal*, 57, 807-830.

- Choeda, & Kinley. (2013). Implementation of Teaching Skills and Strategies: A study of Graduates of a Teacher Education Program. *bjrd-Bhutan Journal of Research and Development*, 53-63.
- Chotto, M. C. (December 2010). DESIGNING FOR CHANGE IN UNIVERSITY TEACHING PRACTICES: The Case of UNAgora - A Community of Practice Approach to Facilitate University Teacher Professional Development in ICT and Project Oriented Problem Pedagogy. *Thesis Submitted for the degree of Doctor of Philosophy*. Aalborg, Denmark: Aalborg University.
- Clement, A., & Besselaar, P. (1993). A retrospective look at PD projects. *Communications of the ACM*, 36(6), 29-37.
- Cole, K., Simkins, M., & Penuel, W. (2002). Learning to teach with technology: Strategies for inservice professional development. *Journal of Technology and Teacher Education*, 10(3), 431-455.
- Collis, B., & Wende, M. (2002). *Models of technology and change in higher education: An international comparative survey on the current and future use of ICT in higher education*. Netherlands: Center for Higher Education Policy Studies (cheps).
- Conole, G. (2010). Current Challenges in Learning design and pedagogical patterns research. *7th Networked Learning International Conference*. (s. 57). Aalborg: Aalborg University.
- Creswell, J. W. (2003). *RESEARCH DESIGN: Qualitative, Quantitative and Mixed Methods Approaches (2 ed.)*. London: SAGE.
- Creswell, J. W. (2009). *Research Design: Qualitative, Quantative, and Mixed Method Approaches (3rd ed.)*. California: SAGE.
- Creswell, J. W., & Clark, V. L. (2011). *Designing and Conducting Mixed Methods Research (2 ed.)*. Los Angeles: SAGE.
- Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into practice*, 39(3), 124-130.
- Cross, M., & Adam, F. (2007). ICT Policies and Strategies in Higher Education in South Africa: National and Institutional Pathways. *Higher Education Policy*, 20(1), 73-95.

- Crotty, M. (1998). *The Foundations of Social Research: meaning and perspectives in the research process*. London: SAGE Publication Ltd.
- Darling-Hammond, L. (1999). Educating Teachers: The Academy's Greatest Failure Or Its Most Important Future? *Academe*, 85(1), 26-33.
- Darling-Hammond, L., & McLaughlin, M. W. (1995). Policies that support professional development in an era of reform. *Phi Delta Kappan*, 76(8), 597-604.
- Dart, B., & Boulton-Lewis, G. (1998). *Teaching and Learning in Higher Education*. Herndon: Stylus Publishing.
- Davidson, J., & Georgsen, M. (2010). ICT as a tool for collaboration in the classroom: Challenges and lessons learned. *Design for Learning*, 3(1-2), 54-69.
- Davis, B. C., & Shade, D. D. (1999). Integrating technology into the early childhood classroom: The case of literacy learning. *Information technology in childhood education annual*(1), 221 - 254.
- Dawes, L. (2001). What stops teachers using new technology? I M. Leask, *Issues in Teaching using ICT* (s. 61-79). London: Routledge.
- Dede, C. (2009). *Comparing frameworks for 21st century skills (21st century skills: Rethinking how students learn*. Harvard: Harvard Graduate School of Education.
- Denman, B. D., & Namgyel, S. (2008). Convergence of Monastic and Modern Education in Bhutan? *International Review of Education*, 54(3-4), 475-491.
- Denzin, N. K. (1978). *The Research Act: A Theoretical Introduction to Sociological Methods*. New York: McGraw-Hill.
- Denzin, N. K., & Lincoln, Y. S. (2005). Introduction: The Discipline and Practice of Qualitative Research. I N. K. Denzin, & Y. S. Lincoln, *A SAGE HANDBOOK OF QUALITATIVE RESEARCH THIRD EDITION* (s. 1-32). London: SAGE Publications.
- Dewey, J. (1938). *Experience and Education*. New York: Mac-Millan.
- Dewey, J. (2004). *Democracy and education*. Ohio: Courier Dover Publications.

- Dirckinck-Holmfeld, L. (2002). Designing Virtual Learning Environments Based on Problem Oriented Project Pedagogy. I L. Dirckinck-Holmfeld, & B. Fibiger, *LEARNING IN VIRTUAL ENVIRONMENTS* (s. 31-54). Frederiksberg C: Samfundslitteratur.
- Donnelly, D., McGarr, O., & O'Reilly, J. (2011). A framework for teachers' integration of ICT into their classroom practice. *Computers & Education*, 57(2), 1469-1483.
- Dorji, J. (2003). *Quality of Education: A personal perspective on the Development and Changes in Bhutanese Education System since 1961*. Thimphu: KMT Publisher.
- Ehn, P. (1993). Scandinavian Design: Participation and Skill. I D. Schuler, & A. Namioka, *Participatory Design Principles and Practices* (s. 41-70). Hillsdale: Lawrence Erlbaum Associates Inc.
- Ehn, P. (1998). *Work-Oriented Design of Computer Artifacts (Doctoral Thesis)*. Stockholm: Arbetslivscentrum.
- Elmore, R. F. (2002). The limits of change. *Harvard Education Letter*, 18(1), 7-8.
- Embassy of India. (8. 9 2014). *Chiphen Rigpel (Total Solution) Project*. Hentede 8. 9 2014 fra Embassy of India, Thimphu, Bhutan: <http://www.indianembassythimphu.bt/pages.php?id=86>
- Empak, F. (1993). Workers Unions and New Technology. I D. Schuler, & A. Namioka, *Participatory Design Principles and Practices* (s. 13-26). Hillsdale: Lawrence Erlbaum Associates Inc.
- Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit.
- Engeström, Y. (1996b). Development as breaking away and opening up: A challenge to Vygotsky and Piaget. *Swiss Journal of Psychology*, 55, 126-132.
- Engeström, Y. (1999a). Development as breaking away and opening up: A challenge to Vygotsky and Piaget. *Swiss Journal of Psychology*, 55(2/3), 126-132.
- Engeström, Y. (1999c). Expansive visibilization of work: An activity-theoretical perspective. *Computer Supported Cooperative Work (CSCW)*, 8(1-2), 63-93.

- Engeström, Y. (1999f). *Learning by Expanding: Ten Years After. Introduction to the German Edition of Learning by Expanding*. Marburg: BdWi-Verrlag.
- Engeström, Y. (2000). Activity theory as a framework for analyzing and redesigning work. *Ergonomics*, 43(7), 960-974.
- Engeström, Y. (2007). Putting Vygotsky to work: The Change Laboratory as an application of double stimulation. I M. Daniels, & J. V. Wertsch, *The Cambridge companion to Vygotsky* (s. 363-382). Cambridge: Cambridge University Press.
- Engeström, Y. (2009a). The Future of Activity Theory: A Rough Draft. I A. Sannino, H. Daniels, & K. D. Gutierrez, *Learning and Expanding with Activity Theory* (s. 303-328). Cambridge: Cambridge University Press.
- Engeström, Y. (2011). From design experiments to formative interventions. *Theory & Psychology*, 21(5), 598-628.
- Engeström, Y., & Miettinen, R. (1999). Introduction. I Y. Engeström, R. Miettinen, & L. Punamaki, *Perspectives on activity theory* (s. 1-16). Cambridge: Cambridge University Press.
- Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundation, findings and future challenges. *Educational Research Review*, 5, 1-24.
- Engeström, Y., Rantavuori, J., & Kerosuo, H. (2013). Expansive learning in library: Actions, Cycles and Deviations from Instructional Intentions. *Vocations and Learning*, 6, 81-106.
- Ertmer, P. A., Ottenbreit-Leftwich, A., & York, C. S. (2006). Exemplary technology-using teachers: Perceptions of factors influencing success. *Journal of Computing in Teacher Education*, 23(2), 55-61.
- EVA. (2009). *IT i skolen. Undersogelse af erfaringer og perspektiver*. Denmark: Danmarks Evaluringsinstitut.
- Ferrance, E. (2000). *Action Research*. Providence: Brown University.
- Fullan, M. (1991). *The New Meaning of Educational Change*. London: Cassell.
- Fullan, M. (2007). *The new meaning of educational change (4th edition)*. London: Teachers College Press.

- Fullan, M. G. (1993). Why teachers must become change agents. *Educational leadership*, 50, 12-12.
- Gallimore, R., Ermeling, B. A., Saunders, W. M., & Goldenberg, C. (2009). Moving the Learning of Teaching Closer to Practice. *The Elementary School Journal*, 109(5), 537-553.
- Georgsen, M., & Zander, P.-O. (2013). The Unheard Voices at Dhaka University. I M. Georgsen, & P.-O. Zander, *Changing education through ICT in developing countries*. Aalborg: Aalborg University Press.
- Georgsen, M., Murshed, S. M., & Zander, P.-O. (2011). *ePolicy IN Practice Report I*. Aalborg : e-Learning Lab.
- Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of educational psychology*, 76(4), 569.
- Gimmler, A. (2005). *American Pragmatism - Creativity in Everyday Life*. Copenhagen, Denmark: Hverdagslivssociologi.
- Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The qualitative report*, 8(4), 597-607.
- Granger, C. A., Morbey, M. L., Lotherington, H., Owston, R. D., & Wideman, H. H. (2002). Factors Contributing to Teachers' Successful Implementation of IT. *Journal of Computer Assisted Learning*, 18(4), 480-488.
- Greenbaum, J., & Kyng, M. (1991). Introduction: Situated Design. I J. Greenbaum, & M. Kyng, *DESIGN AT WORK: Cooperative Design of Computer Systems* (s. 1-24). New Jersey: Lawrence Erlbaum Associates, Inc.
- Gregory, J. (2003). Scandinavian approaches to participatory design. *International Journal of Engineering Education*, 19(1), 62-74.
- Grøøbæk, K., Grudin, J., Bødker, S., & Bannon, L. (1993). Achieving Cooperative system Design: Shifting From a Product to Process Focus. I D. Schuler, & A. Namioka, *Participatory Design Principles and Practices* (s. 79-98). Hillsdale: Lawrence Erlbaum Associates Inc.
- GSP. (4. 6 2015). *The Glossary of Education Reform*. Hentede 6. 5 2015 fra The Glossary of Education Reform by Great School Partnership: <http://edglossary.org/scaffolding/>

- Guri-Rosenblit, S. (2009). *Digital Technologies in Higher Education: Sweeping Expectations and Actual Effects*. New York: Nova Science.
- Gurung, J., & Bhattarakosol, P. (May 2014). Impacts of ICT Policy Towards Bhutan Private Sector Development. *Journal of Convergence Information Technology (JCIT)*, 9(3), 109-119.
- Guskey, T. R. (1994). *Professional development in education: in search of the optimal mix*. ERIC.
- Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: theory and practice*, 8(3), 381-391.
- Gutierrez, K., Rymes, B., & Larson, J. (1995). Script, counterscript, and underlife in the classroom - brown, James versus Brown V. Board of Education. *Havard Educational Review*, 445-471.
- Gyamfi, S. A. (September 2014). Pedagogical Reflections on a Blended Learning Environment in Ghanaian Universities: A Formative Experiment Approach. *A Thesis Submitted for the Award of PhD in Information Technology*. Copenhagen, Denmark: Aalborg University.
- Heeks, R. (2010). Do Information and Communication Technologies (ICTs) Contribute to Development? *J.Int.Dev.22 (Published online by Wiley InterScience)*, 625-640.
- Heeks, R. (2012). Information Technology and Gross National Happiness: Connecting digital technologies and happiness. *Communications of the ACM*, 55(2), 24-26.
- Heron, J., & Reason, P. (1997). A Participatory Inquiry Paradigm. *Qualitative Inquiry*, 3(3), 274-294.
- Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and achievement in problem-based and inquiry learning: A response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist*, 42(2), 99-107.
- Hofstede, G. (1980). *Culture's consequences: International differences in work-related attitudes*. Beverly Hills: SAGE Publications.
- Holliman, R., & Scanlon, E. (2004). *Mediating Science Learning Through Information and Communication Technology*. London: Routledge.

- Holtzblatt, K., & Jones, S. (1993). Contextual Inquiry: A Participatory Technique for System Design. I D. Schuler, & A. Namioka, *Participatory Design Principles and Practices* (s. 177-210). Hillsdale: Lawrence Erlbaum Associates Inc.
- Holzman, L. (2006). What kind of theory is activity theory? *Theory & Psychology*, 16(1), 5-11.
- Hussain, S. (2011). *Designing for and the Marginalized People in Developing Countries: Efforts to Undertake a Participatory Design Project with Children Using Prosthetic Legs in Cambodia (Doctoral Thesis)*. Norway: Norges teknisk-naturvitenskapelige universitet, Fakultet for ingeniørvitenskap og teknologi, Institutt for produktutvikling og materialer.
- infoplease. (27. 9 2014). *Bhutan*. Hentede 27. 9 2014 fra infoplease.com: <http://www.infoplease.com/country/bhutan.html>
- Jamtsho, S., & Bullen, M. (2007). Distance Education in Bhutan: Improving access and quality through ICT use. *Journal of Distance Education*, 28(2), 149-161.
- Jimoyiannis, A., & Komis, V. (2007). Examining teachers' beliefs about ICT in education: Implications of a teacher preparation programme. *Teacher development*, 11(2), 149-173.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14-26.
- Jonassen, D. (1999). Designing Constructivist Learning Environment. I C. M. Reigeluth, *Instructional Design Theories and Models* (s. 215-240). New Jersey: Lawrence Erlbaum associates Inc.
- Jonassen, D. H. (2000). *Computers as mindtools for schools: Engaging critical thinking*. New Jersey: Prentice-Hall.
- Jones, A. (2004). *A review of the research literature on barriers to the uptake of ICT by teachers*. Coventry: British Educational Communications and Technology Agency (Becta).
- Joyce, B., & Calhoun, E. (2010). *MODELS OF PROFESSIONAL DEVELOPMENT: A Celebration of Educators*. California: Corwin: Thousand Oaks.

- Jung, I. (2005). ICT-Pedagogy Integration in Teacher Training: Application Cases Worldwide. *Educational Technology & Society*, 8(2), 94-101.
- Jungk, R., & Mullert, N. (1987). *FUTURE WORKSHOPS: How to Create Desirable Futures*. London: Institute for Social Futures.
- Kemmis, S., & McTaggart, R. (2005). Communicative action and the public sphere. I N. K. Denzin, & Y. S. Lincoln, *The Sage handbook of qualitative research* (s. 559-603). London: Sage Publications.
- Kensing, F., & Blomberg, J. (1998). Participatory design: Issues and concerns. *Computer Supported Cooperative Work (CSCW)*, 7(3-4), 167-185.
- Kensing, F., & Madsen, K. H. (1991). Generating Visions: Future Workshops and Metaphorical Design. I J. Greenbaum, & M. Kyng, *DESIGN AT WORK: Cooperative Design of Computer Systems* (s. 155-168). Hillsdale: Lawrence Erlbaum Associates Inc.
- Keogh, K. M. (2001). National Strategies for the Promotion of On-Line Learning in Higher Education. *European Journal of Education*, 36(2), 223-236.
- Khan, , M., Hossain, S., Hasan, M., & Clement, C. K. (2012). Barriers to the Introduction of ICT into Education in Developing Countries: The Example of Bangladesh. *International Journal of Instruction*, 5(2), 61-80.
- Khan, M. A., & Kamarul, M. (2013). Pre-Service Teachers' Learning Experiences with E-Portfolios or ICT and Language Development. I M. Georgsen, & P.-O. Zander, *Changing education through ICT in developing countries* (s. 195-213). Aalborg: Aalborg University Press.
- Khirwadkar, A. (2007). *Integration of ICT in education: Pedagogical issues*. Assumption University: Educational Review (1).
- Kinley, Zander, P. O., Georgsen, M., & Choeda. (2013). The usage of ICT for teaching at a bhutanese College. *INTED2013 Proceedings* (s. 4126-4135). Valencia: International Association of Technology Education and Development.
- Kleiman, G. M. (2000). Myths and realities about technology in K-12 schools. *Leadership and the New Technologies*, 14(10), 1-8.
- Koehler, M. J., & Mishra, P. (2008). Introducing TPCK. I A. C. Technology, *The handbook of technological pedagogical content knowledge (TPCK) for educators* (s. 3-29). New Jersey: Lawrence Erlbaum Associates.

- Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development (Vol.1)*. Englewood Cliffs, NJ: Prentice-Hall.
- Kuensel. (23. 5 2015). *Lets not debate descend to indecorum*. Hentede 23. 5 2015 fra Kuenselonline: <http://www.kuenselonline.com/let-not-debate-descend-to-indecorum/#more-122441>
- Kurtz, G. (31. 3 2008). Technological Innovation in Teaching at Bar-Ilan University: Transfer from Experimental Phase to Ongoing Adoption. *Paper Preseanted at a Symposium on 'Attitudes of Academic Faculty Towards the Implementation of Technologies in Teaching*. Raanana, Israel: Raanana-Open University.
- Kvale, S. (1995). The social construction of validity. *Qualitative inquiry*, 1(1), 19-40.
- Kvale, S. (2007). *Doing Interviews*. London: SAGE.
- Lai, K. W. (2011). Digital technology and the culture of teaching and learning in higher education. *Australasian Journal of Educational Technology*, 27(8), 1263-1275.
- Laurillard, D. (2008). *Digital technologies and their role in achieving our ambitions for education*. London: University of London, Institute of Education.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Law, N., Pelgrum, W. J., & Plomp, T. (2006). *PEDAGOGY AND ICT USE IN SCHOOLS AROUND THE WORLD: FINDINGS FROM THE IEA SITES 2006 STUDY*. Hong Kong: Comparative Education Research Center.
- Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research*, 77(4), 575-614.

- Leach, J., & Moon, B. (2000). Pedagogy, information and communications technology and teacher's professional knowledge. *The Curriculum Journal*, 11(3), 385-403.
- Lee, C., Pillutla, M., & Law, K. S. (2000). Power-distance, gender and organizational justice. *Journal of Management*, 26(4), 685-704.
- Leont'ev, A. N. (1978). *Activity, consciousness, and personality*. Englewood Cliffs: Prentice-Hall.
- Leontyev, A. N. (1981). *Problems of the development of the mind*. Moscow: Progress Publishers.
- Leung, K. P. (2004). *Effects of professional Development on Teachers' Integration of ICT in Teaching in Hongkong (PhD Thesis)*. Queensland: Queensland University of Technology.
- Lincoln, Y. S., & Guba, E. G. (2000). Paradigmatic controversies, contradictions, and emerging confluences. I N. K. Denzin, & Y. S. Lincoln, *Handbook of qualitative research* (s. 163-188). California: SAGE.
- Little, J. W. (1993). Teachers' professional development in a climate of educational reform. *Educational evaluation and policy analysis*, 15(2), 129-151.
- Lloyd, M. (2005). Towards a definition of the integration of ICT in the classroom. *Proceedings AARE '05 Education Research- Creative Dissent: Constructive Solutions*. Parramatta, New South Wales: AARE.
- Luckin, R., Bligh, B., Manches, A., Ainsworth, S., Crook, C., & Noss, R. (2012). *Decoding learning: The proof, promise and potential of digital education*. London: NESTA.
- Mackenzie, N., & Knipe, S. (2006). Research dilemmas: Paradigms, methods, and methodology. *Issues in Educational Research*, 16(2), 193-205.
- MacKinnon, A., & Scarff-Seatter, C. (1997). Constructivism: Contradictions and confusions in teacher education. I V. Richardson, *Constructivist teacher education: Building new understandings* (s. 38-55). London: Routledge Falmer: Taylor & Francis Group.
- Mathison, S. (1988). Why triangulate? *Educational Researcher*, 17(2), 13-17.
- Maxcy, S. J. (2003). Pragmatic Threads in Mixed Methods Research in the Social Sciences: The Search for multiple modes of inquiry and the end of the

- Philosophy of formalism. I A. Tashakkori, & C. Teddlie, *Handbook of Mixed Methods in Social and Behavioral Research* (s. 51-90). California: Thousand Oaks: SAGE.
- Mayer, R. E. (2010). Learning with Technology. I H. Dumont, D. Istance, & F. Benavides, *The Nature of Learning: using research to inspire practice* (s. -). Paris: OECD.
- McConnell, D. (2006). *E-learning groups and communities*. England: McGraw-Hill
- Merrill, M. D., Drake, L., Lacy, M. J., Pratt, J., & ID2 Research Group. (1996). Reclaiming instructional design. *Educational Technology*, 36(5), 5-7.
- Mertens, D. M. (2010). *Research and Evaluation in Education and Psychology: Integrating Diversity with Quantitative, Qualitative, and Mixed Methods (3 ed.)*. London: SAGE.
- Mertens, D. M., Farley, J., Madison, A., & Singleton, P. (1994). Diverse voices in evaluation practice: Feminists, minorities, and persons with disabilities. *Evaluation Practice*, 15(2), 123-129.
- Miettinen, R. (2006). Pragmatism and activity theory: Is Dewey's philosophy a philosophy of cultural retooling? Outlines. *Critical Practical Studies*, 8(2), 3-19.
- Mishra, P., & Koehler, M. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, 108(6), 1017-1054.
- MoE. (2014). *Bhutan Education Blueprint 2014-2024 - Rethinking Education*. Thimphu, Bhutan: Ministry of Education, Royal Government of Bhutan.
- MoE. (4. 9 2014). *Ministry of Education, Bhutan*. Hentede 4. 9 2014 fra Education in Bhutan: <http://www.education.gov.bt/about-us>
- MoIC. (2004). *Bhutan ICT Policy and Strategies*. Thimphu: Ministry of Information and Communication (MoIC).
- MoIC. (2013). *Bhutan e-Government Master Plan*. Thimphu, Bhutan: Ministry of Information & Communications.
- MoIC. (2014). *Bhutan e-Government Master Plan*. Thimphu, Bhutan: Ministry of Information and Communications.

- Mondal, A., & Mete, J. (2012). ICT in Higher Education: Opportunities. *Journal of Multidisciplinary Studies*.
- Muller, M. J. (1993). PICTIVE: Democratizing the dynamics of the design session. I A. Namioka, & D. Schuler, *Participatory Design: Principles and Practices* (s. 211-237). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Muller, M. J., & Druin, A. (2013). *Participatory design: the third space in HCI*. Hillsdale, NJ: Lawrence Erlbaum Associates Inc.
- Muller, M. J., & Kuhn, S. (1993). Special issue on participatory design. *Communications of ACM*, 36(6).
- Mumford, E. (1993). The Participation of Users in Systems Designs: An Account of the Origin, Evolution, and Use of the ETHICS Method. I D. Schuler, & A. Namioka, *Participatory Design Principles and Practices* (s. 257-270). Hillsdale: Lawrence Erlbaum Associates Inc.
- Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: a review of the literature. *Journal of information technology for teacher education*, 9(3), 319-342.
- MYNDIGHETEN FOR SKOLUTVECKLING. (2008). *Effective use of ICT in Schools: Analysis of international research*. Stockholm: The Swedish National Agency for School Improvement.
- Nachmias, C. F., & Nachmias, D. (2002). *Research Methods in the Social Sciences (Fifth Edition)*. London: St Martin's Press, Inc.
- NCES. (2002). *Technology in Schools: Suggestions, Tools, and Guidelines for Assessing Technology in Elementary and Secondary Education*. Washington DC: National Center for Education Statistics, US Department of Education.
- Neeru, S. (2009). ICT in Indian Universities and Colleges : Opportunities and Challenges. *Management and Change*, 13(2), 231-244.
- Nielsen, J., Dirckinck-Holmfeld, L., & Danielsen, O. (2003). Dialogue Design-with mutual learning as guiding principle. *International Journal of Human Computer Interaction*, 15(1), 21-40.
- NSB. (2013). *Statistical Yearbook of Bhutan*. Thimphu: National Statistics Bureau, Royal Government of Bhutan.

- NSW. (nd). *Evaluation of the Information and Communication Technology (ICT) Knowledge and Skill Levels of Western Australian Government School Teachers*. Hentede 20. 1 2013 fra NSW Education and Communities: <https://www.det.nsw.edu.au/proflearn/der/docs/wherenow/teachict.pdf>
- Nyvang, T., & Georgsen, M. (2007). *Collaborative e-learning design method (CoED)*. Aalborg: e-Learning Lab: Aalborg University.
- Nyvang, T., & Johnson, N. (2004). Using Activity Theory Framework (ATF) to build an analytic bridge across the Atlantic: Two cases of Information and Communication Technology (ICT) Integration. *Society for Information Technology & Teacher Education International Conference* (s. 1310-1317). Atlanta: SITE.
- Oliver, M. (1992). Changing the social relations of research production? *Disability, Handicap & Society*, 7(2), 101-114.
- Pajares, F., & Johnson, M. J. (1994). Confidence and competence in writing: The role of self-efficacy, outcome expectancy, and apprehension. *Research in the Teaching of English*, 28(3), 313-331.
- Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods* (2 ed.). Newbury, Canada: SAGE.
- Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3 ed). California: Thousand Oaks: SAGE.
- Pedler, M. (2011). *Action Learning in Practice*. Hampshire: Gower Publishing, Ltd.
- Pedro, H. K., Enrique, H. S., Ernesto, L. M., & Lucio, R. F. (2004). *Technology in Schools: Education, ICT and the Knowledge Society*. World Bank, Distance & Open Learning and ICT in Education Thematic Group, Human Development Network, Education.
- Peeraer, J., & Van Petegem, P. (2012). The limits of programmed professional development on integration of information and communication technology in education. *Australasian Journal of Educational Technology*, 28(6), 1039-1056.
- Pelgrum, W. (2008). School practices and conditions for pedagogy and ICT. I N. Law, W. J. Pelgrum, & T. Plomp, *In Pedagogy and ICT Use* (s. 67-120). Netherlands: Springer.

- Pelgrum, W., & Law, N. (2003). *ICT in education around the world: Trends, problems and prospects*. Unesco, International Institute for Educational Planning.
- Pence, H. E. (2009). Teaching in the 21st century. *Journal of Educational Technology System*, 38(2), 103-110.
- Perraton, H., Robinson, B., & Creed, C. (2001). *Teacher education through distance learning: technology, curriculum, evaluation, cost*. Paris: UNESCO.
- Pianfetti, E. S. (2001). Teachers and Technology: Digital Literacy Through Professional Development. *Language and Arts*, 78(3), 255-262.
- Powdyel, T. S. (2005). The University as an Instrument of Gross National Happiness: Some Reflections. *Proceedings of the Second International Conference on Gross National Happiness* (s. 166-182). Thimphu: Centre for Bhutan Studies.
- Prasad, A. (2002). The Contest Over Meaning: Hermeneutics as an Interpretive Methodology for Understanding Texts. *Organizational Research Methods*, 5(1), 12-33.
- Puentedura, R. (2006). *Your District Through Technology Workshops*. Hentede 30. 1 2013 fra <http://www.scoop.it/t/samr-model>
- Puentedura, R. (2010). *SAMR and TPCK: Into to advanced practice*. Hentede 20. 2 2015 fra http://hippasus.com/resources/sweden2010/SAMR_TPCK_IntroToAdvancedPractice.pdf
- Puntambekar, S., & Kolodner, J. L. (2005). Toward implementing distributed scaffolding: Helping students learn science from design. *Journal of research in Science Teaching*, 42(2), 185-217.
- Purushothaman, A. (2013). *Empowering Women Through Learning to Use the Internet: An Ethnographic Action Research Project to Address the Second Order Digital Divide (PhD Thesis)*. Aalborg: Aalborg University Press.
- Reid, A., & Cano, V. (2005). *Information and Communications Technology at the Royal University of Bhutan*. Thimphu: Royal University of Bhutan.
- Revans, R. (2011). *ABC of action learning*. London: Gower Publishing, Ltd.

- RGoB. (1999). *Bhutan 2020: A Vision for Peace, Prosperity and Happiness Part II*. Thimphu, Bhutan: Planning Commission, Royal Government of Bhutan.
- RGoB. (2004). *Bhutan Information and Communications Technology Policy and Strategies (BIPS)*. Thimphu: Royal Government of Bhutan (RGoB).
- Richardson, V. (1997). Constructivist Teaching and Teacher Education: Theory and Practice. I V. Richardson, *Constructivist teacher education: Building new understandings* (s. 3-14). London: Routledge Falmer: Taylor & Francis Group.
- Ritchie, J., & Lewis, J. (2003). *Qualitative research practice: a guide for social science students and researchers*. London: SAGE.
- Robin, B. R. (2008). Digital Story Telling: A powerful Technology Tool for the 21st Century Classroom. *Theory in to Practice*(47), 220-228.
- RUB. (2011). *Prospectus 2010-2011*. Thimphu: Royal University of Bhutan.
- RUB. (2013). *Staff and Student Statistics 2012*. Thimphu: Royal University of Bhutan.
- Sannino, A., Daniels, H., & Gutierrez, K. D. (2009). Activity Theory Between Historical Engagement and Future Making Practice. I H. Sannino, H. Daniels, & K. D. Gutierrez, *Learning and Expanding with Activity Theory* (s. 1-15). Cambridge: Cambridge University Press.
- Saunders, M., Lewis, P., & Thornhill, A. (2000). *Research Methods for Business Students*. London: Pearson.
- Sawyer, R. K. (2005). *The Cambridge handbook of the learning sciences*. . Cambridge: Cambridge University Press.
- SCE. (2014). *About SCE*. Hentede 2. 3 2015 fra Samtse College of Education: <http://www.sce.edu.bt/>
- SCE. (2015). *The College Strategic Plan*. Samtse: Samtse College of Education.
- Schibeci, R., MacCallum, J., Cumming-Potvin, W., Durrant, C., Kissane, B., & Miller, E. (2008). Teachers' journey towards critical use of ICT. *Learning Media and Technology*, 33(4), 313-327.

- Schuelka, M. J. (2012). Inclusive education in Bhutan: A Small State with Alternative Priorities. *Current Issues in Comparative Education*, 15(1), 145-156.
- Schuler, D., & Namioka, A. (1993). Preface. I D. Schuler, & A. Namioka, *Participatory design: Principles and practices* (s. XI-XII). Hillsdale: Lawrence Erlbaum Associates Inc.
- Schwandt, T. A. (2000). Three epistemological stances for qualitative inquiry: Interpretivism, hermeneutics, and social constructionism. I N. K. Denzin, & Y. S. Lincoln, *Handbook of Qualitative research (2 ed)* (s. 189-214). California: Thousand Oaks: SAGE Publications.
- Servaes, J. (2002). By Way of Introduction. I J. Servaes, *Approaches to Development Communication Part I* (s. 3-24). Paris: UNESCO.
- Shannon, S., & Doube, L. (2004). Valuing and using web supported teaching: A staff development role in closing the gaps. *Australasian Journal of Educational Technology*, 20(1), 114-136.
- Shear, L., Gallagher, L., & Pattel, D. (2011a). *ITL research 2011 findings: Evolving educational ecosystems*. Menlo Park CA: SRI International.
- Shear, L., Hafter, A., Gloria, M., & Trinidad, G. (2011b). *ITL Research Phase II Design: Introducing ITL Professional Learning*. Hentede 5. 5 2013 fra ITL research:
<http://www.itlresearch.com/images/stories/reports/ITL%20Research%20Phase%20II%20Design%20Document-Final%20November%202011.pdf>
- SIF. (27. 9 2009). *BHUTANESE LECTURERS IN SINGAPORE TO STUDY IT-IN-LEARNING*. Hentede 12. 9 2014 fra Singapore International Foundation (SIF) for a Better World: http://www.sif.org.sg/story_details.php?id=195
- Silverman, D. (2000). *Doing Qualitative Research: a practical handbook (2 ed.)*. London: SAGE.
- Silverman, D. (2011). *Interpreting qualitative data: Methods for analyzing talk, text and interaction*. London: SAGE Publication Ltd.
- Smith, D., & Hatton, N. (1993). Reflection in teacher education: A study in progress. *Education Research and Perspectives*, 20(1), 13 - 23.
- Sparks, D., & Loucks-Horsley, S. (1989). Five models of staff development. *Journal of staff development*, 10(4), 40-57.

- Spinuzzi, C. (2005). The methodology of participatory design. *Technical Communication*, 52(2), 163-174.
- Steinert, Y., Mann, K., Centeno, A., Dolmans, D., Spencer, J., Gelula, M., et al. (2006). A systematic review of faculty development initiatives designed to improve teaching effectiveness in medical education. *medical teacher*, 28(6), 497-526.
- Stigler, J. W., & Hiebert, J. (1999). *The Teaching Gap*. New York: Free Press.
- Suchman, L. (1993). Forward. I D. Schuler, & A. Namioka, *Participatory Design Principles and Practices* (s. vii). Hillsdale: Lawrence Erlbaum Associates Inc.
- Tashakkori, A., & Teddlie, C. (1998). *Mixed Methodology: combining qualitative and quantitative approaches*. London: SAGE.
- Tashakkori, A., & Teddlie, C. (2003). *Handbook of Mixed Methods in Social & Behavioral Research*. California: Thousand Oaks: SAGE.
- The Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32(1), 5-6.
- Thimphu TechPark. (2010). *First IT Park (Press Release)*. Thimphu: Thimphu TechPark.
- Thimphu TechPark. (8. 9 2014). *Thimphu TechPark Bhutan's First IT Park*. Hentede 8. 9 2014 fra Bhutan Innovation & Technology Centre: <http://www.thimphutechpark.com/home-featured-category/about-thimphu-tech-park>
- Titlestad, O. H., Staring, K., & Braa, J. (2009). Distributed development to enable user participation: Multilevel design in the HISP network. *Scandinavian Journal of Information Systems*, 21(1), 3.
- Trucano, M. (2005). *Knowledge Maps: ICT in Education*. Washington, DC: infoDev/World Bank.
- Tshering, G. (2014). Indicators for Knowing the Trajectory of the Bhutanese Education System. *Bhutan Journal of Research & Development (bjrd)*, 3, 17-28.
- Tshewang, P. (1994). *History of Bhutan*. Thimphu: National Library of Bhutan.

- UNESCO. (2002). *Information and communication technologies in teacher education: A planning guide*. Paris: UNESCO.
- UNESCO. (2003). *Developing and using ICT indicators in education*. Bangkok: UNESCO Asia and Pacific Regional Bureau for Education.
- Ura, K., Alkire, S., Zangmo, T., & Wangdi, K. (2012). *A Short Guide to Gross National Happiness Index*. Thimphu, Bhutan: The Centre for bhutan Studies.
- Ura, K., Alkire, S., Zangmo, T., & Wangdi, K. (2012). *An Extensive Analysis of GNH Index*. Thimphu, Bhutan: The Centre for Bhutan Studies.
- Uslu, O., & Bumen, N. T. (2012). Effects of the Professional Development Program on Turkish Teachers: Technology Integration along with Attitude towards ICT in Education. *Turkish Online Journal of Educational Technology-TOJET*, 11(3), 115-127.
- Virkkunen, J. (2009). Two Theories of Organizational Knowledge Creation. I A. Sannino, H. Daniels, & K. D. Gutierrez, *Learning and Expanding with Activity Theory* (s. 144-159). Cambridge: Cambridge University Press.
- Vrasidas, C., & Glass, G. V. (2004). Teacher Professional Development: Issues and Trends. I C. Vrasidas, & G. V. Glass, *Online Professional Development for Teachers* (s. 1-11). USA: Information Age Publishing Inc.
- Vrasidas, C., Pattis, I., Panaou, P., Antonaki, M., Aravi, C., Avraamidou, L., et al. (2010). Teacher Use of ICT: Challenges and Opportunities. *In Proceeding of the 7th International Conference on Networked Learning* (s. 439-445). Aalborg: Aalborg University.
- Vygotsky, L. S. (1978). *Mind in Society: the development of higher mental processes*. Cambridge: Harvard University Press.
- Wagner, D., Day, R., James, T., Kozma, R., Miller, J., & Unnwin, T. (2005). *Monitoring and evaluation of ICT in education projects: A handbook for developing countries*. Washington DC: InfoDev, World Bank.
- Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational technology research and development*, 53(4), 5-23.

- Wang, Q. (2008). A generic model for guiding the integration of ICT into teaching and learning. *Innovations in Education and Teaching International*, 45(4), 411-419.
- Wangdi, T. (18. 5 2012). *ICT Lab Put to Optimal Use*. Hentede 10. 1 2013 fra Bhutan Observer: <http://www.bhutanobserver.bt/ict-lab-put-optimal/>
- Wangmo, T., & Choden, K. (2011). The Education System in Bhutan from 747 AD to the First Decade of the Twenty-First Century. I Y. Zhao, *Handbook of Asian Education: A Cultural Perspective* (s. 442-451). New York: Routledge.
- Warr, A. (2006). *Situated and Distributed Design*. Oslo: NordiCHI Workshop on Distributed Participatory Design.
- Watson, D. (2006). Understanding the relationship between ICT and education means exploring innovation and change. *Education and Information Technologies*, 11(3-4), 199-216.
- Webb, M., & Cox, M. (2004). A review of pedagogy related to information and communication technology. *Technology, pedagogy and education*, 13(3), 235-286.
- Wenger, E. (1998). *Community of practice*. Cambridge: Cambridge University Press.
- Wertsch, J. V., Rio, P. D., & Alvarez, A. (1995). *Sociocultural Studies of Mind*. Cambridge: Cambridge University Press.
- Westbury, I. (2002). " The Educational Situation as Concerns the Elementary School": Implications for Our Time. *Journal of Curriculum and Supervision*, 17(2), 120-129.
- Westerheijden, D. F., Stensaker, B., & Rosa, M. J. (2007). *Quality assurance in higher education: trends in regulation, translation and transformation* (Årg. 20). Dordrecht: Springer.
- Whitaker, P. (1993). *Managing change in schools: Developing teachers and teaching open guide to literature*. Michigan: Open University Press.
- Wilson, S. M., & Berne, J. (1999). Teacher Learning and the Acquisition of Professional Knowledge: An Examination of Research on Contemporary Professional Development. *Review of Research in Education*, 24, 173-209.

- Wims, P., & Lawler, M. (2007). Investing in ICTs in educational institutions in developing countries: An evaluation of their impact in Kenya. *International Journal of Education and Development using ICT*, 3(1).
- Wiske, S. (2001). A new culture of teaching in the 21st century. (D. T. Gordon, Red.) *The digital classroom*, s. 69-77.
- Wong, P. (2008). Bhutan "Support for Teacher Education" Project. I UNESCO, & E. Meleisea (Red.), *ICT in Teacher Education - Case Studies from the Asia Pacific Region* (s. 3-9). Bangkok, Thailand: UNESCO.
- WordPress. (2009). *His Majesty the King's Speech at the 3rd Convocation of the Royal University of Bhutan*. Hentede 20. 5 2015 fra Thus Spoke the King: <http://no.dou.bt/2009/02/17/convocation-royal-university-bhutan-2/#more-64>
- Yamagata-Lynch, L. C. (2010). *Activity Systems Analysis Method: Understanding Complex Learning Environments*. New York: Springer.
- Zander, P.-O., & Georgsen, M. (2013). Fundamentals of Education and ICT for Development. I P.-O. Zander, & M. Georgsen, *Changing Education Through ICT in Developing Countries* (s. 13-30). Aalborg: Aalborg University Press.
- Zemsky, R., & Massy, W. F. (2004a). *Thwarted Innovation: What Happened to E-Learning and Why*. Pennsylvania: University of Pennsylvania.
- Zemsky, R., & Massy, W. F. (2004b). Why the E-learning Boom Went Bust? *The Chronicle of Higher Education*, B.6-B.8.
- Zuppo, C. M. (2011). Defining ICT in a boundaryless world: The development of a working hierarchy. *International Journal of Managing Information Technology (IJMIT)*, 4, 13-22.

APPENDICES

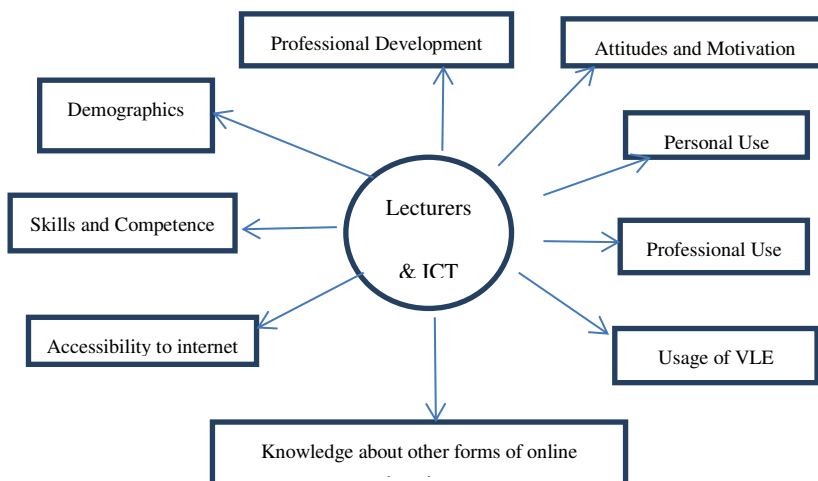
Appendix A. Survey questionnaire sample, reflection notes from pilot projects, plan for intervention workshop, and interview transcripts.....	1
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Appendix A. Survey questionnaire sample, reflection notes from pilot projects, plan for intervention workshop, and interview transcripts.

Survey Questionnaire

The aim of this survey/interview question is to find levels of ICT knowledge and skill, the ways in which ICT is used, attitude towards using ICT for teaching and factors that impact on the use of ICT for teaching at Samtse college of Education.

The following conceptual frame work is developed based on the literature reading carried out in relation to the topic of study, some general observation, reflection as a member of the same community and feedback provided by some lecturers. The themes from the conceptual framework (concept map) will be used to derive the questions. The concept of this framework is derived from the document Teacher ICT Skills (nd) <https://www.det.nsw.edu.au/proflearn/der/docs/wherenow/teachict.pdf>.



Survey Questionnaire for Integration of ICT in teaching

Dear Sir/ Madam,

I am undertaking an investigation to understand the integration of ICT for teaching at Samtse College of Education. I would appreciate if you could kindly fill out the questionnaire with integrity. Your cooperation in this matter will facilitate the researcher to better understand the status of the use of ICT in teaching. I assure that your confidentiality will be maintained.

Demography (tick any that apply):

- a. What is your gender? Male Female
- b. What age group do you belong to?
 - 25 to 29 years
 - 30 to 39 years
 - 40 to 49 years
 - 50 to 64 years
- c. How many years have you been working at SCE?
 - 0 to 1 year
 - 2 to 3 years
 - 4 to 5 years
 - 6 to 9 years
 - 10 to 19 years
 - 20 years or more
- d. Number of years in service

Skills and Competence (tick any that apply):

- a. What is your IT qualification?
 - Master Bachelor Diploma Certificate
 - Others
- b. Attended training related to ICT outside Bhutan in the last 2 years
 - Yes No
 - If Yes please specify.....
- c. Attended training related to ICT within Bhutan in the last 2 years.
 - Yes No
 - If Yes please specify.....
- d. Attended training related to ICT within college in the last 2 years
 - Yes No
 - If Yes please2specify.....

Attitude & Motivation (tick all that apply):

		SA	A	N	D	SD
a	The development in ICT must result in a change in curriculum and pedagogy					
b	Integrating ICT has enabled me to deliver my lesson more effectively					
c	Teachers of today need to be competent in ICT to cope with demands of integrating ICT with content, pedagogy and technology					
d	Student's use of ICT has the capacity to strongly support student-centered learning					
e	ICT provides valuable resources and tools to support student learning					
f	I like exploring technology and new software and its possibilities					

Key: SA-Strongly Agree, A-Agree, N-Neutral, D-Disagree, SD-Strongly Disagree

Personal Use

1. I use the following technologies for my personal purpose (tick all that apply):

- Desktop computer
- Laptop
- LCD projector
- Television
- Mobile phone
- Calculator
- Ipad
- Video camera

2. With computer file navigation (e.g. Windows Explorer) I can (tick all that apply):

- Save files in selected folder
- Create and name new folders
- Install software
- Zip and unzip files
- Copy
- Delete
- Rename files

3. With email I can (tick all that apply):

- Access emails
- Create and send emails
- Add attachments to emails
- Add signature to emails
- Create a mailing list

4. With world wide web/internet I can (tick all that apply):

- Navigate to known websites, create favorites or bookmarks
- Do basic search, read news, watch movies
- Games,
- Download and install software

5. For my personal purpose I often use the following (tick all that apply):

- Face book
- Google
- YouTube
- Twitter
- Tagged
- hi5
- Skype
- Video Conference
- Google hangout
- Others.....

Professional

1. I regularly use the following technologies for my teaching (tick all that apply):

- Desktop computer,
- Laptop,
- LCD projector,
- Television,
- Mobile phone,
- Calculator,
- Ipad
- Others.....

2. I am motivated to use technology for teaching because (tick all that apply):

- It motivates student learning,
- Is easier and comfortable,
- Materials are readily available.

3. I usually do all ICT related work only when I am in the college (tick all that apply):

- I have no internet at home:
- Connectivity is very slow at home

- Internet is fast and free at the college
- Expensive to connect to at home
- Service is not available

4. I use the following micro soft office for my teaching (tick all that apply):

- Microsoft word
- Microsoft PowerPoint
- Microsoft Excel
- Others.....

5. I use ICT for the following purposes:

Sl #	Purposes	Yes	No	If Yes please indicate the frequency
a	create materials for students use (e.g. handouts, test),			<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly
b	access research and best practices for teaching, curriculum administration (e.g. Planning, monitoring, evaluating and reporting),			<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly
c	communicate with colleagues/other professionals,			<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly
d	communicate with student(s),			<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly
e	communicate with friends and family,			<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly
f	post information to a website to assist your students in their work,			<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly
g	online professional learning,			<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly
h	online search for resources (e.g. journals, conference papers, books etc)			<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly

On-line teaching-learning (tick all that apply):

1. I use the following mode of teaching:

- Face to face
- On-line
- Both

2. If you select online what percent of your teaching is done through on-line?

- 20%
- 20-40
- 40-60
- 60-80
- 80-100

3. What on-line features do you use while delivering lesson on-line?

- Group discussion forum
- Chat
- Quiz
- Others.....

4. I use on-line teaching for the following purpose:

- Provide module outline and work plan for the students,
- Upload reading materials for students, share lecture notes,
- Create discussion,
- Chat with students,
- Chat with other tutors,
- Quiz for learning assessment,
- Post messages,
- Others.....

5. Please describe/state any factors that would increase your use of ICT in the classroom?

Reflection log from pilot study participant

Topic of the lesson: The rate of reaction

Date:

Technology/ICT used: PowerPoint presentation with some animation slides. Some video down loads from you tube

Purpose of the ICT use: to show the simulation of how rates of reaction can be monitored.

What went well?

The concepts that reactions occur at different rates was well received by the learners. The power point presentation was clear and added variety to the lesson besides the usual chalk and talk.

One Animation of how rates are monitored using spectrophotometer was shown to the students which were received well.

What went wrong?

The other ways of monitoring reaction rates when there is gas involved was explained verbally and with diagram drawn on chart paper. This concept was not very clear. If I had animation of such method the lesson would have been more interesting and clear to students.

Support that you would require (resources) that would enhance your future lessons:

If I can download available resources from youtube but due to slow connectivity it cannot be done. If I can be trained in the use software to make such animation, a virtual Lab can be designed for my students. Many students should be able to design animations for their lessons in schools.

Reflection log

Topic of the lesson: Free energy and Chemical equilibrium

Technology/ICT used: PowerPoint presentation for information input.

Purpose of the ICT use: For information input and to show static graphs of spontaneous and non spontaneous reaction

What went well?

The explanation of how the graphs would change as the reaction progresses went well. The power point presentation was good as students were able to answer when questioned.

What went wrong?

As such this concept is complex, I wished if I had an animation of how the graph changes over time as the reaction progresses. I couldn't get one from net also. The success of my lesson will depend on how students imagine at the molecular level.

Support that you would require (resources) that would enhance your future lessons:

If I had access to such resources like creating virtual lab, the lesson will go very well.

DANISH-RUB RESEARCHER ACTIVITIES AT SCE, SAMTSE
9th – 12th October 2013

Name	Date/Time	Activity
Par-Ola Mikael Zander	9th October 1.30 pm	<ul style="list-style-type: none"> - Meeting with Director General (9 am) - Meeting with College Management (DG/ Deans / PLs/HoDs) - Presentation on ‘<i>University Research Capacity Development</i>’ by Par-Ola Mikael Zander
	10th October 9.30 am	Meeting with SCE Research Group & Preparation for Workshop
Par-Ola Mikael Zander Marianne Georgsen	11th October 9 am - 4.30 pm	Intervention Workshop for 23 voluntary participants of SCE (<i>list attached</i>) on ‘ <i>Educational Technology for the 21st century education, a move from “technological enhancement – transformation” on ICT integration in teaching (Details attached)</i>
	12th October 9 – 10 am 10 – 12 pm 1 – 4 pm	<ul style="list-style-type: none"> - Presentation to faculty on ‘<i>Evolving trends in educational research methodology</i>’ - Post discussion with selected participants from the previous day workshop - Reflection and discussion with SCE research group



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བསམ་ཚུལ་ཤེས་རིག་མཁོ་རིམ་སློབ་གྲྭ།

Royal University of Bhutan
Samtse College of Education



Ref. 57/SCE-RES/2013/

Date: 03.10.2013

NOTICE

The following faculty members of the college shall attend the Intervention Workshop on 'Educational Technology for the 21st century education, a move from "technological enhancement – transformation" on ICT integration in teaching' organize by the Danish-RUB Research Group on 11th October 2013 starting from 9 am – 4.30 pm in the IT Laboratory. They should arrange their classes with their own students on the day of the workshop:

- | | |
|----------------------------|----------------------------|
| 1. Ms Ugyen Pem | 14. Ms Kezang Choden |
| 2. Ms Wangmo | 15. Ms Kinley Sedey |
| 3. Mr. Ugyen Dorji | 16. Mr. Kishore Mongar |
| 4. Ms Yangdon | 17. Mr. Chenga Dorji |
| 5. Ms Bijoy Hangmo Subba | 18. Mr. Pema Drukpa |
| 6. Mr. Purna Bahadur Subba | 19. Mr. Bal Bahadur Mongar |
| 7. Ms Sonam Wangmo | 20. Mr. R. S. Tamang |
| 8. Mr. Tandin Penjor | 21. Mr. Yeshey Dorji |
| 9. Mr. Sangay Wangchuk | 22. Mr. Sangay Tshering |
| 10. Mr. Bhim Prasad Raika | 23. Mr. Choeda |
| 11. Mr. Lhapchu | 24. Mr. Kinley |
| 12. Ms Dechen Doma | 25. Mr. Dorji Dukpa |
| 13. Mr. K. C. Jose | 26. Ms Reeta Rai |

INTERVENTION WORKSHOP

Date: Friday, 11th -12th October, 2013
Time: 9 am
Venue: College ICT Lab
Theme: Educational Technology for the 21st century education, a move from “technological enhancement – transformation” on ICT integration in teaching (SAMR Model)

Resourced by: Par-Ola Mikael Zander & Marianne Georgsen, Aalborg University, Denmark
Participants: 23 registered voluntary participants of SCE

Aims of the workshop (Day one)

- Recap on the concept of 21st century teaching,
- develop and present new learning designs in their respective module,
- initiate a move from the technological enhancement-----transformation level (SAMR – Model),

Additional inputs on the following areas could be made possible in a different time slot, and also depending on the aspiration from the management and the participants (Day two):

- Introduce online collaborative writing,
- introduce to teaching & learning tools,
- Present to the faculty on evolving trends in educational research methodology.

I - Pre- workshop activity (Tentative)

Lesson observation on each department representative (possible methods of data collection – snapshots of lesson presentation, a copy of lesson plan, video record, and a short interview)

II – Day One 11th October 2013 - Workshop activity (starting at 9.00 a.m.)

1. 21st century education and teaching
 - a. Welcome Address (DD) 9 – 9.05 a.m. (5 min)
 - b. Workshop Opening (DG/Dean AA) 9.05 – 9.15 a.m. (10 min)
 - c. Activation (present few slides on the concept of 21st century education and rethinking) by Kinley 9.15 – 9.35 a.m. (20 min)
 - d. Contextual presentation with examples on few good practices in ICT integration for teaching and learning (focus on transformative level) and discussion by PO 9.35 – 10.45 a.m. (70 min)

Tea Break 10.45 - 11 a.m. (15 min)

2. Learning Design (strategic move from enhancement to transformation of technology integration in teaching and learning) PO/MG
 - a. Overview (introduction to SAMR Model), findings from the workshop and pilot study data, examples (topics from professional/pedagogical modules like inquiry based learning, collaborative learning; English) and use these as examples in the presentation to illustrate the move from enhancement to transformation level of ICT usage in teaching. 11 - 11.45 a.m. (45 min)

- b. Independent work - reflection (pick a module they have taught and correspond with different levels of SAMR model). This provides opportunity for the participants to rethink their lesson, learn the state of their ICT use and eventually develop a lesson to move from the existing state. 11.45 - 12.15 p.m. (30 min)
- c. Instruction for Group work 12.15 - 12.30 p.m. (15 min)

Lunch Break 12.30 – 1.15 p.m. (45 min)

- 3. Preparing Learning Design (one lesson/department)
 - a. Group work 1.15 - 2.p.m. (45 min)
 - b. Group Presentation/comments/feedback and discussion 2 – 4 p.m. (120 min)
 - i. Each Presentation (10 min)
 - ii. Comments/feedback and discussion (5 min)
- 4. Workshop Summary - PO/MG 4 – 4.20 p.m. (20 min)
 - a. Introduce to teaching and learning tools
 - b. Commitment from participants
 - c. Future plans
- 5. Closing Remarks DD/DIR/Dean AA 4.20 – 4.30 p.m. (5 min + 5 min)

4.30 – 5.30 pm Reflection and discussion amongst the IIC-RUB research group.

Note: Some reading materials on educational technology, 21st century teaching and SMAR model will be provided to the participants earlier to the workshop date via email.

III - Day two 12th October 2013 - Post Workshop Activity

- A. Post discussion with interested individuals and selected presentations (coaching session to support participants further).
- B. One hour presentation and discussion with the faculty on the general research topic if they propose on the first day.
 - a. Present to the faculty on evolving trends in educational research methodology.
 - b. Take some examples from collaborative writing (dropbox, Zotero, Digital humanities)
- C. Meeting and Discussion with the IIC-RUB researchers

Interview transcript

Interview with Pilot 1 on 11/12/2012 (14 mins)

After the workshop what has been lying in the mind about using ICT facilities in the classroom got awakened. In the sense I have been thinking about these possibilities, but then I never used it in a sense I was complacent thinking that even without using ICT normal classes are going on and syllabus get covered. But once somebody from outside or some

external stimulus comes explaining these are the possibilities and then you rethink, ok why not let me try, that complacency is gone, and those hidden or sleeping thoughts were awakened and we were made to give a try and it worked, that is the first thing complacency removed . Once you make a plunge then you have to swim, and once you swim you know the joys and sorrows of swimming, you know the dos and don'ts of swimming otherwise the swimming has been only in the thinking level only not in the implementation level. When I use ICT for example when I use the mobile phone to discuss important themes in the essay for example the beauty industry the themes which the senior groups already covered and they did in their lesson in the previous year and so they are already aware of it. For the benefit of the juniors I thought why not let them talk about it comment on it so that the juniors can listen to it. So juniors were in the class because the syllabus is theirs. Seniors were somewhere else may be relaxing in the hostel we made an appointment with them and they agreed to talk to the class regarding those themes. And they talked over the phone without them having to come to the class. So that was one good advantage of using the facility and it created a novelty in the classroom unlike the simple chalk and talk. The advantage was students were able to listen to things which are new and so their interest was aroused and they were eager to listen to some of their seniors. They knew that these people studied it and what they understood about it they were eager to know. Not the meaning of the essay but how they understood it was important for them, so that made the learning easier and simpler. Now as a teacher I know what went wrong and what went well then so that I can rectify in my next lesson when I use the same facility in the next lesson. If I had not done that in my class I would not have known the plus and minus of it. So that is what I said make a plunge then only you can learn to swim.

Perhaps another possibility as a derivative of this activity, will be asking the students to have an academic pen friendship with the sister college, i.e. PCE, as they also do the same module and same content and so what happens of what we understand and they understand may be similar may be different. Their interpretation of certain ideas may be different the way we look at and they look at so there is a good cross fertilization of ideas on the same content. My next plan of activity for the students perhaps in the next semester is to make them establish a pen friendship through email and they should submit a text of their emailing for example it could be an essay or poem, or a same text of the content that is studied in both the college. They can either use this discussion on the chat forum. Which could be a new practice in the RUB College?

Future plans:

Poetry from net getting from real authors reciting their own poems.

Language improvement: could be starting broadcasting in the college.

Interview with Pilot 2 on 4/2/2013 (9 mins)

My thinking of pedagogy before the workshop was how to deliver my content to the students and of course keeping in mind the student's ability and my convenience. I have been using power point presentation as it was convenient and faster. After the workshop I started to think technology in a better ways, instead of considering only my convenience I could redesign my lesson using technology how students could get better from it. I could collaborate with students come up with different kinds of animations, and develop some concepts in chemistry with animation.

I consider use of technology as very important aspect of my lesson, always tried to use it in my teaching, and have been also telling students to collect relevant resources and share with the class.

Drawbacks: resources had been a constraint with regards to internet, comp and LCD. Sometimes even when I have the resources like CDs I am not able to use because as am not familiar with the tools.

I would like to definitely like to redesign my lesson incorporating technology. There is lot of advantage of using that, besides delivering only the content it is also important how you interact with your students. I have been talking with students and they have expressed being motivated when technology is being used in the classroom teaching and learning.

Basic requirement:

Laptop, CDs with software tools and skills training.

Interview Transcript (Phase II Pilot 1)

Date 10/11/2013

Question 1: What motivated you to use technology in your lesson?

I found that the technology being used in my lesson for example the Email partnership for academic discussion the other one talk to the author, this I found very interactive rather than the chalk and talk lesson without using technology. Because in the lesson as you may have observed especially that email exchange of opinions and content discussion students were all taking part in that discussion. Why is this essay an expository or argumentative essay there were about three groups of students in the class who had different opinions that itself generated active interaction and discussion because group defended their stand and they found that students from Paro College they supported or opposed so there was a very interesting cross fertilization of ideas between the students who deal with the same module. So I thought that it's a kind of peer discussion and peer sharing of ideas rather than the tutor telling them what to do.

And the other one where the two girls talked to the author of the Essay, rather than the girls talking to the author I found that the author's response very interesting a kind of direct link between the students and the author of the Essay. The girls who asked the question were found to be a bit artificial they wrote down their question or points which I forgot to tell them not to do that I should have told them that it should be natural. Then maybe they thought this are famous author they should not make mistake so they prepared a kind of speech and they were reading out that made it a bit artificial, but otherwise they were expressing what they felt about being glamorous or not being glamorous on the other side I found that the author was talking at quite a length means she was interested in this kind of activity. First of all she was congratulating me for taking up this IT pedagogy because maybe she has not seen it happening elsewhere in Bhutan. She has been in Bhutan for quite some time now.

Question 2: Who/what inspired you to make your lesson plan using ICT?

This actually has been in my mind before hand, and using the mobile phone to talk to others we did in our earlier lesson, and the email exchange of academic matters wasn't there before but then I had the pen friendship which I did in the school days between students of Bhutan and students of England with has aVSO working in the school, and with the help of VSO we collected the postal address of students in England. And I made my students in Paro Shaba send letters to students in England and students in England responded to our students and I found that there was a visible, clear change in the interest of the students so there was an exchange of letters. Now it is 15 years passed by since that took place, now it's time to do a similar kind exchange of letter through email now it is electronic letter writing. So then I thought Paro and Samtse since they are sister colleges why not pair the students up and then try, they will be interested in exchanging ideas. This is the first time I experimented with it, though the response was not so strong from Paro at least we got little response from Paro that helped in an understanding of the content. And I found that when there is a response from their friends in Paro from here when they want to reply to the mail they should know what they are writing they cannot simply bluff or they cannot simply imagine and say something. They should take ownership of the learning that actually happens. Because when I write a letter or a email to my friend I should know what exactly what really I am talking about. So that is the advantage of having a mail exchange so that I found is very useful very effective.

Question 3: Limitation on Time, resources and skill?

Time I don't think it is a big deal, of course you need to have a little extra time and effort that is there I agree. But then the outcome, the result that you get is more rewarding, the time and effort you spend with IT pedagogy maybe a little more than the usual pedagogy but the time is worth spending. And of course I took some time to arrange the email ID of students from PCE, that took some time maybe about 2-3 days, but if you have very strong link with some of the colleagues from the other college it is possible I don't say that it is not impossible. Because it is just an email exchange only that is not a big deal, so long as you have the id and then you request the tutor there to encourage those students to respond. And as you noticed in the beginning of our lesson that the loud speaker was not working, some sort of technological

problem may crop up in between, but my students were so smart that they sorted out within 2-3 minutes, so I was not taking any extra effort there the students themselves came up they were interested in that, when one loud speaker did not work they immediately went to hostel and brought another one and they made it possible. So I don't think that it is a big problem, it is possible.

Question 4: Any comments or feedback you received from your students on your IT pedagogy lesson?

Yes two three students like Deki, Deki Yangzom, and the class captain Sonam Wangdi they were telling me that this is a new experience to them, they haven't found this during their entire education, they found a freshness in a freshness of approach, and they also found out that when such activities were going on nobody felt sleepy or and there is no question of drowsiness and all were involved especially when the author was talking to from Thimphu that situation itself arouses interest, and many of them may not have seen the author and they have heard of the author. And maybe they are for the first time listening to the real author we often assume an author to be an author that's all, here there though don't see the author they listen to the author as we say that listening to the mouth of the host. When the author speaks about the content of the essay they said that they understood the essay better than when they read it themselves. So there was a feedback from one or two students that this is a very good experience and I thought I should continue not necessary in all lessons but wherever it is possible and wherever I can establish such links with the author why not that saves lot of my explanation also.

Question 5: As teacher educators is it important to consider using technology in teaching? "Teachers teach the way they were taught".

I would say that is going to be the method of teaching. Because now a days whenever we look for jobs elsewhere, a very important aspect they demand in the advertisement is are you able to teach the lessons using IT. Your IT ability or IT skills in conducting a class is always demanded in almost all advertisement. That means IT pedagogy is catching up even if you don't like it or don't want it you cannot live without it. So I am sure that this is going to be the method, even in the school I am sure they are insisting on using a laptop or computer and I don't think it is a problem because at least mobile phones are used very wide spread and laptops are also very common so this can be made use of in future. I don't think that we should give up the chalk board work, it can also be a part of the lesson, all this can be put components put in a 40 or 50 minutes lesson.

Question 6: What are your future plans?

I am sure that this email exchange I should continue at least with one or two modules, because that helps me to keep track of their real discussion and interaction with the students of the other college. It's a kind of an assignment to them. Through this if friendship grows, not a romantic friendship but an academic friendship grows that will be a great achievement

because I am sure that this two people will continue to discuss academic matters even after they become teachers because they have already developed the friendship when they were in the college. So they have found a kind of kindred spirit a similar people of similar interest and so their academic friendship will continue and in future I will use this email. Then maybe as you said that Wiki forum, discussion forum I think that is also a very good place where we get students to like. I know that students do because they are interested in email related things and internet related things. And so we should exploit their interest now people are no more interested in paper and writing so it is internet why not.

Question 7: Do you intend to develop your blog?

Yes, I think I should use it because I feel that I am lagging behind because some of my Indian friends working in colleges and schools they have their own blogs already and they had been asking me sir, we would like to see your blog and we would like to get into your blog and respond. Then I said I don't have a blog, I feel that I am not up to date many of them are ahead of me so, I should start immediately otherwise I am lagging behind.

Interview Transcript (Phase II Pilot Project 2) Date: 12/11/2013

Key R= Researcher; P= Pilot

R- Ok we will start now. First question I would like to ask you is your motivation what has actually motivated to use technology in your teaching?

P- I am motivated to use technology because it really facilitates it makes things faster and easier to communicated with my students

R- Who is the main inspiration for you to make your lesson plan using ICT

P -It all happened when I was studying in Technology University. In that university I saw many teachers using technology and it really motivated to use some here

R- You say you are motivated but i would like to ask question do you face difficulty with time, resources, and skill

P – Yes one is time. Since I have many modules to teach i face problem. In terms of resources also we do not have not many people who are trained in technology related skills particularly used in teaching and other limitation is my family

R - Do you also feel limited by skill?

P- Yes since I am not well versed in computer. Yes I find difficulty, especially to install If I can software i have difficulty in installing it and using it, .it takes a lot of time

R- How do you improve your knowledge and skills on technology?

P – Yes I do whenever I get software from other friends or internet. I use most of the time YouTube, how to use YouTube how things have to be done. For instance how to use Skype I watch YouTube.

R - Can you briefly talk about the new redefined lesson after our intervention workshop we had that revisiting workshop.

P- After I have few ... I have started using wiki in my class specially to write essays it is in the process.

R- Apart from wiki what are the regular tools you use?

P - I use VLE, I use mobile phone, I use power point presentation. In the process of campatasia that records our teaching.

R - Can you be specific like in VLE what you use maximum?

P - I use maximum discussion forum. We discussion a lot

R - By the way did you receive comments from your students on the change of technology or pedagogy, like forum discussion you started wiki

P - My students are also saying they are exploring. They say it is convenient to write and upload

R - There a famous actually from an article, teachers teach the way they were taught. Since you are also one of the faculty member teacher educator's college, and as a teacher educator it is important to consider using technology in your teaching?

P - I think the teaching is mostly driven by technology. It is very important to use technology. It really makes things faster and very convenient it is necessary to use technology

R- at the back of your mind making = besides making things faster and easier for you to teach do you also think that when you use technology your students also get inspired and they will also use the same methods when they go to school and teach

P - I am sure some of students are better than me using dome technology. Given the resource and time and within the education policy i think they will use it.

R - What are your future plans? Do you intend to enhance using more and ICT in your teaching?

P- Yes I want to explore more software and a lot of plans

R - Thank you. You have already mentioned that you have started wiki you also actively use forum may be i will take few photographs.

P - One drawback here something related is teaching policy of university. For instance the policy says that we will have to certain specific face to face contact with students meaning that I have stand in front of them lecture them. And it sometimes hinders the use of technology in teaching.

Appendix B. Photographs from intervention workshop and pilot project and lesson design posters from intervention workshops.

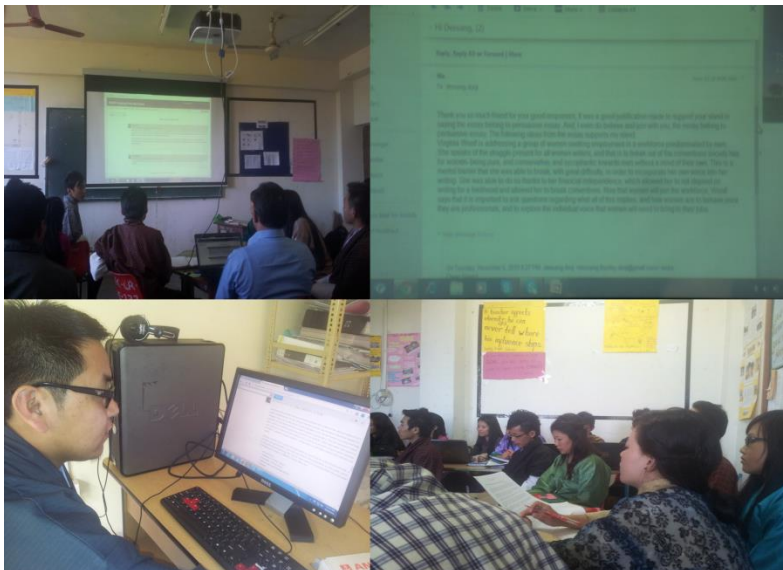
Photographs from Intervention Workshop II



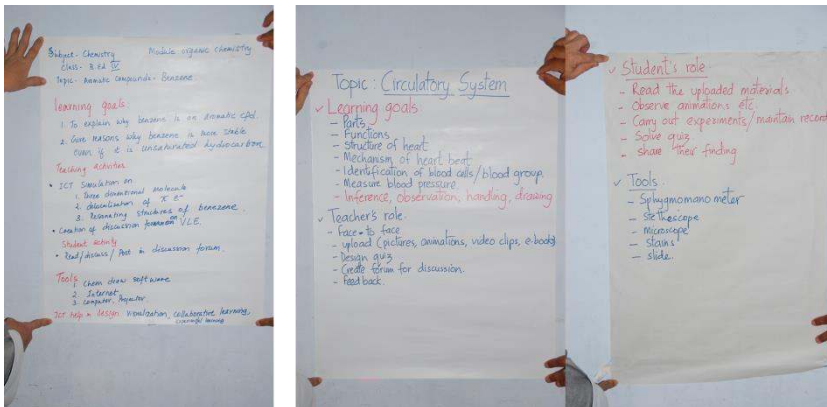
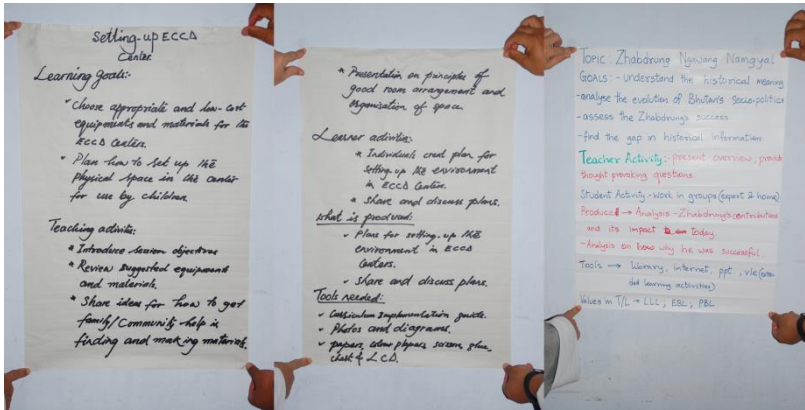
Photographs from Plot Study Phase I



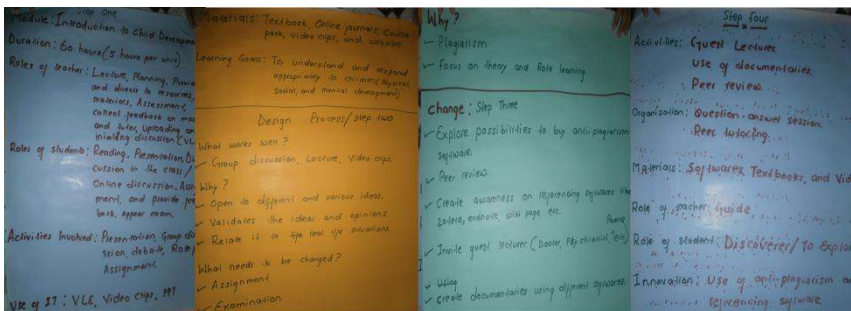
Photographs from Plot Study Phase II



Posters from Intervention Workshop I



Posters from Intervention Workshop II



APPENDIX B. PHOTOGRAPHS FROM INTERVENTION WORKSHOP AND PILOT PROJECT AND LESSON DESIGN POSTERS FROM INTERVENTION WORKSHOPS.

Thermodynamics
 → 15 weeks x 4 periods
 Theory - 30 parts
 Practical - 30 parts

Roles
 Teacher: Planning, assessment, Facilitating, Information input
 Student: discussion/presentation, writing assignments/practical

Use of IT
 - VLE/PPT/google/wiki/simulations/ youtube sms.

Learning goals: Predicting spontaneity of reactions

What works well?
 - Group project work
 - Most Practical
 - PPT with proper animation
 - simulation features
 - What needs to be changed?
 - Encourage home tasks
 - Handling lab equipments
 - Personal copies
 - Other features of VLE
 - Modify T/L materials on VLE

3- Use more frequently - for assessment
 - Look for relevant software to create simulation/animation
 - make 50% of T/L online through VLE.
 - Virtual labs for experiments that cannot be done under Normal conditions.

④
 - activities- Timed activities on VLE with grading.
 - Tr. uploads assignments Topics with rubrics
 - Introduce peer assessment Online
 - Train both T-P how to use VLE
 - maintain e-learning log

Step 1
 1. ACS-EDN IOT 2. 15 weeks
 3. Tr. Facilitator 4. Writing and presenting
 Std. Active learners
 5. ACS Manual • PPT (use of IT)
 Students write-ups • Video clips
 6. Academic integrity, good academic writing

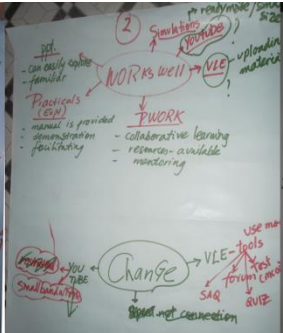
Step 2
 What works well? Why?
 → Oral presentations
 → Student exercises
 What needs to be changed? Why?
 → More exercises-despite enough exercises, no mastery.
 → Inadequate time, feedback, follow-up

Step 3
 • Spread the module into 2 sems.
 • Stds with laptops and mobiles do the exercises.
 • Academic pal. b/w the RUB colleges.

Step 4
 1. Activities- Stds along with the tutor carry out activities pre-identified (net) by the tutor.
 2. Organisation- T+S, S+T, S+WC
 3. Materials- laptops, mobiles, LCD
 4. Role of teacher: facilitator
 • student active learners
 5. Innovation: Use of laptops in the class

Module: Electricity
Roles
 1. Teacher: plan, develop, secure, analyse, evaluate
 2. Student: Project work, softs, assignments, project presentation, module feedback.

ACTIVITY: Lecturing, content, oral, video
 - demo, facilitate, exp. Simulations, monitoring, PPT, feedback on VLE, discussion
Planning: lab equipment, projects, internet, books
 - project set-up, project model, Practical skills
Learning goals: content familiarization, practical skills, ICT skills, program solving skills, implementation of T/L materials



Incorporating VLE tools
 1. Teacher - learn how to set
 (i) mcqs
 (ii) quiz
 (iii) SAQ & their evaluation.

2. Std activity:
 - participate
 - innovation - computer based tests.



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