

Evaluating 21st Century Skills of Primary School Students by
using Stop Motion Animation as a Technological and
Pedagogical tool



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Dedication

Dedicated to my family and friends

THESIS ACCEPTANCE CERTIFICATE

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List of Abbreviations

Abbreviations	Meaning
P21	Partnership for 21 st century learning
SMA	Stop Motion Animation
FEG	Framework for Economic Growth
ICT	Information and Communication Technology
OECD	Organization for Economic Co-operation and Development
ATCS	Assessment and Teaching of 21 st Century Skills
NETS	National Educational Technology Standards
ISTE	International Society for Technology in Education
NAEP	National Assessment of Educational Progress
UNESCO	United Nations Educational, Scientific and Cultural Organization
ANOVA	Analysis of Variance

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Abstract

The existing pedagogies practiced in schools are not successful in developing essential 21st century skills amongst the students. The teachers are focused on completing the curriculum, without focusing on the learning gain of the students. More importantly, in recent years, the need and demand of these skills have increased in the professional sector to cope with the field dynamics and to face challenges of the 21st century.

Technology has become an integral part of every walk of life as it has set the new trends of work in the professional world. Even, In the field of education, technology is integrated in a number of components. The concept of online learning is introduced to accommodate and overcome issues based on accessibility of education. In some school's content learning is being improved by application and game based lessons in classrooms. Hence, it is evident that positive results can be achieved by using low cost technological tools to foster 21st century skills development among students.

The main objective of this research was to evaluate the 21st century skills of the students by facilitating their learning process by using a technological pedagogical tool i.e. Stop Motion Animation (SMA). It was a mixed research method, in which communication, and collaborative skills were measured multiple times during class activities. The data was gathered through observations, recordings, and in-depth interviews of participants and it was further analyzed to form the results.

The research was conducted in the two public schools of Sialkot, Pakistan with a total sample of 35 students. The students develop Stop Motion Animations on the topics chosen from Literacy and Science learning. They were assessed upon their collaboration and communication skills against pre-defined rubrics adapted from prior research.

The research study found that the group work and integration of the low-cost technological and pedagogical tools helped in developing and improving communication and collaborative skills of the students. Along with these skills, student interest towards the learning was also improved. The intervention can be applied in other schools too, involving different 21st century skills and subjects.

1. Introduction

In this section, the relationship between hard and soft skills, 21st century skills, employer's demand and the dynamics of the workplace in 21st century, role of schools in developing 21st century skills and the commitment of the schools in Pakistan in developing 21st century skills among students are explained in a meaningful way. At the end, problem statement and research questions are mentioned.

1.1 Hard Skills, Soft Skills, and 21st Century Skills

For all the job-seeking applicants the job opportunities are not the same. The job opportunities differ due to the following reasons; economy, geographic location, academic qualification and gap between applicant knowledge and industry requirement. These reasons among others narrow down the job options for them. Along with other reasons, applicant's skillset narrows down the options for them. In the 21st century, employers are mainly looking for two types of skills - hard and soft skills. Hard Skills are specific, teachable skills. They are specific to the job post and important for university admission too. Soft skills are described as the personal traits, attitude, or interpersonal skills, which characterize the relationship with the people. Soft skills compile a number of social skills under its name. Some of the soft skills important for the employers in 21st century are communication skills, teamwork, adaptability, creativity, and work ethic. Hard skills or academic skills are obtained through acquiring knowledge in school and college. These skills are important to perform tasks related to particular industry or subject. Unlike hard skills, soft skills are not the learning outcome of academia. Soft skill is a very generic term and a number of skills could fall into this category. In the 21st century, a new set of skills has come into being. It comprises of different soft skills and it categories the skills according to its need and importance in every stage of life. These skills are known as 21st century skills. A number of organizations are working for highlighting its importance, development and integrating them in educational and professional world. Some of the organizations are: National Education Association, Partnership for 21st Century Learning, eLearning Solutions, National Speech and Debate Association and many more. Many organizations have suggested descriptions for 21st century skills, which are explained later in the literature review section but most famous and trusted definition of 21st century skills were proposed by P21 (The Partnership for 21st Century Skills). The P21 organization is known as the prominent representative and advocate for integrating 21st century skills in education. The main goal of this organization is to guarantee that the students passing out of the schools are equipped

with skills important to be the productive citizens, workers and leaders of the 21st century. According to P21 (Framework for 21st Century Learning, 2009), 21st century skills are as follows:

1. Learning and Innovation Skills
 - Creativity and Innovation
 - Critical Thinking and Problem Solving
 - Communication and Collaboration
2. Information, Media and Technology Skills
 - Information Literacy
 - Media Literacy
 - ICT Literacy
3. Life and Career Skills
 - Flexibility and Adaptability
 - Initiative and Self Direction
 - Social and Cross-Cultural Skills
 - Productivity and Accountability
 - Leadership and Responsibility

The reason for using P21 list of 21st century skills is explained in the next chapter. However, this list of skills provides a clear understanding to anyone about the skills, that are important to succeed in student, career, and personal life. The 21st century skills have now become the distinguishing factor in hiring the employees.

1.2 Background

1.2.1 Employer's Demand in 21st Century

When employers are hiring, they search for soft skills along with the hard skills in promising applicants. In a number of previous studies (Evenson, 1999; Glenn, 2003a; Hall, 2003; Perreault, 2004; Wilhelm, 2004; James & James, Teaching career and technical skills in a "mini" business world , 2004), it has been reported that employers consider a person with mastered soft skills, namely; who can communicate and work effectively with others, inventive, problem solving, leadership, creative thinking and have excellent work ethics for the job post. These soft skills are increasingly essential for 21st century workers. To increase the productivity of the organization, these soft skills plays a crucial role. All the important soft skills are emphasized and are part of the

21st century skills. Over the past few years, there has been dramatic increase in the demand for the candidates who are equipped with 21st century skills. The focus of the employers has shifted from knowledge towards skills. This demand of skills has highlighted the problems in the skill supply too. Study conducted by (Trilling & Fadel, 2012) indicates that today's workers have inadequate level of fundamental literacies, competencies and character qualities. To fill the gap, tools need to be provided at educational and professional level to enhance the 21st century skills of the masses.

1.2.2 Dynamics of the Workplace

Historically, hard skills were sufficient to succeed in the job as major tasks were accomplished through a fixed method and book knowledge was preferred instead of creativity and innovation (James & James, Teaching career and technical skills in a "mini" business world, 2004). The clientele for most of the industries was restricted to its local area. In the 20-th century, hard skills and soft skills were the defining criteria to hire someone for the job (Glenn, 2003a). Many of the soft skills are still considered important. However, in 21st century a lot has changed at the execution level in the workplace environment. The previously exercised ways in the workplace were effective but not necessarily efficient (Redmann & Kotrlik, 2004). The recent developments in technology and professional world have heightened the need for acquiring and developing these 21st century skills within the youth (Timm, 2005). The innovation in technology is substituting the manual labor. Technology has let the companies to do business not only in their region but also in different parts of the world. Personal interactions have become more common due to global market. It is now more important for the employees to have skills to carry out different processes and to understand and satisfy the needs of their clients. The dynamics of the work environment has made soft skills more important than hard skills. The employees with effective soft skills and hard skills are more successful at securing good jobs than the ones who just have hard skills (Glenn, 2003a). Therefore, upon hiring, employers consider applicants with 21st century skills.

1.2.3 Role of Schools in developing 21st Century Skills

Globally, different educational organization along with the schools are working to integrate the 21st century skills in the curriculum. They are providing a 21st century learning environment and tools to students so that they could develop 21st century skills among themselves. In such environments, students work on a project in groups. Along with the comfortable environment, teachers play an important role in developing these skills. To accomplish the positive result,

teachers need to trust their students to think freely and to come up with a number of valid solutions to a given problem.

Many schools have introduced technological tools in the classrooms. Technology has helped teachers to teach students in an easy, interactive and engaging manner. Students stay focused in learning different topics when they see animation, use any application, or play any game to understand the topic better. Working on technological projects in groups, has also helped students to learn effectively and keeps them engaged in the learning process. Collaborative work and discussions help students in developing 21st century skills.

1.2.4 Current Situation of Schools in developing 21st Century Skills in Pakistan

Even after knowing the grave importance of soft skills in a career, academic institutions are not giving it as much attention as it needs. The end goal for all of the schools is to achieve A or A+ grade in final term examinations for as many students as possible. Teacher's priority is to complete the course work as soon as possible before the end of the academic year. In schools, students are involved in rote learning and utilization or development of soft skills is not the part of this process. Rote learning does not take part in developing critical thinking, problem solving, or any other important skill. Students do rote memorization without understanding the content, which discourages them to think and question it (Klemm, 2007). Therefore, memorizing book text is the main goal of rote learning other than meaningful learning. Schools only evaluate the book knowledge of the students. The pedagogical content present in the books has been the same for decades. The book content only equips the students with knowledge. Students do not gain any problem solving, thinking or creative skills along the way. Therefore, in their lives, they are unable to make any decision and follows the same old direction like their older generations. In most schools, students do not get involved in extra-curricular activities. Moreover, even if they do, only a few students take part in these events every year and the school management and teachers do not motivate other students who feel shy to participate in such events. Sometimes the student who got good opportunities in school, gets no or fewer chances at college and university or vice versa. Therefore, most of the students are unable to show their talents at all three level of academic institutions. No or less number of events contributes in low self-esteem and inadequate soft skills of the students.

Several changes are happening in work and life due to the advancement in technology, but, the corresponding changes in the school education is not up to the mark. The national curriculum of Pakistan implemented in the schools went through a key revision process in 2006 (PCTB, 2014). Instead of objective based model, the revised curriculum was based on competency based model. But, due to the reservations within the Provincial Textbook Boards, this revised curriculum could not be implemented till April, 2010. Another reason considered for the non-implementation of the curriculum was the absence of a concrete curriculum implementation framework (PCTB, 2014). However, the revised curriculum facilitates in providing a comprehensive teaching outline for the teachers of each subject and learning resources for the teachers and boosts the uses of the assistive educational technologies. The entity responsible for the implementation of the curriculum is Provincial Education Department (PCTB, 2014). But, it does not make necessary changes to fully implement the revised curriculum in the schools. They don't bother to regulate the working of public and private schools. Along with that, there is no check and balance on the pedagogy of the teachers, they apply to teach the students. Secondly, there is no way of recording or checking, if teachers are performing all their tasks defined for them in the curriculum of the respective subject. In the curriculum, there is a defined list of tasks and benchmarks for each grade level that can help the teachers in developing 21st century skills among the students. If the curriculum is fully followed by the teachers, the learning outcomes of the students and results would be different. But in the past and in present scenario, teachers only job in the classroom is to give lectures to the students. While teaching, teachers are unaware about the student's understanding of the current topic and his prior or base knowledge. Teachers judge themselves as good if they can finish as many topics as possible in each class period. Another major problem is that teachers are focused on those students who achieve good marks and able to learn the content of the book word by word (Memon, Joubish, & Khurram, 2010). Those students who struggles in scoring good marks are stamped as stupid and average students. These students suffer not only in school but later in their lives. Whereas the students who excel in schools only have content knowledge and no skills to overcome and solve challenges in their future (Memon, 2007). They would be unable to adapt themselves to the changing environment. These children as grownups live a life like their elders with no advancement in their socioeconomic graph (Hussain, 2005).

1.3 Problem Statement

In Pakistan, 21st century skills are unable to attain the required focus at academia (Farooq, The Utilization of Education and Skills: Incidence and Determinants among Pakistani Graduates, 2011). A right skillset not only requires academic knowledge but also 21st century skills too. The deficient level of proper skills is among the leading barriers towards the economic stability of Pakistan (Kemal, 2005). The findings based on the Framework for Economic Growth (FEG, 2011) concludes that the graduates have inadequate skills in correspondence to employer's requirement. The development of skills is not the focus of attention for school and college management. At this stage, students are only involved in rote learning. At university level, all students are unable to reach their full skill potential and undermines their chances to get good job opportunities. There is no uniformity in academic institutions and workplace when it comes to these skills (Amjad, 2005). Industry suffers due to the imperfect balance of the knowledge and 21st century skills (Amjad, 2005; Farooq, The Utilization of Education and Skills: Incidence and Determinants among Pakistani Graduates, 2011). Many young people step in their personal and professional life with a defined mindset with no power to do something meaningful and have no decision-making skills and live the same life like their older generations (Kemal, 2005). Nowadays, the right combination of 21st century skills and academic knowledge is necessary to outshine others (Farooq, The Utilization of Education and Skills: Incidence and Determinants among Pakistani Graduates, 2011). It is important to provide opportunities to students in K-12 education and universities to develop and polish 21st century skills so they can flourish in life and career (Memon, Joubish, & Khurram, 2010). Education department need to work along with the school managements on making plans about integrating skills and knowledge (PCTB, 2014). As the schools are the bases for any student's knowledge and skills, therefore, the need to acknowledge and develop the 21st century skills among them since school grade is important.

1.4 Research Questions

The research questions for the study are as follows:

1. What will be the effect of ICT intensive pedagogy on student's communication skills?
2. What will be the effect of ICT intensive pedagogy on student's collaborative skills?

1.5 Research Setting

By keeping in mind the importance of 21st century skills throughout life, the research was done in schools. The public schools selected for research were not fully equipped with all the learning

facilities for the students and their targeted students belonged to low and medium income families. The schools were Boys school and Girls School. The element of gender biasness in the result was avoided by conducting the research at boys and girls school. The implementation at both the schools lasted for 8 days. The students belonged to class seven and were involved in a series of activities throughout the implementation period. The students created stop motion animations in groups based on subject topics. For the current research, the targeted 21st century skills were communication and collaborative skills. These skills were selected due to their vital role in achieving success in personal and professional life (Casner-Lotto & Barrington, 2006).

2. Literature Review

In this section, an overview is provided about different definitions of 21st century skills that has been used over the years. Then, references to a number of studies have been mentioned that represents the shift of the employers towards the employees having 21st century skills from vast academic knowledge. In the end, the education system and usage of stop motion animation as a technological and pedagogical tool for learning new concepts and developing 21st century skills are explained in detail.

2.1 Frameworks of 21st Century Skills

A brief introduction of the 21st century skills was given in the Introduction section. Here, some renowned frameworks of 21st century skills are described. In the end a comparison of all the frameworks is given. The frameworks are as follows:

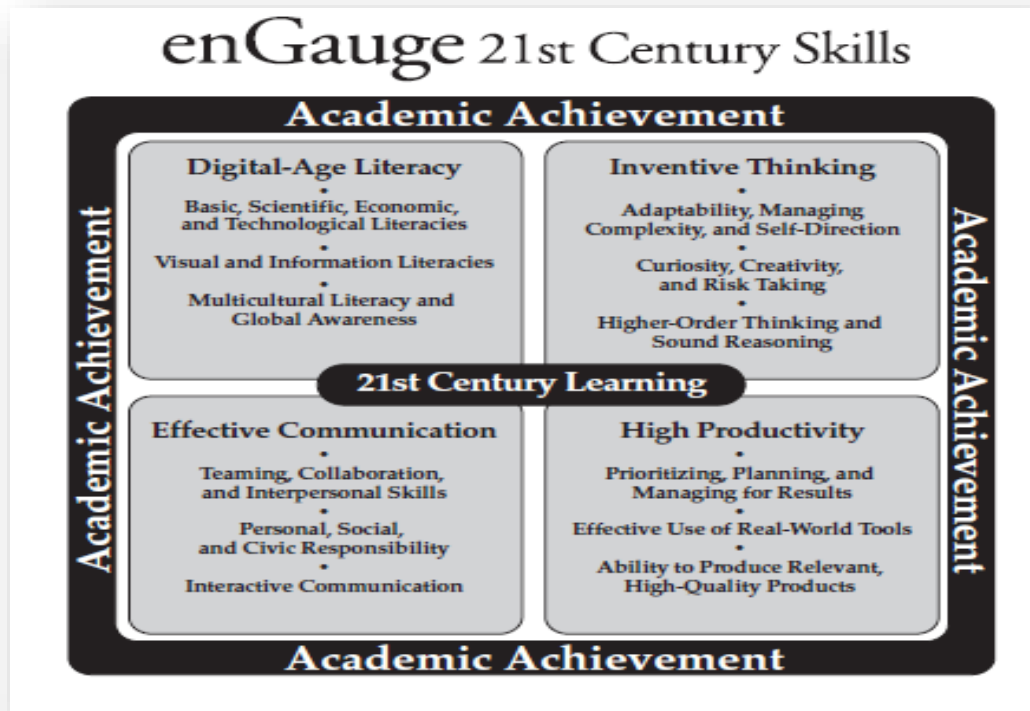
2.1.1 enGauge Framework

In 2003, the enGauge Framework was developed by the North Central Regional Educational Laboratory (NCREL) and the Metiri Group (Group, 2003). The figure 2.1 explains the 21st century skills, according to enGauge Framework. The figure 2.1 explains the 21st century skills in reference to the enGauge Framework. This framework represents different cluster of skills in correspondence to the academic standards, which needs to be mastered by today's students in order to work in the digital age. It has mentioned the academic achievement in order to support the defined skills. However, the framework does not include any reference or mentioned any details about the academic content that is considered important in the present age.

2.1.2 Organization for Economic Co-operation and Development (OECD) Framework

The Organization for Economic Co-operation and Development has organized the 21st century skills in three categories (Laughlin, 2014). This framework defines three categories of 21st century skills that are mentioned later in the table 2.1. This framework like the enGauge framework do not mention the elements of the basic academic content. It has primarily focused on contextual, affective and psychosocial skills.

Figure 2.1 enGauge Framework



2.1.3 Wagner’s “survival” skills:

In 2008, Wagner proposed seven survival skills after conducting a number of interviews with business leaders, and different organizations, that are important for students to flourish in the global world (Wagner, 2017). The seven survival skills are as follows:

1. Critical thinking and Problem Solving
2. Collaboration and Leadership
3. Agility and Adaptability
4. Initiative and Entrepreneurialism
5. Effective Oral and Written Communication
6. Accessing and Analyzing Information
7. Curiosity and Imagination

Here, the subjects representing the academic content is again missing. However, through his research, Wagner also concluded that the content related to the job can be easily taught but the necessary survival skills mentioned by him could not.

2.1.4 Assessment and Teaching of 21st century skills (ATCS) Framework

The assessment criteria's and standards used in the classroom does not integrate and evaluate the skills, attitudes, and collaborative learning, that has now become an integral part for our global economy. Therefore, framework was developed to define clearly the definitions of 21st century skills in order to design the assessment tasks in correspondence to these skills to use in the classrooms (Binkley, 2010). It defines ten 21-century skills divided into four main categories. The 21st century skills according to this framework is given in the table 2.2.

Table 2.1

OECD Framework

Category	Skills
Using Tools Interactively	Use language, symbols and text interactively Use knowledge and information interactively Use technology interactively
Interacting in Heterogeneous Groups	Relate well to others Cooperate and work in teams Manage and resolve conflicts
Acting Autonomously	Act within the big picture Form and conduct life plans and personal projects Defend and assert rights, interests, limits, and needs

Note: Taken from The Definition and Selection of Key Competencies: Executive Summary by Organization for Economic Co-operation and Development, 2005, pg. 10 – 15

Table 2.2

-ATCS – 21ST Century Skills

1. Ways of Thinking Creativity and Innovation Critical thinking, problem-solving, decision-making Learning to learn/metacognition	2. Tools for Working Information literacy Information communication technology literacy
3. Ways of Working Communication Collaboration	4. Ways of Living in the World Citizenship Life and career Personal and social responsibility

Note: Taken from <http://www.atc21s.org/>

2.1.5 National Educational Technology Standards (NETS)

This standard was developed by International Society for Technology in Education (ISTE) in order to provide with a set of objectives for school administrators, teachers and students that they should understand and perform by using technology in education (ISTE, 2007). The ISTE standards are given in the table 2.3, below:

Table 2.3

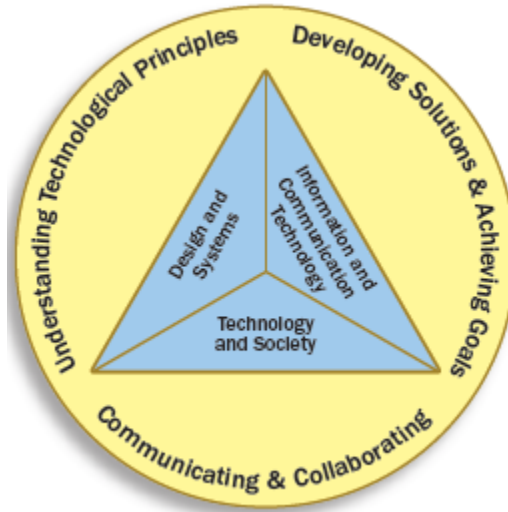
ISTE Standards

ISTE Standards
1. Creativity and Innovation
2. Communication and Collaboration
3. Research and Information Fluency
4. Critical thinking, Problem solving and Decision making
5. Digital citizenship
6. Technology operations and concepts

2.1.6 Technological Literacy Framework for National Assessment of Educational Progress (NAEP)

This framework was developed by WestEd (a non-profit organization that improves education through innovation in research, evaluation and consulting) for National Assessment of Educational Progress (NAEP). The reason for developing this framework was to authorize what students of grade 4, 8 and 12 should be able to do with technology. It was also used to design the criteria for future national assessments (WestEd, 2010). The framework is shown in figure 2.3.

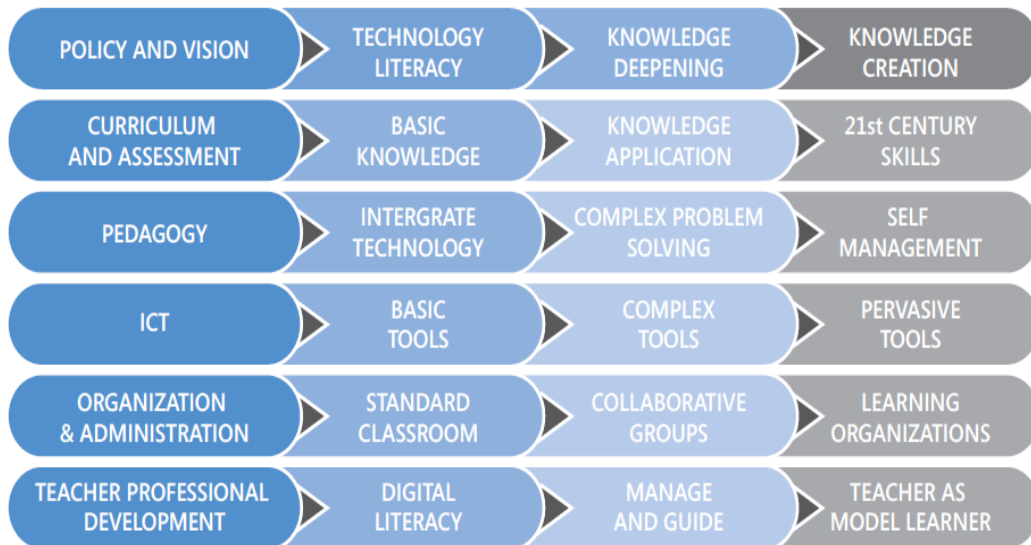
Figure 2.3 Technological Literacy Framework



2.1.7 ICT Competency Framework for Teachers

It was a UNESCO reform to identify the qualifications that was essential for the purpose of ICT in teaching and learning (UNESCO, 2008). Teachers need to be equipped with the ICT skills so they could play their part in achieving socioeconomic goals. The figure 2.4 explains the components for this framework. According to UNESCO framework, it is not enough for teachers to have ICT skills, but it is also important for them to develop these ICT skills among the students so they can become effective members of the society and workplace.

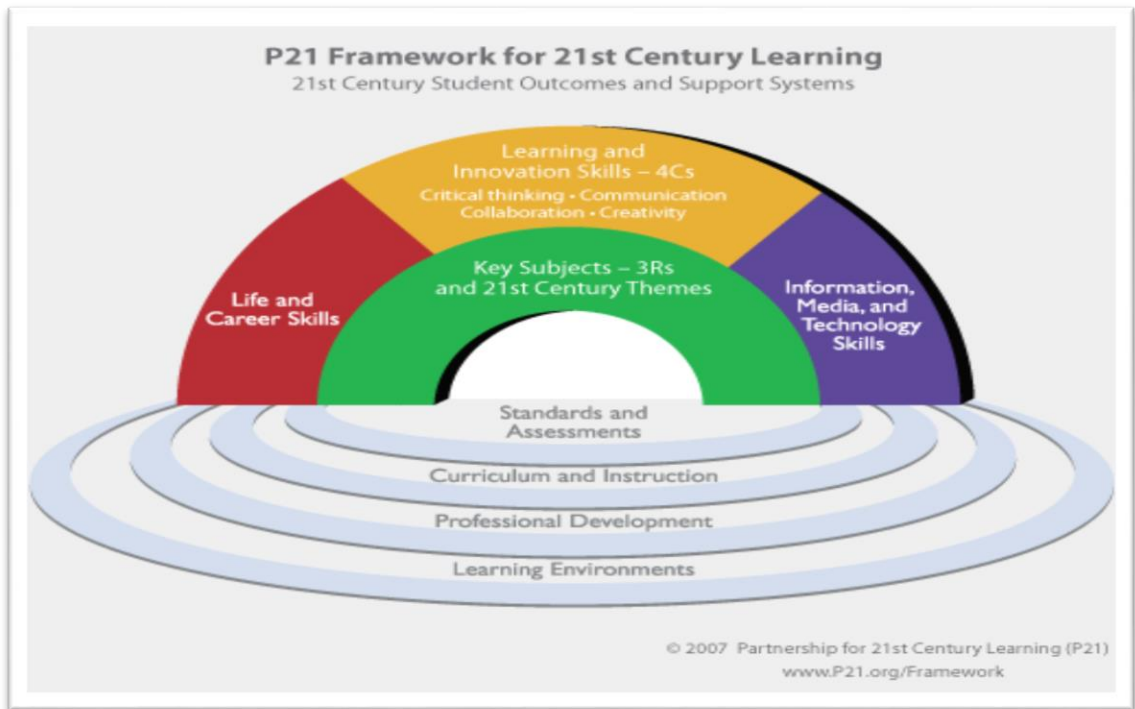
Figure 2.4 ICT Competency Framework for Teachers



2.1.8 Partnership for 21st Century Skills (P21) Framework for 21st Century Learning:

The widely accepted and implemented framework for 21st century skills are defined by Partnership for 21st Century Learning. The framework for 21st century skills (Framework for 21st Century Learning, 2009) is shown in figure 2.5.

Figure 2.5 P21 Framework for 21st Century Learning



The core subjects are as follows:

Table 2.4 P21 Framework – Core Subjects

Core Subjects	English, reading or language arts World languages Arts Mathematics Economics Science Geography History Government and Civics
----------------------	--

The themes are:

Table 2.5 P21 Framework - Themes

Themes	Global awareness Financial, economic, business and entrepreneurial literacy Civic literacy Health literacy Environmental literacy
---------------	---

The detail of the 21st century skills are as follows:

Table 2.6

P21 – 21st Century Skills

21st Century Skills
1. Learning and Innovation Skills
• Creativity and Innovation
• Critical thinking and Problem Solving
• Communication and Collaboration
2. Information, Media and Technology Skills
• Information Literacy
• Media Literacy
• ICT Literacy
3. Life and Career Skills
• Flexibility and Adaptability
• Initiative and Self Direction
• Social and Cross-Cultural Skills
• Productivity and Accountability
• Leadership and Responsibility

In contrast to other frameworks, P21 framework also describes the subjects, themes, and the support system, along with the 21st century skills that are necessary to integrate and master to prosper in life and work in the 21st century. Other factors for using P21 list of 21st century skills, it is the oldest organization in advocating the importance of 21st century skills and widely used framework for infusing 21st century skills in the curriculum (P21, Our History: P21, n.d.). P21 was founded in 2002 and has many key multinational companies as its members. The important and founding members are: U.S. Department of Education, AOL Time Warner Foundation, Apple Computer Inc, Cable in the Classroom, Cisco System Inc, Dell Computer Corporation, Microsoft Corporation, National Education Association, and SAP (Framework for 21st Century Learning, 2009).

2.1.9 Comparisons of the 21st Century Skills Frameworks

A brief comparison of the frameworks and the skills mentioned in them are as follows:

Table 2.7

Comparisons of the Frameworks

	Skills	Frameworks
Skills mentioned in <i>all</i> frameworks	<ul style="list-style-type: none"> • Collaboration • Communication • ICT literacy • Social skills, citizenship 	All eight frameworks
Skills mentioned in <i>most</i> frameworks	<ul style="list-style-type: none"> • Creativity • Critical thinking • Problem-solving 	<ul style="list-style-type: none"> • EnGauge • ATCS • NETS/ISTE • P21
Skills mentioned in a <i>few</i> frameworks	<ul style="list-style-type: none"> • Learning to Learn • Self-direction • Planning • Flexibility and Adaptability • Core Subjects 	<ul style="list-style-type: none"> • ATCS • EnGauge • OECD • P21

Skills mentioned only in <i>one</i> framework	<ul style="list-style-type: none"> • Risk taking • Manage and solve conflicts • Interdisciplinary themes and Core subjects 	<ul style="list-style-type: none"> • EnGauge • OECD • P21
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2.2 Implementation of the 21st century skills

For the complete implementation of the 21st century skills, many factors need to be considered and necessary improvements are required to be made in them. The different elements are curriculum, instruction and assessment (Pearlman, 2010).

2.2.1 Curriculum:

The integration of 21st century skills within the academic curriculum is necessary for the efficient working of 21st century skills. The curriculum of any subject is a defined set of standards and tasks, which provides guidance and makes it easier for the teachers to teach the students with an in-depth knowledge and facilitate in the development of the 21st century skills (McTighe & Seif, 2010). P21 and other educational organizations are encouraging the schools to formulate and adapt a curriculum that assists in fostering the 21st century skills along with the academic content.

2.2.2 Instruction:

The class instructions need to be designed in accordance with the 21st century skills. In 1998, McTighe identified four indicators for effective instruction for 21st century skills. These indicators are; interactive strategies, explicit instruction, multiple opportunities for student transfer and making adjustment to instructions when needed (McTighe & Seif, 2010). Collaborative projects, problem based learning, experiments, creative problem solving, interactive text books and investigations come under interactive strategies (McTighe & Seif, 2010). The instruction also need to be clear and explicit in order to provide students with the opportunity to apply the skills in the domain of the academic content (McTighe & Seif, 2010). In this way, students get the chance to apply and practice and also covers the next indicator of the instructions; which is to provide multiple conditions to transfer their skills. As students are involved in applying their skills, teachers need to monitor their needs and progress of learning and make necessary changes in the instructions accordingly.

2.2.3 Assessment

Student assessments are important in order to get the knowledge about student's learning and it is a critical component of effective teaching. Mostly, the assessments are done to cater the student's capability to remember the factual data of the core subjects by using definition based questions and multiple choice questions. However, it does not measure and engage the student's in thinking process and problem solving tasks.

In recent years, the gap existing between student's acquired knowledge and skills in schools are different from the knowledge and skills needed in the technological and globalized workplace. As mentioned earlier, the current assessment methods and format measure the student understanding of core subjects, there is a severe lack of assessments which focuses primarily on 21st century skills. Therefore, in order to meet the demands of 21st century world, The Partnership for 21st Century Skills concludes that a shift is important in assessment strategies to adapt 21st century skills in academic settings (P21, 21st Century Skills Assessment, 2007).

In general, assessments fall into two main categories: summative and formative. Summative assessments are done to evaluate the student learning at the end of the instructional unit by comparing it against some standards (Eberly Center, 2015). Whereas, formative assessments occur during the lectures in the form of different activities and gives an instant feedback (P21, 21st Century Skills Assessment, 2007). The Partnership for 21st Century Skills recognizes that the integrated approach of assessment method (summative and formative) is mutually beneficial and it should be the part of every school setting.

Therefore, it's important to integrate the skills along with the content knowledge in the assessment method of the students to know the learning and the understanding of the students. Problem-based learning is recommended as the best way to integrate content and skills (Barell, 2010). In this way, teachers use authentic and realistic problems to teach the content. By doing this, students are engaged in an inquiry and discovery process and work in groups to come up with the solution to their problem and assessments can be made. Secondly, assessments need to be flexible in order to cater different learning levels of the students (Greenstein, 2012). Assessments should be adjustable according to different students and circumstances (Greenstein, 2012). Teachers should not only depend on summative and post assessments but the 21st century skills assessments need to be integrated throughout lesson plans (DuFour & DuFour, 2010; Greenstein, 2012). Particularly, the

additional and timely use of formative assessments needs to be done by teachers (Marzano & Heflebower, 2011). Eventually, such integrated assessments value the whole process through which student has arrived at the solution (Greenstein, 2012). This gives students the opportunity to think in a variety of ways and uses different problem solving methods to showcase their understanding. The alignment between teaching and learning methods is of critical importance in order to achieve the desired and defined results and assessments (Wiggins & McTighe, 2005). For this, teachers first need to identify student outcomes and then create rubrics and assessments that are parallel to them. In the end, learning experiences are planned that backs both outcomes and assessments. The assessments need to be responsive towards the student's need (Marzano & Heflebower, 2011; Greenstein, 2012). The 21st century assessments are termed responsive when teachers can provide with specific and defined feedback associated with their learning goals. The most effective way to provide excellent feedback is by using rubrics as a standard (Kay & Greenhill, 2013). Another valuable characteristic of 21st century assessment is its authentic nature. Performance based and open ended assessments gives the student the scope to transfer and display, what he has learned in a new situation (McTighe & Seif, 2010). Another way to increase the creditability of the assessments is to provide students with the multiple ways of representing their knowledge (Marzano & Heflebower, 2011; Greenstein, 2012; Kay & Greenhill, 2013).

2.3 The 4'C (Communication, Collaboration, Critical Thinking, Creativity)

As it is mentioned earlier, there are three main categories of 21st century skills. In this study, the two skills being evaluated belong to Learning and Innovation Skills also known as 4'Cs (Framework for 21st Century Learning, 2009). The skills being evaluated are Communication and Collaborative skills.

2.3.1 Communication and Collaboration:

A person has to collaborate efficiently and purposefully which does not happen without effective communication skills, therefore both these skills are closely associated as they are depended on each other (National Education Association, n.d). Both, collaboration and communication have been studied for a long time and consider as an important and essential skill to develop among the students.

Several authors (Pianta, Belsky, Houts, & Morrison, 2007) have discovered that 91% of the first, third and fifth graders studying in American schools spent most of their school time either working

alone or receiving whole class lectures. The lack of collaboration and due to the nature of working alone in the classrooms, the idea of individuality is deeply embedded in the American culture (Marks, 2010). The other probable cause of having rare or no collaboration in classroom is due to the false perception of the teachers about this technique, as they consider it as a wastage of time and ineffective in achieving the student learning goals (Quinn, 2012).

To flourish in the 21st century, collaboration is termed as an important and essential skill to succeed (Framework for 21st Century Learning, 2009). It is proven through a number of studies that there are many advantages of doing group work in the classrooms. Collaborative effort helps in developing motivational energy to complete difficult and hard tasks, which eventually assists in the discovery of different skills among students and draw them out to complete the tasks and eventually, it helps in improving and achieving student learning outcomes (Marks, 2010; Greenstein, 2012).

Along with the Collaboration, communication is also termed as an important skill in the 21st century. Communication has a wide range of variety, that includes; oral, written, non-verbal and multimodal and the most common way to teach and develop this skill is through English language class (Greenstein, 2012; Kay & Greenhill, 2013). However, it is observed that oral and nonverbal form of communication loses their value and their practice in the classrooms and eventually becomes non-existent as the students are promoted to the higher classes, mostly after third grade (Zwiers & Crawford, 2011). However, it has been proven that by having active and relevant discussions and presentations in the classroom can assist in developing oral communication skills among the students (Dallimore, Hertenstein, & Platt, 2008). The purposeful interactions or discussions among the students eventually helps in increasing their engagement towards the task at hand (Kagan & Kagan, 2009).

2.4 21st Century Skills and the Workplace:

The priorities and the demand of the proficiencies needed by business employees is greatly influenced and changed due to transformations in the global economics in the 21st century (Gardner & BareFoot, 2011; Trilling & Fadel, 2012). Due to the vast developments in the technology along with the fast evolution in the workplace, the immediate concentration in identifying and developing the skills and competencies has increased which are essential for achieving success and to actively participate in the global society (Duff, 2008; Ananiadou & Claro, 2009; Gordon,

2009). These skills or aptitude are commonly known as 21st century skills and are characterized as multidimensional, transversal, and are termed as bases for the advanced skillsets (Westera, 2001; OECD, 2005; Gordon, 2009).

The reason behind the creation of The Partnership for 21st Century Skills (P21) organization was to develop the framework (Framework for 21st Century Skills) for students which could help and prepare them in achieving success at the workplace later in their life (Trilling & Fadel, 2012). According to the conglomerate research, communication and collaboration, critical thinking and problem solving skills, creativity and innovation, and information and digital literacy were termed as set of skills which 21st century employers require in the applicants entering the professional circle (Trilling & Fadel, 2012). For most of the employers, the skills they look and consider in the new entrants, communication skills are on the top of the list and collaborative skills among the top three skills (Casner-Lotto & Barrington, 2006).

The global mismatch of graduate's skillset and employer's demands is also visible in Pakistani workplace too. In Pakistan, several researches have been carried out at colleges and universities to know about the student's 21st century skills level and its shortage, and the reasons behind its downfall among them. The Planning Commission of Pakistan (FEG, 2011) identified the issues that were the leading cause for the mismatch between students and the required skills. The issues it uncovered are: unsteady link between university and industry, insignificant and inappropriate curriculum to the industry demand, absence of youth development programs and less internship programs (FEG, 2011). To overcome this shortage, solutions were proposed. Another researcher, (Hussain, 2005) had already encountered this issue and had suggested that an integrated network of skill development needs to be formed and different components in curriculum and study settings at university level needs to be revised per the industry demands. Regarding technological advancement and knowledge, there is an emphasize on the production of the goods as the output of skills based on technology and knowledge, where the global market grows now (Amjad, 2005).

This mismatch of the skillset with the industry demands was further deduced as a reason of bigger issues in the country. The mismatch of the skills is one of the root cause for the higher rate of unemployment in the country (Qayyum, 2007). To further investigate the reasons and challenges of unemployment in Pakistan, a study concluded that most of reasons for unemployment are common with the global labor market (Hou, 2011). He stressed on improving the quality of formal

and informal education and to toughen the link between academia and industry for the assistance of the youth and benefit of the economy of Pakistan.

A study evaluated the existing job mismatch in Pakistan through three directions. It included participants level of education, his skills and field (Farooq, *The Utilization of Education and Skills: Incidence and Determinants among Pakistani Graduates*, 2011). The result he obtained at the end of the study stated that academic institutions are not providing the graduates with needed skills, according to the industry demand or they are unable to develop important skills among them needed in the market. In another study, author compared the perception of the university graduates and expectations of the market employers about the existing mismatch of the skills (Jabeen, 2011). He was able to demonstrate a significant difference in the perception and expectation about the required skills in the market. Among the needed skills, oral communication, time management, discipline and positive attitude were highly ranked by the employers.

2.5 Quality of Education in Pakistan

The powerful tool for socioeconomic and political transformation and development is the quality of the education (Farooq & Sabil, *MDGs and Quality Education Situation at Primary Level in Pakistan*, 2015). However, even after knowing the importance of this fact, the priority of the government is to spend large amount of the budget on the interest expenditures of its loan (Memon, Joubish, & Khurram, 2010). Therefore, a less amount is left to spend on the infrastructure development. A slow socioeconomic growth and illiteracy has resulted in increased unemployment. The illiteracy and poverty has also contributed to the low indicators of health. Overall, the low quality of education, has a prominent and negative effect on national indicators of Pakistan.

Quality in terms of education means, to create a comfortable and learning environment with resources for the students to learn (Farooq & Sabil, *MDGs and Quality Education Situation at Primary Level in Pakistan*, 2015). All the representatives including schools, parents and government officials need to work together for achieving this quality of education. It has also become a global goal to increase the quality of the education, especially at primary level of the education system. It is important in order to prepare students for the succeeding level of education and to equip them with necessary basic skills and social norms.

The important factors to measure the quality of education includes, school management, learning process, and students learning outcome and achievement (Farooq & Sabil, MDGs and Quality Education Situation at Primary Level in Pakistan, 2015). School managements reflects the type of resources it has used to provide quality education to its students. it includes the physical infrastructure, teaching staff, and other support activities to create a learning environment for the students. the learning process includes the teaching method used by the teachers to help and teach students in the classroom. The learning outcome and achievement of the students provides a way to know whether the students have been able to gain and learn the content. However, these three measures are not given appropriate attention to implement in order to improve the quality of education in the country. In some cases, the criteria used to measure the quality, is the percentage of the A grades that the school is able to achieve in the final examination, which however does not provide the whole and true picture about the quality of the education.

In Pakistan, three types of education system are functional and each target and facilitate a separate socioeconomic class of the society. These are, government, private and madrassah (religious school) school systems (Vazir, 2004). All three education systems differ on a number of factors which determines the quality of education. These factors include, facilities, size of the school building, tuition fees, textbooks, medium of instruction, teacher qualification, examination, classroom structure and teacher student ratio (Ahmed, 1991). All these factors are given partially or full attention depending upon the type of education system being discussed. The private sector, focuses a lot in providing facilities, good quality textbooks and qualified teachers. At the same time, the amount of the tuition fees is quite high but it is affordable for those parents who are mostly part of the upper and middle socioeconomic class. As they provide better and good quality of the education, the enrollments in private schools are increasing as compared to other two education systems. Public or government school systems are governed by the governments. The quality of education being provided in these institutions are not up to the mark. They are not given full attention by the government officials and education department and even the funds allocated to improve the quality of education of such schools are not being utilized by the establishment of the schools. These schools are unable to provide basic facilities to its students. The national curriculum approved by the government is not fully implemented in the government schools. All these issues, finally results in the poor quality of the education. However, as these schools have zero or very minimal fees so the only people being facilitated by these schools are the low class

masses, as they can't afford to send their children to private schools. The last school system is the madrassah system. It is a religious school system and it is governed by the local communities belonging to a religious group and run on charities. The main focus of these types of institutions is to provide students with the religious knowledge. Most of the books taught are decades old and are written by religious scholars. The students are unaware about the advancement in technologies and knowledge and lag behind in career opportunities as compared to the students of other school systems. As the facilities and outlook of all three education system is different, so quality of education suffers in all three systems. It is difficult for the government to come up with a single set of measures and to apply on all systems to measure and improve the quality of the education.

In improving the quality of the education, educated, polished and trained teachers play a very important role. Teacher is one of the most important individual in the school for students as it's the teacher's responsibility to prepare and equip students with skills and knowledge, i.e. important to move in the society and excel in their careers. In corresponds to its importance, the quality of the hired teachers is poor. Most of the teachers have inadequate qualification as they are appointed as a favor to an influential person (Memon, Joubish, & Khurram, 2010). Secondly, most of the teacher training programs governed by the government institutions don't train teachers according to the latest and with multiple varieties of learning techniques and pedagogies. Teachers are unaware of creating flexible, friendly and comfortable learning environment for their students. Eventually, they are unable to incorporate different activities related to the topic for the students to learn and understand better and to keep them engaged and interested in the learning process. This is due to the less qualified staff that are used to train those teachers. The situation of the teachers, teaching at private schools is a bit better than government school teachers. Most of the private schools, arrange training programs for their teachers so that they could learn about new teaching methodologies and apply it in their classes. They are also taught about technological based solutions which provides teachers with different ways of tackling the students learning and understanding problems.

Another factor, that adds to low quality of teachers is their own interest with their job. Most of the teachers don't want to invest time in helping students learn and understand better. Their concern about each student's learning and understanding at the end of the class is none. The teacher pupil ratio also has a defining effect on the quality of the education. When the strength of the pupil is

low per teacher, the pupils will understand better and teacher can concentrate on each pupil too (Farooq & Sabil, MDGs and Quality Education Situation at Primary Level in Pakistan, 2015). However, in most of the schools, every class has around thirty or more students and teacher is unable to teach them properly. All these issues reside in the current education systems.

2.6 Stop Motion Animation

The use of technology is appreciable and helpful, if its usage provides a meaning experience to the students to understand and construct knowledge (Jonassen, 2008). Many other studies also agree with Jonassen (2008) claim, especially if they are used fittingly according to the learning needs of the student (Dede, 1998; Wiggins & McTighe, 2005). Different technological solutions as applications, games, presentations, and animations are available for the students.

Regarding this study, the technological solution being used is an old and simple kind of animation technique known as Stop Motion Animation (SMA). It is a widely-used technique in schools around the world. In a study, author expresses that children like to work around this technique due to involvement of plastic and clay toys to create the whole scene (Pugh, 2013). They can easily change and control the movement of these toys to explain any given topic. This makes the student owner and producers of the information rather than just the consumer which happens in most of the cases. This helps the student to generate meaning and provides a process and space to make healthy discussions (Hoban & Nielsen, 2014). This process provides the students with a way to use and present their interpretation of the knowledge in a flexible and meaningful way (Iiyoshi, Hannafin, & Wang, 2006). The production of Stop Motion Animation requires mobile technology, i.e. digital camera or camera phone. It is easy to implement this activity in a classroom as it is low cost, flexible and safe, which makes it a best tool for learning and teaching purposes (Koszalka & Ntloedibe-Kuswani, 2010). The use of mobile technology provides teachers with a pedagogical advantage due to its easy mobility that would rather be missing with the absence of technology (Kukulaska-Hulme, Sharples, Milrad, Arnedillo-Sanchez, & Vavoula, 2009; Peters, 2007). The students develop these SMA in groups, which in the end helps in developing different skills. This activity provides students with a platform to collaborate with their classmates and participate in discussions related to the content (Deatona, Deatonb, Ivankovicb, & Norrisb, 2014). The creation of animation in groups provides the opportunity for the discussion, which is the driving force of learning and thinking (Scardamalia & Bereiter, 1993). Among all the subjects, Science is the most

benefitted from the learning activity based on discussions (Lemke, 1990). The students also exhibit ability to plan and problem solving skills which arises due to the issues happens during the development of stop motion animation, which in return helps in increasing their engagement towards learning (Pugh, 2013). Ultimately, when it comes to learning purposes, this type of animation is an engaging and fun way of explaining the complex and boring concepts to students (Animation, n.d.). The use of technology is appreciable and helpful, if its usage provides a meaning experience to the students to understand and construct knowledge (Jonassen, 2008). Many other studies also agree with Jonassen claim, especially if they are used fittingly per the learning needs of the student (Dede, 1998; Wiggins & McTighe, 2005).

3. Methodology

This chapter explains the research design used in the study. This part of the chapter includes details about the research design, research settings, participants, data collection types and intervention process.

3.1 Research Design

A mixed method research design is adopted where priority is given to the quantitative data, whereas, qualitative data is used to further gain insights into the results of quantitative data. A mixed method is a procedure of gathering and analyzing, quantitative and qualitative data, in an individual study to get a better and elaborated understanding of the research problem (Creswell & Clark, 2011). The reason behind using this research design was the collection of both types of data, i.e. quantitative and qualitative in the current study. The type of the mixed method used is known as explanatory sequential design. In this design, the quantitative data is collected first, and then qualitative data is collected to assist in refining and explaining the results of the quantitative data (Creswell & Clark, 2011). The reason for choosing this type of research design is that the results from the quantitative data represents a general context for the research problem, therefore a refined picture through qualitative data is needed to explain the general context of the research problem (Creswell, 2012).

3.2 Research Settings:

The data for the research study was gathered from the two public schools i.e. girls school and boys school, located in the two prominent regions of Sialkot. These two schools were selected because the school administration granted the permission and willingness to conduct the research study in their schools. To fulfill the permission requirement, the permission letter (Appendix A) was issued by NUST. The permission letter was accepted by the principals of both the schools. Both the schools have students belonging to lower and middle socioeconomic class of the society and have classes from 1 to 8 grade. The intervention lasted for eight days at both the schools.

3.2.1 Reasons for Selecting Public Schools:

The reasons for selecting the public schools as a research setting are as follows: The basic facilities like, furniture, washrooms, canteen, classrooms and labs are not present in most of the public schools. Most of the management and teaching staff do not work sincerely in providing the best education to the students. One of the reasons is the low socioeconomic background of the students

studying in those schools. They think they do not deserve good behavior and facilities as do not belong to the rich families. The education being provided at public schools is unequal to the private schools. Most of the teachers in public schools don't give their full effort in teaching students. They do not normally use blackboard while explaining any topic to them. Their behavior towards the students is strict and mostly punish or scold if students ask them to explain something again. Many teachers in government schools do not bother to come to school daily as they have a fixed pay and are going to get it at the end of every month. In this way, the learning process of the students is disturbed. In these schools, they strictly follow the rote learning system. Students in public schools only study and have a fifteen to thirty minutes break in mid-day. The students are not involved in any learning activity. The technological element is missing from the teacher's daily pedagogy. The absence of new pedagogies and activities limits the development of any type of 21st century skills among students.

3.3 Participants:

The total population of the class seven students were 48 (25 boys and 23 girls). Considering the class activity for the research, it was decided to have four to five members in each group. It is mentioned in previous researches that larger groups tend to experience coordination issues among the members and eventually affects their performance in achieving the end goal (Lantané, Williams, & Harkin, 1979). The group of four or five works best as its concise and gives everyone the opportunity to participate fully (Fink, 2004). In the intervention activities, the work required is easily manageable among 4 to 5 members. To select the sample on the random bases, a simple random sampling technique was used. All the students are assigned with numbers from 1 to 4. The first four students who were assigned with number one were formed in a single group. The same procedure was done to form other three groups too. So, the strength of the sample was 35 (16 boys and 19 girls) participants for the research study. The sample size is small; however, it is appropriate to provide evidence to support the results of the past researches and it represents the population of interest.

The tabular representation of the participants is as follows:

Table 3.1 Participants Detail

Gender	Total
Females	19
Males	16
Total Participants	35

3.4 Research Questions and Hypothesis:

The research questions for the study are as follows:

RQ₁: What will be the effect of ICT intensive pedagogy on student's communication skills?

The null and alternate hypothesis based on the research question are as follows:

H₀ = There is no positive change in the speaking skills of the students due to the ICT intensive pedagogy.

H₀ = There is no positive change in the use of the body language and vocabulary of the students due to the ICT intensive pedagogy.

H₀ = There is no positive change in the technique of the students to engage and involve audience due to the ICT intensive pedagogy.

H₁ = There is a positive change in the speaking skills of the students due to the ICT intensive pedagogy.

H₁ = There is a positive change in the use of the body language and vocabulary of the students due to the ICT intensive pedagogy.

H₁ = There is a positive change in the technique of the students to engage and involve audience due to the ICT intensive pedagogy.

RQ₂: What will be the effect of ICT intensive pedagogy on student's collaborative skills?

The null and alternate hypothesis based on the research question are as follows:

H_0 = There is no positive change in the cooperative skills of the students due to the ICT intensive pedagogy.

H_0 = There is no positive change in the communication skills of the students due to the ICT intensive pedagogy.

H_0 = There is no positive change in the concentration of the students due to the ICT intensive pedagogy.

H_0 = There is no positive change in the behavior of the students due to ICT intensive pedagogy.

H_1 = There is a positive change in the cooperative skills of the students due to the ICT intensive pedagogy.

H_1 = There is a positive change in the communication skills of the students due to the ICT intensive pedagogy.

H_1 = There is a positive change in the concentration of the students due to the ICT intensive pedagogy.

H_1 = There is a positive change in the behavior of the students due to ICT intensive pedagogy.

3.5 Data Collection:

The data was collected through observations, in-depth interviews and recordings. The details of the method are as follows:

3.5.1 Observations:

The observations were done during the student's presentation and their collaborative tasks in groups. Along with this, each group was monitored individually from time to time in order to get the observations and details about their work better. These observations were done according to the rubrics for communication and collaborative skills. General observations were also done throughout the intervention.

The rubrics for communication skills are:

1. Demonstrate effective speaking skills
2. Make appropriate use of body language and vocabulary
3. Use effective techniques to engage and involve the audience

Rubric 1 indicates the level of clarity, pace volume in the speaking skills. Rubric 2 indicates the usage of vocabulary that is understandable by the audience. Rubric 3 indicates the overall confidence level and the ability to make the eye contact with the audience. The rubric for communication skills was adapted from The University of Western Australia. The Business School of this university developed these rubrics as a guide to grade student's skills (School, 2011). The communication skills were calculated on a Likert scale, ranging from unsatisfactory to highly satisfactory.

The rubrics for collaborative skills are:

1. Cooperation with the groupmates
2. Communication with the groupmates
3. Concentrating on the group task
4. Respectful behavior towards the groupmates

Rubric 1 demonstrates the level of support and assistance provided by the student to his other groupmates. Rubric 2 demonstrates the student's ability to listen and talk to his groupmates. Rubric 3 indicates the attentiveness of the students towards the group task. Rubric 4 demonstrates the student behavior towards his groupmates. For the evaluation of the collaborative skills, the rubrics were adapted from the rubric list created by Kate O'Connell (O'Connell, 2012). Kate created the rubrics for the school teachers to evaluate the skills of their students. The collaborative skills were also evaluated on a Likert scale ranging from zero (Not Effective) to two (Effective).

Every single student was evaluated using these rubrics.

3.5.2 In-depth Interviews:

The participants for the in-depth interview were the students. The interviews were conducted after creating every stop motion animation. So, at the end of the intervention at both school, the total number of interviews were six. All the students were part of the interviews. The interviews were done for the triangulation purposes, to further help in defining and evaluating the results obtained using statistical tests. Other reason was to know about the student's feedback about the group work and their learning from this intervention. In between the tasks, small purposeful conversations were also held with the students. The topics of these conversations were their studies, hobbies, school and their questions regarding research and their tasks.

The questions for the in-depth interviews are as follows:

Table 3.2 Questions for the Interview Session

	Interview Questions
1	How would you describe your experience about working on Stop Motion Animation?
2	Was there any conflict during the group work? If Yes, what were they?
3	How did you overcome those conflicts?
4	What kind of skills you think these group projects helps in developing? And what skills you think you have developed?
5	Did you get bored while working on SMA?
6	If Yes, why? Any particular reason?
7	Did you get bore while listening to regular lectures? Any particular subject?
8	Among all three Stop motion animation, on which SMA you enjoyed working on? Why?
9	Were the tasks divided in the group? How?

3.5.3 Audio Recordings:

The audio recordings were done to get the insight about the interactions of the students while working in groups. To record the student interactions while working in groups, a simple mobile recording application was used. It was visible and known to students that their conversations were being recorded. The recordings were done during the project work. It was later transferred to the laptop to use in data analysis purpose. During the intervention at the Boys school, four mobile phones were used and two were used during the intervention at the Girls school. The total recording was of 20 hours 53 minutes.

The integration of the research questions, tools and its procedure is as follows:

Table 3.3 Relationship between Research Questions and Tools

Research Question	Tools	Procedure
What will be the effect of ICT intensive pedagogy on student's communication skills?	Observation Audio Recording	Observations are done during presentations of the topics and while working collaboratively on stop motion animation. Recording is done while working collaboratively on stop motion animation.
What will be the effect of ICT intensive pedagogy on student's collaborative skills?	Observation	Observations are done while working collaboratively on stop motion animation.

3.6 Intervention Activities

The main activities for the intervention are as follows:

1. Presentations
2. Group Names
3. SMA Idea Finalization
4. Creating Stop Motion Animation

3.6.1 Presentations:

The first activity planned for the students was to give presentations. The presentations were based on the topics from English and Science book. Presentations were done individually by each student. The topics were, Traffic Sense, Types of Pollination and Formation of Sodium Chloride.

3.6.2 Group Names:

Before the students started with other group work, they were tasked to name their group by themselves. This activity was done to increase their interest and sense of ownership towards the other tasks of the intervention. The group names are as follows:

Table 3.4 Name of the Groups

Boys School	Girls School
1. Sialkot Kings	1. Queens
2. Four Warriors	2. Scientists
3. Furious Four	3. Four Princess
4. Dragon Warriors	4. Five Flowers of Paradise

3.6.3 SMA Idea Finalization:

The next tasks for the students is to finalize the idea based on their topic for the SMA. In order to finalize the best story idea to work on, the students discussed different ideas within the group. After finalizing the idea, students storyboard the whole story, scene by scene and afterwards, finalize the things needed to create the SMA. Every group divided the things they needed to make the animation within themselves.

3.6.4 Creating Stop Motion Animation:

In the final activity, the students worked on the SMA. In groups, students created the project with different materials. After completing the project, students took pictures of the project using the digital camera. Students took pictures of the project with a sequence. To create the stop motion animation, the software called Windows MovieMaker was used.

3.7 Daily Procedure of the Intervention

In both the schools, the procedure of the intervention was the same. First, the intervention was performed in Boys School and then in Girls school. The main procedure is as follows:

Students were given an introductory session about the whole research and their tasks. The concept of stop motion animation was explained to them. they were also shown some videos about it to help them understand it better. Students did the reading of the topic and then gave presentation on that topic. After the presentation, the students were tasked to prepare and present stories based on the topic. In the groups students discussed different ideas in order to finalize an idea upon which they will create stop motion animation. When students created their project, they clicked its pictures in order to create animation. The pictures were then transferred to the laptop to create stop motion animation using Windows MovieMaker. The procedure was repeated on the other two animations as well.

The tables described below shows the tasks done at the Boys school on each day of the intervention.

Day 1
Tasks
1. Introductory session about the students and intervention was done.
2. Students read chapter “Traffic Sense” from English book.
3. Students prepared presentation on this chapter to showcase their understanding.
4. For the next day, students were asked to prepare stories based on this chapter and to search about SMA on their own.

Day 2
Tasks
1. Students presented their stories to the class.
2. Students shared their understanding about the SMA with the class fellows.
3. Students were divided in the group of four members.
4. Students decided their group names.
5. All the groups were involved in the group discussion to finalize the idea and to do the storyboarding for the SMA.
6. After completing the discussion, students showed their final idea for the SMA.
7. Students divided the things needed to create the SMA within the group.

Day 3
Tasks
1. Students worked in their groups to create SMA.
2. Audio recording of the groups were done while they were working on the SMA.
3. When the project was completed, groups took pictures of it to create SMA.
4. In-depth interviews were conducted individually.
5. For the next day, students were asked to prepare the presentation on the topic Pollination from the Science book.

Day 4

Tasks

1. Students did the reading of the topic Pollination and prepared its presentation.
2. Students gave presentation on the topic Pollination.
3. The animation that was created yesterday was shown to the students.
4. All the groups did group discussion to finalize the idea and to do the storyboarding for the second SMA.
5. After completing the discussion, students showed their final idea for the SMA.
6. Students divided the things needed to create the SMA within the group.

Day 5

Tasks

1. Students worked in groups to create the SMA.
2. Audio recording was done in groups to record their conversations while working.
3. When the project was completed, group took pictures of it to create SMA.
4. The in-depth interviews based on SMA was conducted individually.
5. For the next day, students were asked to read and prepare the presentation on Preparation of NaCl from Science book.

Day 6

Tasks

1. Students read the topic Formation of NaCl from the Science book.
2. After that, students prepared their presentations.
3. Students gave presentations individually.
4. Students were asked to prepare stories based on this topic.

Day 7

Tasks

1. Different animation on NaCl formation was shown to the students.
2. Students were given time to come up with the stories. But, they were unable to do it.
3. Students were settled in groups to discuss the idea about the animation based on this topic.
4. The groups shared the final idea with the class.
5. Students distributed the things needed to create the animation among themselves.

Day 8

Tasks

1. Students worked in their groups to create SMA.
2. A mobile recorder was placed on each group's table.
3. Camera was provided to the groups when they completed their project to take pictures for SMA.
4. After creating the SMA, the in-depth interviews were conducted.

For the girl's school, the intervention procedure went as follows:

Day 1

Tasks

1. An introduction about the research intervention and students was done.
2. Students did the reading of the topic Traffic Sense from the English book.
3. Preparation time was given to students for the presentation.
4. Students presented their presentations.
5. For the next day, students were tasked to prepare stories based on this topic.
6. In the end, the groups were made.

Day 2

Tasks

1. The students presented their stories based on the topic Traffic Sense.
2. Students were shown different SMA to give them better understanding of its process.
3. Students settled in groups to finalize the idea about their first animation.
4. Students divided the things among them that they needed to create the animation.

Day 3

Tasks

1. Students worked in their groups to create SMA.
2. A mobile recorder was placed near the groups.
3. Camera was provided to the groups when they completed their project to take pictures for SMA.
4. SMA was created using Windows Movie Maker.

Day 4

Tasks

1. The in-depth interviews based on yesterday's work was conducted individually.
2. For the next day, the students were tasked to read and prepare the presentation on the topic Pollination from Science book.

Day 5

Tasks

1. The students gave presentation based on the topic Pollination.
2. The students settled in their groups to discuss idea for their next SMA.
3. Students distributed things among them they needed to create the SMA.

Day 6

Tasks

1. The students settled in groups to create the SMA.
2. The mobile recorders were placed near the groups to do the audio recording.
3. Camera was provided to the groups when they completed their project to take pictures for the SMA.
4. SMA was created using Windows Movie Maker.
5. In-depth interviews were conducted individually.
6. For the next day, students were tasked to read and prepare the presentation on the topic Formation of NaCl.

Day 7

Tasks

1. Students were given time to prepare the presentation.
2. Students gave their presentation based on the topic Formation of NaCl.
3. The animations related to this topic were shown to students to give them idea about its story.
4. Students settled in their groups to finalize the story about the SMA.
5. Students divided the things among them, they needed to create the SMA.

Day 8

Tasks

1. Students settled in groups to create the SMA.
2. The mobile recorder was placed near the groups.
3. When the project was completed, camera was provided to the groups to take pictures for SMA.
4. SMA was created using Windows Movie Maker.
5. In the end, the in-depth interviews of the students were conducted individually.

In the Appendix section D, pictures representing the intervention done in both the schools are present.

3.8 Issues in Selection of the Schools:

As mentioned before, the intervention was carried out in the public schools of Sialkot. However, a number of issues were faced in order to select the schools.

Sialkot is an industrial city famous for its sports and leather products. small city, in the past no major educational research is carried out in schools. The whole process of the intervention was explained in detail to the school management during the first meeting. Still, a lot of rejections specially from school administrations of the girl's school was faced. A number of concerns and ignorant comments were heard. In some schools, they had the issue with the time as the implementation required ten to fourteen days. Secondly, the final papers were starting in schools in one to two months' time and they had to finish the course work and were required to prepare the students for the exams by taking tests. Some schools, without giving any explanations, simply said they could not allow the research to take place in their schools. At one school, management argument was that they could not allow their students to do someone else's work in their class time. One major issue that was being faced was in the Girls School. The management of the Girls School was not comfortable with the implementation especially with the materials required to complete the implementation process. The use of mobile phones and camera were unacceptable for them. They wanted the implementation to work without the use of mobile phones and camera. In all Girl Schools, management were unable to wrap their head around the purpose of mobile phones and camera in the learning process of the students. The concerns showed by them upon using digital camera and mobile phones were, security issue, playing games on mobile and taking pictures with camera or mobile phone. They thought that student's inappropriate videos could be recorded by themselves or someone else would do it. As discussed earlier, the intervention process was explained to the school managements thoroughly in the start and later, after hearing all these concerns from them. In the briefings, they were informed about the purpose of all the materials needed to perform the research. The sole purpose of the digital camera was to click pictures of the student's project for creating the animation and mobile phones were only to be used for recording the group conversation while working on the animation. They were told repeatedly that both the devices were necessary for carrying out the research and to create stop motion animation. It was

explained in the briefing that cameras and mobile phones would be accessible to students when they are required to take pictures of their project and their conversations need to be recorded.

To overcome the concern about the misuse of mobile phones and camera, some suggestions were provided to the school management. One was the parent consent form. In the form, the student's parent was clearly informed about the implementation details and what their child is going to be doing during the intervention. Parents could easily show their consent by signing these forms. Secondly, the school was given the option to place their own teacher in the classroom during the research work. By doing this, they could easily observe the involvement and accomplishment of the students. Even, with all these arrangements, they were not okay with the research settings and refused to let the research take place in their school.

Even after facing all these negativities, two schools, a boy's school and a girl's school gave a positive response and allowed to do the research in their schools.

4. Results

The research study was conducted to measure the 21st century skills of class seven students by using the stop motion animation as the technological and pedagogical tool. As mentioned in the Methodology chapter, the different data collection technique namely; rubric based observations, in-depth interviews and recording were used to collect the data. Therefore, in this chapter, the results and the analysis of these tools are described in detail here.

4.1 Results of Collected Data

The results of the rubric based observations were calculated by using IBM SPSS Statistics 20. Before conducting the calculations on the observed data, the assumptions for One-way ANOVA Repeated Measure were checked. The Repeated Measure ANOVA is applicable on related groups and it is applied to calculate the presence of general differences between related means (Creswell, 2012). It is used in a study design if the study investigates the changes in mean score over three or more time points (Cohen, 2007; Creswell, 2012). For the analysis purposes, a type of mixed research design method known as Explanatory sequential design was used.

The statistical method used is called Repeated Measure ANOVA. Repeated measure is an experimental design in which the group participates in more than one treatment and the change in the mean values is investigated over three time points with the same condition (Creswell, 2012). It is a small research study with its major focus to evaluate the change in student's communication and collaborative skills due to the usage of stop motion animation as a low cost technological pedagogy. Therefore, stop motion animation is the independent variable, while communication and collaborative skills are the dependent variable. The variable of gender is not considered as the results of this study are not gender biased.

The Normality test were conducted on the collected data to know whether the data was normal or not.

4.2 Normality Test

The normality of the data was calculated by using the Shapiro-Wilk Test. The test compares the values in the dataset to a normally distributed set of values with same mean and standard deviation (Field, 2009). This test is used to check the normality because the size of the data sample is 35 and this test is appropriate for data sample less than 50, however, it can be used

for the data sample greater than 50 (Cohen, 2007). This test states, if the **Sig.** value is greater than 0.05, the data is normal, otherwise the data is not normal (Cohen, 2007; Field, 2009). In general, Shapiro-Wilk Test gives an exact value for significance, whereas, Kolmogorov-Smirnov test occasionally yield an estimate of .2 for the significance (Field, 2009). Along with the Shapiro-Wilk test, the visual representation of the data is presented through a column graph. The rubrics and results of measured skills are as follows:

The rubrics for evaluating the communication skills are as follows:

1. Speaking Skills
2. Use of body language and vocabulary
3. Engaging audience

Table 4.1 Values of Mean, Median and S.D – Communication Skills

No of Days	Speaking Skills			Body Language & Vocabulary			Engaging Audience		
	Mean	Median	S. D	Mean	Median	S. D	Mean	Median	S. D
DAY 1	1.86	2.00	0.845	1.91	2.00	0.612	1.37	1.00	0.598
DAY 2	1.23	1.00	1.140	1.20	2.00	0.994	0.91	1.00	0.887
DAY 3	1.46	2.00	0.980	1.43	2.00	0.850	1.29	1.00	0.893
DAY 4	1.60	2.00	1.006	1.46	2.00	0.886	1.29	1.00	0.926

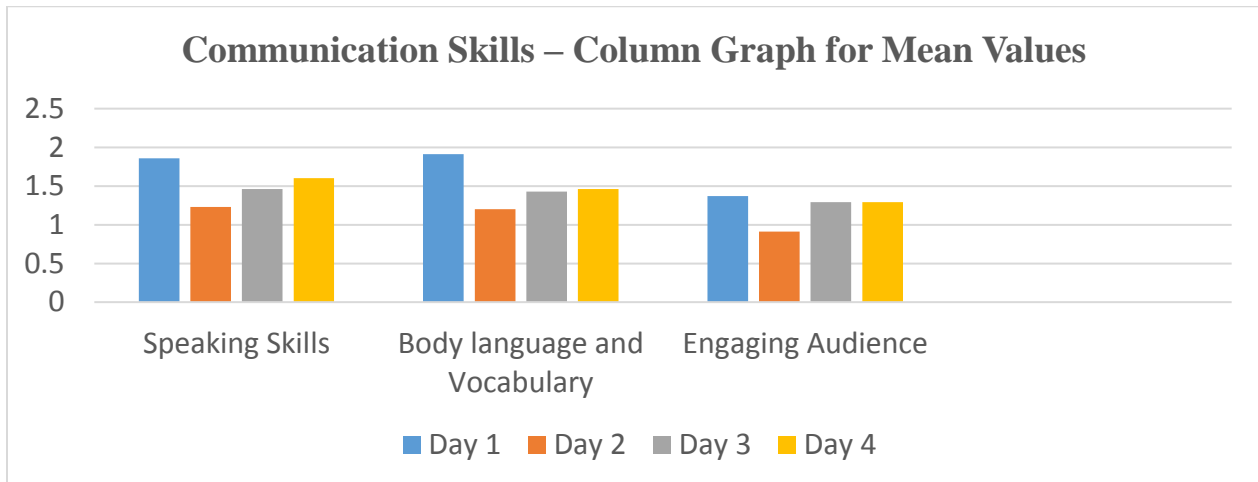
Table 4.2 Shapiro-Wilk Test for Normality – Communication Skills

No of Days	Speaking Skills	Body Language and Vocabulary	Engaging Audience
	Sig. value	Sig. value	Sig. value
Day 1	0.000	0.000	0.000
Day 2	0.000	0.000	0.000
Day 3	0.000	0.000	0.000
Day 4	0.000	0.000	0.001

As mentioned in the table 4.2, the significance values for all the rubrics is 0.000, except for engaging audience on day four which is 0.001. Therefore, it is clear from the Shapiro-Wilk test

that the data is not normal. As the value for significance is smaller than 0.05. The column graph for the mean values of the communication skills is given below.

Figure 4.1 Column Graph for the Communication Skills



It is visible from the Figure 4.1 that all the rubrics went up on the Day 1. On Day 2 there was a sharp decrease in all the rubrics value. There is a rise in values on Day 3. The values remain steady between Day 3 and Day 4. Overall, the graph depicts a positive result on communication skills of the students.

The rubrics for evaluating the collaborative skills are as follows:

1. Cooperation
2. Communication
3. Concentration
4. Respectful

Table 4.3 Values of Mean, Median and S.D. – Collaborative Skills

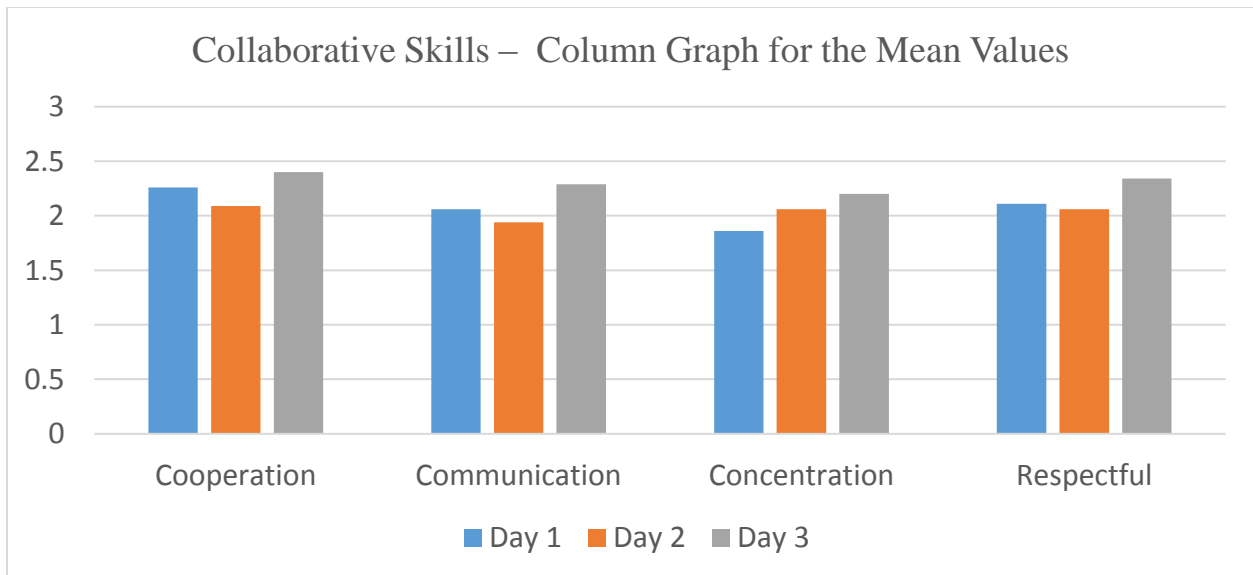
No of Days	Cooperation			Communication			Concentration			Respectful		
	Mean	Median	S.D	Mean	Median	S.D	Mean	Median	S.D	Mean	Median	S.D
Day 1	2.26	2.00	0.852	2.06	2.00	0.802	1.86	2.00	0.733	2.11	2.00	0.832
Day 2	2.09	2.00	1.147	1.94	2.00	1.083	2.06	3.00	1.187	2.06	2.00	1.136
Day 3	2.40	3.00	1.143	2.29	3.00	1.126	2.20	3.00	1.106	2.34	3.00	1.136

Table 4.4 Shapiro-Wilk Test for Normality – Collaborative Skills

No of Days	Cooperation	Communication	Concentration	Respectful
	Sig. value			
Day 1	0.000	0.000	0.000	0.000
Day 2	0.000	0.000	0.000	0.000
Day 3	0.000	0.000	0.000	0.000

According to the table 4.4, all the rubrics of the collaborative skills represents non-normality in the data. The column graph depicting the mean values of the collaborative skills is given below.

Figure 4.2 Column Graph for Collaborative Skills



According to the Figure 4.2, on Day 1 all the rubrics raised. On Day 2 there is a slight decline in cooperation, communication and respectful rubrics. While, concentration shows an increase on Day 2. On Day 3, all the rubrics gradually grew. Overall, the graph represents a positive response in the development of the collaborative skills as there is no low values.

After conducting the normality test, it was cleared that the score for all the rubrics represents non-normality and violates one of the assumptions (i.e. normality of the data) for using the parametric test, therefore nonparametric test alternative to the one-way repeated measure ANOVA, i.e. Friedman Test will be applied on the collected data to evaluate the null hypothesis.

4.3 Results of applying a Non-parametric test to the Collected Data

Friedman test was conducted to see if the means of the observed communication and collaborative skills measured multiple times were equal. The test is used to calculate the difference among the groups when the variable being measured is dependent and it is either continuous or ordinal (Cohen, 2007).

The assumptions for applying the Friedman test are as follows (Field, 2009):

1. One group that is measured, on three or more different occasions.
2. Group is a random sample from the population.
3. The dependent variable should be measured at the ordinal or continuous level.
4. Samples do not need to be normally distributed.

The justification for using the Friedman test are as follows: In this study the group is measured at three different occasions. The participants were randomly selected. The dependent variable are the communication and collaborative skills and both are ordinal variables. The sample is not normally distributed.

The result of Friedman test is statistically significant when the Sig. value, $p < 0.05$ (Field, 2009). After applying the Friedman test on all the rubrics of communication and collaborative skills, the results are as follows:

4.3.1 Communication Skills:

Rubric # 1: Speaking Skills

N	35
Chi-Square	10.365
Df	3
Asymp. Sig.	.016

a. Friedman Test

The table above, summarizes the data about the speaking skills displayed by the students. It indicates that there was a significant difference among the speaking skills of the students based on the Friedman test, $X^2(3) = 10.365$. $p = .016$. The result conclude that it rejects the null hypothesis

H_0 and implies a positive change in the speaking skills of the students due to ICT intensive pedagogy.

Rubric # 2: Vocabulary and Body Language

N	35
Chi-Square	13.696
Df	3
Asymp. Sig.	.003

a. Friedman Test

The table above, summarizes the data about the vocabulary and body language displayed by the students. It indicates that there was a significant difference among the speaking skills of the students based on the Friedman Test, $X^2(3) = 13.696$, $p = 0.003$. The test analysis conclude that it rejects the null hypothesis H_0 and suggests a positive change in the vocabulary and body language of the students due to ICT intensive pedagogy.

Rubric # 3: Engaging and Involving Audience

N	35
Chi-Square	8.324
Df	3
Asymp. Sig.	.040

a. Friedman Test

The table above, mentions the data about the student's skills in engaging and involving the audience. It indicates that there was a significant difference among the student's skills in engaging and involving the audience based on the Friedman test, $X^2(3) = 8.324$, $p = 0.040$. The test analysis conclude that it rejects the null hypothesis H_0 and suggests a positive change in the technique of the students to engage and involve audience due to ICT intensive pedagogy.

4.3.2 Collaborative Skills

Rubric # 1: Cooperation

N	35
Chi-Square	7.013
Df	2
Asymp. Sig.	.030

a. Friedman Test

The table displayed above, mentions the data about the cooperative skills displayed by the students. It indicates that there was a significant difference among the student's cooperative skills based on the Friedman Test, $X^2(2) = 7.013$, $p = 0.030$. The test analysis conclude that it rejects the null hypothesis H_0 and suggests a positive change in the cooperative skills of the students due to ICT intensive pedagogy.

Rubric # 2: Communication

N	35
Chi-Square	6.473
Df	2
Asymp. Sig.	.039

a. Friedman Test

The table displayed above, mentions the data about the communication skills displayed by the students. It indicates that there was a significant difference among the student's communication skills based on the Friedman Test, $X^2(2) = 6.473$, $p = 0.039$. The test analysis conclude that it rejects the null hypothesis H_0 and suggests a positive change in the communication skills of the students due to ICT intensive pedagogy.

Rubric # 3: Concentration

N	35
Chi-Square	7.237
Df	2
Asymp. Sig.	.027

a. Friedman Test

The table displayed above, mentions the data about the concentration skills displayed by the students. It indicates that there was a significant difference among the student's concentrative skills based on the Friedman test, $X^2(2) = 7.237$, $p = 0.027$. The test analysis conclude that it rejects the null hypothesis H_0 and suggests a positive change in concentration of the students due to ICT intensive pedagogy.

Rubric 4: Respectful

N	35
Chi-Square	6.432
Df	2
Asymp. Sig.	.040

a. Friedman Test

The table displayed above, mentions the data about the respectful behavior displayed by the students. it indicates that there was a significant difference among the student's respectful behavior based on the Friedman test, $X^2(2) = 6.432$, $p = 0.040$. The test analysis conclude that it rejects the null hypothesis H_0 and suggests a positive change in the behavior of the students due to ICT intensive pedagogy.

The results indicate, there is a statistical difference in all the rubrics of communication and collaborative skills. It represents the effectiveness of group work and use of technological pedagogy on 21st century skills.

4.4 Results of the In-depth Interviews:

The interviews of the students were conducted after creating every stop motion animation. All the students were part of this session. The questions of the interviews covered different aspects of the whole intervention process. The data collected from the interviews were used to create themes representing the meaningful analysis. The themes for the interviews are explained below.

4.4.1 Intervention Experience:

Overall, the students responded in a positive way about their experience in creating stop motion animation. They said their experience was good and they enjoyed on working something new and different. However, they did felt bored due to one thing, that was coloring. Students said coloring large area of charts was boring for them. Instead of coloring, if they have used paints, they would

have enjoyed it more. They said they were okay with how the different activities were planned for them.

4.4.2 Better Understanding of the Topics:

Students expressed that they have grasped and know the topics more thoroughly after creating their animation. Before that, they had only read about it but, due to animations they had to go through every single step manually and created it. Most of the students said their confusions about the formation of sodium chloride are resolved now. They said they were happy that due to creating animations their understanding about them is more clear.

4.4.3 Skill Building:

When students were inquired about the skills they have learnt or what they gained from the activities, they pointed out a number of things. Many of them said that this intervention helped in developing problem solving skills. When something goes wrong while creating the stop motion animation they would discuss and would find an alternate way to deal with it. Along with this, they know how to resolve issues or conflicts with each other. They said they concentrated on their end goal, that was the animation and let go of the bad feelings. They also said that intervention helped them about how to work in groups. For some students, their communication skills got better and their shyness was also decreased. Some of them even became more good friends at the end of the intervention. One of the students said, that he has learnt how to use scissor appropriately. For some students, their photography skills were improved as they used camera to take pictures for the animation.

4.4.4 Routine School Experience:

Students were asked to share their routine school experience. As expected, students were not happy how lectures and other things were carried out in their schools. Students said they only receive lectures during the class and their only task is to take notes. The question answer session is not welcomed in their classes. Their participation is very rare or nil in the class and varies according to the teacher. Students said that the only focus of teachers is to complete the course without knowing the student's understanding of the topic. As they didn't have any playground so they stay in the classroom during break. They said they even their lunches in the classroom. Students also said that they are rarely involved in different extracurricular activities in the school and in these activities every student does not get a chance. During class lectures there is no individual or group

activity based on the ongoing lecture. They said that that is the reason they were happy that this intervention was happening in their school and they were part of it.

4.4.5 Stop Motion Animation Experience:

Students were asked whether they enjoyed creating stop motion animation. Upon which their answer was yes. They said as it was a new experience for them and they have never heard about this animation concept before. Students were interested in knowing more about it and wanted to know about other soft wares that can be used to create SMA. Students were also asked about which the animation they enjoyed working the most. Most of the students answered first animation. The reason they gave for this was that it was their first experience of such activity so they enjoyed it the most. Secondly, they didn't felt bored as it involved no or less coloring as compared to the other two animations. Students said as they were creating the animation, they stayed well engaged in the process which helped in understanding the topic better.

4.5 Analysis of Audio Recordings

The purpose of the audio recording was to know about the interactions the students had within their groups while working on the stop motion animation. A total of eighteen audio files compromising of 20 hours and 53 minutes were collected, at the end of the intervention. The key elements that were highlighted after listening to the audio files are as follows:

4.5.1 Quality of the Audio File

The audio was recorded by using smartphones. There was a lot of noise in the audio file. This was contributed by the number of the reasons. A good quality audio recorder was not used to record the audios. It resulted in a lot of noise in the audios. Secondly, these recordings were done in the same room. Therefore, all the four groups voices, at some point do overlapped with each other. This contributed in not hearing and understanding few of the conversations properly.

4.5.2 Conversations based on the Project

When the groups were working on the animation, they kept every group member in the loop. Students would ask each other's approval about their work. As in one group, Dragon Warriors, when they were working on their first animation, they had only one chart upon which need to create the model for the animation. In order to create buildings and road of appropriate size, they had the following conversation.

Student A: (while drawing the width for the road with the ruler) is it enough?

Student B: Yes, it's enough.

In another conversation of the above-mentioned group, two of the members were tasked to place the buildings on the chart. Their conversation went as follows;

Student A: I am holding the building (chart model) with its stand so place the tape on it.

Student C: where?

Student A: (he pointed towards the exact spot on the building) Here.

Student C: (he placed the tape on that spot and cut it).

Student A: It's fine.

Student B: Hmmm, its good.

It's clear from the conversation, everyone worked collectively, assisted each other in accomplishing the task and asked for each other's opinion to make the right decision for the project.

In audio files, it was hearable that the students were asking help form other groups too. The main reasons for asking other's help was either due to absence of their group member who was responsible to bring the particular item or they didn't anticipate well the things they would need to complete the animation. Some student was asking for the scissor and the other one was asking for the colors. Both the students were assisted in this matter. The students did enjoy while working on the animation as they worked continuously for 2 to three hours and laughers were also heard from time to time.

Students also helped out each other when one wasn't able to do the task assigned to him. In this situation, no one pressurized him or gave faulty remarks about his intellectual nature. They helped him out and guided him in completing the task. This is visible by this following conversation, where one member was having difficulty in writing "R" for the name of the building. The conversation between him and one fellow member went as follows:

Student A: hey, how we are going to write R (in big capital letter for the name of the building)

Student B: made no comment.

Student A: Tell me how to draw it.

Student B: (Takes the pencil and drew for him).

Student A: Okay. I will do it like this. (and resumes his work)

This and other conversations mentioned above shows that the students worked like a team and helped each other out in the time of need. Their interactions displayed that they had developed communication and collaborative skills among them.

4.5.3 General conversations among friends

As students were working on the projects and discussing about different aspects of the project, students also talked about the other things that were going on with them in the school or at home. For instance, students at boy's school were discussing about the admission test they had to take to get admission in the cadet school. Some were certain that they will get through the test while some weren't. At girl's school, students were mostly discussing about the homework or test that needs to be complete or conducted in the next class. Students were involved in humorous conversations too.

5. Discussions

The present study was designed to determine the effect of the ICT-intensive pedagogy on developing the 21st-century skills among the students. This study focuses on using low-cost technological tool to enhance or modify the current teaching pedagogies used by the teachers for decades.

As mentioned previously, in the literature review section, that the integration of the 21st-century skills within the course curriculum is important to develop these skills among the school students. Along with this, several other researches shows that the classroom activities involving discussions and group work also helps in the development of these skills and helps in better understanding of the topic.

The result of this study is consistent with the results of the previous researches that concluded the group activities involving the creation of the stop-motion animation helps in evolving communication and collaborative skills of the students. The explanation of the achieved results is discussed below.

5.1 Communication Skills

The results gathered at the end of the intervention tasks showed improvement in the communication skills of the students. The values for the communication skills indicated that its respective rubrics, which includes, speaking skills, body language and vocabulary, and engaging the audience had the highest mean values due to student's involvement and curiosity about the intervention tasks on day one of the intervention. The student's question and eagerness to be the part of the task contributed to the positive result. The evident reason for the decrease in the mean values on the day two was due to the task based on the presentations, during which the students needed to present their stories to the class. The students did not have any experience of creating stories on their own, so most of them were not enthusiastic to perform or to be part of this activity. Secondly, only a few students were interested in this activity and to share their stories with their fellow classmates. While others did not work on it and prepared their stories in the classroom to present it later. The increase in the mean values for the next two days was due to the change in the activities as students did not create stories for the next two chapters. The students only gave presentations based on their understanding of the topics.

5.2 Collaborative Skills

The results obtained regarding the collaborative skills of the students are also positive. The current study found out that the student's collaborative skills were significantly improved due to their contribution in the group activities involving the creation of the stop-motion animation. The mean values for the communication skills indicated an overall positive change in the collaborative skills of the students. All the rubrics for the collaborative skills, that includes, cooperation, communication and respectful except concentration, showed high values for the day one as the creation of animation involved usage of toy cars. The students were deeply involved in making the project for the animation. The use of the digital camera could be the reason for the low value of the concentration. Being their first experience, students were eager and distracted to use the digital camera to take pictures for the animation. On the second day, the mean had a low value due to the topic being studied. It was a science topic, called pollination. Most of the students did not even bring any toys as they did not have anything which they could use to present the topic in the project. Their interest was minimal in it. The mean value of all the rubrics for day three had highest values as it was their last group activity and they wanted to perform better from their previous animations and other group's performances. The students were keenly interested and worked hard in representing their project as different as possible. One of the unanticipated finding during the intervention was the development of the problem-solving skills among the students. It is previously mentioned in other researches too, that collaborative work, not only help in developing collaborative skills but also the problem-solving skills as they are connected with each other.

5.3 In-depth Interviews impact on the Result

The students gave a good insight about their experience during the interview session. On the question based on their experience, the students expressed joy and excitement on most of the days. However, they did felt bored and tired on some occasions, particularly on day two of creating stop motion animation. The obvious reason they gave for this particular feeling was due to a lot of drawing and coloring big portions of the charts with pencil colors in order to complete the project. Students also propose a solution to avoid this exact feeling in future by using water paints instead of pencil colors to do the coloring. The students suggested in the interviews that this intervention helped them in developing problem-solving skills too, along with communication and collaborative skills. This feedback further supports the previous research findings that these skills

are the stepping stone or base for each other. The interview further provided reasons for their engagement towards the content learning. Students revealed that they didn't feel bored during the long hours of the intervention tasks and understood the content better. A possible explanation for this action is that the students were not just involved in listening to the lectures. Instead, they were part of different learning activities that assisted in increasing their engagement towards learning. These explanations further come in accordance with other researches done that supports the idea of doing class activities for the benefit of the students, to better understand the content knowledge. For more solid reasoning, during interviews, students even gave an example of the third animation that was based on the formation of sodium chloride. They revealed that they understood it better after creating its animation. The findings from the interviews also elaborated about the necessary changes that need to be made regarding the teaching standards currently practiced in the public and government schools.

It can thus be concluded that the prominent reason for this study's positive result is due to old and substandard teaching method being used to teach students in schools. As students didn't experience this type of learning environment before, so their total interest and concentration contributed in yielding positive results.

6. Limitations

A number of issues and limitations were faced at the start and during the research.

6.1 Selection of Schools

In order to do the intervention, a number of schools were visited in Sialkot. But, a cold response was received from a number of schools. Schools were unwilling to provide assistance in order to conduct the research in their institutions. A number of reasons were given by them. Most of them said, as no research has ever carried out in their school and they have never heard of it, so they won't allow it. One of the school said they won't allow their student to do someone else work. This school was even given assurance that the students will do activities based on their subject topic and will not be part of any harmful activity. Still, they didn't agree with the research idea. At another school which was a girl's school, they had the issue with the usage of the mobile phones. They said it's a security issue and their parents won't consider it appropriate if they girls are involved in an activity which involves the usage of mobile phones. They were told many times about the reason of using the mobile phones. A demonstration was also given to them about how the girls will use mobile phones. It was only to take pictures of their project and not them. they were even told that a digital camera can be used instead of mobile phones to take the pictures and they can even place their own school teacher in the classroom to see how things are being done but, they literally didn't listen to any reason. Some schools showed willingness to conduct the research. But as the research needed around two weeks, they said they don't have extra time for a long research activity as they had to complete the course.

6.2 Issues at Selected Schools

The two schools, where the research was conducted, they had their own kind of limitations. At boy's school, as the final papers were approaching, the time became an issue. Therefore, two activities were done on a single day to wrap up the research work quickly. The school and classroom area was small which later became an issue when students needed space to work on animations. There was no computer lab in this school which later formed issues in creating the animations. However, a laptop was provided to them which helped in understanding the concept of the stop motion animation. At girl's school, the same issue of time was faced. As the research was carried out in the class times so some activities were done in a hurry as the teachers needed to teach them. Secondly, girls were unfamiliar about how to use the digital camera or computer. the

classroom where intervention was carried out, had computers at the back but the students did not use it as the school had no computer teacher.

6.3 Issues in Observations

At the boy's school, two observers did the observation of the four groups. No assistance was provided by the teachers in doing the observations. At girl's school, only one observer was present to observe the behavior of the students. Here, again the teachers didn't help out. Only audio recording was done at both the schools. Video recording wasn't done due to the lack of resources and secondly, due to the obvious issues regarding the usage of mobile phones in the classroom.

6.4 Absence of Interest among Teachers

From the both the schools, the teachers didn't really showed interest in the intervention and its activities. They were invited to get involved in the intervention. But as they had no important role in the research plan therefore they didn't bother to see how their students were working on the animations or to learn and get awareness about the animation technique which they can use later in their classes too.

7. Recommendations

The findings that was gathered through this research work has highlighted many important aspects about the working of the schools and do give a strong direction who want to pressure research on 21st century skills.

7.1 Recommendations for the Government

Government should develop new system for checking the working of the school administration and the teachers. Administrations should be held accountable if they are using the funds and available resources in the best interest of their students. teachers should be answerable to their higher management if they are not teaching the students in the best way or they are not achieving all the tasks that was already listed in the approved curriculum. The government should provide assistance to the education department in order to update the curriculum according to the needs and demands of the 21st century. This is important, if the government wants its citizens and young generation to be efficient and flourish in their personal and professional life.

7.2 Recommendations for the School

Administrations of government and public schools should provide a healthy and a comfortable learning environment. A student centered learning environment should be provided, where their response and needs are mattered. Students should be able to do learning activities within their classes in order to enhance their understanding. School should also consider space for a playground for the students, when getting or renting a place for their institution. As it is unhealthy for them if they are not actively involved in any games. Extracurricular activities should be a part of every school. As such events helps in building confidence and developing 21st century skills among the students. at such occasions, teacher also need to be sure that every student is part of it in one way or another. Every school should have a computer lab and should be available for the students to use it for the learning purposes. The schools also need to make sure they have teachers for every subject. So, that students could be equipped with all the knowledge and skills to advance in the next phase of academic life.

7.3 Recommendations for Teacher Training Programs

A lot of necessary changes needs to be done in the teacher training programs. In these programs, they should add courses or diploma that focuses in providing the teachers with the knowledge of

how to use technology in assisting the students in their learning process. Teachers need to know about different learning methodologies, which they could adapt in order to integrate content and 21st century skills. Teacher should know and adapt to new pedagogies with or without the technology in order to meet the learning needs of their students. All the teachers should have computer skills and should use it in their classes in order to introduces students with multiple ways of explaining a concept.

7.4 Recommendations for Future Researchers

In the research study, only communication and collaborative skills were evaluated. However, for future research, other 21st century skills could be evaluated with stop motion animation or any other technological and pedagogical technique. Secondly in the intervention, only class seven students were involved and animations were made on Science and English topics. Though, students of other classes and other subjects can be the part of the future research too. The research study could be done in private schools too. This could give an insight, whether their students are trained with essential 21st century skills with all the facilities provided to them.

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9. Appendices

Appendix A

Permission Letter



Date: 12 April 2016

Dear Madam,

I am a student of MS Innovative Technologies in Education at School of Electrical Engineering and Computer Science (SEECS) NUST, a newly launched program at NUST aiming to equip young graduates with necessary skills, enabling them to devise sustainable solutions for real life challenges in Education.

I am currently working on my thesis titled “Evaluating the 21st century skills of primary school students by using Stop Motion Animation as Technological and Pedagogical tool”.

For this, I would need to carry out some tasks and activities with the students of class 7. The students need to make stop motion animations related to their subject topics. The digital camera/mobile phone camera is going to be used for developing stop motion animations. For the data evaluation, I would do voice recording of the students while they are working on their animations. The skills of the students that are going to be evaluated are communication and collaborative skills with the help of rubrics. To gain the point of view about the activities, I would be interviewing the students also after the completion of activities. All the data will be destroyed after the completion of the thesis. I would be grateful if you could please allow me to interact with the students and teachers of your school for the duration of two-three weeks.

Ms. Farzana Ahmad who is a faculty member of MS ITE program supervises my thesis. She could be reached at this Email farzana.ahmad@seecs.edu.pk and Cell #: 03205429392

I look forward to your positive response as well as your kind approval to work on my thesis at your school.

Looking forward to receiving your support in this regard.

Sincerely,

Maria Tauqir

MS ITE (Innovative Technologies in Education)

SEECS, NUST

Appendix B:
Rubric for communication skills

Rubric	Highly satisfactory - Demonstrated ability to communicate effectively	Satisfactory - Demonstrated basic ability to communicate effectively	Unsatisfactory – Failed to demonstrated the ability to communicate effectively
1. Demonstrate effective speaking skills	Speaks clearly and with good pace and volume.	Speaks clearly and with satisfactory pace and volume most of the time.	Sometimes lacks clarity and is hard to hear.
2. Make appropriate use of body language and vocabulary	Uses appropriate vocabulary and extends the audience's vocabulary by defining words likely to be new to them.	Uses appropriate vocabulary but sometimes uses words the audience are probably unfamiliar with without defining them.	Vocabulary is mostly appropriate but sometimes uses words and phrases not understood by the audience.
3. Use effective techniques to engage and involve the audience	Stands up straight, looks confident and makes eye contact with most people. Invites audience participation and responds to questions with little difficulty.	Stands up straight and makes eye contact with some of the audience. Answers most questions.	Poor posture and makes little effort to make eye contact with the audience. Response to questions indicates a lack of topic knowledge.

Appendix C: Rubric for evaluating Collaborative Skills

Rubric	Not Effective (0)	Somewhat Effective (1)	Effective (2)
Cooperation	<ul style="list-style-type: none"> • No cooperation • Argued a lot • He did his own things 	<ul style="list-style-type: none"> • Co-operated with some group members • Did some of the work 	<ul style="list-style-type: none"> • Worked with everyone • Listened to other group members • No arguments • Sometimes he would lead and sometimes follow
Communication	<ul style="list-style-type: none"> • Didn't talk • Didn't listen 	<ul style="list-style-type: none"> • Talked with some members • Listened to some members 	<ul style="list-style-type: none"> • Shared his ideas with other members and listened to their opinion • Stayed involved in constant communication and feedback
Concentration	<ul style="list-style-type: none"> • Did other things 	<ul style="list-style-type: none"> • Worked sometimes on the project and sometimes didn't 	<ul style="list-style-type: none"> • Paid attention • Thought about all options before acting • Worked on the project
Respectful	<ul style="list-style-type: none"> • Spoke in a meaningful way • Yelled at others 	<ul style="list-style-type: none"> • Spoke respectfully with some members and with some didn't 	<ul style="list-style-type: none"> • Spoke in a kind and friendly way with others and said please and thank you

Appendix D: Intervention Pictures
Boys School







Girls School





