USE OF ICT IN SCHOOLS: EXPLORING OPPURTUNITIES AND CHALLENGES

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ABSTRACT

This dissertation is submitted in partial fulfillment of the requirements for the degree of Master of Philosophy in Education (Educational Leadership) of Kathmandu University.

Title: *Use of ICT in Schools: Exploring Opportunities and Challenges*

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In the context of technology evolution, practices of teaching learning have changed around the world. Use of Information Communication Technology (ICT) in schools has been supportive for enhancing the quality of education providing efficient educational management and effective classroom instructions. In Nepal, some private schools have started using ICT for the facilitation of classroom instruction, school management and administration. Some public schools are supported by NGOs for the same.

In this scenario, my journey of research began with a broad objective of exploring the use of ICT in schools; perception of administrators, students, and teachers on use of ICT; and finding opportunities and challenges of the use.

I formulated three research questions: How has ICT been in use in schools? How do administrators, teachers and students perceive the use of ICT? In addition, what are the challenges and opportunities of using ICT in schools? To set the fitting methodological premise to my study, I adopted interpretive paradigm of qualitative method which helped me to explore the contextual world of reality about ICT use in

schools. For this, I designed semi-structured interview schedule with open ended questions, observation check list/guideline and field diary as tools to generate primary qualitative data. Following general principles of qualitative data analysis (transcribing, coding and thematizing), I interpreted the meaning of 'experiences' on narratives collected from research participants (school principals, teachers, ICT coordinators and students) in connection with various literature.

Findings of this study reveal that ICT are used for three major purposes in schools. The first purpose is to facilitate administration to ensure efficiency and effectiveness in service delivery. For this, schools are using database/SIMS, computer software for administration, finance, exam/result, and record keeping. The second purpose is to enhance classroom instruction. Schools aimed at providing better quality of education by assuring improved students' motivation, personalized student learning, enhanced student learning, feedback and reinforcement, enhanced quality of teaching and improved teacher education. For this, schools have been using productivity software tools, audio/video teaching aids, animated and simulated teaching materials, and ther online resources. In addition, a school has placed all possible sets of ICT hardware in eah classroom for ICT friendly environment to facilitate teaching and learning. The third purpose of using ICT in schools is to strengthen communication, networking and school exposure. For this, they have been using telephone, SMS, email and other web-based communication, web-based exposure, and professional networks.

This study has also explored how the use of ICT is perceived by end users in different schools to foster technology innovation in educational practices. In this regard, the research revealed that the use of ICT in schools, as radical change in education, ocean of resources, learning beyond the classroom, has brought about

changes in the role of both students and teachers. Likewise, the use of ICT has shown many opportunities to improve the overall teaching learning methods in various ways. One of the major opportunities is improved quality of education. However, there exist some challenges like adaption to new change in technology, information chaos, total cost, infrastructure, electricity/power backup, language and context, national policy, data security, technical support and trouble shooting.

The study has also drawn some implications on policy, practice and research. All schools can implement SIMS system as it allows entering, storing and retrieving useful data that are fed to educational planners for assessment, monitoring and evaluation of education programs as well as inputs to policymakers for a more rational decision-making. Likewise, a curriculum reform to adopt ICT as a separate compulsory subject in school level can set a new height to Nepalese school education towards minimizing digital divide.

Implications on practice are focused on what and how schools, principals, teachers and students can do/use ICTs to enhance their practices of teaching learning. The research implications indicate need of a comparative research to explore the effectiveness of ICT based pedagogical practices of teachers and learning achievement of the students.

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DEDICATION

To all the Nepalese school leaders who desire to use ICT

in schools to transform traditional ways of

teaching and learning.

DECLARATION

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

_____

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ACRONYMS

CCTV	Closed Circuit Television
CD	Compact Disc
CDMA	Code Division Multiple Access
CMS	Content Management System
CPD	Continuous Professional Development
CRT	Cathode Ray Tube
CTPD	Continuous Teacher Professional Development
DE	Distance Education
DVD	Digital Versatile Disc
e-	Electronic
E-Banking	Electronic Banking
EC	Educational Change
E-Commerce	Electronic Commerce
E-Learning	Electronic Learning
FM	Frequency Modulation
GON	Government of Nepal
GPS	Global Positioning System
HOD	Head of the Department
HR	Human Resource
ICT	Information Communication Technology
ID	Innovation diffusion
IJEDICT	International Journal of Education and Development using Information and Communication Technology

IMS	Information Management System
IT	Information Technology
KUSOED	Kathmandu University School of Education
LCD	Liquid Crystal Display
LMS	Learning Management System
MCEETYA	Ministerial Council on Education, Employment,Training and Youth Affairs
M-Learning	Mobile Learning
MMS	Mass Messaging System
MOE	Ministry of Education
NCED	National Centre for Educational Development
ODL	Open and Distance Learning
OLE	Open Learning Exchange
OLPC	One Laptop Per Child
PBL	Problem Based Learning
PC	Personal Computer
Q&A	Question and Answer
R-Learning	Robotic Learning
ROM	Read Only Memory
SIMS	School Information Management System
SIS	School Information System
SMS	Short Massaging Service
SSRP	School System Reform Plan
TL	Transformative Leadership
TOR	Term of Reference

TPD	Teachers Professional Development
TV	Television
U-learning	Ubiquitous Learning
UNESCO	United Nations Education Science and Cultural Organization

CHAPTER I

INTRODUCTION

When I started teaching in a secondary school thirteen years ago, I used the pieces of chalk to write on the blackboards. After a few years, I started using board markers to write on the whiteboards. These days, I use e-pen to control computer system pointing on the active board fitted on the wall replacing those blackboards and whiteboards. I can get access to unlimited e-resources of education in my classroom as soon as I want. I can design interactive teaching materials and make teaching learning activities more interesting as well as fun-filled. I have multiple options and methods such as the use of audio/video, graphics, animation, simulation, instructional games and internet to make my teaching live/practical, resourceful, knowledgeable and enjoyable. It has been possible because of the use of Information Communication Technology (ICT) in education. In addition, I agree that "ICT is used more and more in education, so much so, that it is becoming a ubiquitous resource for supporting students' learning" (Joiner, Littletonw, Chouz, & Martin, 2006, p. 137).

"Teaching and learning is undergoing a dramatic change due to the advancement in telecommunication and IT" (Lam, 2012, p.378). Looking at the evolution in the field of ICT, it is difficult to believe its magical innovations for education and its agencies – schools, colleges, universities and other training institutes. ICT enables us to receive information and communicate or exchange information with others via internet, emails, SMS, satellite system, mobile phone, tablet, telephone, radio, TV, video conferencing, online blogs and forums, laptop, notebook, desktop computer and all other means. Use of all or some of these means

of ICT to enhance pedagogical practices and managerial efficiency in educational institutions is considered ‘ICT in Schools’ in this research.

On the one hand, development of innovative technologies and its use in education is rapid. “Nowadays, there is a widespread use of Information and Communication Technology (ICT) in education, and a lot of schools around the world have been equipped with technological facilities” (Karami, Karami, & Attaran, 2013, p. 37). On the other hand, access and capacity of the people in the developing countries like Nepal to such innovative practices is limited. As a result, digital divide and digital illiteracy is increasing. Therefore, universities, colleges and schools have started incorporating an idea of “ICT integrated education” and many countries in South Asia have national policy for ICT in education including India.

I have seen interactive multimedia white boards (also called Active Boards) installed in the classrooms in some of the private schools. Those boards are capable of being connected to a computer/laptop and projector. Such boards allow students to see and interact with the displayed objects on a large screen of the board whatever is running on the connected computer. It is interactive since the users can control the computer with an e-pen on the surface of the board. Interactive Board is used for effective teaching learning activities in the classroom (H. L. Sharma, personal communication, 10 June, 2010) and is a 'live experience that supports to ‘bring the world in the classroom’ (Pangeni, 2010). A single lecture can be distributed to different classes if the boards are in a network. All the lessons and activities can be recorded, stored and retrieved later. It is an innovation for education as one of the best ICT tools so far for classroom activities.

ICT as the means of teaching aid can enhance learners’ motivation. Play-way method and fun learning approaches are possible using ICT in education. As in the

concept of "Edutainment" (Wagley, 2012), technically a teacher can deploy all tools of ICT such as radio/cassette player for audio, TV for video, learning games, computers and all kinds of multimedia. Pedagogically the teacher can link those Media to motivate students towards learning.

Managing financial transactions in any organization are simplified by using computer software. Many schools use software for easy processing of examination and result with the help of software and web tools. Some of the schools have started internet based learning activities i.e. E-Learning and have initiated to uplift E-Learning management. Systems of E-Banking, E-Commerce, E-Learning and Virtual management are emerging potentials of ICT innovation to make working life easier.

This scenario shows that the developments in ICT are changing organizations, including those in educational settings (UNESCO, 2009). According to Tomlinson (2001), ICT enables managers to develop their understanding about the role of ICT for improvement on service delivery. Tomlinson further advocates that ICT helps school leaders to identify good practices, improve school effectiveness and innovate the ways of developing their own capabilities. School leaders can also examine the leadership and management implications of managing growing ICT resources in order to maximize outcomes.

"The growth of the virtual learning community in the world has been rapidly emerged in recent years, especially for those in positions of leadership in schools. This is part of a global trend to *online anything*" (Stephenson, 2001). Stephenson further focused that governments, educators and companies are keen to exploit the potentials of the Internet and Web-based online learning.

Another aspect is that ICT has become a part of life skill. ICT is the base for literacy after reading, writing and numeracy. ICT tools like laptop PC, notebook PC,

and desktop computers are affordable. Email, internet and other means of communication are easily accessible. Wireless technology has shown new possibilities in effective exchange of communication. Mobiles and notebook/tablet PC are friends of today's educators and learners. Use of ICT ensures transparency in monitoring activities and information exchange (Anderson, 2010). Modes of instructions are simplified, resources are increased, and explorative teaching has emerged. Likewise, flexible work hours are possible to employees in organizations; sharing organizational activities, transparency, and open communication can be maintained by using ICT. It is the time to be aware of each and every aspect in the development of technology and innovative practices around the world about ICT in education. This is why, I have a keen interest in exploring more about ICT in education in the local context of Nepal.

In Nepal, Pudasainee (2009) reports 90% (i. e. 364 out of 400) schools have installed computer lab. According to Aryal (2011), use of Closed Circuit Television (CCTV) is effective to minimize bullying[1] and monitor various activities in schools. In addition, it is possible to enhance administrative efficiency, access to large learning resources and innovative learning through E-learning, M-learning, and U-Learning (Anderson, 2010) via use of ICT. We find varieties of schools in regard to using modern educational technologies in Nepal. Some schools have already been using e-boards, multimedia system, e-books, and are full of e-resources. They also provide sophisticated ICT environment to facilitate teaching learning activities while many schools still depend on backboards and textbooks. Computer science as an optional subject is offered by many private schools and some public schools in the major

[1] school bullying is defined as a burning social issue in schools by Wagley (2012).

cities. The situations of rural schools are unpredictable since there is a greater divide of access to ICT in urban and rural schools.

On the other hand, National Center for Educational Development (NCED) has been providing teacher training program through National Radio and local FM Radio stations. Department of education provides e-learning resources via website for students of open schools. Computer Engineering/Computer Science program in Bachelor's and Master's Level are run by different colleges under various universities. Various training institutes conduct technical education and vocational training courses in computer and ICT. Tribhuvan University has started B.Ed. in ICT education program in three of its constituent campuses. Kathmandu University offers some courses on ICT at the master's level. Besides, Ministry of Education (MOE) has implemented some of the programs related to ICT in Education. They are: one Laptop Per Child (OLPC) pilot project in selected 26 schools of six districts; lab model (computer sharing mechanism) project in a school of Kaski district; and internet connectivity to district education offices and computer labs in schools with internet connection from the local Internet Service Providers (ISPs). Matching fund policy is adopted to arrange such facilities.

However, comprehensive policies and programs are yet to be developed in order to provide relevant ICT education and use ICT devices, equipment and services to enhance pedagogical practices in the schools of Nepal. Nevertheless, academic researches to explore the potentials and obstacles of ICT use in schools are indeed scarce.

Statement of the Problem

Every year pass percentage of the students in School Leaving Certificate (SLC) examination is declining. It was only 41.5% in the year 2013. As the SLC

examination is only one national standard of evaluation in Nepal for school education, declining results raise the question on the quality of education that the schools provide. However, there are various ways to uplift the quality of education. UNESCO (2009) clearly states that effective use of ICT in education promotes the quality. If so, why schools are not paying attention towards integrating ICT in their schooling practices? Why schools seem to be reluctant in this regard? Don't they see any opportunity in using ICT in schools? What are the barriers to them to use modern technology in the process of teaching and learning?

We see the development or any kinds of activities in social, cultural and educational settings from other countries affect Nepal immediately. It is because of ICT based access to online resources of information and its exchange via websites and social networking sites. UNESCO (2009) states that the developments in ICT have changed the ways people live and work and the ways people communicate with one another. The countries that are using ICT extensively in education have become knowledge societies, societies that are reliant on creating, sharing, and using electronically communicated knowledge for their prosperity. Why are Nepalese education institutions not responding to the ICT use?

"Nowadays formal education systems are under increasing pressure to respond and adapt to rapid technological innovation and associated changes in the way we work and live" (Arnab et al., 2012). In response to the pressure of adopting technology evolution in education, MOE Nepal has recently developed a draft of ICT in education master plan (2011-2016) which has not been brought into effect yet. It means there is lack of a national policy for ICT in education. On the other hand, schools lack trained teachers, physical facilities and qualification of teachers to adopt

latest technology (Wagley, 2002). No change in the situation has been noticed since 2002.

The above discussions declare that neither there are trained teachers and conducive physical facilities nor are there any national policy guidelines to use ICT in schools. However, some schools in the Kathmandu Valley claim that they have created "ICT based teaching learning environment". Such claim can be found in their schools' websites and newspaper advertisements. Are the claims true? If yes, what kinds of ICTs do they use? And how are they using them? What leadership role is needed to initiate and promote ICT use in schools? Is the ICT innovation diffused into their schools? Are there any changes experienced by students and teachers?

Pudasainee (2009) indicates the need of research on the impact of ICT use and stakeholder's perceptions towards it. He also claims that promotion of ICT based teaching learning in Nepalese school education is one of the primary areas and that requires improvement. Only a few public schools have established computer lab where computers are used just for administrative task although most of private schools have established computer labs and computers are used to teach a subject 'Computer Science'. Teachers and administrators are not yet well known about multi-disciplinary uses of ICT and its potentials. Why are the uses of computers limited to teaching a subject? What problems hinder them to use computers in teaching other subjects? What do school stakeholders think about promoting ICT integration in the whole process of teaching and learning?

On top of this phenomenon, there are some pertinent researchable issues about the use of ICT in the schools of Nepal. Such as exploring the situation of use, opportunities and challenges, and exploring the perception of teachers, students and

principals based on ICT integrated pedagogical practices and experiences in highly equipped environment of ICT based teaching and learning.

In addition, the level of diffused innovation and change experienced in schools after using ICT and leaders' role in the process are unknown. At this point, I am curious to uncover the reality of ICT use in Nepalese schools.

Purpose of the Study

The main purpose of this study was to provide an overview of ICT use in Nepalese schools by exploring the opportunities and challenges. Another purpose of the study was to explore the perceptions of students, teacher and administrators on the use of ICT in school education.

Through the study, I also expected to see the level of diffused innovation and change experienced by school stakeholders after using ICT in the practices of schools. In addition, I wanted to connect the leadership roles in the process.

Research Questions

The leading question for this study was "How do students, teachers and administrators perceive the use of ICT in schools with respect to uses, opportunities and challenges as they have observed the innovation and experienced the change?" Answer to this major question has been given through the collective answers to the following subsidiary questions:

1. How has ICT been in use in schools?
2. How do students, teachers and administrators perceive the use of ICT?
3. What are the opportunities and challenges to use ICT in schools?

Rationale of the Study

Due to rapid change and development in the area of ICT, other countries have changed their ways of educating pupils at the school level. However, in Nepal the

majority of the schools are still practicing traditional ways ‘chalk and talk’ of teaching and learning. Therefore, my research is contextual to explore and provide a comprehensive overview on the use of ICT in schools focusing the challenges and opportunities. It will be a guideline to the school leaders/managers willing to use ICT for the facilitation of administrative, instructional and communication system.

The perceptions of students, teachers and administrators are reflected over their everyday experiences on ICT friendly environment. This provides insights to the concerned people to implement ICT for quality education. The government policymakers also can use this research as a reference to plan and develop educational policies to reform the present traditional practices fostering innovative use of ICT. Future researchers can use this research as a reference for their study in the field of ICT in education.

In addition, this research sets values on the use of ICT in schools through contextual examples such as the use of e-paath, e-paati, e-pustakalaya, e-resources, active boards, and other ICT devices, tools and services from the field of study and evidences from various literatures as Tomlinson (2001) stated the importance of ICT in four major aspects (see page 27).

The implications drawn on policy, practice and research also provides a frame on how ICT can be used in schools for educational reform or how we can change the ways of receiving and providing educational service at school level.

This research provides a clear picture of how the roles of teachers and students have been shifted in ICT friendly environment of teaching and learning. This impression provides teachers and students with a guideline to adopt in the changing situation with innovative use of ICT.

Some national issues of education such as enhancing access and quality of education, increasing student motivation, creating student friendly learning environments and providing efficient and effective educational services in the context of Nepal are addressed in this research. How the use of ICT supports to overcome those issues is discussed presenting the field based facts that in advance, work as a conceptual knowledge for the concerned people.

Delimitations of the Study

In this research, I have concentrated on the perceptions of school stakeholders in the secondary schools where one can observe some means of ICTs in practice. The use of ICT can be seen from various perspectives at the different levels of education. However, my study is focused on the use of ICT in the secondary[2] schools for

- Administrative use,
- Instructional use, and
- Use for information exchange.

In addition, educational standards, efficiency, effectiveness, and 'digital skills' in school education are relatively analyzed.

[2] Secondary schools in this study refers to the schools running grade I to X.

CHAPTER II

LITERATURE REVIEW

As I am influenced by innovative practices in school education around the world, my research intends to foster ICT integrated school practices in Nepal. It is the demand of time that schools ensure lifelong learning and 21st century skills through the education they provide. This is not possible without ICT integrated practices in education. Various literatures are found in the ocean of online knowledge resources. Through this chapter, I have reviewed potential literatures that are related to my study area and can support me to enhance my knowledge. Getting a clear concept of the terminologies used in the research questions is yet another purpose of reviewing literatures in this section.

Therefore, I wanted to provide a comprehensive overview of literatures based on various theoretical and philosophical grounds that are strongly connected to the major concepts of my research. Literatures are reviewed on the basis of related theories, key themes, contemporary studies and policies.

Shaping of Mind by Theories

ICT in education is a broad and diverse field. Scholars in this field normally integrate theories from communication, cognitive psychology, management, computer science, behavioral psychology and many other fields into the development of instructional products and systems. In this research, I have selected two theories to view the world of reality that exists into the practices and perceptions of school students, teachers and administrators about the use of ICT in education. The selected

theories are “Diffusion of Innovation” (Rogar, 1995), “Transformative Leadership” (Covey, 2007) and “Theory of Educational Change” (Fullan, 1991).

Diffusion of Innovation

Diffusion is defined as the process by which an innovation is adopted and gains acceptance by members of a certain community (Surry, 1997). In other words, diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Diffusion is a special type of communication concerned with the spread of messages that are perceived as new ideas.

Innovation Decision Process. Rogar (1995) describes five steps of innovation decision process as *Knowledge:* person becomes aware of an innovation and has some idea of how it functions; *Persuasion***:** person forms a favorable or unfavorable attitude toward the innovation; *Decision:* person engages in activities that lead to a choice to adopt or reject the innovation; *Implementation:* person puts an innovation into use, *Confirmation:* person evaluates the results of an innovation-decision already made.

A number of factors interact to influence the diffusion of an innovation. The four major factors that influence the diffusion process are the innovation itself, how information about the innovation is communicated, time, and the nature of the social system into which the innovation is being introduced (Rogers, 1995).

As described by Surry (1997), four main elements in the diffusion of new ideas are: Innovation, Communication Channels, Time, The Social System (context):

The Innovation. Why do certain innovations spread more quickly than others? The innovation, to spread and be adopted should show: the characteristics which determine an innovation's rate of adoption are: (1) Relative advantage, (2)

Compatibility, (3) Complexity, (4) Trialability and (5) Observability to those people within the social system.

Communication. Communication is the process by which participants create and share information with one another in order to reach a mutual understanding. A communication channel is the means by which messages get from one individual to another. Mass media channels are more effective in creating knowledge of innovations, whereas interpersonal channels are more effective in forming and changing attitudes toward a new idea, and thus in influencing the decision to adopt or reject a new idea. Most individuals evaluate an innovation, not on the basis of scientific research by experts, but through the subjective evaluations of near-peers who have adopted the innovation.

Time. The time dimension is involved in diffusion in three ways. First, time is involved in the innovation-decision process. The innovation decision process is the mental process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to the implementation of the new idea, and to confirmation of this decision. An individual seeks information at various stages in the innovation-decision process in order to decrease uncertainty about an innovation's expected consequences. The second way in which time is involved in diffusion is in the innovativeness of an individual or other unit of adoption. Innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system. There are five adopter categories, or classifications of the members of a social system on the basis on their innovativeness: (1) Innovators – 2. 5%, (2) Early adopters – 13. 5%, (3) Early majority – 34%, (4) Late majority – 34%, (5) Laggards – 16%. The third way in

which time is involved in diffusion is in rate of adoption. The rate of adoption is the relative speed with which an innovation is adopted by members of a social system. The rate of adoption is usually measured as the number of members of the system that adopt the innovation in a given time period. As shown previously, an innovation's rate of adoption is influenced by the five perceived attributes of an innovation (Time/Infected Population).

The Social System. The fourth main element in the diffusion of new ideas is the social system. A social system is defined as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and/or subsystems. The social system constitutes a boundary within which an innovation diffuses. How the system's social structure affects diffusion has been studied. A second area of research involved how norms affect diffusion. Norms are the established behavior patterns for the members of a social system. A third area of research has had to do with opinion leadership, the degree to which an individual is able to influence informally other individuals' attitudes or overt behavior in a desired way with relative frequency. A change agent is an individual who attempts to influence clients' innovation-decisions in a direction that is deemed desirable by a change agency.

Surry (1997) states that the study of diffusion theory is potentially valuable to the field of ICT for three reasons: First, most school leaders do not understand why ICTs in education are, or are not, adopted. Second, ICT is inherently an innovation-based discipline. Many tools of ICT represent radical innovations in the form, organization, sequence, and delivery of instruction. Third, the study of diffusion theory could lead to the development of a systematic, prescriptive model of adoption

and diffusion. Moreover, the theory of innovation and its diffusion shapes my research because "innovation is strongly dependent on its inputs that can be described in terms of knowledge, people, money and infrastructures. Its efficiency is related to several parameters such as fiscal and regulatory environment, design capacity, organizational flexibility, networking capability, entrepreneurship" (Conceição & Heitor, 2005). In addition, I have followed innovation diffusion theory because Fichma (1992) stated "innovation diffusion theory provides well developed concepts and body or empirical results applicable to the study of technology evolution, adoption and implementation" (p. 195).

Theory of Transformational Leadership

As a student of leadership stream, the theory of transformational leadership has influenced me to view the reality of ICT use in school from leadership perspective that focuses institutional development by transforming them from one paradigm to another paradigm of pedagogical practices. I believe those school leaders who deserve the ability to influence others with their skills of inspirational motivation, intellectual stimulation, idealized influence and individualized consideration can foster the use of ICT in their organization to be transformative as per the demand of time and need of the society. Those leaders are transformative who are "continuously investing in the development of themselves and others, and developing a culture of collaboration rather than command and control where change is welcomed as an opportunity rather than a threat" (Covey, 2007).

I also believe coping with the challenges of ICT innovations in 21st century, principal leaders of any schools requird to invest in the institutional research and development and take every challenges of ICT development as oppurtunity for organizational change.

MCEETYA (2006) states the following principles provide a framework for transformative leadership that integrates information and communication technologies (ICT) to improve teaching and learning:

> **Pedagogy.** *Effective use of ICT enables and requires leadership that:* affirms, utilizes and extends student engagement with, and expertise in, ICT; creates student-centered, constructivist, interactive and blended learning environments; promotes pedagogies effectively integrating ICT in order to personalize learning and ensures higher order learning and meta-cognition; monitors and manages the access to, and impact of, ICT on all groups of students.
>
> **Educational Soundness.** *Effective use of ICT enables and requires leadership that:* makes judgments about the use of ICT adding value to the intended learning; aligns and shares information, practices, knowledge and skills across the school, between schools and with education systems; appraises the inclusiveness, appropriateness, effectiveness and ethics of using ICT in learning and communication; engages all students with ICT in ethically, culturally sensitive and productive ways.
>
> **Professional Learning.** *Effective use of ICT enables and requires leadership that:* engages teachers with the teaching and learning possibilities afforded by new and emerging technologies; provides professional learning and connects staff with school and external professional expertise and experience; recognizes and utilizes student ICT expertise and leadership in extending collective professional knowledge and capacity; models purposeful and confident use of technologies, critically evaluating the use of ICT in their work. (MCEETYA, 2006, p. 6)

Four components of transformational leadership presented by Covey (2007) are given blow to conceptualize the theory of transformational leadership throughout the study and are connected with the use of ICT in schools and leadership styles as discussed above.

- *Inspirational Motivation.* The foundation of transformational leadership is the promotion of consistent vision, mission, and a set of values to the members. Their vision is so compelling that they know what they want from every interaction. Transformational leaders guide followers by providing them with a sense of meaning and challenge. They work enthusiastically and optimistically to foster the spirit of teamwork and commitment.
- *Intellectual Stimulation.* Such leaders encourage their followers to be innovative and creative. They encourage new ideas from their followers and never criticize them publicly for the mistakes committed by them. The leaders focus on the "what" in problems and do not focus on the blaming part of it. They have no hesitation in discarding an old practice set by them if it is found ineffective.
- *Idealized Influence.* They believe in the philosophy that a leader can influence followers only when he practices what he preaches. The leaders act as role models that followers seek to emulate. Such leaders always win the trust and respect of their followers through their action. They typically place their followers' needs over their own, sacrifice their personal gains for them, and demonstrate high standards of ethical conduct. The use of power by such leaders is aimed at influencing them to strive for the common goals of the organization.

- *Individualized Consideration.* Leaders act as mentors to their followers and reward them for creativity and innovation. The followers are treated differently according to their talents and knowledge. They are empowered to make decisions and are always provided with the needed support to implement their decisions.

For successful practice of ICT in education and its process, a leader needs to have a mission and vision valuing the potentials of ICT. Team work and commitment to foster sustainability is another crucial part while considering the ICT in the process of education. Every member of the school/education system is required to be creative and innovative to cater the notion of ICT integrated education. Without clearly shared common goals of organization, it is almost impossible to foster ICT in education. Likewise, success of ICT practice in educating pupils also depends on school leaders' capability of mentoring followers. Therefore, I believe the theory of transformative leadership as one of the key theories that supports analysis and interpretation of the field data of the study from leadership perspective wherever it exists.

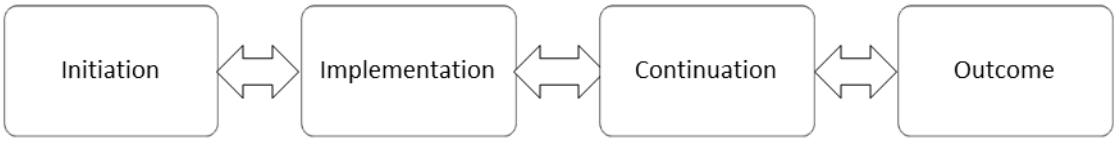
Theory of Educational Change

Use of ICT in school education in Nepal is a new practice and educational institutions have started adopting change in their traditional practices with innovation of ICT. While viewing the use of ICT in education, it can be viewed from the educational change perspective as Fullan's theory of educational change has proposed that "there are four broad phases in the change process: initiation, implementation, continuation, and outcome" (Fullan, 1982, 1991).

In my research, this theory has supported to view the practice of ICT in schools through change perspectives connecting to the roles and responsibilities of school teachers and administrators answering the question "What can different

stakeholders do to promote change that addresses their needs and priorities?" (Ellsworth, 2000). Rogers (1996) views a change agent as an individual who influences clients' innovation-decisions as required by the change agencies (schools in this study). On the other hand, Fullan (1991) views every stakeholder in the educational change as a change agent.

Interlink between the phases of change process as described by Fullan's theory of educational change is presented below.



Initiation. The factors affecting the initiation phases include: Existence and quality of innovations, Access to innovations, Advocacy from central administration, Teacher advocacy, External change agents.

Implementation. Fullan and Stigelbauer (1991) identified three areas of the major factors affecting implementation: characteristics of change (Need of change, Clarity about goals and needs, Complexity: the extent of change required to those responsible for implementation, Quality and practicality of the program), local factors (The school district, Board of community, Principal, and Teacher) and external factors (government and other agencies).

Continuation. Continuation is a decision about institutionalization of an innovation based on the reaction to the change, which may be negative or positive. Continuation depends on whether or not: The change gets embedded/built into the structure (through policy/budget/timetable), the change has generated a critical mass of administrators or teachers who are skilled and committed to, and the change has established procedures for continuing assistance.

Outcome. Attention to the following perspectives on the change process may support the achievement of a positive or successful change outcome: active initiation and participation: change does not end in recognizing or initial context with the innovation, but starts with the contact and evolves along with the continuous interaction with it and the environmental changes that it brings forth; pressure, support and negotiation; changes in skills, thinking, and committed actions; and overriding problem of ownership.

Theory of educational change in my study has been an additional lens to view the use of ICT in different phases of the change in schools. It has been easy for me to explore the educational changes on behalf of the use of ICT in school education. How the uses of ICT are initiated in school education and what is the progress on implementation both aspects are analyzed from the change perspectives. Analysis on continuation and outcome of ICT from change perspective has supported me to dive in depth into my research phenomenon.

My major concern while viewing use of ICT from the perspectives of educational change theory was to connect each aspects of ICT in school education and change desired or acquired by the schools after successful practices. Through the change perspectives, I have analyzed experiences of students, teachers and administrators as they expressed perceptions on the use of ICT for facilitation of administrative tasks, instructional procedure and entire communication system of schools.

Revolution of Information Technology

Here, to conceptualize the notion of ICT evolution in education, review of literatures on IT revolution is crucial. Understanding the current state of revolution by the technology in the 21st century is important before we examine its impacts in

education sector. Educational institutions are the change agents of society through the education they impart. Therefore, adopting the evolution in the field of IT is a major concern for school education today as Hargrove and Prasad (2010) focus on how technologies are being developed each day reshaping our way of life stating:

> We live in the technological paradise of the 21st century. Technology is growing in countless manifestations almost by the hour, and daily it powerfully affects our lives. A major task of schools is to equip students to manage technology and use it skillfully and responsibly. In fact, many of our students are more knowledgeable and skilful in the use of technology than are their teacher. (Hargrove & Prasad, 2010, p. 45)

They also have raised the issue of workforce (teacher) preparation to integrate technology in the classroom. They view that technological innovations of the late 20th century promised breakthroughs in the methods and effectiveness of teaching for 21st century. Some of the most potential innovations include e-mail, internet, web 2.0 technology, online Learning Management Systems (LMS), cell/mobile/wireless technology, cloud computing, and smart technologies.

There exists revolution of IT around the world. Especially in education, it has brought a discrete dimension of revolution. Such revolution of technology in education is termed as "fourth revolution" by Anderson (2010) stating that:

> The internet and services such as Google, and email, together with numerous new by-products Wikipedia, Skype, Facebook, and Twitter are transforming further the way we live, learn, work and play. In some countries learning is moving beyond the walls of the classroom, and that now terms have been coined to express three innovative ways of learning, terms like: m-learning or mobile learning and u-learning or ubiquitous learning. (p. 7)

He has further discussed the dramatic changes in the world of work brought by ICT in the subtitle "ICT and the world of work" (p. 12). Thus, one of the best ideas to integrate ICT in education is to invite dramatic 'shift' in the practice of school education as change from traditional to innovative teaching learning.

ICT in Education

Literatures show the use of ICT in education is worldwide demanding because "ICTs are taking on an ever greater prominence in education. Many governments are emphasizing the need to turn out digitally literate, technologically able graduates who are employable in the global information economy" (Pegrum, Oakley, & Faulkner, 2013, p. 66). They have further discussed the role of ICT in promoting consumption or production, collaboration or personalization, and creating seamless learning spaces. In addition, "In all these levels of education ICT can be utilized for better teaching learning process and improving quality of education" (Devi, Rizwaan, & Chander, 2012, p. 545).

Literatures show the numerous opportunities and few challenges of using ICT in education. This section focuses on the literatures that explore such uses, opportunities and challenges in school education. In addition, I have also discussed the process of ICT integration in education, as it is the first part of uses.

Uses of ICT

Schools can use ICT for different purposes. According to Strigel and Ariunaa (2007), there are number of ways by which use of ICT can be meaningful in schools. The ways suggested by Strigel and Ariunaa are pedagogical support, teaching practice, student assessments, teacher evaluation, teacher efficacy, lesson planning and material development, teacher job satisfaction survey and attendance, teachers'

access to resources and use of equipment and materials, student motivation, access to large ICT resources.

Another major use of ICT in education is associated with the purpose of communication. E-mail based formal communications have grown tremendously and they have been formalized in educational settings over the last decade. Presenting this facts O'Neill and Colley (2006) state "It is now commonly used for contact in place of face-to-face meetings or formal letter, and in distance education it is the primary mode of communication between students and their tutors. E-mail is one of several forms of computer-mediated communication" (p. 360).

Integrating ICT in education is a process. An advanced practice of ICT in education can gradually be developed. There are certain steps of initiating practice of ICT in education. UNESCO (2009) states that learning institutions are under pressure to prepare students for the changing face of society and the workplace, forcing the issue of integrating ICT into education. Institutions are at differing stages in the process of integrating ICT. Emerging, Applying, Infusing and Transforming are the major steps in adopting ICT as shown in the figure given below:

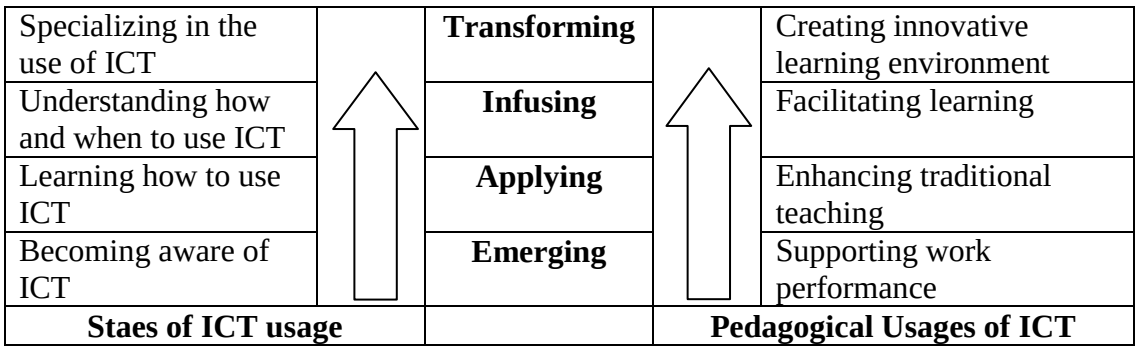


Figure 1. Mapping ICT stages onto learning and teaching (Adapted from *UNESCO, 2009).*

Understanding of ICT integration process presented above lets school leaders assess their present status and set strategic intregration plan for future endeavor. At present, educational institutions are focusing the use of ICT to support their students

and process of teaching and learning. Presenting a paper about ICT in education in the context of Nepal, Shakya (2010) stated that the use of ICT in educational sector mostly focuses on the impact it has had on pupil and teaching/learning. He describes that ICT changes the management, work process, and training of professionals and students in education.

Opportunities

Understanding opportunities of using ICT in eduction is important for this research. Literatures show there are numerus oppurtunities and that are universal but the challenges are limited and contextual.

UNESCO (2009) claims "when used effectively", ICT can make education more accessible by improving access to information, enabling greater access to education, providing affordable any where any time learning, and sustaining life long learning. The same literature advocates that ICT can improve the quality of eduction by improving students' motivation, personalizing student learning, enhancing student learning, giving feedback and reinforcement, enhancing the quality of teaching and improving teacher education. Likewise, ICT provides an efficient management tool that can be used for improving the efficiency of education planing and delivery and facilitating policy making and management.

There are various tasks that can be accomplished by using various means of ICT. Remarkable implication and effects of ICT integrated educational practices are shown by different literatures about the use of ICT. Illustrating remarkable effects of ICT on schools and on teaching and learning, Anderson (2010) says:

> At the institutional level, schools have similar needs to any small business and use the same kinds of computer software for such tasks as accounting, inventory control, communicating, document preparation and printing.

> Schools also use specialist software for the tasks like time tabling, electronic reporting, behavior tracking and student profiling, monitoring attendance and library management. In a whole number of ways, then ICT tools are providing indispensable in making school administration more efficient and responsive to community needs. (p. 5)

Paradigm shift in education. ICTs have capabilities to bring reasonable change and paradigm shift in education. Anderson has shown that the roles of teachers and students have been shifted after the implementation of ICT. A knowledge transmitter has been changed to facilitator, collaborator and knowledge navigator. Given below is a figure that compares the roles of teachers and students before and after using ICT in instructions.

	A shift from		**To**
Teacher	Knowledge transmitter; primary source of information teacher controlling and directing all aspects of learning	⇨	Learning facilitator, collaborator, coach, knowledge navigator and co-learner; teacher giving students more options and responsibilities for their own learning
Student	Passive recipient of information reproducing knowledge learning as a society activity.	⇨	Active participant in the learning process producing knowledge; Learning collaboratively with others

Figure 2. Changes in teacher and student roles (Adapted from Anderson, 2010)

Benefits of social networking sites. Lam (2012) has discussed online social networking sites taking example of FB. Lam claims that social networking sites have capability to change the interaction, communication and interrelation of students and their daily life. Through the study, Lam developed a model of student motivation in learning with social media in four perspectives: interaction, communication, social

relationship, and participation. However, it needs proper incorporation in teaching and learning.

In addition, "the web experience is more personalized, social, open, self-regulated and oriented towards ripping, remixing, sharing, following, reflecting. As a result, also e-learning has recently become more social and open, involving the use of personal learning environments or social networks" (Lorenz, Kikkas, & Laanpere, 2012, p. 326).

Digital literacy. ICT has been the major skill for literacy these days as the definition of literacy has changed in the 21st century. Only the use of ICT in schools and other informal/non-formal education can help people acquire digital literacy. If schools fail to address the issue of digital literacy through their education, they will fail to educate pupils in real sense. "To be literate today requires the ability to interpret and write various codes such as icons, symbols, visuals, graphics, animation, audio and video" (Nallaya, 2010). "Information literacy, Media literacy and ICT literacy form one of the four broad sets of skills defined under the skills of 21st century that students need to acquire to be effective citizens and workers" (Andersen, 2010, p. 26). Andersen has discussed that the terms digital literacy, e-literacy, screen literacy, multimedia literacy, information literacy and ICT literacy describe clusters of skills that students and teachers need in the digital age of 21st century. ICT enabled reading and writing abilities are defined as digital literacy by Andersen.

> Digital literacy include a number of abilities that extend notions of (a) screen reading and internet surfing [reading] and (b) texting, keyboarding, and mailing [writing]. The abilities are: using ICT skills to create and share information; searching, sifting, scanning, and sorting information, navigating through screens of information; locating and evaluating information; using

> ICT to research and solve problems; making multimedia presentation; retrieving, organizing, managing, and creating information; and sending and receiving messages. (Andersen 2010, p. 27)

The digital literacy is a major issue to be addressed by the agencies of education in this age of digital technology. If schools are unable to assure quality education through product 'students' with the above mentioned skills for digital literacy, they can sustain their organization no longer in the 21st century.

Standard, efficiency, effectiveness and skills. Shakya (2010) elaborates the importance of ICT and e-learning stating that it offers opportunity to raise educational standards in schools as well as universities; large range of ICT tools is available for teaching and learning. Sakya also claims that ICT in education closes the gap of "Digital Divide[3]" (is discussed later in this chapter in detail).

An effective use of ICT in education can maintain standards in curriculum and its delivery brings efficiency in management, assure effectiveness in communication and develop life skills of pupils. Tomlinson (2001) shows the importance of ICT in four major aspects, the first is standards: use ICT to raise standards across the curriculum and help learners to achieve excellence. The second is effectiveness: use ICT to improve the efficiency and effectiveness of teachers, school and system. The third is inclusion: use ICT to provide universal access to resources, creating opportunity for all. Likewise the forth is a skill: provide learner with key skills for future employment and lifelong learning and the potential to engage in an ICT–rich society.

Ministry of Education (MOE), through a policy in the draft of "ICT in Education" Master Plan (2011-2016) has focused on the use of ICT to increase

[3] Digital divide is defined as the gap between those having and not having access and use of digital technology.

productivity, efficiency and effectiveness of the management system in schools. The policy states that ICT will extensively be used to automate and mechanized work processes such as the processing of official forms, timetable generation, management of information systems, lesson planning, financial management, and the maintenance of inventories (see page, 40).

Alternate learning approaches. When used ICT effectively, schools can provide an alternative learning approaches like interactive learning, independent learning, networked learning, organizational learning and managed learning. These key learning approaches are conceptualized by (Spring, 2004). Spring states five teaching and learning modes in which ICT enabled e-learning could provide substantial gains in effectiveness, quality and cost benefits as follows:

> *Classroom interactive learning* between students and teachers and among students. *Independent learning* where students or teachers are learning and studying alone in a variety of environments and modes including aspects of self-directed lifelong learning. *Networked learning* through contact with groups, individuals and sources where quite different influences and experiences are creating a qualitative difference to both standard and blended teaching and learning. *Organizational learning* including learning communities, learning precincts and learning cities. *Managed learning* where education technology is creating, through computer managed communication and learning management systems, capability to enable teachers to negotiate and provide individualized curricula and learning experiences for each student. (p. 37, as cited in White, 2008)

Web 2.0 technology can be used for such learning approaches. The use of Content Management System (CMS) and other web tools and technology can be the

best way to provide/incorporate the above discussed five alternates of learning modes by schools in their processes. Intranet technology would be the best idea for initial exercise of alternative learning approaches because "Intranet systems can enhance communication between teachers and students" (Fan, 2010, p. 55).

Open and distance learning. While exploring the reality on ICT in education, it is obvious to see its implication in Open and Distance Education. Recent developments in ICT, particularly web tools with integrated voice, video and data systems, as well as satellite and compression technologies, have made distance education a viable alternative to improve access to educational opportunities for learners of all ages, at all levels and in diverse environments. ICT can play a greater role in all the activities by providing a lot of benefits to students, teachers, parents, and educational institutes. ICT can be used for providing education to the people who are not able to come to school due to various constraints (Devi, Rizwaan, & Chander, 2012). This is an indication to possibilities of online and distance education. "Distance Education is a technology-enabled learning program where technology bridges the gap of physical distance between the teachers and students. It offers academically sound alternative to traditional face-to-face instruction via distance education technologies" (Kathmandu University School of Education, 2012, p. 4).

Discussing the open online PBL[4], Nerantzi (2012) states that "PBL has the potential to enable learners and educators to break out of academic and virtual silos. It also widens collaborative learning within Academic Development in multidisciplinary and multi-institutional groups" (p. 306).

Especially computer assisted distance education lets the students keep on learning, no matter where they live and work. Having online access to their peers,

[4] PBL is short for Project Based Learning

tutors, and resources, any time round the clock, and from anywhere across the globe, means they will never be alone. This is possible because of the innovation of ICT in education. Even schools can offer some courses or learning activities via online services to support students' day-to-day learning. Some courses can be offered in distance mode even for high school students.

Challenges

Despite numerous opportunities of using ICT in education, there are some challenges that may hinder the potential of getting full benefits. Strigel and Ariunaa (2007) indicated challenges like infrastructure and ICT equipment, access to ICT tools by teachers, trainers, administrators and students, purpose of ICT use, policies and strategies of ICT, resources and guidance on ICT, system level support on ICT integration, financing and attitudes to ICT.

According to Devi, Rizwaan, and Chander (2012), barriers of ICT use include costly supportive infrastructure, developing online material can be expensive and time consuming, quality, validity of online material, lack of flexibility in already prepared study material. A lot of information available online may dissuade student learning.

Pudasainee (2009) has raised many issues through his research findings. Schools have initiated using some means of ICT as supportive tools or as a subject teaching means but lack many aspects of improvements like setting objectives to use ICT, curriculum and instruction, processional trainings, infrastructure, budgeting, technical support and so on.

UNESCO (2009) indicates infrastructure, total cost, professional development, language, contextualization and technical supports as major challenges while integrating ICT in education. Likewise, regarding the challenges of using ICT in

education; Pelgrum, Oakley, and Faulkner (2013) indicate the need to carefully manage the technology, ethical issues in its use, and staff roles in its deployment.

Daniel (2012) presents a failure case of OLPC project launched by Nicholas Negroponte in 2005. This is a challenge of using ICT in education even for Nepal and precaution is needed because the project was also launched in Nepal. However, OLE Nepal claims it is a successful project in Nepal. Daniel presents four clear reasons for the failure as follows:

> First, the project had no clear aims that could be evaluated. Second, the computers were launched with very little educational software. Third, there was no attempt to fit them into the existing educational systems by providing training for teachers. Fourth, the distribution and maintenance of the machines were left largely to chance. (p. 5)

In addition, evaluation research on OLPC pointed the need of teacher training, revision of curriculum and changed classroom environment in order for computers to have a more positive impact.

After reviewing literatures in this section, I am able to conceptualize the major themes of research such as the various uses of ICT, its opportunities and challenges. In addition, the process of integrating ICT in education and its significance have also provided conceptual clarity. These can meaningfully be discussed later in the discussion part with the data from the field. A systems model of leadership and change for ICT implementation in education is another good example to guide leaders to take initiatives of ICT integrated educational practices. Discussion made about opportunities and challenges of ICT also helps me to analyze and interpret the field data in the real context of schools and draw appropriate implications.

Perspectives on ICT Use

Some scholars have presented their valuable ideas about the use of ICT in education. These views found in the literature are presented below as scholarly perceptions on the use of ICT in education.

Innovating education. It is the foremost priority of the educational institutions and governments in developed countries around the world. National policies for the 21st century are set to foster lifelong learning and building knowledge society increasing access to and use of ICT. Pelgrum and Law (2003) said, "Many governments, by the end of 20th century, have been undertaking initiatives to innovate education because they have to prepare their citizens for life-long learning, team work, and build knowledge society". For this, educational innovations in basic education are necessary if new demands are to be met, and such innovations should have a strong pedagogical focus on student-centered and increasingly student-directed didactical approaches facilitated by ICT, where by teachers should play more of coaching role. Therefore, without a clear national policy in education, paradigmatic shifts in educational practices are not possible.

Holistic educational improvement. Daniel (2012) views ICT as a driver of holistic educational improvement. Daniel further argues about educators' realization that the combination of digitally based ICTs gives more powerful possibilities for extending and improving learning, teaching and training than all previous educational technologies from the blackboard to television. In addition, Daniel claims that the intelligent use of ICT can bring similar revolutions to learning, teaching and training.

System model of ICT leadership. Leadership plays a vital role in designing and implementing ICT into practices in schools. In a system model of ICT leadership purposed by Pelgrum and Law, practice of ICT can be viewed from three levels:

education system level, school level and individual level. System level deals with the policy formation on networked and IT-rich environment for education, professional development, change in curriculum and assessment, implementation plan, and monitoring and review mechanism. Similarly, school level consists of the governance of school, school's local policy, school management and other implementation factors like physical and technological factors, resources and professional development/ expertise of teachers.

Likewise, an individual level indicates the learning outcomes. Learning outcomes can be affected by various factors like personal characteristics, interests and social and economic background. A systems model of leadership and change for ICT implementation in education presented by Pelgrum and Law (2003) is given below:

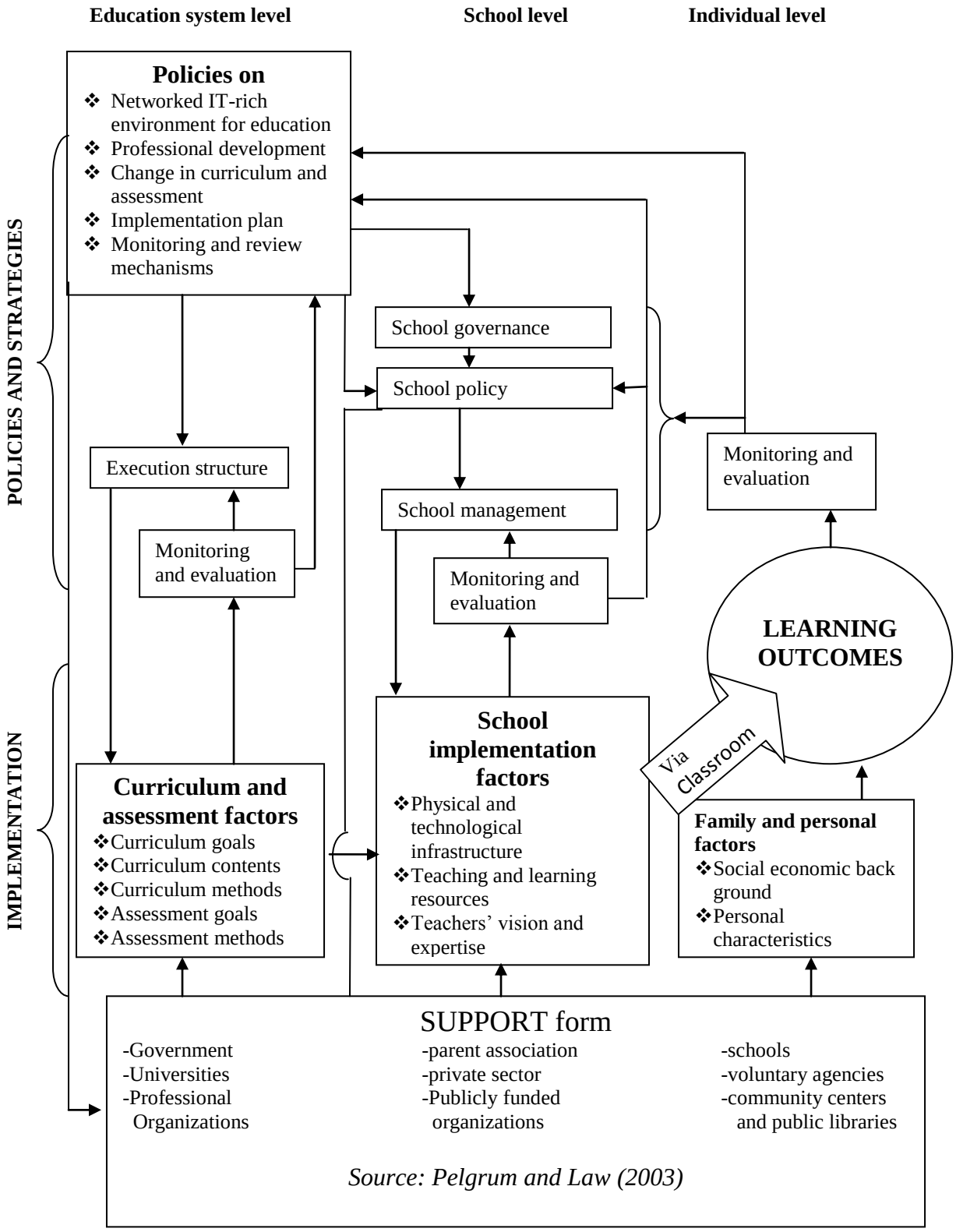


Figure 3. Systems model of leadership and change for ICT implementation in education (Adapted from Pelgrum and Law, 2003).

Rationale of ICT use. Without understanding the rationale of using ICT in schools, school leaders cannot take action to initiate the use of ICT in daily instructional practices. Adopting strength and innovation of ICT; and addressing demand of community and need of students can be significant to schools to cope with the 21st century issues. Robertson, Webb, and Fluck (2007) focused on four major rationales about the use of ICT for educational purposes:

- *The strengths of ICT*: ICT is a potentially useful and powerful set of tools and access to information is crucial for all citizens.
- *Community expectations*: ICT is part of our world, and the community expects it, schools need to be seen using it, computers in all classrooms are a basic learning tool, children do (and show) some of their works using ICT, but schools don't have too many computers to meet the demand and need.
- C*hildren need ICT*: ICT is part of our world children need to experience and use it; they need to be able to use ICT for future employment; ICT skills are basic skills similar to literacy and numeracy; the curriculum should be ICT embed; classroom practices need to be aligned with common practices such as using word processing and the Internet.
- *ICT is strategic to the school:* ICT is strategic to school purposes; it underpins the development of practices schools will require to provide for learning in the future; this requires developing staff competence, rethinking and redeveloping classroom practices and preparing for different teaching and learning arrangements.

These rationales of ICT for educational use, provide a clear answer to the question "why ICT in education?" to all the schools and its leaders who are resisting to change technology and its innovative use in education.

Challenge of 'Digital Divide'. Use of ICT in urban areas comparing to rural area is high due to access opportunities to various means of ICT. There is a clear gap between "haves" and the "have nots" of ICT in urban and rural societies. The group whose access to ICT is unequal may fail to reach their full potential in school and beyond. They might not have acquired the skills needed to participate fully in today's digital world, and they may be at a disadvantage when applying to enter the workforce (Andersen, 2010). Discussing the digital divide, Andersen states:

> The digital divide may occur between countries in the Asia-Pacific region because certain nations are less developed economically, or because they have less developed infrastructures. The digital divide may occur within a country because of differences in resources between metropolitan and rural areas, or within cities between affluent and less affluent schools. The digital divide may occur within schools because some families have internet access at home while other families do not and this affect school policy on homework expectations. The digital divide may also occur between boys and girls because at home parents often favors boys when it comes to accessing ICT, or it may occur at school because boys tend to dominate when ICT access is limited. And the digital divide may occur between age groups where, for instance, senior citizen has no previous experience with ICT. (Andersen, 2010, p. 11)

In the context of Nepal, digital divide occurs in all the ways as identified by Anderson. Nepal is a developing country; it has geographical diversity, male dominating culture, wider gap in the status of development of urban and rural area, and the existence of different types and levels of schools. These all are indicators for digital divide in Nepal which can be a greater challenge to use ICT in all schools.

ICT and leadership. Study of literature on leadership styles to foster ICT integrated teaching learning environment in schools is crucial because it gives a deep concentration on related concepts of the research.

Potentials of ICT for school effectiveness are considerable. With a strategic planning into the process of school education, school leaders can initiate ICT. For this, principal leaders need to have clear understanding about ICT in education and need to value ICT integrated school culture. Tomlinson (2001) discussed that the leadership in ICT is about enabling school leaders to develop their understanding of the role of ICT, identify good practice and improve school effectiveness, identify ways of developing their own ICT capability, examine strategic development planning for ICT development in schools and examine implications of growing ICT resources in order to maximize pupil outcomes. Tomlinson further discussed that online environment offers many kind of coaching/mentoring for educational leaders in their managerial issues and leadership issues. Such practice helps understanding the role of ICT and identifies the good practice to improve school effectiveness. Leaders can assure a supportive administration. ICTs are widely practiced for educational improvement: quality standard, effectiveness, and efficiency in its input, process and output as well. Similarly, ICT helps in socio-cultural communication that is useful in bridging the diversity of cultural, geographical distances and minimize the challenge of digital divide.

Effective use of ICT requires certain leadership roles that maintains knowledge of recent and emerging ICT, establishes planed ICT integration program and creates local and worldwide education communities. MCEETYA (2006) states that there are three ways (evidence based, management and partnership) that effective use of ICT enables and requires leadership that are:

> *Evidence-Based:* undertakes new leadership roles, styles and actions uniquely afforded by ICT; maintains a knowledge of current and emerging ICT, engaging in critical evaluations of their use; generates, collects, analyses and acts on data in improving teaching and learning; sustains a research culture using technologies to manage on-site research and to connect with expertise in schools, universities and other research centers;
> *Management:* establishes a whole-school planned and sustained ICT integration program with quality technical support; creates and encourages improvements and efficiencies in curriculum, pedagogy, assessment and reporting, with flexible management and learning programs; establishes flexible and transparent systems for collective planning, sharing of resources, monitoring student progress, resource provision and administration; establishes protocols and processes to manage ICT communication, interaction, priorities and workloads; *Partnership:* creates new local and global education communities, extending learning opportunities beyond the classroom; connects schools to each other, to education systems and communities, responding to requirements and priorities; connects students and their families to learning programs, required tasks, student work, assessment and attendance and draws on community expertise in planning and sustaining ICT innovation. (p. 7)

This literature provides a clear road map to those all the leaders working for their school improvements/change to meet the need of 21st century generation. Within a framework of three components, a perfect transformative leadership style is reflected and real picture of ICT and leadership is visualized. In my research, it is helpful to connect the perception of school principals and their practices towards ICT

integrated education while interpreting the data, and to examine whether they are interlinked with the above discussed frameworks or not.

Policy Perspectives in Nepal

There is an absence of consolidated policy for ICT in Education in Nepal; however, the IT Policy (2010), SRRP (2009-2015) and Three Year Interim Plan 2011-1013 of the GON have provided some policy and strategies for the development and use of ICT in education. ICT Policy (2010) has the following policy provisions:

> Expansion of access of the Internet to all schools; coordination and collaboration with national and international institutions to develop skilled human resources for continuous, relevant and quality education; promotion of Industry-Academia collaboration; and formulation and implementation of special IT program, focusing on students, teachers and schools in order to develop competent human resources. (pp. 24-25)

The School Sector Reform Plan (SSRP) states, 'ICT assisted teaching/learning will be implemented and expanded in all schools'. Similarly, SSRP has made a policy provision to develop ICT infrastructure in education and provide alternative modes of schooling through ICT. One of the objectives of distance learning and distance education set by the MOE is to develop learning support materials to enhance quality of education through ICT.

The Three Years Interim Plan of GON (NPC, 2007) has included the following polices related to ICT Education and ICT in Education: ICT skilled human resource development management; use of ICT in all aspects of education; and infrastructure development.

Based on the above mentioned policy indications, MOE has prepared a draft national policy framework that suggests three main working policies for ICT in education.

The first is 'ICT for all students', meaning that ICT is used as an enabler to reduce the digital gap between the schools. The second is to emphasize the role and function of ICT in education as a teaching and learning tool, as part of a subject and as a subject by itself. Apart from radio and television as teaching and learning tools, this policy stresses the use of computer for accessing information and communication. In addition, the focus is also given to the use of computers and software as productivity tools. ICT as part of a subject refers to the use of software in subjects such as "Invention" and "Engineering Drawing". ICT as a subject refers to the introduction of subjects such as "Information Technology" and "Computer Education". The third emphasizes the use ICT to increase productivity, efficiency and effectiveness of the management system. ICT will be extensively used to automate and mechanize work processes such as the processing of official forms, timetable generation, management of information systems, lesson planning, financial management, and the maintenance of inventories. Eight broad objectives are formulated by the policy as:

> to create ICT based learning environment; to prepare "Next Generation" teachers; to develop awareness among the policy makers/ Managers/Administrators; to enhance ICT competencies of human resources working in education sector for their better performance; to develop interactive digital contents based on the national curriculum framework; to develop and enhance policy and regulatory provisions for effective and efficient use of ICT in education; to develop institutional arrangement to carry

> out the ICT plans and programs at all levels; and to establish Research and Development system. (p. 10)

This seems that the future of Nepal for ICT integrated educational practices is bright if the draft comes as real policy framework in action. There are ambitious objectives in the draft that require strong desire to be implemented. Although the policies are good, due to lack of strong regulations/rules for implementation, such policies stay idle. This is our past experience in Nepal.

Section Summary

To sum up, Hargrove and Prasad (2010) stated, "Technologies are being developed each day reshaping our way of life" (p. 45). It indicates the revolution of ICT. Likewise, Anderson (2010) termed the evolution of technology in education "fourth revolution". Andersen also has shown remarkable impact of ICT in school education to shift the role of teacher and students.

There is a high pressure for learning organizations to incorporate ICT into their system as stated by UNESCO (2009), learning institutions are under pressure to prepare students for the changing face of society and the workplace, forcing the issue of integrating ICT into education. Pelgrum and Law (2003) have stated that many governments, by the end of the 20th century, have been undertaking initiatives to innovate education because they have to prepare their citizens for life-long learning, team work, and build knowledge society. "To be literate today requires the ability to interpret and write various codes such as icons, symbols, visuals, graphics, animation, audio and video" (Nallaya, 2010). This scenario shows there exists revolution of ICT around the world and adopting evolution in the field of ICT is a major concern today for school education.

In the context of Nepal, Shakya (2010) said that ICT offers opportunity to raise educational standards in schools and Pudasainee (2009) identified that the promotion of ICT based teaching learning in Nepalese school education as one of the primary areas, although it requires improvement.

As a summary of these literature reviews, I see, ICT in education can foster innovative practices in educating pupils in their school level education and it can change the whole education system to modern approach from the traditional practices. There are numerous potentials of ICT in education despite some challenges for the developing countries like Nepal. Literatures show education without ICT in the 21st century will have no value at all.

Reviews of the Past Studies

I have reviewed many literatures on the use of various ICT tools, equipment and services in school education and the education outside the formal schools. Reviews of some empirical research based journals that are closely related to my research area are presented in this section. However, there are very few in the context of Nepal.

Devi, Rizwaan, and Chander (2012) found that using multimedia in education results in the increasing productivity and retention rates, because people remember 20% of what they see, 40% of what they see and hear, but about 75% of what they see and hear and do simultaneously.

In a research, Hwang, Tam, Lam, and Lam (2012) found that animations are beneficial to learning as supplementary materials. Their findings indicated that animations were a good media to explain concepts more clearly, and to improve understanding of the content of topics, as to students' perception. Animations were particularly helpful in explaining complicated and dynamic concepts, which were

otherwise difficult to represent through mere text or static images. In their research, students reported that they became more interested in learning, and the animations facilitated memorizing of the content. However, they also emphasized illustrations; narration and speed determine the effectiveness of the animation. The summary of the research findings is an effective animation has power to simplify complicated and dynamic concepts, improve understanding, increase interest in learning, and facilitate memorization.

Video technology as a part of ICT can be a best way to enhance quality of education in the context of Nepal. This technology can be used even in rural areas where access to computer and internet are limited. Pouezevara and Parajuli (2007) in a case study research entitled "Using Video Technology for Primary School Teacher Training in Rural Nepal", found positive aspects of using technology in teacher training. Findings are presented below:

> Video technology makes training interesting, exciting, unique, and fun creates learning environment. Teachers could know about their performance, get feedback, and identify weaknesses. Permanency: having a record for a long time of teachers' performance and activities. Learning is more effective, practical, real, and meaningful. Visual/sound is more effective way of learning. It is helpful for trainers to conduct training (organization, workload, and more active). Various topics (including subject topics) related to training were shown. Teachers can view colleagues activities, share best practices, get to know other places; trainees were encouraged for participation, discipline, support and cooperate to learn; could learn about technology; arouses competition among participants; can analyze overall training; as a tool for

> entertainment: and can show to students and parents. Video technology is really a good in fostering fun learning and motivation. (p. 70)

Lam and Tong (2012) found two ways of using digital devices in the classroom instruction. The first is guided use in which teachers have controlled and well-defined tasks for students to work on their mobile digital devices such as notebook or tablet computers in the classroom. Likewise, another is free-use approaches where students use the devices in the classroom for their own purposes. There are both negative and positive aspects of allowing digital devices in the classroom. Their research revealed that the digital devices are useful in improving their motivation to learn, enhancing meaningful course-related interactions in class through online communications, enabling students to actively explore information for learning as they looked for online resources, making students appreciate the teacher was considerate to students' needs, and making students more willing to attend class. However, the research also pointed out the potential danger of distraction in classroom learning when mobile computers are allowed in the classes.

In a study on effectiveness of e-portfolios, Mok (2012) pointed out the "Need for teachers to be aware of the importance of student preparation in the implementation of assessment innovations" (p. 415). Kilbane and Milman (2005, as cited in Mok, 2012) found that the electronic portfolio assessment offers learners a multimedia platform to design, produce and distribute their portfolios; for example, learners can enhance their portfolios using a combination of digital media including animation and sound effects.

According to Venema and Lodge (2013), "digital ink provides a potential avenue for increasing interaction in lecture sessions whilst not limiting the capacity for capturing all aspects of the session" (p. 20). Venema and Lodge also found that

students benefited from this innovation. Students generally agreed or strongly agreed that they found the lectures organized and engaging. Furthermore, they also stated that the concepts were easy to follow and they felt that the teaching methods used enhanced their learning. Consequently, the lectures using digital ink were engaging and lead to improved learning outcomes.

Cheng, Lou, Kuo, and Shih (2013) found that Digital Game Based Learning (DGBL) closely combines educational content and games on computers or online to stimulate learners' interest and provide them with the opportunity for continuous learning as well as ultimately to enhance their learning effectiveness.

Niles (2006) and Burgad (2008) found that there was a paradigm shift in terms of classroom dynamics, communication and belief around the impact of 1:1 laptops from both teachers and students. In addition, students, teachers, and parents all perceived increased student engagement, motivation, and organization, along with improved research, writing, and editing skills. Using those laptops, students also experienced significant gains in mathematics (as cited in Crook, Sharma, Wilson, & Muller, 2013).

In a study about a mind map based collaborative learning approach for supporting creative learning activities and enhancing students' innovative performance, Wu, Hwang, Kuo, and Huang (2013) experimented the effectiveness of the proposed method. The experimental results show that the proposed approach significantly enhanced the students' innovative performance in a project-based learning task.

Pudasainee (2009) found that 90% schools under his study have introduced computer education establishing computer lab. However, application of ICT tools for teaching learning in schools is heavily intensive with the use of radio/cassette players

and computers. In addition, 50% of administrators and teachers are not trained to use ICT.

Reviews of the past studies have provided a strong conceptual base and knowledge of some possible components applicable in the field of my study. These literatures are also useful to establish a common understanding of the whole research findings and link with meaning while interpreting the primary data of the study.

Research Gap

I believe that practices and innovations are contextual. Innovation depends on various factors as described by innovation diffusion theory, mainly the purpose, the ways of using the means of ICT and skills of users. It is also highly dependable on the strategy of origination and initiation of school leaders.

Scholars are afraid of 'digital divide' forecasted for the 21st century due to the revolution in ICT. Many researchers have carried out studies to see the effect of ICT and its innovation in education around the world. I found those studies are reflected onto their respective setting and practice of education. That does not represent the context of my research. Very few researches have been carried out in Nepal to see the educational practices that explore the use of ICT in schools. Those researches capture only the status of the use of ICT objectively. No single study has been found to capture the whole scenario of ICT in Nepalese schools' subjective perspectives. Thus, this research has been a milestone to give an overview of potentials and challenges of ICT use in schools for various purposes capturing perceptions and practices of students, teachers and administrators in the context of Nepal.

Conceptual Frame Work

I developed the following conceptual framework for this study to be guided k throughout the process of research.

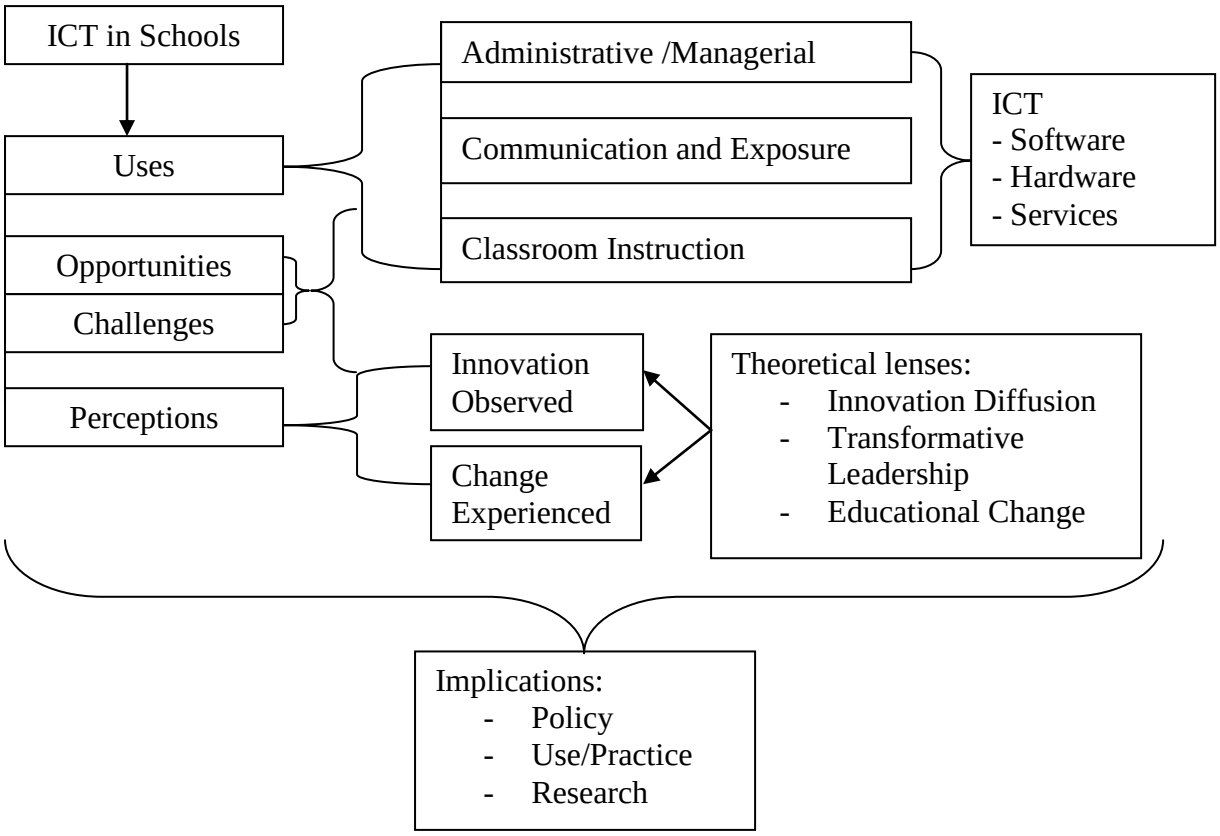


Figure 4. Conceptual framework

Through this conceptual frame, I have planned to see three major aspects of contemporary use of ICT in schools under the use that are administrative, instructional and communication. Hardware, software and services are further parts to include under use. Innovation observed and changed experiences are drawn from the perceptions of participants and are analyzed from the theoretical perspectives. The study has drawn implications for policy, practice and research.

CHAPTER III

METHODOLOGY

It is true that my eyes to view the world and theoretical influences play a vital role in internalizing the whole research process, its phenomenon and outcomes. Therefore, in this chapter, I have discussed the guiding philosophical and theoretical positions for my research project. The selection of philosophical grounding, methodological frameworks and approaches appear to hold some promise when researching about the ICT in education. As I understand research philosophy attempts to develop general explanations for phenomena of study and personal stances of a researcher. They are suppositions or systems of ideas used to explain a particular phenomenon on the basis of general principles.

This chapter also reflects my discussion on how I planned to dive into the research. I have traced out the research frame and data collection techniques that are suitable to my study. Sub-sections include the ways of selecting informants, sources of data with the process of collection, schemes for analysis and interpretation, ethical considerations and ways to maintain the quality standards.

Philosophical Stances

As my feelings, beliefs and assumptions play an important role in making me knowledgeable. I believe realities in the world are neither fixed nor single rather they are contextual and differ from person to person and place to place. The real world is not measurable phenomenon as in positivist research. People have individually different mindset; life style, culture, leaving standards, and working phenomenon consequently construct the realities in different ways. As in Guba's (1990) words,

"Realities exist in the form of multiple mental constructions, socially and experientially based, local and specific, dependent for their form and content on the persons who hold them" (as cited in Willis, 2007, p. 9).

I have set my philosophical stances as follows to view, explore and understand the world of reality (use of ICT in schools).

Ontology

As I understand ontology is all about the deal with the nature of reality through the process of research. I believe the social reality is the product of individual consciousness and cognition; I like to emphasize the inter-subjectivity. In relation to my research project, there is no single reality in education to accept the innovation of ICT. As the use of ICT in schools differ depending upon the policy, strategies and readiness, available infrastructure, financing, trained professionals, technical supports and other circumstances of the schools; the perceptions and practices towards use of ICT in education differ as well. In addition, the realities depend on individual's real world experiences, knowledge and the context of the institutions "Qualitative researchers stress the socially constructed nature of reality, the intimate relationship between the researcher and what is studied, and the situational constraints that shape inquiry" (Denzin & Lincoln, 2005, p. 10).

Epistemology

For me, research is a journey of researcher and participants together to create knowledge exploring the social meaning. Thus, the knowledge is co-created. It is not an absolute thing that we find it out there. As a researcher following interpretive paradigm, I believe on the knowledge and understanding rooted in our everyday world, people's experience while encountering their everyday experiences paves the path for truth and understanding of life. It is not wise to generalize the context of two

different schools for the use of ICT. Meaning making cannot be an objective exercise and due considerations are given to the different contexts. Therefore, I believe that the knowledge is created by the process of an interpretation and meaning making over various forms of data collected from the field of research (Bryman, 2008, p. 336). In addition, the source of knowledge is the inter-subjective discourse with the research participants.

Axiology

I value the use of ICT in schools as an innovation for educational practices around the world. ICT can foster motivation of learners, quality of education, efficient administrative management, and effectiveness in entire communication in schools. Educating is not simply imposing theories; it is also development of life skills to be competitive in the world of 21st century. Therefore, my value is placed on innovative practices of emerging technology and its use in school education. I am guided by this value to re-conceptualize and explore experience of research participants and draw perceptions on the use of ICT in schools.

Research Design

By nature, this research is qualitative following the notion that "qualitative research is defined as research devoted to developing an understanding of human systems, be they small, such as a technology-using teacher and his or her students and classroom, or large, such as a cultural system" (Savenye & Robinson, n.d.). Data are taken from primary source in natural settings. Perception on ICT use, its opportunities and challenges in schools are explored interpreting meaning over the interview narratives of participants. Interview narratives are the reflections of participants' everyday experiences of ICT use. At this point, I agree with Creswell (2012) who defines qualitative research as a means for exploring and understanding the meaning

individuals or groups assign to a problem. Creswell further focuses that the qualitative research seeks researcher's interpretation or meaning of the data. In addition, I followed Denzin and Lincoln (2013) who advocate that "qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (p. 7). I liked the metaphor 'researcher as a quilt maker' in the words of Denzin and Lincoln that is a quilt maker stitches, edits, and puts slices of reality together.

On the other hand, this research is guided by my ontology and epistemology (belief and knowledge) therefore it stands on interpretive paradigm. To justify my claim as an interpretive researcher, I agree with Denzin and Lincoln (2005) who said, "Every research is interpretive when it is guided by researcher's feelings, beliefs and assumptions" (p. 22).

While aiming to explore and unearth the uses, opportunities and challenges of ICT in schools capturing the perception of students, teachers and administrators on top of their everyday experience in 'ICT friendly teaching learning environment'. This certainly demanded the qualitative method to gather information, analyze and interpret the meaning. Another reality is that qualitative research does not belong to a single discipline; nor does qualitative research have a distinct set of methods or practices that are entirely its own" (Denzin & Lincoln, 2013, p. 11). Therefore, qualitative researchers have wider flexibility to set methods of site selection, participants' selection, data collection, analysis and interpretation.

Qualitative method helped me to reveal and understand the subjective experience of students, teachers and administrators of schools as perceived by them. I also agree with Creswell (2007) in the sense that qualitative study describes the

meaning for several individuals of their experiences. Therefore, in this research, I have described the meaning from the field data to uncover the reality of ICT use in schools as perceived and experienced by teachers, students and administrators during their every-day practice.

Selection of Schools and Participants

"In an interview study, it is connected to the decision about which person you will interview" (Flick, 2007). The study site and participants were purposively selected to reach the participants with rich information related to the subject of the study. My purpose was to explore opportunities and challenges of ICT in school as perceived and practiced by students, teachers, and administrators. Keeping the purpose in mind, I limited my study site to three secondary schools of Kathmandu Valley. I selected two private schools and a public school. Also, see 'Appendix E' for a brief introduction to the selected schools.

Table 1 below shows the number of selected participants from the selected schools.

Table 1

Number of participants

Schools	Type	P	C	T	S	Total
School A	Private	1	1	3	2	7
School B	Private	1	0	1	2	4
School C	Public	1	0	2	2	5
Total		4	1	6	6	16

P: Principal, T: Teacher, S: Student and C: ICT Coordinator

The schools are selected on the basis of information rich cases under purposive-extreme case sampling. Patton (1990) explained, "Extreme case sampling

is used to select participants who exemplify characteristics of interest" (as cited in Denzin and Linclon, 1994, p. 229). Here, extreme case refers to the selected case or site or research participants with full of information demanded by research question and the purpose of the study. To maintain the notion of extreme case, I have selected schools where the use of ICT has been adopted. The schools where one can easily observe and experience ICT friendly infrastructures and facilities used for the facilitation of administration/management, classroom instruction, and communication and exposure are selected. However, the public school is selected considering that the school is piloted for OLPC project and every child from class II to class VI use laptop for study.

Moreover, highlighting the method of purposeful sampling, Patton (1990) argues that information rich cases are those "from which one can learn a great deal about issues of central importance to the purpose of the research. The purpose of purposive sampling is to select information rich cases whose study will illuminate the questions under study" (p. 16). To get enough information demanded by the research questions, I used purposive sampling and maintained homogeneity of research sites and participants such as the schools using ICT, teachers teaching with ICT and students learning with ICT.

There are three categories of the participants from each school: Administrators (P and C), Teachers (T), Students (S) as shown in the table 1 above. Also, see 'Appendix D' for a brief introduction to the selected participants. In this research, "Administrators" refers to the head teacher/principal or ICT coordinator of the school. Likewise, "Teacher" refers to those teachers who are in the leading role to use ICT in classroom instruction other than a 'Computer Science' subject teacher and "Student"

refers to a representative of students who is forward in ICT related activities in the school recognized by school administration and teachers.

Tools and Process of Generating Information

As guided by qualitative research method and agreeing with Creswell (2007) "open-ended questions may also be asked, … focus attention on gathering data that will lead to a textural description and a structural description of the experiences, and ultimately provide an understanding of the common experiences of the participants" (p. 61), I used open-ended questions in my interview schedule.

I also aligned with the idea of Erlandson, Harris, Skipper, and Allen (1993) agreeing with their statement "Interviews also help the researcher to understand and put into a larger context the interpersonal, social, and cultural aspects of the environment" (p. 85). To be directed towards thematic sequence I realized to schedule semi-structured interviews because "thematic direction is given much more preference" (Flick, 2006, p. 205) in semi-structured interviews. Interviews were focused directly on the topic under discussion. Interviews were focused; I was always guided by the interview scheme. The semi-structured interview schedule with open-ended questions helped me for in-depth probing. Thus, I focused interviews to explore perception of students, teachers and administrators on top of their practice in using ICT in schools. In doing so, I was consciously guided by research questions and conceptual framework. I prepared a general interview guideline (see 'Appendix B') for interview before preparing interview schedule to the specific group of participants.

Kvlae (1996) states that the qualitative interview attempts to understand the world from the subjects' points of view, to unfold the meaning of peoples' experience, to uncover their lived world prior to scientific explanations. Therefore,

the way by which I could collect the information appropriately and interpret them was only the interview. Thus, the data for this study were generated through interviews. Total 16 participants were selected and interviewed as key participants. While conducting interviews, a conversational relationship with participants was maintained. I had gone deep down probing into the ideas and reflections of students, teachers, and administrators about their ICT friendly practices in schools.

A preliminary study was conducted in a school to evaluate the interview schedule (see 'Appendix C') and observation checklist (see 'Appendix A') as the tools for data collection. Following Krathwoh (1993), "some forms of observation are the prime methods of the qualitative approach. Observation is like a flashlight: it lights up only where it is directed" (pp. 314-315). Observation was another tool for data collection in my research.

To ensure whether the tools are communicable to the research participants, I conducted preliminary data collection sessions before the final data collection. During the preliminary session, I interviewed one each student, teacher, and principal from a school. The school was not under the selection for final data collection. I also used observation checklist in the school where preliminary data collection sessions were conducted. Similarly, the tools were revised and finalized after the preliminary study.

During the real data collection, interviews were held after the observations. First, I completed observation of ICT infrastructures installed in different places of the school including in the classroom (see 'Appendix G'), library, labs. I also observed the classes to see how teachers and students access to those facilities available in the school in real time classroom instruction. More particularly, the method of use, purpose of use and types of tools were observed. After observation

was over the interviews were conducted. Observation check list and field notes were the tools for such data collection.

Thus, I used 10-15 minutes of every visit to familiarize them about the notion of my research project. In the early stages of the research, clear sets of ethical and practical guidelines were agreed with the participants. Participants who did not agree were not forced.

Each interview sessions lasted for 30-60 minutes. Until I felt all aspects to address the research question at the point of data saturation, I re-scheduled the interviews. Intervals of at least a week between two interviews were maintained. In the second interview, dilemmas emerged in the first interview and missing points were focused. The second interviews were conducted via telephone. Likewise, research participants were encouraged to share critical incidents, in the form of anecdotes, stories or experiences, about their practices of using ICT in schools.

The main instrument for data collection was a smart phone with the capability of high quality audio/video and voice recorder as well as 12MP camera. I have also used participants' feedback in my research because Boyce and Neale (2006) highlight feedback from the participants represent their response in qualitative research when information is collected through interview.

Moreover, I also used memos as a supporting technique in collecting the data. Goulding (1999) defines memos as "notes written immediately after data collection as a means of documenting the impressions of the researcher and describing the situation… which help to re-orient the researcher at a later date." (Goulding, 1999, p. 9). These memos are vital as they provide a wealth of ideas which can be revisited in order to map out the emerging theory. Thus, I used field notes to capture the major

points during the informal sharing of their everyday teaching experiences, before and after the interviews.

Denzin and Lincoln (2005) stated that there are mainly five primary types of qualitative interviews: informal, conversational; semi-structured; standardized, and open-ended. Researchers are free to deploy one or more than one interview strategy. Therefore, I prepared semi-structured schedule and open-ended question sets prior to the interview. In addition, I also used field notes to describe events that occurred before, during and after the interview sessions.

I also gathered the data primarily through close visual inspection of a natural setting rather than actively engaging members of a setting in conversations or interviews. I conducted direct observations as an initial approach to understand a setting, a group of individuals, or forms of behavior prior to interacting with members. Classes were observed where ICT friendly delivery of lessons was performed. Before conducting the interviews, I observed the class of the interviewee teacher. This method helped me to connect his/her class activities in interview probing. Forms of data gathered from direct observation were field notes and video records, with detailed behaviors, conversations, or setting. Here, I adopted the idea of Hicolas that the direct observation as a research method is most appropriate to open, public settings where anyone has a right to be or assemble. They can also stand-alone, to explore topics in their own right in depth (Hcolas, 2004).

Besides audio data from interview, video and field notes from observation, I also collected some photographs related to ICT, hardware, infrastructure, facilities and its implemented scene and activities in the technological atmosphere. In addition, I collected data by reviewing more literature. The literatures are covered from the

various books on the related subject and recent online open access journals are published in various websites.

Analysis and Interpretation of the Data

In qualitative research, data analysis is considered as the process of making sense from the information collected "preparing the data, connecting the variables, and drawing deeper understanding, while presenting an interpretation of the larger meaning" (Creswell, 2009). Agreeing with Creswell, I collected data, transcribed all audio interview (see 'Appendix F') and video data into text. Audio video player and text processing software tools were used to transcribe the audio and video files. All transcribed texts were analyzed for the themes in the first stage. In this process, I was in line with Creswell's idea, "During qualitative analysis, the researcher collects data, analyzes it for themes, and reports the findings".

After converting all data into text narratives, those were processed and analyzed in accordance with the outline laid down for the purpose, research question and conceptual framework. To maintain the notion of 'systematic qualitative analysis', I prefer Anderson (1998), who explains that this approach is used to "organize the data into descriptive themes that emerged during the data collection and preliminary analysis" (as cited in Ipinge, 2003, p. 41).

In processing the data, I used the ways of transcribing, editing, coding, forming quotations and themes so that they are ready for analysis and interpretation. Use of computer software made it easy for me in this process. "Now, quite a range of software programs is available, mostly focused on the area of qualitative data analysis" (Flick, 2006, p. 359). Therefore, I used a demo version of software ATLAS. ti 7. 0. According to the software manufacturing guidelines, this software supports

qualitative data analysis and knowledge management in education, business, administration and research.

ATLAS.ti 7.0 is widely used software for qualitative data analysis. The software has capability of registering transcribed text or doc files, literatures in the form of pdf files, picture files, videos files, memo text files, and sound files directly as primary documents[5]. Researchers can develop some codes to cluster the texts from different primary documents into themes. Quotations can be grouped by codes. Moreover, texts, audio clips, video clips, memos and picture notes clustered under the same code can be extracted and exported in a separate file. Counting frequency of words or phrases for the purpose of deep analysis is possible. The major facility of the software is to compare and contrast data within and among the primary document(s). I used all possible features of the software applicable for the analysis of my primary field data. See 'Appendix H' for sample output of coding generated by this software. The software supported me to code texts, create quotations, generate themes and filter the texts under clustered coding.

In this study, I have blended the reviewed literatures with field information to see how the knowledge and information gained from the literature are in compliance with the field information. It is allowed in qualitative research as "an extension can be considered through theoretical generalizability, where the reader of the report is able to assess the evidence in relation to their existing professional and experiential knowledge" (Smith, 2008, p. 4). Likewise, personal experiences, observation during the study period, previous study experiences, various books, reports and literature relevant to the study were reviewed, analyzed and used to understand the problems emerged out there in the field data.

[5] Primary document is the document registered with the software ATLAS.ti.7.0 as the source of data for analysis.

I used the concept of 'real time data processing' for data analysis. For me, this means starting the analysis process right after the first interview. I started transcribing, coding, sorting, filtering and drawing themes from data as soon as I obtain data from the field. This strategy supported to identify significant issues early in the process, and focuses on what to look for in subsequent interviews and observations. Considering the experience, in previous data collection and obtained data, each successive interview schedules and observation guidelines were modified as per the need of the researcher.

As suggested by Patton (2002), "Inductive analysis approach" was applied to analyze the data obtained from interviews. An inductive analysis involves discovering themes and categories in data where findings emerge out of the data, through the analyst's interactions with the data. The inductive approach is used in two phases: (1) a vertical analysis according to which each of the participants' interview was analyzed separately, and (2) a comparative, horizontal analysis to look for common patterns and differences (Devos & Bouckenooghe, 2009, p. 180). Finding a communing meaning was the main notion of using this process in analysis. It also helped me to reduce redundancy in the data interpretation.

Thus, through the process of analysis discussed above, common themes and key findings were generated for interpretation as "interpretation of the data is core of qualitative research" (Flick, 2006, p. 306). Many themes and categories were emerged through the process.

Ethical Considerations

Research ethics are considerable while interacting with the research participants. Gaining access to the site, making agreement with the participants,

making them comfortable to support throughout the research process, and obtaining trustful data require a careful dealing with ethical aspects.

I made a formal letter from the university and send its copies to the heads of the schools to inform and request them for their permission to select the school as my research site. I also have an experience of rejection. One of the private schools rejected my request. Then I immediately selected another school to fulfill the quota of the sample schools. As soon as I got the consent from the school heads to select the school as research sites, I went to the participants.

I know, the participants must agree to support as volunteer co-researcher. There must be an assurance to the participants that there is no harm to participate. A letter of agreement was prepared to distribute to the participants (see Annex I). They had autonomy in deciding whether to take part in the research process or not. As a result of this autonomy, two of the participants from a school dropped out and I faced a problem in the middle of data collection. However, I requested other two teachers as substitutes of the dropped out participants. Anonymity is addressed in the dissertation by pseudonyms. When I felt contradictions while interpreting the data, I asked the concerned participants and got confirmed. Plagiarism is avoided by true citation and references.

As I believe ethical considerations are an important matter in qualitative research, I have kept myself within the framework of research ethics, i.e., I had got to abide by the research ethics from gaining permission to entering the site and selecting the participants to the presentation of the final report. I also made arguments, analysis, and conclusion with the support of data and truly cited literatures. With reference to Madison (2005) and Flick (2006), I prepared “Codes of ethics” as follows.

Participants were valuable and they had right to be informed in time about the purposes, methods, and intended uses of the research. So, they were informed about the procedures used in the research, the risks and benefits of participating in the study, and their rights as research participants. The *informed consent* to participate on the basis of information given to them about the research project was gained to start data collection.

Participants' participation in the research was voluntary. They were not forced to take part in the research believing that the participants after being clear about the research project can provide the fullest possible information. Thus, *voluntary participation* of the participants was assured.

I was careful about the dilemmas and moral issues that might arise during the research. Therefore, I took extreme care to *avoid any harm* to them. In addition, I maintained harmony with the participants. They were treated in an ethical manner, not invading their privacy and not deceiving them about the aims of the research.

Moreover, they were not encouraged to provide any kinds of biased data by forced probing, and on the other hand, they had full right to *denounce their agreement* to take part in the research. Therefore, their identity, values and decisions were highly respected.

Likewise, the c*onfidentiality* of the participants is highly maintained in writing the dissertation. Instead of mentioning their real identities, some pseudonyms are used like P1, P2, P3 for principals C1 for ICT coordinator, T1, T2. T3,… for teachers S1, S2, S3,… for students. Similarly, the participants were informed that the data they provided (recording and transcript) would be kept confidential, and their identities and that of their schools would not be revealed to the public.

Similarly, I have maintained fairness and originality in my research report avoiding possible *plagiarism*. I have presented the exact citations and references when ideas or theories are incorporated. It is a great attempt to make a balanced reporting avoiding personal biases toward a particular theory, idea, or conclusion to ensure *fair treatments of the data*.

Quality Standards of the Study

For me, understanding context in its natural setting, where the researcher does not attempt to manipulate the neutrality and context of interest is the main strategy of maintaining quality standards in a qualitative research. Findings of a qualitative research are drawn from real-world settings where the phenomena unfolds naturally (Patton, 2002).

Patton (1990) claims that the triangulation of data is used to ascertain the credibility of the findings. Denzin and Lincoln (2005) state, "terms such as credibility, transferability, dependability and conformability replace the usual positivist criteria of internal and external validity, reliability and objectivity" (p. 24) in qualitative research. Quality standards are maintained using credibility. The credibility is used as an appraisal to determine whether the research findings represent a 'credible' interpretation of the data drawn from the participants' original data or not. However, there is no appropriate way to evaluate the qualitative research "the problem of how to assess qualitative research not yet been solved" (Flick, 2009, p. 384).

For the credible result of research, Guba and Lincoln (1985) have suggested four ways to maintain trustworthiness in a qualitative research "credibility, transferability, dependability and confirmability" (as cited in Bryman, 2008, p. 337). Each of these is discussed in relation with my strategies of maintaining quality

standards of this research. In addition, I have taken steps towards maintaining trustworthiness in this research from the very beginning of the data collection phase. Moreover, cross referencing of the data collected from the field with the review of literature has helped to enhance the credibility of the research and hence maintain the quality standards.

In order to maintain consistency, the criterion of dependability is maintained. For that, a set of guidelines were prepared (interview guidelines, observation guidelines see appendices) and probing points were included. As a result, participants from all schools with different categories were asked the same questions and their answers were examined against the same set of probing points. Conformability of the study was maintained by emphasizing interview and observation records and maintaining proper referencing mechanisms. It was involved in reading the transcription of interviews, observation, and field notes. I took help of the concerned experts to avoid errors that occurred while transcribing and translating the interviews in English from the Nepali language. However, many interviews were conducted in the English language and transcribed as they were in the original versions of the participants.

Denizen and Lincoln (2005) said that qualitative researchers should address 'triple crises': crisis of representation, crisis of legitimating, and crisis of praxis. In order to address the crisis of representation, students, teachers and administrators from different categories of schools were selected such as private and public schools. Also the participants (teachers and students) from different level of schooling: primary, lower secondary and secondary levels were selected. Crisis of legitimacy is associated with the sense any text makes to reflect the real context and the individual's daily experience (unbiased presentation of data). For this, reflexivity of

the research participants and researchers are maintained. Stories from the participants as the reflection of their real-life (every day) experiences of teaching-learning with ICT are presented. Meanings are co-created in a manner of continual dialogue with the participants, researchers' reflection and literatures. Crisis of praxis is associated with the combination of theory and practice "the significance of the research findings to change the world of reality" (Onwuegbuzie, Leech, & Collins, 2008). To address this crisis, I have clearly outlined the significance of the study. Contextual example, reflections of the participants (real world practitioners) provide worthwhile evidences for readers of this report so that they may replicate the findings into their practices on the basis of knowledge (theory) they already have in mind. In addition, I have focused on the reflection of their practices and how they have been planning their future programmes stepping on the past experiences and theoretical knowledge. Therefore, I have moved towards pragmatism and adapted many perspectives, observed real situation and achieved deep understandings of the use of ICT in schools' educational practices.

Data triangulation is yet another way to maintain the quality standards of research. Denizen and Lincoln (2005) described three types of data triangulation: (1) time, (2) space/context, and (3) person. In addition, according to Denzin (1978), Creswell (2007), Patton (1990) and Wagley (1995), there are four types of data triangulation for credibility. Those are (1) the use of a variety of data sources in a study, (2) the use of several literatures based on contextual issues and empirical studies, (3) the use of multiple perspectives to interpret a single set of data, and (4) the use of multiple methods to study a single problem.

I understood both versions of definitions about triangulation in the qualitative research. Therefore, following them, triangulation was adopted to obtain the data from

different contexts and sources and analyzed from multiple perspectives and interpreted blending various literature supports. It helped me to uncover the same information from more than one vantage point and describe how the findings occurred under different circumstances. Triangulation in process: data were generated through interview, observation and memos. Triangulation in time: I visited participants at different time interval for first, second and third phases of interviews. For person triangulation, a group of different people such as administrators, teachers and students were selected as participants. For context: different types of schools (private and public) were chosen.

Lincoln and Guba (1985) posit that this is the most crucial technique for establishing credibility (as cited in Cohen & Crabtree, 2008). Although, this technique has several critics, I have carried out the *member check* method as "it provides an opportunity to understand and assess what the participant intended to do through his or her actions" (Cohen & Crabtree, 2008). I adopted this process by summarizing the data and allowing the participants to correct errors of fact or challenge interpretations; conforming interpretations and data gathered at previous interviews; and providing the final review of the entire report to the participants.

To maintain quality standards of the research, I have verified the report from the concerned subject specialists (professor) in the qualitative research. Methods initially adopted were revised in consultation with the specialist. I have incorporated all the feedbacks given by the concerned research specialist. As the prescribed format of writing and language plays secondary role in maintaining quality standard of the research report, these are ascertained by evaluating the report from the APA and language experts.

Finally, this report is presented with an adequate list of references as a complete evidence of in-depth study consulting different books, recent journals and theories. I have acknowledged them in the text indicating citations and in the references. In addition, I followed the prescribed APA 6th edition of formatting the dissertation while writing this final report.

Summary

As presented in the conceptual framework, I have framed the methodology to represent a clear outline of the research strategies. I presented my philosophical and methodological stances. I discussed through the chapter about how and why qualitative research method is adopted and interpretive paradigm is considered. I have also presented data collection tools (interview schedule, observation outline and check list). In addition, as discussed in the chapter, the instrument for data collection was a smart phone with audio/video recording and still camera. ATLAS. ti 7. 0 software was used for the data analysis: transcribing, coding, forming quotations and theme induction.

In the chapter, I planned to interpret the data mapping with conceptual framework, theory and literature. In addition, I planned to link the data vertically and horizontally to examined inter relationship among different sources of data such as interview, field note/memo, observation, reflective diary.

I also have discussed the strategies that I adopted to maintain the quality standard of the research and this report. In this regard, I have clearly mentioned the strategies such as triangulation, dependability, conformability, addressing triple crisis (representation, legitimacy and praxis) and the member check.

Through the process I realized the major methodological challenge for a qualitative research is the flexibility it allows. Moreover, the summary of the research design is presented as a methodological framework below.

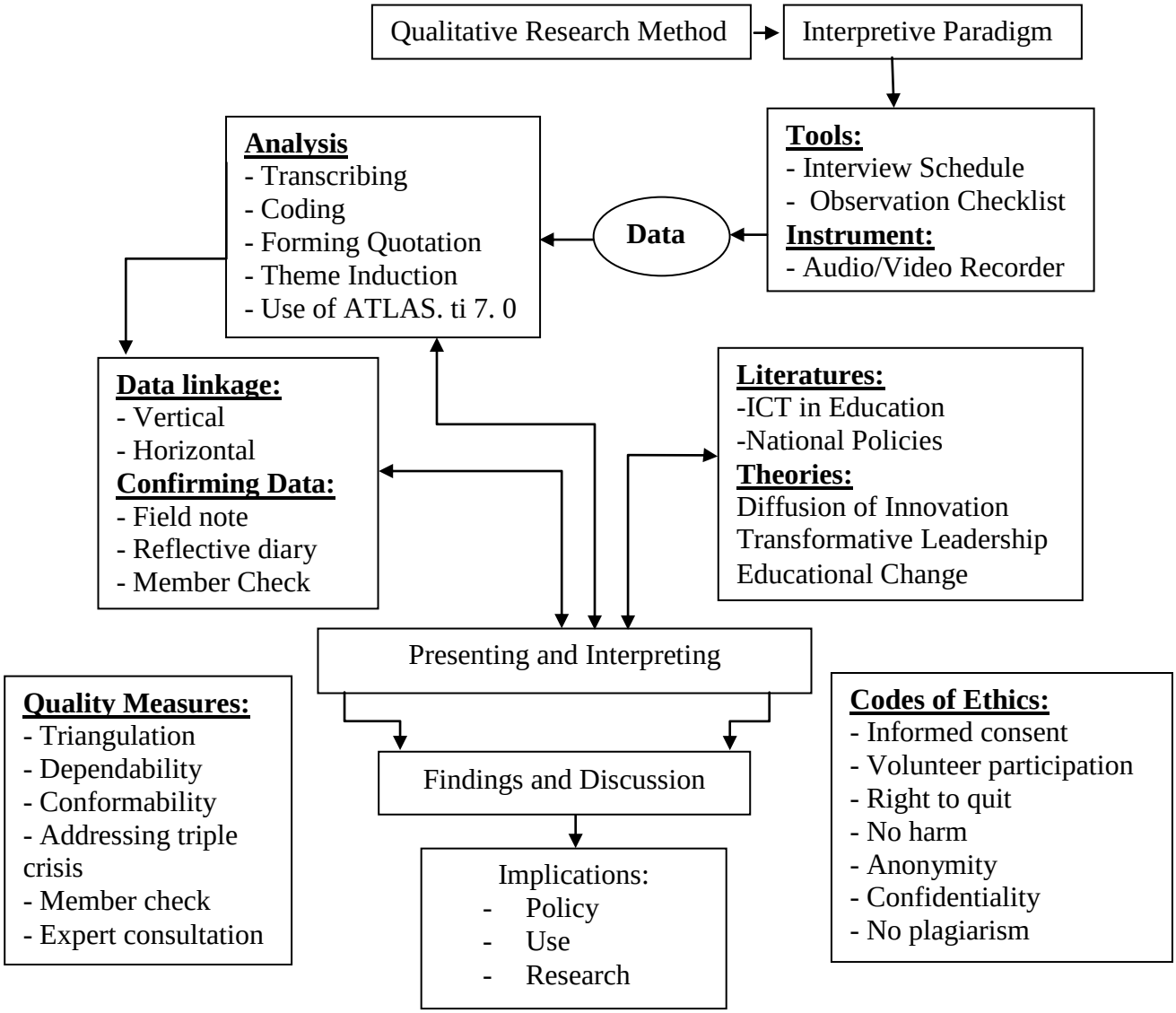


Figure 5. Methodological framework

CHAPTER IV

USE OF ICT IN SCHOOLS

This chapter is designed to explore the answers to the first and second research questions. Two major sections are designed to address each question. The first question desires to get the answer to 'how has ICT been in use in the schools?' Likewise, the second question seeks to explore the perceptions of students, teachers and administrators regarding the use of ICT in schools. Field observation and interview data show that ICTs are used for various purposes in the schools. Innovation observed and change experienced are subjective to the level and category of the research participants. The uses depend on the purpose of school and type of ICT tools. The field data are presented and interpreted thematically. The themes uncovered out of the data are ICT tools in use, ICT for school administration, ICT for classroom instruction and ICT for school exposure. Perceptions of students, teachers, and administrators are also presented in this chapter because the perceptions were based on their everyday use.

ICT Tools in Use

According to UNESCO (2009), ICT tools make information exchange easier, faster and cheaper, it has become clear that ICT tools offer a range of benefits for education. In particular, ICT tools offer the potential to make education more accessible, improve quality of education and provide an effective and efficient management tool. However, “the educational effectiveness of ICTs depends on how they are used and for what purpose. And like any other educational tool or mode of educational delivery, ICTs do not work for everyone, everywhere in the same way”

(Tinio, 2003, p.17). Therefore, I am presenting and interpreting the field data about what and how ICT has been in use in schools.

There are many devices, tools, and services of ICT used by schools. My observation checklist shows ICT in use are CCTV[6], Attendance Machine, SIMS/School Dbase, Various Software, IP/Smart Boards/Active Board, Slates, Laptop, Multimedia Projector, Sound System, CD/DVD, E-mail, Internet, Radio, TV, Modem, Wifi, Networking, Desktop Computer, Laptop, Printer, Smart Phones, Tablet PC, SMS, Online Library, Websites, and Digital Songs.

Stating the ICT facilities available in his school, P2 said, "Our school has the internet facility and Wi-Fi". He further added, "We have other devices like desktop computer, printer, ADSL internet, and photocopy." Practice of a new tool "clone system"[7] was found during the observation. Similarly, a local server system was managed to access "e-pustakalaya" from the laptop during the classes.

Likewise, the principal of school C stated the use of CCTV, Finger touch attendance machine, intranet, internet, SIMS, website and various software at his school. During observation in school C, I also found a well-equipped computer lab with multimedia projector, library with the e-library system.

The cause of school A was different. It was found the best ICT user among the three schools selected for the study. The main feature of the school was its highly equipped classroom environment for ICT based activities. Each of the classrooms were equipped with all possible ICT hardware and software required for a classroom. Mainly, the use of active board in each classroom was interesting. The main attraction about the ICT use in the school A was the use of the active board. Details on the use of the active boards in school A is discussed in the section given below.

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[6] Close Circuit Television are used for security surveillance

[7] Is a system of transferring file from one laptop to another like Bluetooth file transfer system

A Big Computer on the Wall

One of the schools has the Active Boards in each class. The board is the multimedia (Audio, Video and Sound support) embedded with a projector. In addition, a computer system is placed in each class. The board is connected to the computer and additional supportive devices are Slates[8]. It works as a screen touch computer on the wall.

Expressing the usability of the Active Board, a teacher said, "I felt that this is a huge support for the teachers because it is so simple and very much meaningful" (T1). In addition, teachers (T1), (T2), and (T4) all explained about the feature of the Active Board in the same way that operating the whole computer technology is possible through the Active Board. It works as a big computer monitor/screen on the wall that can be controlled using a magnetic pen as the mouse. The Active board is the board, which provides an easy way of learning with many more functions than a normal computer. The best feature is that the board can be used as a classical white board as well. While using the Active Board as a classical white board, the text we write can be saved and translated to digital text in desirable fonts.

The experience of the Active Board is like using a big computer screen attached on the wall and the system to be controlled with a pen. Moreover, the activities on the Active Boards can be made more interactive via the use of Slates. Experience of a teacher (T3) about the use of Slate with the Active Board is presented below.

> There is a device like remote control that helps student to participate in the activity on the board like question answer/quizzes. In our school, we have 30 such devices. We can distribute the device to each student of a class at a time.

[8] A small device to be used by students while conducting quiz contest on the Active Boards

> It means one student one device. We teachers can write questions on the board and ask for the answers. Student can click the correct answer from the option pressing the corresponding number in the device. The software records the responses of each student. Teacher can later display the individual responses or if you don't like to show the whole answer you can just give the statistics. It is like a survey report. There is another mini-board, which looks like a tablet PC. We call it "Writing Slate" with the size of 2×2 fit. It has a separate pen. A teacher moving around the classroom can write on the Slate to display via the Active Board. It means the slate can be used as a mobile board around the classroom. It is good to share the answers from students at real time classroom activities. Teachers need not go to the Active Board to write something if they are at the back of the classroom. Students can write on the board from their own respective places.

The teacher also informed that they currently have limited number of the writing Slates in the school. It is available only for teachers not for the students. According to him, the school is planning to make a slate each for all the students.

My observation on the use of ICT tools shows that the classroom seems to be ICT equipped and furnished in school (A). Likewise, I noticed that radio and TV are less compatible in the context of the Nepalese schools. In this regard, one of the teachers stated that radio and TV technology are rarely used in classroom teaching because these are means of real broadcast and direct show from the station. However, some useful videos are used by recording and playing back. If the resources are useful, teachers are using some of the online broadcasting but online search and play of radio and TV is occasionally used.

From the perspective of drawing attention of learner for learning and raise their consciousness in learning activities, the displays on the big screen has the ability to develop critical analysis and synthesis as argued by Semenov:

> When we visualize with the help of computers, video camcorders, and big-screen high-resolution projection, we restructure a problem situation so that more of it can be processed by the preconscious part of our brain – the visual system that is our silent partner. In this way, consciousness can be devoted to higher levels of critical analysis and synthesis. (Semenov, 2005, p. 112)

Thus, the concept of 'A Big screen on the wall' in each classroom applied by School (A) is useful for interactive teaching as well. In addition, the use of the big computer screen on the wall has been observed as an innovation of ICT for education by all of the users in School A. It is because the traditional black boards chalk and markers are replaced by those systems of active boards in the school.

ICT for School Administration

ICT is a powerful tool for school administrators. It provides the ability to make use of various information retrieval systems; to access, evaluate, organize, share and present the information (Pelgrum & Law, 2003). Similarly, ICT provides an efficient management tool that can be used for improving the efficiency of education planning and delivery and facilitating policy making and management (UNESCO, 2009).

Some of the major uses of ICT as reported by school principals, students, teachers and ICT coordinators from the sample school are discussed below. Mainly ICTs are used for effectiveness and efficiency of administrative function of schools such as School Information Management System (SIMS), School Financing,

Exam/Results, Security Surveillance, Staff/Students Records, Store Keeping, and HR Management.

School Information Management System (SIMS)

SIMS is the short for School Information Management System. According to the principal (P1), "It is very much useful for school information management". Such systems are developed through computer software. The software helps to store, process and retrieve the desirable information about school's management and any kind of other activities. If students, parents, teachers or any other persons want to get any kind of information regarding school's activities or other records SIM software helps to provide the intended meaning within a minute. "It also helps to enhance the working efficiency of the administrative staff" (p. 2).

Some of the schools have initiated the web based SIMS. One who wants to retrieve any information about the school can browse the site and access the information. General information is open to all. For particular information, user login system is managed. However, one can fill up a web based request form to get some particular information if needed. In maximum two working days, SIMS department provides the required information to the concerned person.

Out of three schools of my research sample, only one school has been using the SIMS. Regarding the use of SIMS, the principal of the school shared his experience as follows.

> We are rich of our information. SIMS has given us many options of retrieving information about our school, activities and records within a second or on a single mouse click. Use of computer technology has made it possible. We have records of each and every activities of the school from the date of

establishment. The records such as student enrollments pass out, dropout, repeat, and anecdotal records are simple to retrieve. (P1)

The claim of the school is true because in my observation, I found that they have separate department for SIMS. Moreover, the TOR of the department head was to maintain the system as per the need of school such as entering records, storing and creating database, provide appropriate platform to retrieve data. It is exactly as I have the knowledge about SIMS. As I know SIMS are computer programs used for entering, storing and retrieving useful data that are fed to educational planners for assessment, monitoring and evaluation of education programs as well as inputs to policymakers for a more rational decision-making.

From the perspectives of educational change, establishment of department for ICT/IT or SIMS are institutionalization of innovation in school which ensures the continuation of change in the process of schooling.

Financing

ICT has many uses in school finance. Various computer softwares are available in the markets that allow the rapid calculation of financial statistics, as well as electronic transfers of money and records, and financial transactions of a school scientifically. "Use of ICT in school finance is very important for maintaining transparency" (P2). This reality is also stated by Chigona, Chigona, Kayongo, and Kausa, 2010) as "use of ICT can increase transparency".

School financial reports are also improved with information technology. Various computer programming is used to standardize the financial information in public and private schools' annual reports. In such programming, users can quickly sort through records in standard format. They can easily find the statistical data they need to determine which goes in different expenses.

Financial data can be easily transferred with information technology. Instead of using cheques and checking accounts, information technology can clear a transaction instantly. A debit or credit can be rapidly compared with the user's account. Information technology allows transactions during weekends and holidays, when there is no staff working at the school. It also gives the records of students' fees and other information quickly.

School finance is simplified by using information technology. Technology provides data on checking and recording the expenditure and revenue in the standardized formats. A school accountant can store transaction records on a computer easily. Finance software includes additional features, such as charts and reports, which show users expectations and sources of funds.

Technology such as computer systems help to calculate and display the interest, principal amount of a loan and dues and estimate the returns on investment when the school borrows or generates money to expand its operations. Schools can securely transfer data online, and the computer system record is used in all transfers which simplifies bookkeeping in the entire financial operation system in school.

Exam Result

Managing the examination, processing evaluation records and publishing the results are one of the major parts of the student evaluation system in schools. Preparing worksheets/question papers for test, keeping marks records of students, processing and publishing result are simplified with the use of ICT. "Computer is our assistant it helps me to prepare question bank, conduct online/offline quiz or test and keep student's individual records" (T2).

Some of the schools have made records accessible via website. Student or guardian can access student's individual account with a provided username and

password. This makes it easy to view the progress report of the students from anywhere. Guardians are not required to visit school all the time. Teacher T4 has an experience in this regard. T4 shared that maximum number of students are staying in the hostel and their parents or guardians are abroad. Online result publishing system has helped them a lot to access the progress report of the student wherever they are.

Surveillance

Two systems of ICT are found installed by schools for surveillance purpose. First is CCTV and the second is finger touch attendance. Both of the systems have their own purpose. However, both systems are used mainly for administrative efficiency such as keeping and checking students' as well as teachers' attendance and their activities throughout the school hours. My field data explores more about CCTV as it was perceived differently by the different people.

Close Circuit Television (CCTV) with camera is one of the popular devices especially used in monitoring criminal activities or social violence (Aryal, 2011). Nowadays in the schools, especially it has been used to control social behaviours and monitor disciplinary problems. Similarly, such devices are used in monitoring activities in the classroom, library, computer lab, science lab, playground, passages, cafeteria and other sensitive places where standby monitoring is not possible.

One of my sample schools had CCTV surveillance system. In response to my question about the purpose of using the system T3 said:

> I think it is to monitor the activities of students and teacher both by the management. In my view, it is kept to know the types of activities that are focused in the classroom. We are unable to reach the bottom point in case of students' unwanted activities like quarreling and teasing each other. To detect such things is the main objective of placing a camera. We teachers cannot

> work as a watch dog for the whole school hours. So, we expect the camera does this work.

Here, in T3's view purpose of keeping CCTV system is monitoring students' and teachers' activities. In the third sentence, the teacher focused it to the students' unwanted activities with examples of quarreling and teasing. From his indication "teacher is not a watch dog to look after every student", I understand that the system of CCTV is mainly installed to reduce the job of teacher. Instead of being an activity controller for students, teachers can focus on teaching learning activities. However, some of the teachers see the use of CCTV as integral part of teaching and learning activities. Here, answer to the similar question given by teacher T5 seems to be logical. His indications on personality development, transparency, minimizing risk factors, discipline control, habit formation and the new application are as follows.

> We can see the purpose of CCTV system in different ways like *Personality development:* Formal activities will be tracked under the use of camera that helps to develop personality of a teacher. In front of camera every people like to be formal and try to be up to date, it develops habit of seriousness too. *Transparency:* In the sense that there will be fair judgment. As an example student A does mistake and teacher can accuse student B in absence of camera but chances of such error is less if there is a camera. *Minimizing risk factors:* Some times, especially in absence of teachers, risk of students false consequence. *Discipline control:* The students with bad attitude will be controlled. In support of real visual evidences, teachers or administrators can take action to particular student who shows unwanted activities in the school. No use of such camera is good if used to detect a particular teacher' activities or minor habit related activities of students too. *Habit formation in students:*

> under the system of CCTV, controlled habits likes proper walking, talking, acting and teaching or reading can be formed. The sense of fear of punishment helps a force in maintaining the habits. *New application:* If the recorded videos are used to show an example to other class as a teaching material, it brings a new test in application. (T5)

Looking at these two teachers' narratives, I see the purpose of monitoring activities is clear. The way people view a single subject has disparity. T3 provided a generic answer to the purpose of CCTV but T5 went in depth and supported his answer with various logics.

My thirst for knowing their understanding was not fulfilled until I was able to know whether students have ideas about the purpose of keeping camera in their class. Therefore, I asked, "Do you know why camera is kept in your class?" the response of both students are presented as follows:

> As I know, it is to control students and to avoid unwanted activities in the school and classroom. It records the activities and helps the study of students. Principal can watch regularly. Students cannot take a rest or sleep in the class. Therefore, study can be focused, we study as we are preparing for the SLC, and we need to read. (S5)

> Well, it is placed to see all the activities like how we are and how we behave in our class. It means to observe the students' behavior and activities. Like eating in the class, misbehaving with friends as well as misbehaving with teachers. (S6)

These students' understanding and the teachers' understanding regarding habit formation and discipline control is similar. The students understood CCTV camera monitors students' activities and teachers understood it monitors activities of the

teachers, too. One main point that I got here is that it is kept for the sake of administrative purpose, as there is no evidence in narrative that it is to support teachers' teaching and students' learning. Therefore, I went to the principal to know the administrative purpose of using CCTV in the school. His version was as follows.

> We have installed CCTV system in our school. The system contains a computer, hard drive, channel indicating software and the ability of 16 connected cameras. The main purpose of installing this system was to award good performers both students and teachers. The system is working but before launching it, I had complexity to reward or award students detecting them through camera. Every month we use to call the disciplined students and reward but the consequence came opposite as we located some mistrusted students and punished them. That was not my consent to handle that but ultimately we started from negative. Any way, it is working but I don't think it is a long term solution and durable solution to keep CCTV in all the classes and detecting every time. (P2)

This principal is not satisfied as his purpose of keeping CCTV system went out of expectation. As his narrative talks, the major purpose was to find good performers and reward them but the practice is to find mistrusted ones and punish them. Therefore, teachers always thought it is to observe their activities and students thought it is to discipline them. It is good to link the view of another principal (P1) who did not like to keep the system because the principal thinks using CCTV to observe the activities of students and teachers creates mistrust. Following narrative fits into this discussion.

> First of all, we trust our teachers we are supervisors not the snooper-visors. You may have known who snoopers are; those who snoop the activities inside

> the classroom having CCTV and the finger touching attendance shows not trusting teachers. It shows no trust and disrespect. If I am convinced, our teachers are able to deliver instructions up to our standard; there is no point to see the teachers are cheating or not in the classroom. (P1)

The above discussion clarifies that people have different perceptions on the same thing. One principal thinks it is for 'goodies' another thinks 'creates mistrust'. One teacher thinks 'Monitoring activities of teachers and students' while other think it is for 'personality development, transparency, minimizing risk factors, discipline control, habit formation and the new application'.

Moreover, Aryal (2011) states that CCTV helps school administrators to improve their monitoring mechanism in teaching and learning as well as other activities. Teachers and school administration believe that the problems like, misuse of leisure periods, ego centric threats, sexual harassments, group fighting, teasing others, showing power of muscles, in some extent the drug abuse and ignorance of learning activities are raising and they are normally out of teachers' and administrators' control especially in secondary and higher secondary schools. In this context, CCTV has become a 'Discipline In-charge (DI)'.

Students/Staff Records

Keeping students and teachers record is one of the major administrative functions in the schools. This can be simplified using electronic spread sheet software or database software for individual records. Managing folders of anecdotal records and cumulative record are the major parts for students' evaluation.

Schools have initiated the system of individual record keeping by using the 'school manager' software. The software is used as online School Information System (SIS). P2 explaining about SIS said, "we have implemented online SIS to provide

students record for authentic users (students, teachers and parents). Users can login using their username and password to access online records of students such as progress report, cumulative records and anecdotal records". However, the records of staff are not accessible online. P2 stated that the offline SIS is used to manage staff records as well. The records of staff such as profile, attendance, salary and annual appraisal are maintained using SIS.

Attendance machine is used to record punctuality of students and teachers in school B. Explaining the benefit of the e-attendance, P2 said:

> It is very useful and has replaced the traditional register based attendance. An accurate record or arrival and departure can be tracked by the machine and can be used for various purposes. For example, how many students are absent today? We can immediately inform parents about the absent student(s) and get record. It makes the service better. This record provides instant actions such as replacement of absent teacher's class and inquiry about absent student. Students do not miss their classes, and teachers also arrive in time and go to the class with appropriate preparation before they enter the class. Another benefit of using the machine is record tracking of the part time staff and teachers. Verifying the record extra pay and other benefits can be provided to the concerned staff and students. (P2)

Here, P2 focused on the use of e-machine for administrative efficiency rather than the academic use. However, the principal argued that punctual students do not miss and it is linked to the performance in the class as well. He was indicating an academic value of the machine rather just administrative use.

Store Keeping

Maintaining log of demand, stock check, purchase and supply through integrated storekeeping software is commonly used in the schools to minimize the manual workload and human resources. "Use of the software has increased efficiency of storekeeper and replaced the traditional method of store keeping (register based)" (P1). Especially in the residential schools use of the store keeping software has been significant because they supply everything for residential students. And all of the transaction of demand, purchase and supply are regular process under school administration. It is very easy for school administrators to verify stock and accept or reject the demand sheet. Experience of principal (P2) about storekeeping software is remarkable. During an informal sharing, the principal said, "The store keeping software is accessible directly from my computer via internal networking. So, I can access at any time to retrieve desirable information about the status of store". P2 further explained that the up to date information on regular transaction of store guides appropriate projection of monthly budget of the school.

Both the principals indicated that the use of software has helped to minimize the human error, maintain transparency in transaction and avoid misuse of goods. However, regular data backup, information update and technical efficiency of storekeeper are crucial.

Moreover, the store keeping software has been in the practice of only the private schools as they sell even books and copies to the students directly from school. The system is not practiced in the government schools. It is because, "First, we have very less daily transaction of goods, second government has no provision of storekeeper's position in the public schools" (P3).

HR Management

Human resource management has become very much important part of any kinds of organizations these days. It is obvious that recruiting employees from the mass of applicants has high chance of getting a right candidate or a competitive one because of more options of selection. Exemplifying this reality, principal (P1) states, "Posting vacancies on websites is much cheaper than publishing that in newspapers. Also web based vacancies are accessible worldwide until the last date of application". This indicates minimizing the cost and maximizing the selection option.

Using computer and HR database an organization can develop a systematic job profile of employees such as placements, appraisal, pay, promotion, job portfolio and other all kind of HR records. Sharing the features / facilities of the computer, principal (P1) said, "Computer is everyone's' assistant. It is also the HR assistant in our school. Everything is computerized. I need no store for hard files and clerk to look after the records. A click of mouse is enough!" However, the conditions of many other schools are different. Only one out of three schools of my study has initiated computerized record keeping of employees. In other two schools, they have computers used for classroom instructions but not used yet for record keeping.

Giving emphasis on the professional development as one of the major parts of HR management, a principal said, "We use ICT means such as multimedia project and computer lab to conduct training, train computer skills, and other programs related to teacher development" (P2). This principal indicates the use of schools' ICT resources for teachers' professional development.

Job portal is a web based CMS accessible to the world. Anyone interested in applying for the vacant post can create an account with personal details, employment details and the details of academic degree and awards. The users also can upload

credentials. Once the account is created and activated, users receive an automated email notification on new opening of vacancy. Then the user can just change a cover letter and apply for the suitable post in a click of 'Apply' button. This feature simplifies creating user database to shortlist and further processing of data for employer during the process of recruitment. Likewise, for the users, it simplifies the application process and saves time. Once an account is created, it works for ever. However, this system has not yet been practiced in schools of my research field.

ICT for Classroom Instruction

Reflecting back on my personal experience, I believe ICT has become a significant tool to innovate classroom instructions. For an effective delivery of instruction, a teacher can use internet resources, digital materials, and computer programs while planning a classroom instruction. Audio, video, graphics and animated software materials can be used for an interactive design of instructional delivery. Likewise, an interactive computer quiz sessions can be designed for student assessment and auto feedback system can be set. In this research, one of my main concerns was to see how teachers use ICT for classroom instruction. Responding to my concern about the use of ICT for classroom instruction, one of the teachers said, "It is good to use ICT for designing classroom teaching. I mainly use internet resources. Especially, I have been using ICT to plan the lesson. Similarly, ICTs have potential in teaching pedagogy, and evaluation procedure as well" (T3). This clarifies that the possibilities and potentials of using ICT for the whole process of classroom instruction.

As I know, classroom instruction process comprises planning, managing resources, delivery, assessment and feedback. I have discussed the use of ICT for each of these components of classroom instructions below.

Planning

As planning is the initial phase while designing a classroom instruction, teachers are using ICT to develop soft materials for long-term use "ICT support teachers in lesson planning. I use computer to plan and design my lessons. Especially, I create animated materials. Once I prepare them, they can be used forever" (T3). Another teacher illustrates his understanding as "Lesson plan for me is to develop a concept map of classroom teaching, so I use computer to draw a pictorial concept map of my lesson plan and use it in the real session of classroom instruction" (T4). This understanding is linked with the concept of software called 'FreeMind'. This software is known as "free mind mapping and knowledge building software" also a "personal information manager" (FreeMind V 0. 9. 0 RC6) and is particularly focused on developing a whole process of event(s). For example, teachers can use it to plan a complete lesson or whole course in an illustrative manner using "nodes" available in the software. Text, picture/graphics, charts, audio/video files, external links, PowerPoint presentations, etc. can be embedded while framing mind map. However, planning ICT integrated teaching consumes time "Out of 8 periods of the day I have to teach only 3 periods and the rest 5 leisure periods can be used to prepare the lessons and student feedback" (T4). Thus, it is clear that the use of ICT demands ample time of teacher for planning phase.

OLPC users have different experience regarding lesson plan. They use readymade lesson plans. Laptops are preloaded with digital contents and planned lessons. Lessons are organized on weekly basis; teachers just use it as reference and review before they go to the classroom.

Resources

Managing resources for classroom instruction is another major part of instructional design. Use of ICT is considered as an integral part of classroom teaching by the teachers, "ICT is definitely related to my lesson plan and my subject in my daily classes" (T2). Internet resources, CDROM resources and Digital library resources are commonly used in the schools while designing and delivering a classroom instruction. Experience of a teacher (T4) given below is interesting about managing resources for everyday lessons.

> Every day after 2 pm, we send students and stay in the school to prepare lesson plans. We use internet and digital library to collect soft materials related to the lesson. Some of the materials we prepare ourselves. Once we prepare, it works for the next years too with some minor updates. ICT coordinator also helps us to find and use e- resources related to our lessons. (T4)

This exemplifies the allocation of additional time for the preparation of next lesson. This example also addresses the issue raised by another teacher who said "Use of ICT is time consuming as there are thousands of resources. It takes a lot of time to select the appropriate materials. It is hard to select the proper one" (T4). Therefore, the system of providing free time after 2 pm for further preparation in the school sounds good.

Instructional Delivery

The data show that the instructional delivery is the major part of the whole classroom instruction process and the use of ICT in the delivery of lessons seemed to be significant. As I had a concern, how school teachers/students use ICT during

delivery of instruction? I observed the classroom activities and instructional strategies in real time delivery. A story based on my observation note is presented below.

> I entered into the classroom together with a subject teacher. There was a class teacher already in the class. The classroom was fully equipped with multimedia accessories connected to Smart board. It was a fourth grade English language class and the lesson was "cause and effects". A video was being played on the board. The video was five minute long and was about a story. After the video, the teacher highlighted the dialogs of the story, characters in a comparative chart with the help of animated PowerPoint slides. Teacher re-casted the video and asked to note the words and that indicate 'cause' and 'effect'. After re-caste was over, T2 started a quiz session with many words to identify 'cause' and 'effect'. Turn was given to everyone. Everybody did well and reflected their understanding in the question answer session. Every time students were engaged with full concentrations. The quiz was online and accessed in the classroom.

The approach of classroom delivery was a real combination of multiple means of ICT within a single session of 40 minute. The teacher used video, PowerPoint and online quiz with the help of computer, internet, Active Board and all other supportive multimedia accessories. I observed the full session and noticed that the instructional process accomplished by the teacher during the classroom delivery was a successful story of the use of ICT in classroom instruction. The teacher had a different role[9] from the one in a traditional 'Chalk and Talk' method of teaching.

PowerPoint presentation, audio/video show, internet, encyclopedia, e-paath, e-pustak and digital library are used with the help of multimedia projector or the Active

[9] Facilitator, energizer, motivator, a role model etc.

Board technology in the real time classroom instruction. However, such combinations of ICT are not possible all the time. A mathematics teacher was clarifying the reality as "In mathematics, what I believe is, the concept building is the major part of any lesson. So, I use ICT for concept building at the beginning of each lesson or chapter not all the time*"* (T4). The teacher believes that teachers need higher level of skill in computer to design their lessons making compatible to ICT use for real time delivery in the classroom instruction. T4 also indicated that some lessons require simulation with animation for clear concept. This clarifies that simulated lessons have power to clarify the complexity of practical concepts in any subject.

In case of OLPC project school, teachers have been more instructive depending on laptop and the digital contents installed in the laptop. Students and teachers open the laptops together and the teacher starts providing instruction to navigate the screen of computer or take a quiz after the lesson. Voice of teacher and sound of the laptop was making the class noisy. However, students were concentrating in screen activities rather listening to the teacher. I found the changed role of teacher as a guide to use the computer based contents. 1:1 laptops were distributed; e-path and e-pustak which are used in the classroom delivery of instruction.

Assessment

During the classroom activities, teachers conduct a quiz contest using software. The quiz is used as an immediate evaluation tool. Audio/ Video review, posting assignments in blogs of school's website and e-mail attachments are also in practice. As assessments are designed to see the progress or achievements of students in particular lesson, knowing how teachers use ICT means for assessment purpose

was one of the concerns during the interview. What teachers say about using ICT for assessment? See the experience and opinion of a teacher presented below.

> We post assignments via web site as well. There is a link in web site for assignment. Every day we teachers update the site ourselves. We can upload project works for the reference of the students. We can encourage student posting the best project work on the web site. You can put assignments on website. It help students to access the materials and assignment if they have missed the classes. They don't have to be worried about missing classes they can get all the related materials of the class through the web post. In this way, the student support is enhanced. (T1)

Another teacher added, "Preparing an interactive quiz with computer software and organizing the contest would be better to assess the students' achievement" (T3). The teacher also explained that T3 prepares the quiz even in MS PowerPoint. This method is useful handling classroom activities with big number of students where a teacher cannot check thoroughly all written assignments immediately in the classroom. It also "saves time of teacher to evaluate mass of the students which is not possible or is very difficult" (T6). This indicates that computer based assessment and evaluation has been efficient and effective for teachers who need to handle a large number of students in a single classroom.

Thus, developing interactive e-assessment tools are commonly practiced as a part of ICT use for evaluation and assessment purpose during the instruction process. In addition, "provision of two-way communication facilities during class discussion including student polling are more interactive learning experiences that is greatly impossible in traditional classroom" (Jarvenpaa & Vogel, 1992, p. 285).

Feedback

It is my impression from 12 years of teaching experience that the feedback of a teacher/facilitator plays a vital role to motive student in the process of learning. All the exercises in OLPC laptops are computer guided. Teachers can let students attempt the problems given in the lessons. Students can self-practice. They get automated feedback by the computer. Sound "Thik" (Correct) for right answer and "Milena" for incorrect answer along with some emotional symbols are used to provide immediate feedback to the students. Developers of the program have added interactivity and interesting ways of navigation for the users.

School A has established assignment portal or e-portfolio where teachers have access to post their assignments. In the same portal, teachers also can post comments or feedback to the students on the assigned task. Moreover, the guardians in school A also can provide their feedback to teachers and school via e-mail. As I see while observing the website, parents/guardians can simply browse school's website and post their feedback or comments in "guestbook" page or write message in "contact us" page. A teacher believes that the feedback system helps to foster the quality service provided by the school "Guardians/parents of our students' can post their comments and feedback to the subject teacher or class teacher and school. It always helps to maintain the service quality (T4). This indicates that the use of ICT enhances the quality educational services. "We can track activity log in the web portal, using this feature in school's website teachers can prepare better progress report of a student to his/her guardian" (T2). Indication of this teacher is about cumulative record of the student. Teachers can look at the history of log and check what type of feedback or comments were given to the student and what corrections were done by the student. It also helps to track the status of the students in the assigned work.

ICT for School Exposure

Networking, communications and websites are used for the exposure of the school activities to the external society. Only the private schools have exposure via websites. Basic information about the schools can be accessed via schools' official websites.

Networking and Communication

Telephone and email are commonly used means of communication. Social media especially Facebook is used for networking and event notification. "We have a school's account in FB and all the parents, teachers, students and other guests can join us to know recent activities and get email alerts on our post"(P4).

Web based automated email to admin, mailing list, SMS alert systems are commonly practiced for communication. However, the networking part seems week. "We have created a web forum for parent teacher interaction it has been never used" (P3). This shows that lack of practical use of ICT tools in networking among the stakeholders.

Illustrating the system of communication in the school, teacher T3 said, "In our school there are no peons. All the information passes through a chain of command. Online notice board, intranet and email system is used for information sharing". T3 further mentioned that they have reduced the paper work and promoted e-version of the school newsletters. Teachers prepare news on events and activities of the entire class and post it as newsletter to the website monthly. They also sent the newsletter through e-mail to all of the concerned parents and students. They have created a group mail of parents and consider it as very much useful way of communication because "all the parents will be well informed about what is going on in the school" (T2).

As stated by T2 and T4, there is a facility for the parents to post their comments and feedback to the class teacher and school. They believe that the system of web based communication always helps to maintain the service quality. Principal of the same school added that often times they do not call parents at school in person. They use the email for all types of communication. The principal said "We are totally depending on web/internet system. We have our own server domain hosted school's web site and email server. Email is used to suggest teachers, share events, notices, comment on activities of personal subjects' etc." (P1). P1 mentioned that all possible internal communications are managed via intranet. The principal also believes that such internal communication is good for reflective teaching practices.

The principal further clarified that they have mainly two types of communication system management. The first is web based communication including E-mail, online news and other school activity for online broadcast. IT system administrator is responsible to handle web based communication. Second is media and social communication, for this they have communication department. The department is responsible to publish newsletters, school brochure and whatever to be published out there.

This shows that they have established paperless and non-verbal internal communication system at school. Any kinds of information that is required to pass to students, coordinators, teachers by the principal during the working hour are posted on the online notice board or sent through email. They have categorized the communication into two types: 1) web based communication and 2) media and social communication. Both types of communication are under the chain of respective departments.

Websites and Publications

Websites have become popular medium of school exposure to external society these days. All the private schools I visited have their official websites. However, the public schools have not yet managed official websites. Websites are designed to provide general information about an organization's regular activities.

For example, one of my sample private schools has the following main menu and sub menus in their website. The website has the main menu items like home, about us, school's program, on campus facilities, school's network, admission, special student services, service learning, partners, webmail, school's library, school calendar, user login. Under the home menu, there are some sub-menus such as message from the principal, news, publications and videos, our team, notices, assignments, career opportunities, contact us. The site provides all kinds of information about the school. For the purpose of obtaining general information about the school no physical visit to the school is required. The site contains up to date information. However, the site is not compatible to smart phones.

Explaining the usability of the website a teacher said, "We have been using web tools to post the summary of the lessons taught in the classroom and soft copies of the related teaching materials everyday" (T4). Likewise, teacher T2 also shared about the use of website in their school. T2 said, "within the website there are different login areas one of them is about the assignment. We put assignment every day. If students are absent they can access from their home in the website".

Thus, website has become a popular medium for school's exposure to the external world as well as an effective medium to access varieties of resources related to daily teaching and learning and information about the school. In addition, I agree

with Semenov (2005) who states that "web is one of the most promising and rapidly developing areas of ICT in education" (p. 131).

Perceptions on ICT Use

This section deals with the second research question, which aims to explore the perceptions of principals, teachers, and students. As different people perceive the same thing in different ways, common perceptions about the use of ICT in schools is presented below under the themes innovation, radical change, demand of time, changed role of teachers and students, and need of a separate discipline. In this chapter, the field data are interpreted in line with these themes generated while transcribing and coding the interview data. In addition, perceptions are viewed from the perspectives of theories reviewed and planned as in the conceptual frame. In doing so, the change experienced and innovations observed are focused.

Innovation

Newness in practices is innovation. When ICT is used in schools, it is newness over traditional school education system of Nepal and use of ICT in school education is in the process of 'diffusion of innovation' (Surry, 1997). Uses of ICT in schools are perceived as an innovation in education. The shift from stone slate (Khari-pati) to electronic slates (E-pati) has been observed. Books are going to be replaced by laptops. Reading contents are available in the form of electronic text, audio-visual, graphics and animated illustrations. Assessments are designed with an automated feedback system. Paperless works are increased. E-mails and web based communication are emerged. "Nowadays innovation of information communication technology is emerged worldwide. It is possible to access everything sitting in a close room of a house" (P3). Accessing information and academic resources from a closed

room were not possible in the past. These days innovation of ICT has made it possible.

To exemplify the use of ICT as innovation, a story of principal P (1) is interesting. P1 told that at the time of their school age they used to feel the country is not beyond the hills around them because no one could explain well what lies behind the hills. "These days such complexity does not exist due to the innovation of the ICT. We are able to bring the world in the classroom" (P1). Explaining about innovation, P1 was indicating the Google earth to make travel trips around the world sitting in a closed room. Google Earth and GPS tools are useful to locate the position of a place and see geographical properties. Even 3D views of some of the popular cities are updated in the latest version and update is ongoing. Every updates of the tools are available with new features.

Inviting innovation of ICT in school is to start with a common room for ICT where a set of desktop computer with a wall fitting LCD monitor and CDMA internet access are sufficient. These are cheaper and accessible everywhere and run with low power of solar energy even in a remote village of Nepal. Providing such idea C1 said "I think each school can manage such system so that at least teachers can get access to the information, and be innovative sharing new knowledge with the students". To start with, ICT based innovative practices can be promoted establishing at least one ICT room/lab in schools of Nepal. Along this line, C1 suggested the following ways:

> ICT room can be made accessible to share important information related to certain topic /lesson. There can be a schedule to visit to ICT room so that all classes can visit ICT room in turn. At a minimum cost, schools can arrange to initiate access to ocean of the resources because, ICT gadgets are getting cheaper day-by-day. The school leader must be the person who understands

> the value of ICT in educational use and teaching learning purpose. To initiate such arrangement, understanding of all the possible use of computer technology is curtail. It is not a great issue to initiate and start the system of ICT centre/room/lab in each school. Nowadays, every school has some type of library. They can simply add a computer and internet in the same room. They can start with at least 5 computers and initiate computer lab equipped with internet access. Government also supports establishing ICT resource room in schools of Nepal to minimize the digital divide. If we see the future of present young generation, it is compulsory to train them with digital technology, at least use of computer and internet otherwise they will bear great challenge of ICT skills to communicate with people. (C1)

Of course, the ways suggested by C1 are ideal for the initiation of ICT centers in each schools of Nepal. His suggestions of using available resources and start over the ICT use in low cost are impressive in the context of Nepal. These ideas definitely contribute to the expansion of ICT use in schools and address the prospective hazards of 'digital divide' (Andersen, 2010).

Radical Change in Education

Teachers perceive the context of ICT use as a radical change in education. It is from the perspectives of access to ample resources, infrastructure and learning environment and the ways of integrated[10] teaching methods. Reflecting back on the situation of her student age, a teacher said:

> "I sometimes get surprised when I see our kids even the younger ones. They have their own email ID they know how to open the computer, browse internet

[10] Use of two or more than two methods of teaching.

> and explore things. When I was in 4th grade I did not know what the computer was". (T2)

Of course, these days' even the "students from grade two can use computer very well" (P2). The case in the past was different as mentioned by T2 in the following story:

> When I was in 4th grade I did not know what the computer was all about. Computer was introduced in grade IX but just to look as it was in the ratio of 1:5. I learned computer only in the bachelor level. These days' children in this young age are learning everything using computer. We don't have text book in our school (Social studies and Science book), we create lessons ourselves on top of the topics given to us (syllabus or curriculum) for each semester and we create our own course materials and contents. Sometimes we give topic and ask them doing research on that topic. They know how to do and where to find the learning resources. They know everything. They browse websites and come with the list of the web sites and ask us whether it is good to retrieve the information nor not. They are very advanced and I am sure that if this approach is applied for every schools of Nepal, or government manages such learning environment for our kids, then obviously our country will be developed. (T2)

Here, T2 pointed the use of ICT in schools as "Radical change in the field of education". For me, it connects the idea of Anderson (2010) who termed the evolution of technology in education as "fourth revolution". However, T2 is worried because the environment T2 is talking about is found in very few schools of urban cities of Nepal. The condition of majority schools in the remote and even in the capital city has not been changed.

ICT invites ample possibilities for education through distance and online learning. "One defining feature of ICTs is their ability to transcend time and space. ICTs make possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners" (Tinio, 2003, p. 6). In the following story, a student absent for three months has been doing very well as much as regular students.

> A student of my class has gone to America together with his parent for three months. It has been a month and he will be back to school after two months. His parents are very scared about his missing classes and possibility of getting further back in the study after long absence in the school. As I know, he is an average student, not so good. We also thought something about helping him to continue his study. We thought sending worksheets via email. He already had other stuff. Again, the worksheet would disturb his vacation. Therefore, we asked him to prepare journal about his experience and the reflective journals and send us through email thrice a week. We asked him whatever you learn new things you write to us. He wrote everyday instead of writing thrice a week. He also worked on worksheets that are downloadable from our assignment portal on the website. We are regularly connected with him. I know he is far away from us but he knows what we are doing in our class every day. We are up-to-date about his activities in America. Physical presence in the school or class is not required. His is studying well. (T1)

When I was the principal in a school, a fifth grade student was asked to repeat the class because of his absence for two months. He was absent for two months before the final exam and could not perform well in the exam. If there were facilities as in the above mentioned school, definitely the student would not die.

Therefore, the possibility of distance education with online support system brings radical change in education with quality assurance as stated by Bhukuvhani, Mupa, Mhishi, and Dziva (2012), "In addition to quality assurance, ODL programmes offer flexibility that cannot be matched by conventional programmes. These assurances have been established to the fullest by recent development in e-learning, especially in the context of online learning via the Internet" (p. 17).

As discussed above in this section, teachers experience the radical change in the ways of teaching and learning in school using ICT. It addressed the need pointed by Semenov (2005) "there is a clarion call for innovation and transformation among educators everywhere, especially in the elementary school, the most crucial stage in the development of a human being"(p. 19). Therefore, adopting the evolution in the field of IT is a major concern for school education today as Hargrove and Prasad (2010) focus on how technologies are being developed each day reshaping our way of life (see the title 'revolution of information technology' in literature review). This shows the need of change in the schools to invite innovation of ICT and external factors "evolution in the field of IT" playing the role of change agents as stated in the theory of educational change.

Demand of Time

Especially the teachers and administrators of the private schools (self-initiator of ICT use in school education) have perceived the emerging use of ICT in school education as the demand of time. All schools follow the national curriculum. But the present national curriculum itself does not guide or has no provision on/about use of ICT in schools except the computer lab or computer subject teaching "present curriculum does not have provision of ICT as a separate subject" (C1). However, schools are using the some means of ICT to facilitate teaching learning activities or

administrative procedure in the schools because they think time has come to follow the latest technology and that they have to adopt and compete with the changing circumstances of technological evolution.

In the theory of 'innovation diffusion', Rogers (1995) advocates the span used in the process of innovation diffusion. When we talk about the time factor or say 'use of ICT in education as the demand of time', we are in the process of innovation decision. In case of Nepal, who are decided and accepted the use of ICT as innovation are now adopting but who are not yet decided are still in the process of gathering information and looking into the worldwide practices. It may take a long time to them to adopt the innovation. This process is perceived as the 'demand of time'.

A principal argued that the use of ICT is the demand of time as well. Exemplifying the claim, the principal (P2) said:

> Time is changing. Everywhere information technology is being used and change is adopted. We educational leaders also need to follow the changing ways of educational services and classroom instruction integrating ICT. If not, it will fall into great challenge to sustain the organization in future. As the use of ICT in schools can enhance the whole system of education at the school level and provide various opportunities to students and teachers, we must try to adopt with the demand of time to sustain ourselves.

Here, the principal focused demand of time and pressure of sustaining organization in changing nature of educational services adopting ICT. He also indicated that the use of IT in other fields is forcing them to use ICT in school education as well. This clearly shows that they have been forced by external factors

(revolution of IT in other field) of change to bring about 'positive change outcome' as indicated by the theory of educational change.

Changed Role of Teachers and Students

Research participants (Teachers and students) viewed their roles have been changed. In an ICT friendly environment of teaching and learning, teachers are the 'resource locators' and students are the 'browsers'. From the field data, the following roles of teachers and students are identified.

Multimedia player. Teachers these days actively use multimedia in the classroom to make their presentation interactive. Teachers can play audio, video, story show to make classroom interactive. Students S5 and S6 have experienced that they understand better when teachers use AV media to deliver lessons using multimedia projector.

***Resource browser and locator*.** Browsing/ searching and finding different sources of knowledge related to their lessons and locating appropriate site has been the daily job of teachers. A Principal (P1) told me that teachers these days use Google search and find required materials. Likewise, the ICT coordinator (C1) argues that the requirement of the teacher is to find the location of the online resources related to their lessons.

***Learning facilitator*.** While using interactive CDs, online resources, teacher-made e-teaching materials and laptops with all e-contents like in OLPC laptops; teachers' role is just a learning facilitator. (See [Annex J] observation note on OLPC classroom.) The statement "Teachers become facilitator. It supports student friendly activities too" of principal (P3) is meaningful here. "If used ICT teachers' role becomes more facilitative*"* (T4). T4 further described that the students are more

active and creative in ICT friendly environment and teachers are active in preparing lessons.

Self-learner. To use ICT in the class, teachers need to update him or her with the latest technology being used around the world. They first need to learn themselves before going to the classroom and teaching the students. "Even teachers are getting a chance to upgrade themselves with the latest technology and information" (T3). In the case of government schools, a Principal (P1) said "Even teachers learn correct pronunciation with audio materials". This shows the teachers role as self-learners.

Smart navigator. In school (A), all teachers start their lessons clicking on the Active Board. While observing a class in the school, I found they spend 75% time of their classroom instruction to navigate the various options and tools in the Active Board. PowerPoint presentation, video show, storytelling, quiz session, etc. navigating smart technology available within an Active Board have become the daily routine of the teachers. As I observed and found the board contains various smart features and software for education and teaching. For example, if a teacher wants to demonstrate the use of protector in mathematics class, the teacher can use the software embedded in the Active Board and visually demonstrate the use of different instruments in geometry. Students can simply observe, and follow the process or steps. Thus, a teacher has become a smart navigator.

Worksheet designer. With the help of computer, teachers are developing work sheets to be distributed in the classroom. To engage students in active work during the classroom, worksheets are useful. All teachers prepare worksheets for every class. Worksheets are used for two purposes: 1) Class work 2) Homework.

"We usually develop worksheets for assignments. Designing worksheets is a technical skill a teacher required". (T2)

Thus, teachers in ICT equipped schools are tagged as 'modern teachers' "ICT transforms your role from traditional teacher to a kind of modern teacher" said T4. When I observed the classroom, I also experienced the changed role of teachers. Within a class of 40 minute, a teacher was able to show video, PPT, worksheet based class work and internet based quiz. For me, the roles of teachers appear similar to Anderson (2010) who has set teachers roles as learning facilitator, collaborator, coach, knowledge navigator and co-learner, teacher giving students more options and responsibilities for their own learning in ICT friendly learning environments.

Students as active learners. Students in ICT friendly learning environment have become active learners. Small fingers are moving on the surface of laptops' keys, touchpad and touch screen of smart e-gadgets. They make PowerPoint presentation and share their understanding of syllabus and contents with friends in upper grades. In junior classes, students collect materials from internet for their project works. Students prepare documentary of educational tour and present in and share with other classes. Thus, students have become practical and experiential learners. They have become game player. Education contents available in the form of game are more effective because "They can play back as many times as they like and enjoy the games based on lesson" (P3).

The role of students is also a self-learner as it is possible to design and provide self-learning e-modules. Explaining feature of OLPC laptop, P3 told that the students can self-learn and complete the exercise because the self-learning modules available in the laptop include auto feedback system. "Sometimes students can go faster than teachers. If teacher has taught a single lesson some of the students have already

practiced other two lessons" (P3). Thus, sometimes the students are more forward than the teachers.

Showing the ability of self-learning, a student of OLPC project school said, "Some exercises are very useful for students to learn even if there is no teacher. With the laptops we can learn ourselves" (S4). S4 also added that with the laptops, they are not only learning contents, they are also learning multiple skills such as typing skills, and other basic computer skills. Students mainly like reading lessons, attempting quiz, practicing exercise, visiting e-library, and playing games.

Students are utilizing their leisure time to learn more things and expand their knowledge. I probed: how do you use your leisure time? A students of OLPC user replied, "I use my leisure time to solve the problems of exercise, open e-library, use internet, face book, and play games. I learn everything possible from the laptop. It is possible to be up to date with news" (S6). I see in general the use of Facebook and games as stated by S6 are not associated with the curricular contents.

Students have multiple options to access the resources in School (A). They are eager to access internet in the computer lab to browse learning materials and learn how to use the web forum or create blogs. Likewise, in the library, they have access of internet for reading books from the e-library. Students are learning by exploring themselves. This situation describes that the role of students has been changed and is similar to what Anderson (2010) states. For him, the role of students as an active participant in the learning process produces knowledge; and learns collaboratively with others.

While viewing the changed roles of teachers and students, it is directly related to the outcome of the change in schools by ICT use. This situation is considered as an "achievement of a positive or successful change outcome" by the theory of Fullan's

educational change. As indicated in the theory, “changes in skills, thinking, and committed actions” are observable through the changed roles teachers and students.

Need of an Interdisciplinary Subject

Use of ICT in schools comprises a wider area. However, the schools can initiate ICT as a separate interdisciplinary subject with the aim to literate all students with ICT skills such as basic computer, email, internet, web tools and technology and smart e-gadgets. Research participants viewed the need of ICT as a separate interdisciplinary course or subject. C1 argues that the provision of ICT as separate interdisciplinary subject would be meaningful to integrate across the curriculum of all subject areas. C1 also pointed out the lack of such provision in the national curriculum. C1 also commented, “Due to lack of local curriculum and burden of additional cost, human resource, and infrastructure schools are not interested in doing so”. When ICT is used in an integrated model within the present curriculum frame, its effectiveness depends on how teachers handle it. “It can be used in any subjects. Just it depends on how you use it” (S5). It means ICT can be used in any subject area, however, the purpose of its use has to be clarified.

Likewise, pointing to the need of policy reform, another participant (S6) said, “There has to be some policy to define how to use ICT in different subjects to make education better. Subject oriented to or focused on the use of ICT should be clarified”. S6 also exemplified the use of videos in story telling in English subject to provide a live scenario “In English, there might be a story related to war or something. What is war? How the wars go on? What is its effect? Visual presentation can be made” (S6). Video show about story in mathematics teaching may not be appropriate. This demands the subject wise focus in the use of ICT. In line with the

same issue, C1 argues that the Google earth is rarely used in Mathematics teaching but is essential in Geography or Social Studies.

At present, some of the schools offer computer as an optional subject. This covers some common use of ICT. There are very few schools offering computer as a compulsory subject. However, the subject is oriented to the mastery of computer science. Therefore, the need of a separate discipline 'ICT education' as interdisciplinary subject is overwhelming.

T4 considers it incomparable to be fruitful when we use ICT as a separate interdisciplinary subject. T4 also pointed to the subject focused use as a crucial matter. To justify this claim, T4 exemplified:

> For each and every class ICT is a milestone for social study as it covers all sub areas of geography, history, culture, and politics. They can create a live class. Even travelling around the world in the classroom is possible with the help of internet. Likewise, in English and Nepali language creating language lab teacher are using ICT friendly classroom set up. For science, it is very fruitful. You know simulations of live experiments are possible. Life cycle and experiments are easy to illustrate by demonstrating a video or animation. (T4)

ICT as an interdisciplinary core subject is in need. As stated by T4, students can get a clear idea on what they are going to do or what they are learning while focusing on the need of the lesson in ICT use. Also, using ICT is equally important for all subjects. Thus, it requires a separate discipline. Moreover, the present practices show subject wise use as per the convenience of the subject teacher. No specific frame has been identified to use ICT on the basis of subject focused

perspectives. However, a draft of national framework to integrate ICT in education has recently been prepared by the Ministry of Education in Nepal.

UNESCO provides the scenario of ICT use as a basic need for literacy after reading, wringing and numeracy.

> In addition to recognizing the value that ICT tools offer in terms of improving the reach and quality of education, all countries increasing regard mastering the basic skills and concepts of ICT as part of core of education, alongside reading, writing, and numeracy. These skills are required to enable citizens to function in a society in which ICT is a part of everyday life. (UNESCO, 2009)

When ICT is considered as a part of everyday life skill, it is of course a core part of education and it falls under the base for literacy. In the context of Nepal, making ICT as a core part of education requires the curricular reforms.

When teachers and administrators feel the need of ICT as a separate interdisciplinary subject it indicates the need of change in the existing curriculum. Changing curriculum is not in the hands of teachers in the current practice of Nepalese school education. Therefore, at this point, government agencies should play an active role of affecting factor (external[11]) in implementing the change.

[11] According to Fullan's theory of educational change, government agencies are the external factors of the change process.

CHAPTER V

OPPORTUNITIES AND CHALLENGES IN USING ICT

As everything in the real world has both positive and negative parts, use of ICT in school education also has both opportunities and challenges. In this chapter, I have presented the data and interpreted them to answer the research question number three. The question wanted to explore the opportunities and challenges in the use of ICT as experienced by research participants in their practical school life.

Opportunities

As explored from the field data, ICT use in schools have numerous opportunities to improve the whole system of teaching learning in schools. My research participants have felt and utilized various opportunities of the use of ICT such as increased student motivation, access to unlimited e-resources, improved quality of education, support for lifelong learning, efficient tools for management, learning beyond the classroom, effective classroom instruction, integrated methods of teaching.

Increased Motivation with Fun Learning

Motivation is essential to learning at any age (Finn & Rock, 1997). Teachers and principals of the school where ICT friendly environment is set have experienced teaching with ICT contribute to increase motivation of students in learning. Elaborating this phenomenon, the principal of a school said, “it really . . . children learn faster, they learn quicker and it does not take long to grasp the meaning when they use ICT in the classroom” (P1). Illustrating the situation of motivational learning, another participant (P3) described that reading books always is a

monotonous work for student. "On the laptop, while going parallel connecting activities and lessons (activities designed are audio, visual and audio-visual), are enjoyable, interactive and motivating" (P3). P3 also told that the integration of multimedia creates fun learning and simulates learning. In addition, Roblyer (2008) argues "instructional games increases motivation by adding games rules to drill or simulations" (p. 78).

Using ICT, it is possible to make teaching live and interactive. Principal (P3) exemplifies this reality as "Interactively designed content makes learning fun. For example in English, while teaching can and cannot, the example 'A bird can fly and 'A dog cannot fly' is animated with the sound and video". P3 further states that the contents provided on the laptops are designed to maintain inter-connectivity of reading lessons and assessment activities with audio, visual and audio-visual materials. It makes learning enjoyable, interactive and motivating to the students.

The ICT coordinator of the school where all classes have Active Board has been contributing to train the teachers to use ICT tools and resources and make their lessons interactive. How the Active Boards are used for interactive teaching learning is described below in his explanation.

> I train teachers about how to use the Active Board and its software in the classroom. We have multiple devices to be connected to the Active Board. For example: while conducting quizzes, the device helps us to detect first, second, and third in the order of the students' response interval. In a mass with a large number of student s, it is a very difficult job for teachers to identify the first, second or the third responses in order. (C1)

They use multiple devices compatible with the Active Boards to make teaching interactive. There exist various types of technical devices or tools that make teaching

interactive. The smart boards and slates are useful in classroom teaching as 'human-computer interaction'. Thus, using ICT, teachers can create or design their lessons in an interactive/live way. Example given by C1 is suitable to reflect the live teaching situation using ICT. C1 illustrates his experience as:

> For example if we are teaching a lesson about a country, we can show the country in live Google Earth or map. We may orally describe the location of the country but showing live location and map is far better than oral description. (C1)

Of course, C1 is true. As I have experienced working with Google Earth application, this provides various ways of presenting maps or locations. A teacher can show a location in various forms of views such as satellite, 3D map, 2D map, day light, night, and earth surface etc. Thus, students can experience how a place looks in these various views.

Moreover, some of the opinions of teachers, students and principals about interactive teaching or live teaching with ICT are presented below.

T5 said, "It's helpful and even fun learning". Similarly, S1 said, "With the help of ICT, class can be more interactive than without ICT". T3 said, "Engaging the kids in the classroom is easy through the use of Active Board based interactive teaching". Here, the terms fun learning, interactive and engaging are used to indicate interactive teaching using the Active Board. Likewise, P3 expressed his opinion in detail as:

> That provides real and live sense to students and they learn perfectly. Even in small classes, while teaching parts of the body, mouse over activities are really interesting. In the example, there is a picture of the whole body, when a student moves the mouse across the body parts an automated sound plays with

> the name of the part. In this kind of activity, students can learn name of the body parts and perfect pronunciation of the word. (P3)

Here, P3 talked about the live sense and perfect learning with ICT. T4 also expressed a similar view "with the help of the Active Boards and its software, we can make a live teaching. All the activities in the classroom can be live." In addition, T1 said, "The teacher can use the software and visually demonstrate the use of different instruments in geometry teaching live and ask student to follow the activity in their worksheets". T1 talked about the subject focused live activities.

About the same regards student S6 and S4 have also talked about the use of software and computer simulation especially in science and social studies. S6 said, "For science, it is very fruitful you know simulations of live experiments are possible with the help of ICT. Life cycle and experiments are easy to demonstrate by video or animation". In addition, S4 said, "For each and every class ICT is the milestone for social study. They can create a live class. Even travelling around the world in the classroom is possible with the help of internet and Google Earth."

The data presented above reveal that students and teachers are experiencing fun learning and live sense on mouse over activities, controlling computer on the wall, visual demonstration, and simulation of live experiments and travelling around the world in the classroom with ICT. These all express the reality of ICT use for interactive and live teaching and learning. It also reflects the scenario of 'virtual reality' in the classroom teaching and learning activities. In addition, Semenov (2005) states, "We believe that ICT enable teachers and students to construct rich multisensory, interactive environments with almost unlimited teaching and learning potential" (p. 162).

T4 expressed his views as “It is true that ICT helps students to be interactive. There is no doubt that students learn progressively. It is two way communications” (T4). The teacher was indicating that the interactive teaching fosters learning motivation.

Students also are experiencing a motivational learning with ICT. A student described learning situation as “Long lessons can be explained in a short time duration using visualization. No boring situation as in the long lecturer” (S5). Of course, the word ‘no boring situation’ could indicate the joyful learning or fun learning. However, there could be some other situations, too.

Junior students are also experiencing a fun learning with the Active Board. Fourth grade student described the situation as “Yes, of course. We learn better through the Active Board’s use. It is more fun learning through the Active Board.” We can see the enlarged visual everyone can see from the classroom” (S2). This expression indicates visually perfect display of contents on the Active Board, which is not possible with a marker pen on the whiteboard. Even the video show is better with the Active Board. When teachers use videos, they are effective with the display of Active Boards, not on the screen of small television or computer.

Use of ICT in teaching fosters active participation of learners in the designed learning activities. As I observed a class, students were busy and active doing one and other episode of learning activities during the whole 45 minutes. This was possible because “using Active Board in the class is meaningful for learning as well as to control the class. It also helps to minimize the noise. Kids are curious about what activity comes after. They also compete for activities on the board. This situation as described by T2 reminds me of the situation of human computer interaction for learning (Roblyer, 2008).

Concept Building and Creativity

ICTs are used to develop creativity and build basic concept on/about abstract knowledge. Using ICT lessons can be designed to adapt the pace of students, which provides the space to be creative. As stated by P3, "OLPC laptop comes with the lesson interactively designed. Students attempt the given exercise and report their success to the teacher. Students can report their progress on the lesson in their own at home after school." P3 also added that students can be self-explorative as they can find subject, week and lesson themselves. Students follow the instructions in the interactive module and learn with the mouse clicks on the laptop. For example, in the Nepali subject, students can learn poems with correct rhythm and rhymes listening to the sound embedded in laptop.

> Yes, activities are designed in an interactive way, like game they need to think and apply ideas after reading the lesson on completion of the lesson students learn the lesson. Some of the games are included in the laptop to develop their logical reasoning. It supports student friendly activities too. All lessons are kept in such a way that creates curiosity. In the text book, students only can read but in the laptop, they can read, listen and view the picture and videos related to the lessons. Students can also attempt interactive quizzes. (P3)

Another principal P1 states, "It is possible the simulation of the lesson as game. Lesson related activities are designed by the teachers to make more creative and interactive as per the need of the course."

Here, principals P1 and P3 emphasized the designing of lessons on simulation and gaming approach, which help to develop the logical skills of students that lead to creativity. Likewise, the experience of T4 clearly indicates that the use of ICT is for

creative and interactive learning that fosters the building of basic concepts on complex lessons. T4 confidently stated:

> Using ICT makes them more interactive; students can build up their concept more concretely. They will be creative. They can easily grab whatever you want to communicate. You design some activities and ask students to participate, they present their interest actively. They are eager to learn using ICT. (T4)

A senior student reading in grade ten also agrees that they can be creative while using ICT as they can find and share new ideas among the friends. T6 said, "We use different kinds of software, browse resources in website other friends might not be using that. When we bring in the class we can share with the friend. Different ideas combining together through sharing and create new knowledge" (S6). This indicates self-exploration, use of new software technology and collaborative learning by sharing and exchanging ideas makes students creative. This applies only in higher grades. However, T1 who deals with junior kids of grade two to four also agrees that use of ICT can help to create a creative learning situation where students develop their creativity. T1 believes, "It makes our kids more creative and helps teachers to manage creative teaching environment." By this statement, T1 indicated that using ICT (computers, multimedia and IP boards), teachers can arrange a creative learning atmosphere for junior kids, too.

Especially in the process of concept building, dynamic concepts are difficult to explain in the traditional media such as still slides. "Animations seem to offer the advantage of delivering better representations of these concepts. Compared with static images and text, animations can present procedural information more explicitly as they show the steps in an orderly manner" (Hwang, Tam, Lam, & Lam, 2012, p. 368).

When concepts are clear and students develop creativity then learning becomes permanent. Teachers view this because they believe that impression of knowledge and skills provided with integration of audio, graphics, visualization and simulation helps for permanent learning. An interesting idea was explored about permanent learning while interviewing with T1 who exemplified the phenomenon as follows:

> If a person is taught how to make something with just lecturing, she/he can remember for a few days or months but if the same thing is taught with ICT resources and methods, the person understands the whole process and remembers forever. The person never forgets. Thus, ICT helps in permanent learning. It makes a live demo of the lesson. (T1)

Here, the effect of visual learning for permanent memory is focused by the teacher. In addition, the effect of a live demo and process demonstration results in permanent learning.

Ocean of Learning Resources

All participants of this research perceive that using ICT opens the door to ocean[12] of resources for educational use. All of them pointed to the online resources (e-database, e-books, e-library, training modules and teaching materials etc.). T4 stated that by means of ICT, teachers are searching teaching materials available in the ocean of the internet and updating their knowledge of pedagogy practices.

The laptops distributed to students of the government schools have many reading resources for students in addition to the prescribed contents from the textbooks. "With the laptops, students can learn more than contents of the text book because laptop contains text book, e-library, and other online resources. Newspapers

[12] Metaphor used to represent plenty

and monthly magazine also can be accessed" (P3). Letting students access multiple sources of knowledge from a laptop is a good example of the use of ICT for e-resources. Meanwhile, P3 informed that teachers also can use such resources connected to their lessons for effective teaching.

Likewise, T5 perceives the use of ICT as ease of access to wider educational resources. "In the past teachers used to depend only on the book related things but nowadays book related things are very less. We go beyond the books and dive into ocean of e-resources on the websites" (T5). T5 wanted to show the real scenario of the ease of access to educational e-resources as facility to be used with ICT.

Another teacher (T4) perceives the reality of access to resources in a different way. T4 was connecting it to his real experience "I have experienced that in mathematics teacher need to develop more materials less available in internet but in other subject plenty of already prepared materials on web resources are freely available" (T4). This information is further valuable for teachers because access to readymade teaching materials helps them to minimize time while preparing the materials. However, contextual modifications are required. Because "we get a lots of materials on the web, internet resources by means of ICT but all of them may not be relevant to our context" (T3). Finding relevant material can be a challenge of wider access to educational e-resources but the accessibility is the major part to be considered.

P3 expressed his idea to represent a closed room as the open place to the world. P3 argues that even a closed room of a house has become open to everyone these days. P3 was indicating the open access of internet. P3 further argued, "In this scenario our students from grade two can browse Google search and find required materials. They can download the books and other relevant materials and study

offline at home" (P3). Of course, the metaphor for 'closed room open to the world' is true because of the possibilities of high speed internet access to browse online resources at anytime from anywhere.

The school (A) which has a high level of ICT infrastructure to facilitate students and teachers is capable to provide all kinds of accessible online resources in each classroom. Those computers placed in the class are connected to the Active Board, which has "its own inbuilt educational software for reading, writing, drawing, presentation, mathematics and e-library resources" (C1). In addition, the internet is connected to each computer. Therefore, teachers are able to navigate a variety of online resources as per the need of lessons in the real time classroom session every day. A lesson plan is sufficient for them in making the daily classroom instruction effective. In this connection, Tinio's (2003) idea seems relevant who states:

> Due to internet facility, access to online digital resources has been increased. Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at any time of the day and by an unlimited number of people. (Tinio, 2003, p.6)

However, there is still a need of parental monitoring to encourage in searching appropriate resources instead of letting random access. There are some challenges of such open access from the perspective of education use of ICT means. Those challenges are presented and discussed in the next chapter.

Backup of learning resources. In ICT friendly learning environment, teachers and students are able to create and maintain the rich learning resources.

Schools with ICT use in education are rich in educational resources as they have access to e-database, local backup of teacher made-materials, e-library, etc. especially, access to online resources as discussed in the previous chapter.

One of the opportunities of ICT use in schools is the ability of maintaining backup of learning resources in the form of e-database or e-library. Materials prepared locally can be stored for future use. "Another benefit is until the curriculum the same, materials can be used for next year or other sections of the same class with simple updates. Once prepared it works for ever until the new curriculum is designed" (T1). The teacher experienced that the system of local backup of materials can be retrieved whenever required.

On the other hand, the use of ICT is making possible to obtain online resources for offline use, which helps to access resources from the local computers in the network. Such system is useful for teachers to access resources even if there is no internet connection. "It is possible to download the e-books and other relevant materials and read at home" (P1). Here P1 indicated the possibility of local storage of online resources as backup for offline use.

T4 also views the opportunity of "searching materials available in the ocean of the internet and updating their knowledge of pedagogy practices" when internet facility is provided in the school for teachers and students.

Tools for Efficient Management

There are various tools of ICT that can be used for the purpose of school's efficient administration and management as stated by UNESCO (2009) that "ICT provides efficient management tools that are used for improving the efficiency of educational planning and delivery and facilitating policy making and management."

For the improvement in the efficiency of educational planning and delivery, ICT has potential to facilitate the compilations of educational statistics at the system and school level. Delivery of materials to remote schools, or to schools that have a small number of student taking particular subjects is simplified by the web tools and interactive CD ROM resources. The rapid and cost-effective creation and distribution of socially, culturally and linguistically appropriate learning contents are possible by using through data management system, spreadsheet and database software, radio, educational television and virtual schools and universities.

About facilitation of policy making and management, following narrative of principal (P2) is considerable.

> These days I don't have to prepare hand written letters to post to higher authorities or for other kinds of official communication. I can type a letter and send via email attachment as soon as they demand information from school. In a single click, I can retrieve data or information as demanded in my computer and make an immediate response. (P2)

The principal focused on 'information on demand'. This an example that, for facilitating policy making and management, ICT can aid school, principals, and superintendents in monitoring performance and improving the utilization of physical and human resources. In addition, it is an aid for communication between schools, parents, and central decision-makers through education management information system, emails, cell phones/SMS or text messages.

Learning beyond Classroom

In ICT supported learning environment, students get an opportunity to learn beyond the classroom as stated by a student (S1). According to the student, "With computer we get change to go beyond the classroom and teacher's capacity". S1 was

indicating to the learning opportunity by self-exploration of ample educational resources available in internet and other e-resources. S1 seemed true in the sense that ICT provides access to the 'ocean of resources', it is of course beyond a text book or a teachers' individual capacity.

To exemplify the opportunity of learning beyond the classroom, statement of a student (S4) is impressive "Laptop is always with us but teacher is there in the school only. We can learn in the laptop at any time." The laptops provided by OLPC program are allowed to take home. Therefore, students are able to read any lesson any time at home. Students also prepare next lesson before they go to the school.

Even in a closed room of a school, students and teachers get opportunity to browse the world of information. "It makes a live tour of the world in the classroom which is especially good in teaching social studies and geography" (T2). The teacher with this statement was indicating the software like Google Earth. It makes it possible to 'travel around the world'. Students and teachers make virtual tour to specific geographical locations during their class.

In addition, research participants raised the concept of support for 'Lifelong Learning' through school education by using ICT in schools. This concept is to provide opportunity to students and teachers to be familiar and update with the latest development of technology in education. Students learn to live with skills of ICT required for their day-day activities in the long run of life. As stated by UNESCO (2009), "ICT provides learning space and opportunity for learning beyond the classroom, classroom, or school, long after particular course or activity is completed." However, this requires some special media such as community radio, instructional television program, on-line courses, distance learning and open universities.

Instructional Effectiveness

There are many advantages of ICT use in daily classroom instruction. "If we talk about electronic gadgets computer, laptop, smart phone they have many features more than we can think" (S6). Computer simulation provides a real situation for instruction. A student of science said, "Live cast or demonstration of experimentations or the visual instructions are possible and useful in science." Stating other instructional advantages, one of the principals suggested using ICT for initiating to introduce computer based learning, digitalize the text books, support teachers in lesson planning, motivate students in learning, add interactive activities in possible lessons, and reduce the burden of distributing bundle of text books.

A single laptop can be sufficient for students. ICT integrated instructional designs always make student active in the learning process. Students get chances to do activities more than in the text book. From the perspectives of a classroom instructor, using ICT for every lesson from planning to classroom instructional delivery is to "keep unpaid teaching staff forever" (T2).

The laptop distributed by OLPC project is noticed to be *'very much useful'* (P1) as it contains systematic digital lessons starting from lesson plan. This helps teachers to forward their lessons even if they have no time to review the lesson on the very day. "Even in the absence of the concerned subject teacher, other teachers can handle the lesson. Teachers need no more shouting in the class. No chalk and talk" (P3).

Use of ICT is experienced to be effective for any level of school from primary to secondary. As analyzed by the ICT coordinator of the school (A); in the primary section, students learn effectively with audio and visuals. There is no value of big lecture. Likewise, in the secondary level, audio-visual (AV) materials with

collaborative learning platform are effective. Students in the higher grades use online- library and other reading resources as well. Students can themselves can browse and find relevant reading or learning materials. Therefore, classroom instructions are design to facilitate independent learning for higher grades. However, students in lower grades need closure support of teachers.

To exemplify the effective classroom instruction, a secondary level teacher provided the following example:

> While teaching overlapping sets in mathematics, teacher need to make some kind of animated figures to make clear concept and live presentation before they go to the classroom. Go to the classroom and just play the animation or demonstrate the material you have prepared. Students can follow the instruction, learn and do the activities as guided by the instruction used in the presentation. Such materials raise motivation of students in learning and teaching. (T4)

This teacher again focused on the role of instructional materials including animated visuals for effective teaching and higher students' motivation. This also shows the role of teacher as multimedia player. A teacher goes to the classroom, plays an automated instructional presentation and lets students follow the instructions. For this, initial training to the teachers to use ICT is enough as (Marshall & Taylor, 2012). Marshall and Taylor (2012) further said, "… with a small amount if initial training, the devices were easy to use and teachers effectively deliver instruction" (p. 3).

Cost Effectiveness

Indicating to the use of OLPC laptops, a principal (P1) said that the use of laptop is cost effective. If we provide all e-contents on the laptops from grade one to

ten with worksheets, it becomes many times cheaper than the books students purchase while reading from grade one to ten. Even from the perspective of environment, use of paper is minimized. However, the principal could not talk about the energy required for laptop, its functionality, and lifetime of battery and other sets of equipment used in the laptop. If they are assured for at least for 10 years, it is, of course, very much cost effective.

From the perspective of multiple functions, available e-materials, programs and usability, the laptops are cost effective and better than the books. "The cost is with all the books and program. Once we buy, it is not necessary to buy books every year. If such technology is managed for all the classes from one to ten, it is very good in terms of cost" (P1). I see in this situation, students become free of load they carry every day in their school bags. They become a light laptop carrier. However, students are asked to carry the laptop and books together. They are not free of book even if OLPC has distributed laptops to everyone.

As informed by T4, it is affordable to manage a set of ICT tools required to initiate an ICT resource room in all schools of Nepal. Pointing to the Active Board used in his school, T4 informed that these days Active Boards are available in less than fifty thousands and other all kinds of ICT tools and equipment are also affordable. T4 shows the way to initiate the use of ICT in government schools stating, "SSRP is investing a big amount of money in education. In this situation, the government can support the schools to invest in infrastructure for ICT friendly learning environment as it is the priority sector of SSRP too" (T4). Here I see the teacher was supposed to focus on initiation of using ICT showing the reduced market prices of ICT tools for cost effectiveness. Moreover, he was also conscious of the policy provision about the use of ICT in schools.

In addition, web tools are also cost effective. All of the principals P1, P2 and P3 agree that they found that the web tools are cost effective in sending emails, accessing e-resources and connecting to people. “The affordances of web-based applications are such that tools can be embedded within the curriculum at low cost in order to connect people and information” (Hall, 2009, p.30).

Multiple Methods of Teaching

Using ICT, teachers are able to use integrated approach of teaching methods. Teachers are using multiple methods at a time as per the need of the topics of the lesson. Some methods that are commonly used with ICT are audio/video show, demonstration, project work, peer/group work, individual worksheet, discussion forum, discovery, self-learning e-modules, listening, speaking and collaborative learning.

A teacher presented her experience about the possibilities of integrated methods of teaching in her class. It is presented below:

> For example today my lesson's everything was focused on the topic called ‘cause and effect’, I was teaching them what occurs what is the cause and how it leads to an effect: The ‘reason’ and the ‘results’. We have been doing it for the past three days. We started the lesson on Thursday. First, I did not jump directly to the use of Active Board. Listening about the daily activities and distributing the work sheets, we came to the visual things. Thus, we do everything; we apply all the possible strategy. Listening and speaking and visualization. In this lesson, I showed a small video of a girl bullied by her friends. After they saw the video which was of 10 minutes, students figured out what happened to the girl why it happened and what would happen next.

> It was really nice. They found it interesting and learned themselves all terms I was supposed to teach. (T2).

I had observed the class. As described by the teacher, the class was really interesting and students were very active in the process of learning with the integrated methods of audio, video, listening practice, speaking practice, illustrations, quiz, worksheet, and interaction.

Before assigning projects and works in worksheets, the illustration is required and the illustrations are easy when using ICT. This reality was explained by T2 as follows:

> Before giving any kind of project work, we always prepare a sample. We even give them ideas and different pictures and tell them if they could do it this way or that way, they get different ideas. For assignment, we usually use worksheets. So before giving the worksheets, it is useful to provide them with clear instructions via the Active Board. (T2)

Here, T2 intended to tell that the illustrations on the wall with big pictures are clear and effective rather than showing small sheets and explaining on the black board drawing by chalks traditionally.

Students have been experiencing that Three Dimensional (3D) visualizations are effective to them in understanding the concept of complex geometry with the help of 3D software. Explaining this situation, a student (S5) stated:

> If you talk about science, 3D images cannot be shown by making a sketch on the boards. Animated 3D videos and other illustrations are better through computer simulation. Live cast or demonstration of experimentations or the visual instructions are possible and effective to understand the lessons. (S5)

For me, the above statements show the possibility of effective science teaching even if schools are poor in managing a (sophisticated) science lab. A recorded video of scientific experiments and virtual experimental platform provides a real learning environment.

Similarly, S6 states that learning by sharing ideas through blog posts and collaborative leanings are good aspects of using ICT in classroom teaching and learning. Thus, ICT provides effective instructional platform for teaching and learning through integration of multiple methods of teaching.

Teacher 24 Hours

Self-learning modules prepared and integrated with the laptop provided to students have given the sense of 24 hour teacher. Students can learn independently with a mouse click on the laptop. Popup windows, textual and audio instructions embedded in learning activities work as real-time instructor. Therefore, students who are provided with laptops feel 24 hour teacher with them. Whenever liked, they can open the laptop and start auto instructed lessons. P3 is impressed with this reality and told that students read lessons and attempt the given exercise on their own. They can later report their success to the concerned subject teachers. Parents can also see their children's progress.

While talking about the laptops provided to students, the lessons there in the laptop and text books followed by teachers are the same. Therefore, students feel fun learning with the laptop and the laptop is always with them. A sixth grade student said,

> From the laptop, we can learn more than from the book. A laptop is always with us but teacher is there in the school only. Some exercises are very useful

> for students to learn even if there is no teacher. If parents are unable to teach at home with laptop we can learn ourselves. (S4)

Students feel comfortable with self-learning activities in the laptop as they are available at any time and comprise activities more than in the text book. Moreover, teachers are available only at school; the laptops provide them with a facilitator all the time. This clarifies that ICT simplifies learning process providing the sense of 'teacher anytime'.

TPD Support

ICT enables teachers to participate in the continuous professional development programs and activities. Teachers are able to develop skills required for their professional growth by using ICT resources. In the schools with the facility of unlimited internet access, teachers are able to access the online professional community. In addition, teachers are participating distance learning courses related to their profession. Schools are able to develop a network with the professional communities and run some online or on campus professional development sessions for teachers. A principal expressed his perception in this regard as follows:

> If you see today's dynamic world, teachers cannot stay far off from the skills of the computer and ICT uses. There should be learning attitude even if I don't know, "I have to go to the person who can teach me. If I don't know, others will win me and I will be left back." Every teacher has such feelings in our school. Therefore, they are learning and developing their professional skills in their own. For their professional growth, they can use school's ICT resources. It can be of taking distance courses or self-learning. We encourage using available ICT resources for maximum benefit of school, teachers and students. (P1)

This principal was indicating that ICT empowers teachers to update knowledge and skills required for their professional growth using online resources. Beyond the school's regular professional development activities, they can join other different professional communities and take trainings in their own effort. The principal (P1) indicated that the attitude of teachers is also a determining factor in the professional development activities which reflects their commitment to their own professional development.

Not only the teachers, principals have also got the opportunities to update themselves with the knowledge and skills related to their profession/principalship. In this regard, a Principal (P2) said, "I can update myself with new knowledge. I can browse the required resources and materials related to education and management in the internet. Everyone gets a chance to upgrade in the latest technology and information." Browsing resources on education and management indicates the access to internet resources and search of knowledge-online in self-initiation as a part of professional development. Both are possible only if ICT is used in the school.

The ICT coordinator of the school (A) has experienced the changing technology. C1 believes the uncertainty of future change of technology. Connecting to this reality, the coordinator (C1) said, "With a single training session, teachers cannot adopt ICT in teaching and learning. So, teachers have to have a learning attitude in their own effort and ICT resources available in our school are enough to support them in this regards." C1 further indicated the need of innovative practices in teaching and learning to be adopted with the daily changing technology.

Self-learning as a part of professional development is crucial for teachers and it is possible if ICT facilities, especially online resources, are used for specific purpose of professional skills and knowledge. One of the best examples is using

Massive Online Open Courses (MOOC). Where principals and teachers get hundreds of free courses related to their area of profession. Likewise, growing use of ICT means in education demands up to date knowledge and skills on the part of the teachers.

It is true that supports from school administration for teachers in fostering activities for their professional development, providing sufficient time for planning lessons, access to online resources, organizing training and workshops, facilities for ICT supportive learning environment encourage teachers to be active in their day-to-day job. See Covey (2007) in the literature review section. Teachers enjoy working in a supportive culture.

> Actually, it has been a habit of using Active Board for teaching purpose. Preparing normal slides is easy for us. It does not take more than 5minutes. We get support from IT specialist regarding the problem of Active Board and other use of ICT in the lessons. They also organize workshop to help us in using Active Board and other software. It is really encouraging. (T2)

I found there is a favorable environment for teachers to get involved in continuous development process. Looking at the statements of T2 above, I envisioned that the leadership in the school comprises principles of transformative leadership, particularly the 'Professional Learning' (MCEETYA, 2006) as discussed in the literature review section.

As discussed above, teachers and schools can use ICT resources in various ways for professional development. I found it is better for schools to see and practice the uses of ICT in relation to TPD in three ways:

> *A delivery system* providing teachers with information to improve pedagogy and content mastery; *A focus of study* that develops teachers' abilities to use

> specific tools, such as computers and multimedia; *A catalyst for new forms of teaching and learning*, such as inquiry-based learning, collaborative learning, and other forms of learner-centered pedagogy. (Gaible, & Burns, 2005, p. 2)

Thus, using ICT, teachers can improve pedagogy and content mastery, use different instructional ICT tools and apply learner centered pedagogy.

Connecting People

Teachers, students and administrators all perceive that the use of ICT make strong connection of people and it helps them for their professional development. Both online and offline connections are useful for academic purposes. Network of principals to principals, teachers to teachers and students to students play a vital role to strengthen their relationships with the people in the field of similar profession. "I can chat to my teachers asking about study related matter or any other informal conversation during school off if he/she is online in FB. I also can share homework problems to my friends", said S1. It is clear that S1 often uses FB and chats with friends and teacher about his study related subject matters.

Likewise, a teacher (T4) is able to keep himself up to date about professional activities participating in teachers FB network. T4 said, "At least once a week I join teachers' FB network. I can be knowledgeable with status update of members. I also can be reflective commenting them." T4 sometimes chats with his students and provides feedback on their inquiries related to study.

During school holidays, P2 chats with parents, students and teachers as well if they are online. P2 wants to be different in using social media FB. The major activities of the schools are posted on the status. P2 is rather critical and states, "Connecting people and chatting has both aspects. One should have better idea of filtering good people to connect them in the network". P2 further focuses on the

purpose of using FB and other kinds of social networking and says ‘everything is good for goodness’.

Connecting people via social network and online chatting has been popular these days. However, it is not common for educational purpose. The above mentioned are some rare examples.

Future Prospects

On top of the experiences of research participants as they practiced teaching by using ICT, there are some useful prospects for future. As recommended by S5, there should be access to internet in every school and the initiation to promote ICT in education should be the responsibility of the school administration. “Teaching computer as a separate optional subject is not enough. ICT should be mixed with all other subjects” (S5). Here, the student demands ICT as integrated discipline as discussed in the previous chapter. Likewise, C1 recommends the need of simulation of contents on the basis of game theory. “For example, to increase the typing speed, we can practice TypeShala[13] matching word practice. Like this, all activities should be designed to attract students in engaged learning” (C1). The ICT coordinator (C1) believes that game has power to engage students in the continuous learning. It is similar to “Digital game-based learning (DGBL) that closely combines educational content and games on computers or online to stimulate learners' interest and provides them with the opportunity for continuous learning as well as ultimately to enhance their learning effectiveness” (Cheng, Lou, Kuo & Shih, 2013).

In my view, recommendations of C1 are useful for the schools because C1 is the ICT coordinator in the school and has good experiences. C1 further recommends

[13] TypeShala is software designed to provide the idea of keyboard structure, systematic typing and increase typing speed in Nepali and English.

that the use of ICT have potential to ‘bring the world in a small room’. It should be promoted to school education all over the country.

> If I need some information or resource related to certain subject or topic I can immediately browse in the internet. Because of internet facility, all details can be obtained. Everything is now being based on the world of the internet. This is why schools should use ICT based practices. The government should also support to establish ICT resource rooms in the schools of Nepal to minimize the digital divide. If we see the future of present young generation, it is compulsory to train them with digital technology, at least use of computer and internet otherwise they will bear great challenge of ICT skills to communicate with people. (C1)

The above paragraph raises some pertinent concerns such as establishing ICT resource room in each school, addressing digital divide, need of training on digital technology for the youths.

The teacher (T2) has a unique view in regards to future prospects of Nepalese education. Pointing to the poor infrastructures in many government schools, T2 said, “Teachers can make creative plans for students’ better learning. The government can support us to establish at least an ICT room. Even in the lack of such facilities, teachers can prepare other relevant materials for meaningful learning.” (T2). In one side, T2 recommends establishment of ICT room and on the other side, T2 talks about meaningful learning without ICT. However, both aspects are equally valuable in their contexts.

ICT VS No ICT

It is interesting to discuss the experience of participants about teaching learning with ICT use and without ICT use. S1 is the student from the OLPC

program school. S1 studied with a laptop for five years from class two to class six. Now S1 reads in class seven and there is no use of laptop in the class. S1 expressed his experience as follows:

> If there is no laptop, it is very difficult for me to learn computer and internet. Computer and laptop are different to run and execute. Some lessons are easy in computer but some are easy with teachers. Some lessons can be learnt in self-attempt. Playing game is more entertaining. (S1)

The student clearly stated the learning computer and internet have been more difficult to him in the absence of ICT. The student pointed two situations of difficulty and ease with teachers depending on the nature of the lesson. However, another student S2 told that the lessons with ICT are easy in lower grades than in the upper grades. S2 was talking about the lessons in OLPC laptops and mentioned that there are more reading lessons in upper grades and fun learning in lower grades. From this discussion, I noticed that the self-learning lessons are easy for students with ICT if they are presented with the principles of fun learning and presented interactively.

With ICT, S5 is able to exchange the ideas through blog post and emails with his friends. S5 does not see such possibility in 'traditional learning'. S5 also pointed out that while using ICT, courses become simple and can be completed in time.

A principal (P3) finds better learning situations if used ICT. His analysis is presented as "Students can play back as many times as they like which is not possible in traditional system as teacher's lecture or sound cannot be played back. If ICT is used there is no chalk and talk and learning becomes interactive" (P3). Computer-based interactive learning modules; CD ROM resources and other e-resources have the capability of play and replay or do and redo but one cannot retrieve or recall the teachers' 'chalk and talk' lecture after a few days. Therefore, indication of P3 is

meaningful to understand that the ICT provides students with a better learning situation.

Students get wider learning platform with the ICT, as there is opportunity to access unlimited learning resources via internet. This phenomenon was presented by S1 as follows:

> We would be unable to use internet, e-library, and other internet resources if there was no laptop. We would not get opportunity to learn new things from the internet. Lessons would be harder. Without laptops, our classes depend on teachers teaching way. No new knowledge can be generated. (S1)

The student's indications are clear that the absence of ICT forces students be dependent on the limited sources of knowledge, traditional ways of teaching, which makes things harder, and no access to new knowledge update. Similarly, the statement of C1 also supports the same argument as S1 put forward. "In the past teachers used to depend only on the book related things but nowadays book related things are very less. To go beyond the books we see the ICT based resources on websites" (C1). C1 further explained that the complexity of the context and geographical boundaries do not exist due to the innovation of the ICT. To exemplify this, C1 said, "When we were reading at that time we feel the country is not beyond the hills around us. These days such complexity does not exist due to the innovation of the ICT" (C1). Here, C1 was indicating the possibility of browsing world of information inside a classroom.

Moreover, the following statements and stories obtained from research participants differentiate the context of teaching learning by using ICT and without using ICT.

> If there is an Active Board, it is easy to understand the lesson and if there is no such Active Board it is difficult for teachers to prepare interactive teaching material and it will be difficult for students in learning the lessons. On the white board, it is just writing but on the Active Boards, it is a fun learning experience. (S2)

Here, the student (S2) has been experiencing a situation of 'fun learning', and easy to understand the lessons with the Active Boards. S2 also stands on behalf of teacher indicating the difficulty of teacher to prepare interactive teaching materials if ICT means are not used.

> There is a significant difference in the past and at the present. In the past, I had to do in class hour whatever was possible –lots of work, at present, I have to do lots of labor to find resources and design and develop lesson compatible to ICT use. If there was no ICT, teachers had to depend on the traditional approach. (T4)

Here, I found that the use of ICT makes teachers more responsible and well planned because T4 agrees that he spends more time to search resources, design and develop lessons compatible to ICT use.

> I had a class where I had no computer, no electricity, no Active Board, no audio system, nothing. I have already taught these kinds of schools before also and the difference I find there and here is: if you prepare lessons with all e-gadgets around you it becomes more effective. The children are more excited in learning things each and every part. In absence of the ICT, teaching remains one-way all the time. I want to give all the information but everything depends on the teachers' expression and role. No space for self-exploration. (T1)

Here, T1 clearly puts forward her observations of the ICT used context. On the one hand, lessons are effective and children are excited to learn things. On the other hand, teaching is one-way, information dependent on teachers' expression and the role in the classroom and no space for explorative learning is provided. Thus, ICT is supportive for effective learning.

> There is vast difference in the classroom when we have technology and we have no ICT. I think it is easy to teach, easy to interact with kids; the most important thing is kids enjoy learning. Actually when we plan our lesson, we make sure that kids enjoy. By using the Active Board, kids can use different colors. They like colorful things. (T2)

Here, the indications of T2 such as easy to teach, easy to interact to kids, kids enjoy with colorful things are similar to previous participants' indications in one or other ways around. The fact 'ICT is supportive to teachers to design interactive teaching and fun learning' has been reflected through T2's indications too.

From the above elucidation of views from different participants, it has been clear to me that the debate of 'ICT' Vs. 'No ICT' is useless. Use of ICT is incomparable to no use. It is because the use of ICT enhances teaching and learning in different ways, teachers are responsible, resources are unlimited, teaching is interactive, learning is fun, learning situation is modernized, world of information is in a room, students are self-motivated, sources of knowledge are expanded, learning takes place together with sharing and interaction.

Improved Quality of Education

UNESCO (2009) states enhancing both teaching and learning ICT helps to bring a better learning outcome that is one of the quality indicators of education. As discussed in the literature review section, the indicators for quality of education with

ICT are improving students' motivation, personalizing student learning, enhancing student learning, giving feedback and reinforcement, enhancing the quality of teaching and improving teacher education. Here, I am discussing these sub-themes connecting them to the field data.

Improving student motivation. See the title 'Increased motivation with fun learning' above. I have discussed that the use of ICT creates oppurtunity of increased motivation with fun learning. As stated by P3, the use of sound, images, video, and animation in learning materials and computer software engages students and holds their attention, helping make learning more interesting. ICT allows animations and simulation of process such as the 'hart beat and blood circulation'. Even the integration of multiple approaches such as instructional television programs, realistic simulation software, video documentry, and interactive games are useful to hold the attention of students and foster their motivation in learning.

Personalizing student learning. **"**Some students can learn faster and some learn slowly, teachers can help slow learners in the class asking some extra work to fast learners. Level based exercise can help teachers to design individualized learning environment" (P3). For this tailoring,[14] the level and activity to meet each students' requirements is possible using ICT. For example, productivity software is used to create individual worksheets. Likewise, it is possible to the design the activities to meet students' individual learning ability and pace.

Enhancing student learning. See the title 'Effective classroom instruction' above in this chapter, how ICT enhances student learning is discussed. Computer based learning, access to open learning resources, sharing and interaction, collaboration, oppurtunity for self exploartion and project based learning enhance the

[14] ICT can be used to create tailored, locally appropriate lessons for students, in the relevant languages, quickly, easily, and affordably (UNESCO, 2009)

the way students learn as they learn best by ‘doing and interacting’. ICTs are used to make learning an active process switching sequence of classroom presentation and activities. See the title ‘Multiple methods of teaching’ for details. Moreover, learners have control over what they can do and what they learn in ICT supported learning environment.

Giving feedback and reinforcement. “We communicate with students and parents through email. Even we have some kind of suggestions to students which we sent via individualized email. We can send worksheets also by email” (T4). Besides email based feedback system, automated feedbacks designed in computer-based interactive lessons provide reinforcement for self-learning. Immediate feedback with score and tips for improvement makes learning more effective. Online quizes and flash quizes are useful. To maintain client service quality schools can design web-based feedback portal where “Students and their parent can post their comments and feedback to the class teacher and school” (T5). Thus, feedback and reinforcement are equally important for all to ensure quality of education.

Enhancing the quality of teaching. Teachers are able to engaged in various form of professional development (see the title ‘supportive to continuous professional development’). Teachers have become responsible to deliver effective classroom instructions acquiring some pedagogical trainings “on go” (P1). With ICT, teachers are able to prepare and deliver lessons in lerner-centered methods. In addition, ICT can improve the speed and efficiency of the administrative tasks, enabling teachers to give more time and energy to teaching their students “we spend more thime to search resources, design and develop lessons compatible to ICT use” (T6 & T4). Especially, it is possible by using internet resources for teachers, web-based software, and productivity software like word-processing, powerpoint and databse.

Improving teacher education. Teachers improve their pedagogical knowledge and skills via continuous professional development offered online or participate distance based modular courses or learning by self exploarion. Online teachers' community, professional forum and other professional networks are useful for trainee-teachers and in-service teachers. As discussed in the privious chapter, school (A) offers basic training to newly recruited treachers and refresher training to the old teachers at least once a year. The training focuses only on the use of ICT for effective teaching. During the training, they run a webinar session with the international partner institutions.

Thus, ICT opens the door of oppurtunities for quality eduction. However, there is considerable space for challenges that I am going to discuss in the following section.

Challenges

Despite numerous opportunities and encouraging future prospects of using ICT in school education, there exist some challenges – some of them are purely contextual to Nepalese schools. Chigona, Chigona, Kayongo, and Kausa (2010) have discussed two types of challenges of ICT use: contextual and psycho-sociological. These categories are broad and my research data may directly or indirectly fall into these categories. However, in this section, I am going to present and interpret the data clustering them in various themes emerged out there in the field about challenges of using ICT in schools. The themes identified are: update with the change, language and interaction, electricity backup and infrastructure, financial matters, data security, technical support and trouble shooting, national curriculum and polity framework, and information chaos.

Update with the Change

In the changing context of technology, updating the knowledge and skills has been identified as a challenge of using ICT in schools. It is connected to the professional development of teachers with every update of ICT. For example, "The software presently used can be outdated after a month" (C1). If we talk about office productivity software and operating system software, these are changing almost every year. Every update comes with new features and demands training to use new versions. Likewise, overhead projectors are already outdated and multimedia projectors emerged. Now multimedia projectors are going to be replaced by smart/IP/Active boards. New ways of learning M-learning[15] and R- learning[16] are the emerging realities of the changing world in technology. This demands the regular training to use the updated version of program, devices and software. There is no alternative to following the updated technology. It is interesting to read the experience of C1 about the ultimate reality of changing ICT.

> ICT professionals have no point to relax. Upgraded technology is not our internal thing, it is worldwide. In Nepal, there are no internal sources. We depend on everything in others' products. Therefore, upgrading software versions and developing professionals to use upgraded technology is the biggest challenge. (C1)

Of course, there are very few ICT companies working for educational software tools and products. Even they depend on some other software development platform or kits. C1's indication of dependency for hardware and software is the bitter reality of the Nepalese context.

[15] M-learning is new concept of learning with small hand held mobile devices.
[16] R- Learning is the learning with robots learning i. e. robotic learning

Language and Context

Language plays a vital role in communication and context is crucial for learning. It is also related to an appropriateness of instructional materials. One of the challenges in the context of Nepal is to ensure that teaching learning resources used with ICT are suitable in terms of language and context. It is obvious, very few e-materials, internet-based learning resources and software programs are available in Nepali. English has been the most dominant language that comes with educational software and e-resources. This also creates the confusion in using modality whether to simply translate instructional materials, to adapt programs to meet language and cultural needs, or even to produce school-specific context. Translation or reproduction both are further challenges in relation to human resources, finance and time factor.

Regarding language barrier, T4 raised the issue of contextualization. "It is hard to determine whether the retrieved information is usable or not with respect to the language and context" and P3 pointed out the possibility of language violation. To exemplify his argument, P3 said that the words used in OLPC laptops such as "Mouse click gardai", "Button thicha", are mixed Nepali and English. "Students become neither perfect in Nepali nor in English" (P3). This is an example of challenging language and contextualization of interactive learning materials.

Infrastructure and Electricity

Electricity or any other power sources and infrastructures are the bases to initiate the use of ICT. All kinds of ICT tools require electricity or any means of power supply. However, it has been challenging for Nepalese Schools due to a heavy shortage of electricity. Likewise, many government schools have no infrastructures supportive to the use of ICT. "Government schools have no such facilities like

buildings, electricity, and security of materials. Very poor physical facility is provided in the majority of Nepalese schools" (P3). P3 further focused on the lack of appropriate rooms for ICT equipment and load shading as a major challenge to use e-gadgets. P3 also informed that OLPC laptop can run for two hours with battery power.

As informed by the principal (P3), there is no position of security guard for security personnel in the school's human resource planning by the government. So, the security of valuable ICT equipment and materials are also the challenges for government schools.

Moreover, financially capable schools like school (A) have managed strong power backup system. "In this school, there is no problem of electricity as we have strong generator for power back up. For ICT facilities and infrastructure, school has managed everything" (C1). Nevertheless, teacher (T1) from the same school told that frequent power cut is disturbing them. T1 has the experience of the trouble of power cut. T1 explained that as "when the electricity goes it takes time to start generator and restart devices like overhead projector and Active Boards. This is boring and a waste of time during the class presentation" (T1).

Argument of T1 shows that the power supply is a real challenge for ICT use in schools as teachers bear trouble even in the schools where strong power backup system is managed. Speaking in the same line, T2 from the same school pointed out the lack of fuel/fuel shortage and the trouble of running a generator.

Financing/Total Cost

As discussed under the title 'cost effectiveness' above, it seems that the uses of ICT are cost effective. Mainly the OLPC users see the cost of laptop is cheaper than the books students buy every year. Likewise, looking at the reduced price of e-

gadgets also shows the affordability of essential equipment at least for one ICT resource room in each school. However, it is not true for an ideal setup of ICT friendly infrastructure, hardware, software, technical backstopping to facilitate all students on the basis of equal access. It requires a huge installation cost as well as running cost. Some of the devices and software becomes outdated after a few years. For example, dot-matrix printers are replaced by ledger printers, CRT monitors are replaced by LCDs, Floppy Disc no more exist, wired networking is replaced by wireless/mobile technology and overhead and multimedia projectors which were heavily used are being replaced by the Active Board technology in education.

This is why, the use of ICT requires a strong financial backup for total cost of the tools, including long-term costs that include the devices and associated equipment, relevant teaching and learning materials, ongoing training of teachers, regular upgrading of equipment, ongoing maintenance and technical support, connectivity, telephone and internet connection and infrastructure.

Some of the schools are capable but due to lack of supports from the government, they are unable to implement. Even if it is the matter of cost, government can support waiving the taxes on ICT tools and associated equipment for educational use. This issue was raised by P1 as follows:

> This is really costly and the government has to rethink on tax policy on ICT tools and equipment for educational use when we purchase them from abroad because those are not manufactured here. If government wants the use of ICT in school education, those things must be tax free because they is used for educational purposes as teaching tools. It is essential to encourage all private schools in using ICT for quality education. (P1)

Here, P1 does not talk only about waiving taxes. P3 also indicated that the use of ICT is for quality and the support from government becomes encouragement for private schools. The meaning underlying is advocacy for state responsibility for enhanced use of ICT in schools for quality education.

Data Security, Technical Support and Trouble Shooting

Some pertinent issues are raised by research participants regarding data security, technical support and regular troubleshooting. The Principal of the school running OLPC project complained, "Out of 124 computers, now 20 computers are not functioning well. Sometimes, computers run very slow. Charger has no fitting pins to our electric plug. We have realized the need of technical human resource for regular maintenance" (P3). It is all about the challenges related to technical support and trouble shooting. P3 told that government does not provide support for such case and there is no local fund for such provision. However, the project partner provides technical supports on a monthly basis. Likewise, a statement "Sometimes we face technical errors and get support from IT specialist" (S3) also refers to the trouble shooting practice in technical problems.

Data security issue is one of the major challenges and it comes with internet access as described by O'Brien and Marakas (2008), "with internet access proliferating rapidly, one might think that the biggest obstacle to electronic commerce would be bandwidth. But is not, the number one problem is security" (p. 445). It is about virus attack, account hack, and crash in the hard disc, etc. Virus may damage important document files, account hackers may hack account and misuse information and crash in hard disc may lead to the loss of data. Explaining all these possible troubles of security issues, ICT coordinator of the school said, "All software items commonly used in Nepal are either pirated or from open source. Such software items

are risky for security reason and virus attack" (C1). However, for the protection, C1 suggested to keep a backup copy of important data in the network free computer, use some antivirus protection measures and turn on or off computers systematically. In addition, it is recommended to use a strong password for each online account system, web hosting servers and apply network security measures.

In addition to the training teachers need on ICT -based pedagogy, they also require technical training for minor trouble shooting on hardware, software and networking. This demand is reflected on the following expression of a teacher:

> In the technical problem beyond our ability, we need to call the technical assistant and it consumes time. Keeping technical support staff with us in the class the whole time is not possible. Teachers also must be sound in all aspects of technological knowledge required for them. Sometimes, software does not work, goes on hang. If we fall on such situation, this is never good while lessons are ongoing. (T2)

In the above narrative of T2, I found that the school provides teacher-training on the basic pedagogical aspects of ICT use in the classroom teaching and other associated job tasks not on how to fix minor technical errors. Likewise, another teacher T4 also indicates some technical skills required for all teachers as follows:

> Minor fixing of hardware problems like connecting input units to motherboard, power cables, printer, scanner and monitor plug-in, simple local networking may be challenging to teachers. Teacher with the minimum idea to troubleshoot such problem only can better serve in ICT enhanced environment. (T4)

Hereby, I understand that the teachers with minimum skills of minor trouble shooting can best serve in ICT used learning environment. So, training as defined by

T2 above is needed when schools decide using ICT and it is again related to professional development of the teachers.

Policy Framework and Curriculum

A national policy framework for ICT has been prepared by MOE. However, it has not been implemented. In this context, I was curious to explore the ground reality to know how schools are using ICT without policy guidance and compatible curriculum frame. In response to this curiosity, I could explore the following realities.

"Present curriculum does not have provision of ICT as a separate subject" (C1). However, ICTs are used as integrated supportive tools to enhance teaching and learning (as discussed in previous sections) within the existing curriculum framework not for the students' ICT skills. So, need of curriculum is experienced by research participants, see the title 'ICT as a Separate Discipline' in the previous chapter.

Moreover, T4 views this gap of curriculum framework or policy to use ICT in schools from different angles. The views are presented below.

> Of course, the present curriculum is favorable to use ICT. In other word, the curriculum is compatible to the use ICT in classroom instruction. Nevertheless, if you want to use ICT in your classroom, you must know few things before you go to the classroom such as how to use computer, how to prepare presentations and how to design and develop software compatible lessons. Yes, if a teacher himself or herself is good at using ICT in teaching, present curriculum can completely be compatible to the use of ICT. However, there is a need of separate curriculum to teach skills of ICT to students as a separate subject. (T4)

This narrative does not present the existing curriculum as a challenge. Also, the principal (P2) said, "Curriculum is not the challenge to apply ICT but commitment

to change, electricity and exiting physical infrastructure are the major challenges. ICT as a separate subject of course needs a separate curriculum." However, participants clearly indicated the need of curriculum designers to include ICT as a separate subject. For me, it points to the need of policy to use ICT in education. It can be in the form of integrated or separate discipline.

Schools (A) use ICT to facilitate students' learning from the primary to the higher secondary levels. School (B) is used mainly for administrative purpose and less for students' facilitation and School (C) uses only laptops as purposed by the project design. This scenario clearly indicates the challenges of curriculum and national policy framework/guidelines as they have been using ICT as they like. There is no clear answer to how, why and when to use ICT in schools. Therefore, schools willing to teach ICT as in integrated form or as a different subject face challenge of policy and curriculum framework.

Information Chaos

Teachers have been experiencing the chaos of information while using internet resources. Explaining this reality, a teacher said, "If you type 'work sheet of set' in the Google search field, it gives links to many different types of worksheets. Some of them or all of them may be inappropriate for us" (T4). Here, identification or relevant teaching materials from the 'ocean of resources' is chaotic. I see this as a challenge for teachers because it is a waste of time if they are unable to determine and filter the usable and relevant teaching learning materials from the mass of open resource. This also demands the need of orientation to teachers and students on how to filter relevant information or materials from the internet resources.

The experience of T3 is also similar to T4. "I have faced the problem many times, it is time consuming as there are thousands of sources. It is hard and takes lots

of time to select the appropriate one. If you don't know the proper academic sites, you fall in problem" (T3).

Thus, I found the condition described by both the teachers T3 and T4 above as chaos and it is a challenge for teachers to retrieve relevant information or material from the open internet.

CHAPTER VI

FINDINGS, DISCUSSIONS, CONCLUSIONS AND IMPLICATIONS

This chapter has been designed to present the key findings, discuss the findings and draw some implications. In the finding section, the research findings are presented clustering them under the theme of each research question. Discussion section presents the detailed discussion of the key findings connecting them to relevant literature and theories. Implications section presents the research implications for policy, practice and research. In addition, implications on practices focus on the role of schools, teacher and students in using ICT. Conclusion section in this chapter includes my impression over the research findings.

Findings

This section presents finding based on the data presented and interpreted in previous section. Findings are answers to the research questions. As there were three research questions, this section also is divided into three sub-sections to present the findings respective to the research questions as ICT uses, perspectives on ICT use, challenges and opportunities.

ICT Uses in Schools

The first research question was formulated to know how ICT has been in use in schools. Standing on this question, I explored the purposes and the ways in which schools use ICT. Schools are using ICT in the form of its tools, devices and services to facilitate schools' services for three major purposes: administrative, instructional and communication. Further findings are presented point wise as follows:

- The devices, services and technologies of ICT are powerful for schools' administrative purposes.
- Computer software and devices are used for SIMS, School Financing, Exam/Results, Surveillance, Staff/Students Records, Store Keeping, and HR Management.
- ICT instills the ability in the teachers and learners alike to make use of various information retrieval systems; to access, evaluate, organize, share and present the information.
- ICT is used for improving the efficiency in planning, delivery and facilitation.
- Instructional use of ICT is done for the purpose of instructional planning, management, delivery, assessment and feedback.
- Teachers are using ICT such as personal computer, multimedia projector, scanner, printer, Active Board, digital audio, video, text and graphics, productivity software programs, interactive online/offline quizzes, animated and simulated instructional materials, email, internet resources, and web tools.
- Schools have been using telephone, mobile phone, SMS, web-based notice board, professional networks, intranet, internet, mailing list, e-mail, and official websites for communication and school exposure.
- Only the private schools have developed their websites.

Perceptions on ICT Use

The second research question was about exploring the perception of students, teachers and administrators on ICT use in schools. The use of ICT in schools is perceived in various ways such as an innovation, radical change, creativity and concept building, interactive teaching, teacher 24 hours, a separate discipline, changed

role of teachers and student, demand of time, ocean of resources, connecting people, and continuous professional development. These findings are presented below.

- A paradigm shift of innovative ICT is observed as a shift from stone slate (Khari-pati) to e-slates/ laptops (E-pati).
- The reason to consider ICT as innovation and radical change in education is because the of the following reasons:
    - Ample learning materials are available in the form of e-text, audio-visual, graphics and animated/simulated illustrations.
    - Assessments are designed with an automated feedback system.
    - Paperless works are increased and E-mails/Web-based communication has emerged.
    - Making virtual travel trips around the world sitting in a closed room is possible.
    - Virtualization of learning context, infrastructure, learning environment and the possibility of integrated teaching methods.
    - ICT opens the door for lifelong learning, learning any time anywhere through distance and online technology.
- Students in OLPC project school perceived that they have teachers 24 hour because the laptop they got contains subject wise and lesson wise interactively designed self-learning activities.
- Principals and teachers perceive ICT as a platform for TPD where they use internet resources (e-books, e-training manuals, online journals), take online courses, and join network of professional community to acquire knowledge and skills supportive for their professional growth.

- Expansion of professional network and connecting people around the world via social networking sites is possible with ICT that opens the opportunity to learn by sharing knowledge and skills.
- ICT opens the door to the ocean of educational resources such as e-database, e-library, training modules and teaching materials. In addition:
    - The laptops distributed to students of government schools have access to many reading resources for kids such as e-pustakalaya in addition to the prescribed e-contents.
    - A closed classroom has become a gateway to the world of open resources for anything we want.
- Use of ICT in school is perceive as time demanding as they are inspired by the educational practices in the external world and impact of progressive change.
- Teachers and students perceived their changed role in ICT friendly environment of teaching and learning. The perceived changed roles are:
    - Teachers: multimedia player, resource browser and locator, learning facilitator, self-learner, smart navigator and content designer
    - Students: active learners, users of smart e-gadgets, collaborative learner, information collector, presenter, practical and experiential learner, and game player.
- School principal and teachers perceived the need of a separate subject in the school that aims to literate all students with ICT skills such as basic computer, email, internet, web tools and technology and smart e-gadgets.

Opportunities

As explored from the field, using ICT in schools have numerous opportunities to improve the whole system of teaching learning in schools. Findings regarding opportunities are presented below:

- Teachers are using ICT to foster creativity and develop basic concept on/about abstract knowledge by audio/video, graphics, animations and simulations.
- Students using laptops of OLPC project can find subject, week and lesson themselves and learn following the instructions provided on mouse over the text or audio.
- ICT makes learning enjoyable, interactive and motivating to the students.
- Active board users create 'human-computer interaction' in learning.
- Learning is fun with live sense on mouse over activities, controlling computer on the wall, visual demonstration, and simulation of live experiments and travelling around the world in the classroom with ICT.
- Learners' motivation is increased through learning activities designed with audio, visual, pictures, animation, perfect visual display, clear illustrations and simulation.
- In ICT friendly learning environment, teachers and students are able to create and maintain the rich learning resources in both local and virtual backup system.
- Using ICT, schools are able to increase efficiency in overall school administration and management.
- Schools are able to provide space and opportunity for learning beyond the classroom using electronic self-learning modules and web-based interactive

contents so that students can learn under the principle of ‘learning anytime anywhere’.

- Self-learning environment is created where learners can practice activities, track progress, receive auto feedback, do/redo, and explore more from e-resources.
- Effectiveness of classroom instruction is increased by the following ways:
    - Computerizing teaching learning process
    - Digitalizing text books
    - Standardizing teachers’ lesson planning
    - Motivating students in learning with interactive activities in possible lessons
    - Creating virtual leaning context
    - Providing access to online resources in real time classroom instruction
    - Introducing collaborative learning platform
    - Using various hardware tools and software program
    - Applying multiple methods of instruction such as audio/video show, demonstration, project work, peer/group work, individual worksheet, discussion forum, discovery, self-learning e-modules, listening, speaking and collaborative learning
- Laptops provided by OLPC projects are cost effective than purchasing the text books and hard reading materials as laptop also provides multiple functions, makes the e-materials available.
- Students and teachers have found a large gap between the teaching learning environment with ICT and the one without ICT.
- An ultimate opportunity of using ICT is improved quality of education by:

- Enhancing the process of teaching and learning
- Improved students' motivation
- Personalized student learning
- Enhanced student learning
- Feedback and reinforcement
- Enhanced quality of teaching and improved teacher education

(Adopted from UNESCO, 2009)

Challenges

Despite numerous opportunities and encouraging future prospects of using ICT in school education, there exist some challenges in the context of Nepal. Findings in regards to the challenges of using ICT are presented below.

- In the changing context of technology, updating the knowledge and skills has been identified as a challenge of using ICT in schools because every update of software or hardware comes with new features and that demand regular training to use the updated version of the program, devices and software.
- Appropriateness of teaching learning resources in terms of language and context is prevailing challenge because of the following reasons:
    - Very few e-materials, internet-based learning resources and software programs are developed fitting in the context of Nepal using Nepali language.
    - English has been the most dominant language that comes with educational software and all kind of other e-resources.
    - Language translation or reproduction both are further challenging in relation to human resources, finance and time factor.

- One of the major problems in Nepal is the heavy shortage of electricity and power backup.
- Infrastructure to set the ICT friendly environment is also a problem as there are no appropriate rooms and furniture available.
- The schools where strong power backup system is managed face the problem of fuel shortage and the trouble of running the generator.
- Due to the lack of appropriate physical facilities and human resource, the security of ICT equipment and materials is also challenging in government schools.
- Setting ICT friendly infrastructure, hardware, software, and technical backstopping to facilitate all students on the basis of equal access in the long run requires a huge installation and running cost. Therefore, in schools of Nepal, bearing total cost is the major problem.
- Using ICT invites some troubles such as data security, technical support and regular troubleshooting because computer viruses spread quickly and damage important document files, hackers hack personal or institution user account and misuse information and crash in hard discs result data loss.
- Prevailing challenge in regard to policy is the lack of an umbrella national framework for ICT in education.
- Identification, selection and filtration of relevant teaching learning materials and other educational resources from the ‘ocean of online resources’ is chaotic and time consuming.

Discussion

In this section, I have presented my personal impression over the key findings establishing the linkage with the relevant literatures and theories. Basically, the

theories helped me to interpret the data from two perspectives that are innovation observed and change experienced in ICT based practices of schooling. My main purpose of undertaking this research was to explore the opportunities and challenges of using ICT in schools by capturing the voices of active stakeholders (students, teachers and leaders) and their experiences of everyday practice.

Discussion here is thematic. The themes are broad and capable to capture the discussion relating to each research question. The purpose of giving such thematic impression over the findings is to cluster the underlying ideas together.

ICT Wherever in the School

My first concern was to see how ICT has been in use in schools. This research revealed the various ways that schools use ICT. Therefore, I presented the findings under three major focal areas of schooling administration, instruction and communication. However, I explored that schools are trying to place ICT everywhere and for almost all the purposes – hardware and software of ICT in the office, classroom, account, store, staffroom, library, auditorium, waiting lounge, support desk, and even in canteen as projected by Semenov.

> We can imagine individual keyboards and helmets for all students, and many screens, mostly projection and flat-panel. The large projection screens in an auditorium will be used primarily with teacher or student presentations. Touch screens will be used for special occasions of choosing from a menu (including real school canteen menus). (Semenov, 2005 p. 175)

Semenov's projection and my finding in the context of a school are similar as ICT has become more pervasive, computer-based equipment are supposed to be integrated into every aspect of a school's operation.

In this line, this research revealed that the use of ICT enriches the service of schools facilitating in their administrative management, classroom instructions and communication system. Schools are using computer software and devices for SIMS, school financing, exam/results, surveillance, staff/students records, store keeping, and HR management. It provides the ability to make use of various information retrieval systems; to access, evaluate, organize, share and present the information. However, it is not true in case of all three schools. Only two private schools are capable of showing this strength. It means it is possible even for government schools too if desired and supported by the government.

ICT is used by school administrators to be efficient in policy making, planning, delivery and facilitation of educational services in the private schools. It is similar to Shakya's (2010) observation, "ICT changes the management, work process, and training of professionals and students in education." Using SIMS, schools are able to store, process and retrieve the desirable information about schools' overall activities and management. In addition, they are able to provide schools' information to the concerned authority and persons at any time.

ICT has been supportive to simplify, standardize and make transparent financial operation in the schools through commercial and open source software. Likewise, teachers are able to use various software programs such as word, excel and access to prepare worksheets/question papers and keep marks/grade records for their use. Schools are also using commercial software in processing test results and reporting system. This has been supportive to simplify the tasks of entering, storing and processing the marks/grade records and hence retrieving progress reports of individual students quickly. However, teachers' role is vital to make meaningful use of ICT in schools. "Teachers are the key to the successful integration of ICT into

education. They manage the process of teaching and learning" (Kedar, 2008, p. 17). In addition, ICT can immeasurably enrich the learning resources and materials available to learners but without first winning the hearts and minds of teachers, this is a hollow boast (Ming, Hall, Azman, & Joyes, 2010, p. 5).

CCTV and Finger-touch attendance system are used for administrative purpose. Administrative efficiency in monitoring staff regularity and student's activities in school premises are enriched by the help of e-attendance machines and CCTV camera. In addition, CCTV has been an effective solution to control disciplinary problems as discussed in the finding section. However, these may not incorporate humanitarian values and interest of freedom. Sometimes, decisions taken looking at the report of machine may not be rational as Aryal (2011) said: "practice of CCTV has not brought any significant changes rather than creating psychological fear and forceful control of activities. Students and teachers both are alert to avoid mistakes that they may make unknowingly" (p. 64). Therefore, school administration must be aware of both positive and negative consequences of using such devices.

Record keeping system has been computerized. Computer software is used for entering, storing, processing and retrieving cumulative or anecdotal records of students, teachers and other staff. Likewise, computer based store keeping system has been managed for daily log of demand, stock check, purchase and supply. The system is effective to minimize manual workloads, human errors, and misuse of goods and maximizes efficiency of store keeping maintaining transparency. I see all these enhance the administrative efficiency and therefore proper utilization of resources is assured.

The use of software such as CMS and HR data base has been effective to maintain systematic job profile, database of employees including the records of

recruiting process, placements, appraisal, pay, promotion, career portfolio and other all kinds of HR records. It is true that hiring human resource from a mass of people provides a greater chance to recruit right candidate for the vacant positions.

Thus, schools are able to enrich their services as per the concept of "ICT everywhere in the schools" (Semenov, 2005, p. 175). Moreover, from the perspective of educational change, schools have started adopting change in their traditional practices with the innovation of ICTs. They are at the phase of 'initiation and implementation' of innovation as discussed in Fullan's theory of educational change. In addition, the above discussed scenario shows the changes in services of the schools as stated by Lam (2012), "the process of education is under dramatic change due to the advancement in ICT" (p. 378).

Enhancing Classroom Instruction

Classroom instruction is the core part of school services and output of the classroom instruction has direct impact in the society as students practice in the classroom. Whatever is done in the classroom is reflected in the performance of the students. These days, traditional 'chalk and talk' lectures are replaced by multimedia Active Board presentations as in the concept of 'big screen on the wall'. Therefore, the purpose to enhance classroom instructions by better planning, management, delivery, assessment and feedback using ICT is a good idea. In addition, Higgins (2003) said,

> From the pedagogical point of view, one of the most important goals for introducing ICTs in schools is to enhance teaching and learning practices. The use of technology allows a more efficient way to develop aspects of learners' thinking than would be achieved when employing traditional teaching practices. (as cited in Chigona, Chigona, Kayongo & Kausa, 2010, p. 22)

While planning lessons teachers use productivity software tools to develop soft materials that are useful for long-term. Schools and teachers are using ICT to manage teaching learning resources and organize learning environment using internet resources, CD-DVD ROM resources and digital library resources. In addition, ICT enables teachers and students to create and maintain the rich learning resources in both local and virtual backup system for regular instructional use.

Likewise, ICT has been providing an environment and opportunities to engage students in the interactive learning process inside an e-classroom[17]. The use of PowerPoint presentation, audio/video show, internet, encyclopedia, digital library and online quizzes with multimedia projector with Active Board technology provides option to teachers to integrate multiple methods to enhance the instruction.

Assessment and feedback system is also optimized with the use of ICT through interactive quizzes or question answer session 'on Active Board', instant evaluation worksheets, instructional software tools for e-assessment. Automated feedback through self-paced interactive learning activities and follow-up exercise are used. In addition, individualized feedbacks are provided if assignments are submitted online.

Thus, use of ICT in has been the most prominent aspect to facilitate classroom instructions in various ways as claimed by Dhungel (2011). Dhungel claims that "ICT is the most convenient advancement that facilitates both teachers and students to learn new things through entirely new methods." Likewise, I agree with Spring (2004)'s teaching and learning modes in which ICT enabled e-learning could provide substantial gains in effectiveness, quality and cost benefits (see page 28).

[17] An electronic classroom is a classroom equipped with computer and communication facilities that as instructor and students can use to store manipulate or retrieve information during class or for the purpose of presentation analysis or communication (Jarvenpaa, & Vogel, 1992, p. 285).

Innovation and Radical Change

Perception on the use of ICT revealed that students, teachers and administrators have accepted it as an innovation and radical change due to opportunity for creative learning, interactive teaching, teaching and learning any time, ocean of resources, changed role of teachers and student, connecting people, and continuous teachers professional development. Such radical change in education is 'Fourth revolution' in the terms of Anderson (2010) (see literature review section). In addition, ICT has brought a paradigm shift in education, for example traditional 'Khari-pati' has been replaced by 'E-pati'. A closed classroom has become a gateway to the world of open resources for anything. All the teaching learning materials are digitalized and are available in the form of e-text, audio-visual, graphics and animated illustrations. Web-based assessments with an automated feedback system are available instead of paper pencil test. These all the facilities possible by using ICT has given new dimension to education and perceived as dramatic shift as stated by Agbatogun (2010) who further claims that "Interactive Computer Technologies (ICTs) have crept into education industry, thus dramatically causing transformation in instructional process" (p. 55).

Likewise, interactively designed learning activities and exercise including popup windows, mouse over voice/text instructions and auto feedback have capability to stand alone in place of teacher and provide independent learning environment any time anywhere as '24 hour teacher'. However, the role of teacher is always important to invite innovative practices in education "without the active, enthusiastic and skilled participation of teachers, innovations to enrich education with the advantages offered by technology are doomed to fail" (Kedar, 2008, p. 17).

Using ICT in schools has also opened the door to unlimited e-resources for teaching and learning such as e-database, e-library, training modules and almost all kinds of teaching and learning materials. These are useful not only for in campus face-to-face mode of education rather efficient for the new ways of education i.e. distance/online education. “Distance education is very attractive for governments wishing to achieve a rapid increase in trained professionals without the massive infrastructure costs associated with ‘bricks and mortar’ institutions” (Marshall, Kinuthia, & Richard, 2012, p. 35). A single platform of e-resources works for both types of consumer distance and face-to-face. Therefore, ICT invites innovative ways in accessing education.

Teachers and students can update themselves with the latest knowledge and pedagogy practices around the world sitting in a classroom. Using unlimited resources, teachers can apply various new ways in their teaching strategies. This is all about letting teachers do the things which were impossible in traditional ways. This argument is supported by Churchill (2009) when he states, “ICT adds a new dimension to teaching effectiveness by enabling teachers to do things that might not be possible within the traditional classroom” (as cited in Karami, Karami, & Attaran, 2013, p. 37).

Teachers and students have been experiencing their changed role in ICT friendly schools environments. Teachers are multimedia player, resource browser, learning facilitator, self-learner, smart navigator, and e-content designer. Likewise, students are active, practical, experimental learners and players of e-gadgets. These roles provide a constructive learning and teaching opportunities to the students and teachers. However, teachers need to demonstrate better ICT savvy skills while dealing with young children otherwise students may be frustrated as noted below:

> Students expressed frustration that the teachers were not ICT savvy and did not create opportunities for them to engage in the use of ICT in their learning. Unless this situation is recognized and addressed, the concept of Smart School Education, to invoke transformation towards enhanced quality of teaching and learning through integration of ICT in the learning environment, will not be achieved". (Ming, Hall, Azman, & Joyes, 2010, p. 6)

Web technology has brought great features for schools' radical change in communication, networking and exposure to the external world. Gullier and Durndell (2006) state, "electronic mailing lists, newsgroups or, more broadly, online discussion forums are key features of the digital era, connecting people who share common interests from voyeurism to The Simpsons" (p. 368). Just by connecting to internet and establishing a website, schools are able to be accessible across the globe. Schools have been using telephone, mobile phone, SMS, web-based notice board, professional networks, intranet, internet, mailing list, e-mail, and official websites for communication and school exposure. In addition, students, teachers and administrators are able to expose, share and learn with friends in network of the professional communities. Some other features in this line are noted by Fan as follows:

> The Internet provides a platform for students and teachers to exchange information with people around the world inexpensively and at any time of day. The Internet gives them the ability to connect to peers around the globe. Schools with Internet access can create their own web sites featuring the work of students and staff. (Fan, 2010, p. 56)

Thus ICT has potentials to innovate and bring radical change in the ways of schooling in Nepal. While analyzing these situations from the perspectives of

'innovation diffusion', school stakeholders already have accepted the innovation and they already have diffused it in the process of schooling. Following example connecting to Rogar's five step principle clarifies the situation. According to Rogar (1995) innovation decision process has five steps. First is *Knowledge:* teachers, students and administrators are aware of newness of ICT and they know how it functions. *Persuasion***:** stakeholders have shown positive attitude towards innovative use of ICT in schools; *Decision:* they are using ICT means schools are engaged in activities that lead to a choice to adopt ICT in schooling. *Implementation:* ICT friendly environment is created for teaching and learning, administration and communication of the school. This demonstrates the innovation in use. *Confirmation:* all the user of ICT perceived that it is good for schooling; the result is improved quality of education however they demonstrated some significant systemic obstacles. This example shows that ICT has been in use in schools as an innovation of technology.

Likewise, while analyzing the situation of ICT use from the 'educational change' (Fullan, 1991) perspective, four phases of change must be internalize in the situation of ICT use in schools. Those are 1. *Initiation:* innovations are diffused so, it exists. It is contextual to private and government schools. 2. *Implementation*: Private schools are hindering with external factors like policy framework for ICT integration. The case of government is different as they are dependent on INGO project or policy of government implementation is very hard for them. 3. *Continuation:* one of the private schools A has started institutionalization process of ICT use establishing separate department. In case of this school continuation is committed. But another private school and government school both are yet long way to come to this position. 4. *Outcome:* this is measurable if above process are completed. Only the private

school A has been able to stand in this phase involving stakeholders' active participation in the process of implementation and continuation. Regular training sessions for teachers, furnished environment for learning with ICT devices, equipment and services and regular technical support department are examples of the outcomes of change in the schools.

Thus, I can say school A is experiencing change with innovation. However, other two schools are just in the phase of initiation towards change with innovation.

Improved Quality of Education

"With the introduction of ICT in education, the quality of education will definitely be improved" (Dhungel, 2011). There are various evidences from the field data in this research to support the claim of Dr. Dhungel. How use of ICT leads to improved quality of education is discussed below.

Providing the environment for creative learning such as collaborative learning, project based learning, and learning with interactive e-materials, ICT contributes to quality learning. In addition, abstract learning contents are simplified by audio/video, graphics, animations and simulations that help to clarify basic concept and understand the lesson well. However, these all are effective only if teachers are well trained to teach in ICT friendly environment as argued by Ming, Hall, Azman, and Joyes, (2010), "in order to effect lasting changes in practice, teachers need to be provided with the professional development opportunities which will enable them to successfully integrate ICT into their everyday teaching" (p. 6).

To make learning enjoyable, teachers are able to design learning activities by using multimedia resources, Active Board and computer program with audio, visual, pictures, games, animation, and simulation that makes lessons interactive, live and practical. All of these are effective in making motivation learning environment in

classroom instruction and is related to motivational role of ICT in learning (Karami, Karami, & Attaran, 2013, p. 39). For me, it is like "In schools, educators have always searched for ways to make learning more efficient and more enjoyable" (Cooper, 2006, p. 322).

Visually perfect display of interactive teaching learning activities on the Active Board provides a clear illustration. As stated by Wagley (2012), this is all about 'edutainment' to make learning entertaining and education meaningful. When the learning is entertaining, it promotes students' motivation. In addition, motivation is core part for effective learning and with ICT, students get joyful learning experience which motivates them for learning because "students are motivated by educational experiences that are joyful, enriching, and transformational" (McDowell & Fredrick, p. 19).

On the other side, the use of ICT in schools also provides a 'sustainable learning' opportunity through the concept of 'learning beyond the classroom', 'lifelong learning' and 'learning anytime anywhere'. In addition, it is an option for knowledge beyond a text book and teachers.

An effective classroom instruction also assures the quality education in school through computerizing teaching learning process, digitalizing text books or learning content with interactive design and simulation, standardizing teachers' lesson planning and delivery, motivating students in learning, making virtual learning context, providing access to online resources in real time classroom instruction, and inducing collaborative learning platform. It is possible by using ICT hardware and software. In addition, providing effective instructional platform through integration of multiple methods of teaching and learning such as audio/video show, demonstration, project work, peer/group work, individual worksheet, discussion

forum, discovery, self-learning e-modules, listening, speaking and collaborative learning, ICT has potential to foster quality of education.

Thus, use of ICT has been a trademark for quality education. As discussed above, better learning outcomes by enhancing the process of teaching and learning is indeed. UNESCO (2009) also claims that ICT improves quality of education by improved students' motivation, personalized student learning, enhanced student learning, feedback and reinforcement, enhanced quality of teaching and improved teacher education. Enhancing quality of teaching and improved teacher education requires training to the teachers or teachers' involvement in continuous processional development. It is because teachers are the key actors for instructional design and delivery that ensures quality in education schools provide. However, the commitment from the teachers to CPD plays a vital role in the whole process of using ICT in schools as indicated by Kedar (2008) who states, "The full participation of teachers in adopting new technologies to enhance education requires a commitment to ongoing professional development of teachers."

Quality concern relates even to the financial matters. Effective learning materials are available in low cost with laptops used by students of OLPC project school. Data shows the laptop is cost effective than purchasing the text books because the laptop can include all subjects from grade one to ten with interactively designed learning lessons, activities and worksheets. In addition, the multiple functions of the laptop, available e-materials, programs and usability, the laptops are cost effective and incomparable to the books. However, setting ICT friendly infrastructure, hardware, software, and technical backstopping to facilitate all students on the basis of equal access in the long run requires a huge installation and running cost.

Shortcomings over Impression of ICT Use

Besides the opportunities and encouraging prospects of using ICT in schools as discussed above, there are considerable shortcomings as challenges in the context of Nepal. The first and foremost challenge is lack of power backup due to heavy load shading of electricity. In addition, infrastructure to set the ICT friendly environment is also a problem as there are no appropriate rooms and furniture available.

Every update of technology comes with new features and that demand regular training to use the updated version of program, devices and software. Such changing nature of technology is also a challenge as end users or change agents of organization who are the 'factors affecting to initiate the innovation' (Fullan, 1991), may resist the change.

Language and contextualization of learning resources are also the challenge because very few e-materials, internet-based learning resources and software programs are developed fitting in the context of Nepal. This situation is also pointed by Quah (2008) that "In many countries, there remains an ongoing need for ICT learning resources in local languages" (p. 24). English has been the most dominant language that comes with educational software and all kind of other e-resources. This issue is connected to the national policy and curriculum frame. Nevertheless, national policy and curriculum framework is also regarded as a barrier for uniform quality standard to apply ICT in school education in Nepal. In this situation, I found "systems model of leadership and change for ICT implementation in education" (Pelgrum & Law, 2003) as an ideal way to overcome the policy and curriculum related barrier. Moreover, the uses in schools without integrating across the curriculum cannot be effective as Fan (2010) argues that "eeffective IT integration

must take place across the curriculum in ways that deepen and enhance the learning experience" (p. 57).

Another aspect of challenges is technical troubles such as data security and regular support for troubleshooting, for example, damage of important document files due to computer viruses, hackers hack personal or institution user account and misuse information and crash in hard discs result data loss. Here, I agree with Denials (1994)

> Learning should be a continuous process, integrated with the activities involved in carrying out day-to-day work. Employees should receive at least one week per year of training on how to use IT, as well as several weeks of instruction how IT can be used to enhance the capabilities of the business. (p. 137)

It is true that teachers and students require relevant training to trouble shoot the problem that may hinder during their regular work while using ICT. Therefor it should be considered as continuous learning process as in-service training sessions. Finally, chaos of information such as identification, selection and filtration of relevant learning materials and other educational resources from the 'ocean of online resources' is experienced. It is chaotic as it consumes greater time. In addition, it is like hunting in the dark.

As discussed above, "physical and technological infrastructure, teaching and learning resources, and teachers' vision and expertise" were also envisioned by Pelgrum and Law (2003) as school implementation factors of ICT at the school level (see chart 1 in the literature review section).

Final Remarks

As a field of personal interest, exploring the use of ICT in schools remain a very joyful research project for me. However, I encountered some remarkable

challenges. One of those is about gaining access to the site. One of the school principal of a private school rejected my proposal of selecting his school as my research site. Likewise, two participants from a school, who initially agreed to take part in the research decided quiting their roles. Besides these, agreeing with some of the participants for interview schedule was also difficult. As a qulaitative researcher, I have internalized these events as oppotunities for learning through the research process.

As a student of MPhil in Educational Leadership, I thought that leaving an impression on the ICT use from the prespectives of leadership is worthwile. Therefore, I have made the following discussion in this regard.

I believe success and failure of ICT use in an organization depends on leadership qualities, vison, mission and strategies of a leader. Among three schools, the principal of school A is found to be 'evidence based'(MCEETYA, 2006) for efective use of ICT. P1 has been able to demonstrate the qualities of evidence based leadership by 'undertaking new leadership roles, styles and actions uniquely afforded by ICT'.

Looking at the practices in his school, he has made possible attempts to facilitate all classroom and school environment with useful ICT services, equipment and technologies, we can see P1 also 'maintains knowledge of current and emerging ICT and is engaged in critical evaluations of their use'. In addition, P1 has been able to 'generate, collect, analyze and act on the data in improving teaching and learning' by 'sustaining a research culture using technologies to manage on-site research and to connect with expertise in schools partnering to universities and other research centers'.

Establishing an IT department, appointing separate IT and ICT resource coordinators in the school for quality technical support and other capabilities of 'management' as characterized by MCEETYA for effective use of ICT are also deserved by P1.

Likewise, in the school, the culture of regular training for teacher is established. All the classes are ICT equipped and school has connection to the world with unlimited internet access. In addition, establishment of the official website and web-based practices of teaching learning can be easily observed.

Another capability of leadership for effective use of ICT is 'partnership' (MCEETYA, 2006). For this, the school has developed good partnership with national and international universities to exchange ICT knowledge and practices, and they have kept the welcoming door open for the researchers in the field. I found such enriched examples to be sure about P1's characteristics of all three (see page, 38) ways of leadership for effective use of ICT in the school education.

Thus, innovation of ICT is diffused in the system of the school (A). P1 also has been able to transform the way of educating school students adopting innovation of ICT. This also shows that P1 has been working in the framework of 'transformative leadership' (see page 16).

Regarding school B and school C, they still have a lot of things to do. School C is a public school and is depending on the project of OLPC, but has no plan to sustain the program after the project is over. However the principal (P3) of the school perceives the use of ICT innovates the ways of education and believe it contributes to enhance the quality of education. In addition, he seeks the support from the government to expand and promote the use of ICT in the school.

Likewise, in case of school B, I found somehow better investment in ICT equipment, devices and services that facilitate and regulate the system of school management and administration. Focus on the use of CCTV surveillance, e-attendance machine and commercial software for administrative use reflects leadership oriented to structured management and administration, which is out of the flexibility of ICT based management (see page 38). However, for instructional purposes, they have established a common ICT resource room for the whole school installing multimedia projector and a computer. Though computer science is a subject taught from class one onwards but interdisciplinary practices are not initiated yet.

Conclusions

Use of ICT in schools is a new phenomenon in the context of Nepal. Schools have been exercising innovative practices of ICT to change their traditional pedagogic practices based on ‘chalk and talk’ to modern pedagogic practices based on electronic devices such as computer, IP Board system and multimedia. Thus, increased student motivation, enhanced student feedback and possibility of using multiple methods of teaching are the keys to enhance quality of education with ICT.

ICT has been able to provide access to ample e-resources through online open sources and networking of professional groups. Such resources enhance students’ learning and teachers’ continuous professional development by providing relevant learning and training materials.

The use of ICT in a school increases the overall performance of the school by enhancing administrative efficiency, instructional effectiveness, and information exchange. In addition, strengthening exposure of the school to external societies is possible with ICT.

ICT has been able to bring the world into a classroom. This opens the door of knowledge society where students and teachers are able to contribute to knowledge building by switching their roles of knowledge receiver and provider.

ICT is supportive to address some national issues of education such as relevance, access and quality. In addition, it contributes to minimize the digital divide if applied to all schools.

School’s financial strength, infrastructure, skill of teachers, language of communication, and availability of technical supports are that major factors that determine the success or failure of ICT use in a school. Therefore, schools need a

farsighted comprehensive plan before they start integrating ICT into their educational practices.

Implications

Literatures, research findings and discussion supported me to draw the following implications.

Policy

All schools can implement SIMS system as it allows entering, storing and retrieving useful data that are fed to educational planners for assessment, monitoring and evaluation of education programs as well as inputs to policymakers for a more rational decision-making.

The use of ICT has potential to minimize digital divides by increasing ICT literacy. Therefore, a curriculum reform to adopt ICT as a separate compulsory subject in school level can set a new height to Nepalese school education.

Practice (Schools, Principals, Teachers, Students)

Schools, principals, teachers and students are the end users of ICT to change the way of educational process. Implications drawn on behalf of these entities of end users are presented below.

Schools. Using ICT in the process of education results improved quality of education from various aspects (see findings). Therefore, all schools can initiate using ICT establishing at least a separate ICT resource room with a set of multimedia projector equipment, computer and its accessories and the internet connection.

Principals. School principals are the strategy planners, policy makers and implementers for the overall development of education at the school level. The use of ICT in school depends on how school principals take initiatives and implement school reform plans. Therefore, ICT can help principals providing and facilitating with efficient management tools for improving the efficiency of educational planning, delivery, and management.

Teachers. To enhance the pedagogical practices, professional development and effective teaching adopting the world wide practices, teachers can use ICT as means of their comfort. Using the productivity software, web tools, and internet resources, teachers can empower themselves in teaching profession to adopt modern teaching methods and skills.

Students. Students can use ICT to search knowledge, share and foster collaborative learning using option to learn in their self-peace beyond the classroom. Instead of carrying heavy load of books in the school bags, a light laptop can provide an easy access to all kinds of electronic learning resources and self-learning materials.

Research

The use of ICT in school education in the context of Nepal is an emerging practice. In this context, specific researches to see an immediate result in learning achievements of student, administrative/managerial efficiency of school leaders and effectiveness of teachers in pedagogical practices are considerable.

In addition, a comparative research to assess the educational service delivery system, pedagogical practices and achievement in between the schools where ICT is used and not used can be carried out.

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APPENDIX A

Observation Check List

Devices, Equipment and Services of ICT in School

Schools Name: …….

Type of School: ☐ Private ☐ Public ☐ Community Managed

Please tick (√) the thing(s) you have at your school

A. Administration/management

1. ICT/IT department ☐
2. CCTV ☐
3. Finger touch staff attendance ☐
4. School Database/Management Information System ☐
5. Use of software(Accounting, Exam-Result, Store) ☐
6. Other than listed if any……. . .

B. **Classroom instruction**

1. One teacher-one computer ☐
2. Computer lab ☐
3. IP/Smart boards ☐
4. Internet access to classroom ☐
5. Multimedia hall ☐
6. Multimedia projector ☐
7. Software(E-Learning) ☐
8. Radio/TV ☐
9. Electronic Learning Materials in use: Cassettes/ DVD/CDs ☐
10. Smart phone/E-gadgets in school use ☐

11. Additional subject(s) for ICT ☐

12. Other than listed if any……. . .

C. **Communication/School Exposure**

1. Website ☐
2. Telephone ☐
3. Notice board system ☐
4. SMS ☐
5. Online library ☐
6. Online support system ☐
7. ICT/IT based activities ☐
8. Internet/Intranet: Wired / Wireless networking ☐
9. Other than listed if any……. . .

Observation Guideline

See classroom environments such as arrangement of furniture and ICT equipment.

Infrastructure (number of ICT tools and other means supportive for classroom learning)

Methods used in the classroom

Networking, Intranet/Internet

Condition of school website if exist

APPENDIX B

Basic Interview Guideline

1. How has ICT been in use in schools?
   - In administration/management
   - In classroom instruction
   - For internal and external communication
2. How do stakeholders perceive the use of ICT in schools?
   - Use for administration/management related activities
   - Use for classroom instruction
   - Use for internal and external communication
3. What are the opportunities and challenges in using ICT in school?
   - For administration/management
   - For classroom instruction
   - For internal and external communication

APPENDIX C

Interview Schedules

For Students

Introduction

Personal use, use for study in school and home (What, why and how?)

ICT based good things/facilities for students in your school

Problems faced in schools and home while using ICT for study purpose.

Opportunities/benefits for self-learning, learning with friends and teachers using ICT

Change you experience in learning with ICT

Newness you see in the school, teachers' ways of teaching and your way of learning

Your role in the classroom and at home as a student learning with ICT support

Difference in learning/reading with ICT and without ICT

Probing on school specific cases

For Teachers

Personal introduction, qualification, experience,

Introduction

Personal use, use for teaching in school (What, why and how?)

ICT based good support or facilities in your school for teachers

Problems faced while teaching with ICT in school and using ICT for personal use at home or for PD

Opportunities/benefits of ICT for teachers in self-learning/TPD, teaching in the classroom and dealing with school admiration and parents of students

Change experienced by teachers in their day-day job context, professional career and pedagogical practices

Newness you see in the school, student' ways of learning, principals' administration and your ways of teaching

Your role in the classroom and outside the school for TPD in ICT supported environment

Personal opinion about use of ICT in schools connecting the context of Nepal

Difference in teaching and learning with ICT and without ICT

Probing on school specific cases

For Principals

Personal introduction, qualification, experience,

Personal use, use for school management/administration and classroom teaching (What, why and how?)

ICT based good things/practice in your school for staff, students, teachers, parents and principal.

Problems faced while working with ICT in school administration and using ICT for personal use for PD (Technical, pedagogical and other if any)

Opportunities/benefits of ICT for principals in handling administrative, instructional and communicational use in the school

Change experienced by the principal in specific to his/her school in their day-day job context, professional career and overall schooling practices

Newness the principal sees in the school after use of ICT in regards to student' ways of learning, teachers' ways of teaching, staff's ways of working and principals' job context

Your role in enhancing the better practices and overcoming of the hindrances in ICT supported environment

Personal opinion about use of ICT in schools and education connecting the context of Nepal

Difference in school administration/management with ICT and without ICT

Probing on school specific cases

For ICT Coordinator

Introduction, experience in the field, job roles, rationale of the position

Basic requirements to create ICT based learning environment in the schools

ICT facilities for staff, students, teachers and principals in the school

Newness and changes experienced by the coordinator in own job situation, in school, in teachers, students, principal and other staff

Problems/challenges, opportunities/benefits, and further possibilities in school specific context and the context of Nepal abut ICT use in schools (Technical and procedural)

Personal opinion on ICT use in schools

Difference observed in ICT based schooling and other traditional schooling practices

APPENDIX D

Introduction to Participants

Teachers

T1: Is a female teacher with 6 years of teaching experience. She deals with English language at the primary level in School A.

T2: Is a female teacher with 4 years of experience in teaching mathematics at the primary level in School A.

T3: Is a Female teacher with more than 12 years of teaching experience in School C. She has been teaching Nepali language.

T4: Is a male teacher teaching at the secondary level and has more than 8 years of teaching experience. He is a secondary level science teacher in School A.

T5: Is a male teacher of lower secondary level teaching social studies in School C. He is 4 year experienced in the teaching field.

T6: Is a male teacher teaching Commuter Science in School B. He is a secondary level teacher and has 5 years of teaching experience.

Students

S1: Is a boy reading in grade 8 in school C

S2: Is a girl reading in grade 5 in school A

S3: Is a boy reading in grade 4 in school A

S4: Is a girl reading in grade 6 in school C

S5: Is a girl reading in grade 9 in school B

S6: Is a boy reading in grade 10 in school B

Principals

P1: He is from school A and has more than 15 years of experience in principalship.

P2: He is from school B and has more than 20 years of experience in leading school as a principal.

P3: He is from school C and has 8 years of experience in leading school as a principal.

ICT Coordinator

C1: Is ICT coordinator in School A. He is just one year experienced in the position. However, he is involved in ICT sector for the past 5 years.

A table to represent the codes assigned to teachers, students, principals and ICT coordinators is given below:

		Number of Participants			
Schools	Type	Principal Coordinator	Teacher	Student	Total
School A	Private	P1, C1	T1, T2, T4	S2, S3	7
School B	Private	P2	T3, T5	S5, S6	5
School C	Public	P3	T6	S1, S4	4
Total		4	6	6	16

APPENDIX E

Introduction to Schools

School A:

Highly equipped with ICT infrastructures, regular power backup, unlimited internet access, each classroom has Active Board and multimedia accessories ready. A private school located in Lalitpur district.

School B:

Moderately equipped with ICT infrastructures, power backup, limited internet access, a multimedia hall is equipped with computer and multimedia accessories ready. A private school located in Kathmandu district. Uses of CCTV surveillance in the upper classless, finger touch attendance and school management software.

School C:

This a public lower secondary school located in Lalitpur district. It is a pilot project school for OLPC. Has no power backup. Laptop is distributed to each students of grade 2-6. Laptops are used depending on the electricity schedule. Nepali, English, Science and Math contents are digitalized and installed in each laptop. E-pustakalaya is accessible via local server system.

APPENDIX F

Sample Transcribed Interview

What are the benefits of ICT in your classroom?

If you do not use ICT courses become so vast and cannot be completed in time. You will be compelled to skip some of the portions. Long lessons can be explained in a short time duration using visualization. Develop the thinking ability. Sharing the knowledge.

Do you use some online activities?

Yes, we use but all of the students are not yet friendly about the blog system so what happens even if we create and update regularly for one months also others are not engaged in the blogs. If others are not using the blog it is discouraging us.

How **the school and teachers helping in this regards?**

School itself is not supporting online system in its own but teachers suggest browsing the internet and finding good materials.

Any challenges you see regarding use of ICT?

If we talk about electronic gadgets computer, laptop, smart phone they have many features more than we can think. Presentation and visuals are only used in education. Other features and software are not used in.

What is future projection about use of ICT in education?

Nowadays computers are used from the junior level but to do better there should be access to internet in every school. Initiation from institutions required to promote ICT in education. Only teaching computer subject is not enough, ICT should be mixed with all other subjects.

At the end what I like to say is the information technology you go by school to school it is very different some use some do not use. Government and even the private schools should keep a subject as a whole. ICT must be used in such a way in every class students get equal opportunity of learning. It means there must be a big policy as an umbrella to show the ways how, where and when?

There has to be some policy to define how to use ICT in different subjects to make education better. Means subject oriented or focused on the use of ICT.

APPENDIX G

Sample Observation Notes

Main objectives of the observation were to:

1. see the classroom environment and set up of ICT devices, services and equipments.
2. see how teachers use those ICT means during classroom instruction.

School: A Class: IV

Subject: English Date: 2012/06/18

Lesson: Cause and Effect Teacher: T2 and her assistant

Furniture Sets and Capacity: 6 round tables with chairs for 5 students =30 students

Decoration: Subject wise display boards. Students' creations are pasted on the boards. It makes colorful walls around the classroom, cupboards and bookshelf, a movable white board in the front.

ICT Devices and Services: A big Active Board on the front wall, multimedia projector, audio system, a working desk of teacher on the left corner with a set of desktop computer, high speed internet communication via cable. Computer connected to local networking. Slates are provided to each student when teachers design quiz or other any participatory activities to be done by students simultaneously on the board. Slates communicate with Active Board wirelessly. Active board is fully wall fitting touch screen. The computer connected to the board is controlled by e-pen. Software that comes with the board has educational tools such as recording activities, storing for future use, and access to subject based e-resources customizable to the local use,

handwriting recognition, these all facilitates teachers to design interactive classroom instruction.

Activities: Teacher started activity with review of previous day. A story based video was shown; re-cap of the video connected to the major focus of the lesson was made. Students wrote the summary and presented in group. Then teacher presented the summary of the video and discussed with the students. A quiz session was conducted at the end of the class.

ICT highlight: Clear video on the wall, clear sound, recap clips, summary slides, quiz on board, Q&A on board. Quiz was internet based. All activities were recorded and review of the day was presented at the end.

My observation: Active participation, engagement and motivation. Integration of multiple teaching methods in a single class was possible. Group work, participatory activities and presentation was the combination for meaningful learning. Learning was fun and enjoyment.

Distraction: While conducting quiz, it was online open source, so the unwanted flash advertisement were displayed, emotional symbols and flash.

Note: this observation note is prepared by combining field note and the video that I captured to record activities and major events in the classroom while observing.

APPENDIX H

Sample Data Coding

Code: Academic Features {10-0}

PD 1: Students . doc - 1:29 Codes: [Academic Features]

If we talk about electronic gadgets computer, laptop, smart phone they have many features more than we can think.

PD1: Students . doc - 1:30 [More thing is animated 3D vide. .] (18:18) (Super)

Codes: [Academic Features]

More thing is animated 3D videos and other better through computer simulation. Live cast or demonstration of experimentations or the visual instructions are possible.

PD 2: OLPC-Principal. doc - 2:6 [initiate to introduce computer. .] (9:9) (Super)

Codes: [Academic Features]

initiate to introduce computer based learning, digitalize the text books, support teachers in lesson planning, motivate students in learning, add interactive activities in possible lessons, reduce the burden of distributing bundle of text books

PD 2: OLPC-Principal. doc - 2:27 [It is very good for students. . .] (17:17) (Super)

Codes: [Academic Features]

It is very good for students. It always makes student active learner.

PD 2: OLPC-Principal. doc - 2:28 [Those activities are more than. .] (17:17) (Super)

Codes: [Academic Features]

Those activities are more than in the text book.

PD 2: OLPC-Principal. doc - 2:29 [For teachers, making lesson pl . . .] (17:17) (Super)

Codes: [Academic Features]

For teachers, making lesson plan every day is can be difficult, it has already planed lessons.

PD 2: OLPC-Principal. doc - 2:30 [That lesson plan helps teacher…] (17:17) (Super)

Codes: [Academic Features]

That lesson plan helps teacher to forward his or her lessons. Even in absence of concern subject teacher other teacher can handle the lesson. Teachers need no more shouting in the class. No chalk and talk. Teachers become facilitator. It supports student friendly activities too.

PD 2: OLPC-Principal. doc - 2:51 [100 to 200 US dollar per lapto. .] (29:29) (Super)

Codes: [Academic Features]

100 to 200 US dollar per laptop. The cost is with all the books and program. Once we buy it is not necessary to buy books every year. If such technology is managed for all the classes from one to ten it is very good in terms of cost.

PD 3: OLPC-Student. doc - 3:19 [In lower grades, it is more fu. .] (17:17) (Super)

Codes: [Academic Features]

In lower grades, it is more fun learning but in upper classes there are more reading lessons.

PD 4: ICT Coordinator. doc - 4:11 [It makes a live tour of the wo. .] (10:10) (Super)

Codes: [Academic Features] [Benefits]

It makes a live tour of the world in the classroom, which is especially good in teaching social studies and geography.

APPENDIX I

Signed Informed Consent Document

Kathmandu University School of Education

Name of degree candidate: Shesha Kanta Pangeni

Title of Project: ICT in Education: Exploring Opportunities and Challenges

Dear co-researcher,

Please read the following possible questions that you may raise before agreeing to participate in the research. All possible questions have specific answers. If these answer does not satisfy you than you are free to ask more.

Why am I being asked to take part in this research study?

You have been asked to participate since you are valuable person for this research and have expressed an initial interest in participating.

Why is this research study being done?

This research is carried out to fulfill the partial requirements of the degree candidate and the purpose of this study is to explore challenges and opportunities of ICT use in schools.

What will I be asked to do?

The researcher will be looking for you to participate in the following ways:

1. Participate in an interview or class observation session that will be audio taped or video recorded.

2. Allow use of researcher's field notes from face-to-face meetings.

Where will this take place and how much time is needed?

The interviews will last 30-60 minutes. Class observation will cover whole period of a class. It takes place in your school.

Will there be any risk or discomfort to me?

There are no significant risks involved in being a participant in this study.

Will I benefit by being in this research?

Benefits will include the opportunity to aid in informing finding about using ICT in schools and instruction, benefiting yourself and the knowledge society.

Who will see the information about me?

Your part in the study will be completely confidential. Pseudonyms will be used for all study participants. Only the researcher will be aware of the participants' identities. No reports or publications will use information that can identify you in any way.

If I do not want to take part in the study, what choices do I have?

You are not required to take part in this study. If you do not want to participate, please do not sign this form.

What will happen if I suffer any harm from this research?

There are no significant risks involved in being a participant in this study.

Can I stop my participation in this study?

Participation in this study is voluntary, and your participation or non-participation will not in any way affect. You may discontinue your participation in this research program at any time without penalty or costs of any nature, character, or kind.

Who can I contact if I have questions or problems?

Shesha Kanta Pangeni,

Kathmandu University School of Education, Balkumari, Lalitpur

sheshakanta@kusoed.edu.np or +9779802046009, +9775548104

Who can I contact about my rights as a participant?

If you have any questions about your rights as a participant, you may contact Professor Mana Prasad Wagley. You may call anonymously if you wish.

Will I be paid for my participation?

There is no compensation for participation in this study.

Will it cost me anything to participate?

There is no cost to participate in this study.

I have read, understood, and had the opportunity to ask questions regarding this consent form. I fully understand the nature and character of my involvement in this research program as a participant and the potential risks. Should I be selected, I agree to participate in this study on voluntary basis.

_____

Research Participant (Name)

_____ _____

Research Participant (Signature) Date

The form is adapted from

McDowell, Jr., & Fredrick, H., (2013). "*Technology's impact on student engagement in urban schools: administrators', teachers', and students' perspectives in urban schools.* Education Doctoral Theses. Paper 100. Retrieved from http://hdl.handle.net/2047/d20003034