PROFICIENCY IN USING ICT AND ITS ROLE IN SCAFFOLDING IN EDUCATION AMONG STUDENT TEACHERS AND TEACHERS

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By

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CERTIFICATE

I hereby certify that the dissertation prepared and submitted by Anna Mariam Raj entitled ***"Proficiency in using ICT and its role in scaffolding in Education among student teachers and teachers"*** is her original investigation, which she has carried out under my guidance and supervision.

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DECLARATION

I hereby declare that the dissertation entitled the ***"Proficiency in using ICT and its role in scaffolding in Education among student teachers and teachers"*** is a bonafide record of research work done by me during the course of research under the guidance and supervision of Smt. Leena George.

Anna Mariam Raj

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CHAPTER 1

INTRODUCTION

"The Information age challenges teachers to embrace change. Computer literacy is an essential skill requirement for students in the modern world and teachers must accept and welcome this."- Murchu & Freeman, (2003)

Technology is not a simple innovation. Many teachers have had to gain skills and confidence in using the computer for personal use and made an attempt to include technology in class. Most teachers use technology more than the approach of pedagogy. Teachers are coping with the day to day activities of the classroom and attempting to use some mode of technologies such as using Microsoft PowerPoint, internet searches, video clips etc. They are expected to integrate technology as a pedagogic practice even though most as Ertmer (2005) states, feel ill-prepared to do so. Due to a lack of software in higher education (Murchu and Freeman, 2003) or the high expense of multimedia development, it may be argued that teachers need more exposure to simple and appropriate technology for higher education in ways which would enhance learning practices.

Over the past two decades a substantial number of families have equipped their households with computers and internet access. New generations are more exposed to computers at home than at school. Technological developments in ICT are very rapid. Technology quickly becomes obsolete requiring new skills and knowledge to be mastered frequently. Adaptation is only possible when based on a sound understanding of the principles and concepts of ICT. The use of ICT cuts across all aspects of economic and social life.

ICTs are often spoken of in a particular context, such as ICTs in education, health care, or libraries. ICT is an umbrella term that includes any communication device or application, encompassing; radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. (Margaret Rouse, 2005). The use of ICT in education has brought about numerous studies

from many parts of the world highlighting the benefits and opportunities as well as the challenges for integration.

In Malta's National ICT Strategy (2008 - 2010), it is stated: 'IT-related educational set-up must be made to grow exponentially, in primary, secondary and tertiary education.' The thrust is focused on making people IT literate and giving them skills in ICT which can in turn generate a demand for more advanced technological training.

ICT as a pedagogic practice

Information and communication technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. The term is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephones (Daniels, 2012). A branch of engineering dealing with the use of computers and telecommunications equipment to store, retrieve, transmit and manipulate data (John et al, 2009). As the value of proficiency in using and managing digital technologies has become increasingly evident, its assessment has become an important component of monitoring the extent to which students develop "skills and knowledge for tomorrow's world" (OECD, 2004).

Teachers who aware of a variety of possibilities of different technological uses applicable to higher education and make them aware of effective ways of using technology in class as a constructivist pedagogic practice. The process requires sensitivity to the teachers pace of engaging with technology and their existing practices. Technology is daunting for a teacher who is non-technical and without the necessary support and appropriate training teachers may easily reject the innovation. McCloat, (2008) suggests that, lCT facilitates learners to actively construct their own knowledge and promotes autonomy and critical reflection. The computer is seen as a means for the preparation of lessons, with many teachers showing confident usage of word processors and fewer showing confidence in developing electronic presentations (Korte and Husing, 2006).

A number of issues may found between schools and teachers in their efforts to fully benefit from these windows of opportunity. The teachers were not being able to afford the equipment, because they may lack access to the Internet, or sufficient materials might not be available in their own language. The relationship between ICT and higher education offers challenges and opportunities with implications on education officers, curriculum developers and teachers. However, a fundamental issue is whether teachers know how to use ICT effectively in their teaching.

Need and Importance of ICT in education

The term 'Information and Communication Technology' (ICT) refers to forms of technology that are used to transmit, process, store, create, display, share or exchange means. The technologies include radio, television, video, and DVD, mobile phones, computer and network systems. ICT contributes productivity and economic growth of all over the world. Today's world becoming characterised by so many technologies, ICT explored in developed countries and also provides opportunities for medical professionals, IT areas, business areas and also in teaching areas. ICT permeates the business environment, it underpins the success of modern corporations, and it provides governments with an efficient infrastructure. At the same time, ICT adds value to the processes of learning, and in the organization and management of learning institutions. The Internet is a driving force for much development and innovation in both developed and developing countries.

The way ICT is used will depend on the subject being taught, the learning objectives and also the nature of the students. The project conducted by 'UNESCO ICT Competency Framework for Teachers' (ICT-CFT) set out the basic principles which should guide the use of ICT in teaching given in figure 1. The Framework project draws attention to the many ways in which ICT can transform education to students. ICT offers engaging and fast-evolving learning environments, blurs the boundaries between formal and informal education and prompts teachers to develop new ways of teaching and enabling students to learn. So, it requires education to re-think what skills and competencies students need to become active citizens and members of the workforce in a knowledge society (UNESCO, 2011).

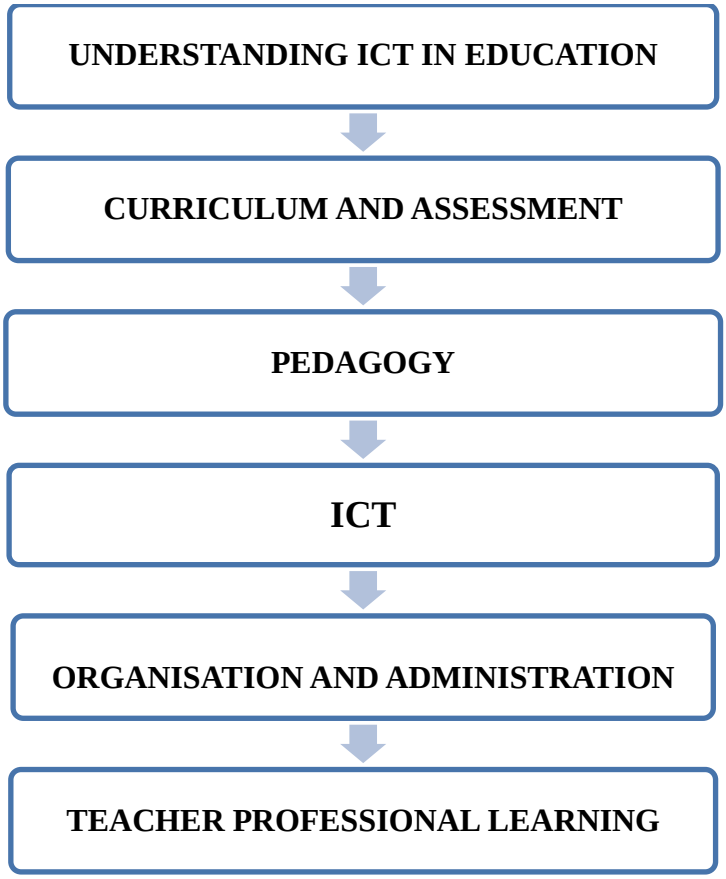

Figure 1

UNESCO ICT Competency Framework for Teachers

The National Curriculum Framework (NCF, 2005), has also highlighted the importance of ICT in school education. ICT plays an important role in people's work, social background and also in personal lives. Information technologies have attracted the attention of academics, business, government and in communities. ICT globally connected the people living in community with an increasing outreach. Student teachers always make use of ICT in schools or institutions to learn more ideas and innovations in teaching and education. Through ICT and its tools, the student teachers find knowledge and resources.

This practical approach given by pedagogues offers opportunities to use active methodologies which can prepare students to think about problems that need to be solved, to seek information, think critically, investigate a range of choices, manage their resources, express themselves with confidence, make judgements and decisions and evaluate their results.

ICT and professional development for student teachers and teachers

ICT explains three words; Information, Communication and Technology. Information refers to the representation of knowledge such as data's, opinions through a medium or including graphics or in audio visual forms. Communication is the main processing of transferring information from sender to receiver with the use of any medium. Technology is the practical form of scientific knowledge and use of this knowledge into practical level. ICT has a role to play in the practice of active methodologies which would enhance the teaching of higher education. ICT can reach students of different abilities (NCET, 1994) by presenting information or activities in a graded and varied manner.

ICT helps to make the student teacher's teaching very effectively and also help the students to develop their interest in studying through multimedia techniques. Through these technologies, it helps share teacher's ideas in any part of the world, by the use of World Wide Web, e-mails, PPTs, web conferencing and so on. It provides creative and also interactive environment in teaching and learning process.

ICT is a better mechanism at school education and it provide way to rethink and redesign the educational systems and processes and also give quality education to all students. However, especially if teachers simply use ICTs to replace more traditional teaching tools or merely add them into existing practices in a superficial manner, a learner- centered approach is not easy to achieve (Oliver & Herrington, 2000). Prensky (2005) states that until recently schools have been dabbling with technology and teachers mostly continue to do things with technology in ways which fit in with their present practices. He states that children are adopting technology in new ways, often inventing innovations and adopting them as their preferred method of behaviour.

In transforming teacher training and professional development programmes, need to ensure that new graduates and experienced teachers will be trained appropriately to enter tomorrow's classrooms skilfully prepared to teach with technology (Ertmer, 2003).Learning experiences provided by the teacher increase the student's motivation and activity. If higher education teachers are supported into making a shift towards using ICT effectively in class, the teaching of higher education may become more constructivist. In a constructivist class learning is socially constructed, active, reflective and collaborative (McCloat, 2008).

ICT act as a scaffolding tool

Pea (2004) even claimed that "the concept of scaffolding has become so broad in its meanings in the field of educational research and the learning sciences that it has become unclear in its significance." Puntambekar and Hubscher (2005) similarly states that "the scaffolding construct is increasingly being used synonymously with support."

In education field, the term 'scaffolding' is a process in which teachers or student teachers in schools model or demonstrates how to solve or overcome a problem, and offering adequate support as needed. Teachers have also used scaffolding to engage students in research work and learning.

Alibali (2006) suggests that as student's progress through a task, faculty can use a variety of scaffolds to accommodate student's different levels of knowledge. More complex content might require a number of scaffolds given at different times to help students master the content. Ideally support should be directed at the zone of proximal development, it should be just enough to complete the task successfully, whereas without the support the student would not be able to complete the task (Belland, 2014). Moreover, the support should function as a temporary scaffold for completing the task, and teaching should be directed at increasingly enabling students to complete tasks independently.

Scaffolding through ICT encourages the students to practice the task in different contexts that are taught in the classroom. Use a variety of supports as student's progress through a task will help the students better in the classroom. For e.g., prompts, questions, hints, stories, models, visual scaffolding- including pointing, representational gestures, diagrams, and other methods of highlighting visual information (Alibali, 2006).

Vygotsky introduced a term called Zone of proximal development (ZPD) it can be defined as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978). According to Vygotsky, the external scaffolds provided by the educator can be removed when the learner has developed in more sophisticated cognitive systems, related to fields of

learning such as mathematics or language, the system of knowledge itself becomes part of the scaffold or social support for the new learning (Raymond, 2000).

Some of the benefits of scaffolding include which provides solutions to the challenges of students through during deep learning and discovery, engages students in meaningful and dynamic discussions in classes, motivates learners to become better students, increases the likelihood for students to meet instructional objectives, provides individualized instruction and affords the opportunity for peer- teaching and learning. Scaffolds can be recycled for other learning situations, provides a welcoming and caring learning environment to the students.

In recent years, a Learning Activity Management System (LAMS) has been developed by researchers at Macquarie University to assist in teaching online content. It can be defined as an online web-based system for creating, managing and delivering sequences of collaborative learning activities (Cameron, 2007). LAMS represent an authentic learning management system which enables teachers and students to use media that is appropriate to the specific elements of their language learning (Otto &Pusack, 2009).

The goal of the educator when using the scaffolding teaching strategy is for the student to become an independent and self-regulating learner and problem solver (Hartman, 2002). The communication that occurs through ICT with more knowledgeable or capable others (parents, teachers, peers, others) helps the child construct an understanding of the concept (Bransfordet al.,2000). Students are guided and supported through learning activities that serve as interactive bridges to get them to the next level. Thus the learner develops or constructs new understandings by elaborating on their prior knowledge through the support provided by more capable others (Raymond, 2000). The kind of questions teachers ask and the way in which they are asked can, to a large extent, influence the nature of students thinking as they engage in the process of constructing scientific knowledge and therefore can become indices of quality teaching. Though the traditional teachers made the class interactive by asking many questions, these mostly asked for what students already knew; in inquiry classes, the questions aided stimulating students thinking and making it explicit to the student as well as to the entire class. Also, the inquiry teachers made active attempts to engage all the students in the discussions and move them towards conceptual understanding.

1.1 Relevance of the topic

ICT helps the student teachers and teachers to learn & achieve good in teaching subjects. Knowing about the computer and internet components is very essential today. The growing importance of ICT in education brought to develop one's own skills in computer literacy and eventually gain more knowledge and understanding of how ICT can be used effectively in higher education teaching and learning. An online community can provide the space to build many resources in collaborative ways.

Higher education teachers need more knowledge and pedagogic skills in ICT in order to support integration. It provides opportunities in learning by seeing pictures, visiting internet through smart board, use of animations, audio etc. (Mugliett, K, 2009).

The investigator has attempted to provide a background as to how those strategies support pedagogues in integrating ICT effectively and give appropriate methodologies can contribute to improved classroom practice. ICT was used with the teachers involved in the study in order to support them in actively constructing knowledge and reflections on their practice with new pedagogies.Technology is just thrown at teachers and expected to magically stick to it and develop. What actually happens is that it slides right off, repelled by the older teachers who trained as teachers before computers evolved beyond command lines or inexperienced teachers who are still getting their heads around making their challenging students stay in their seats.

1.2 Definition of concepts

The main concepts in the study are

- **Information and Communication Technology (ICT)** -

  - According to UNESCO (2002), "ICT is a scientific, technological and engineering discipline and management technique used in handling information, its application and association with social, economic and cultural matters".

  - ICT is the digital processing and utilisation of information by the use of electronic computers. It comprises the storage, retrieval, conversion and transmission of information. (Okauru, 2011).

- **Student teacher** - A student teacher, pupil-teacher or practice teacher, is a college, university or graduate student who is teaching under the supervision of a certified teacher in order to qualify for a degree in education.

- **Teacher**- A teacher or school teacher is a person who provides education for pupils and students. The role of teacher is often formal and on-going, carried out at a school or other place of formal education.

- **Scaffolding** - The scaffolding teaching strategy provides individualized support based on the learner's ZPD (Chang et al., 2002). The scaffolds facilitate a student's ability to build on prior knowledge and internalize new information. The activities provided in scaffolding instruction are just beyond the level of what the learner can do alone (Olson & Pratt, 2000).

1.3 Aim of the study

In this study the investigator has explored the aspects of proficiency of using ICT and to know the role of ICT in facilitating scaffolding in education among student teachers and teachers teaching arts and science subjects with the following objectives:

1.4 Objectives of the study

The general objectives of the study are outlined below:

- To explore the accessibility to various digital assistive ICT in education among student teachers and teachers.
- To comprehend the proficiency in using ICT among student teachers and teachers.
- To know the proficiency in using ICT among student teachers and teachers teaching arts and science subjects.
- To comprehend the knowledge about scaffolding through ICT among student teachers and teachers in education.
- To prepare a booklet on ICT enabled teaching tools to promote scaffolding in learning.

Specific objectives:

- To assess the correlation between proficiency in using ICT and knowledge about its use in scaffolding.
- To assess the correlation between proficiency in using ICT and knowledge about scaffolding strategies.
- To assess the correlation between proficiency in using ICT and knowledge about ICT enabled teaching tools.
- To understand the association between age and experience aspect of proficiency in ICT usage.
- To find the association between age and challenges aspect of proficiency in ICT usage.

1.5 Hypotheses

- There is no significant difference in accessibility to various digital assistive ICT in education among student teachers and teachers.
- There is no significant difference in mean scores for the aspect purpose of using ICT among student teachers and teachers.
- There is no significant difference in mean scores for the aspect required ICT skills among student teachers and teachers.

- There is no significant difference in mean scores for the aspect challenges of ICT usage among student teachers and teachers.
- There is no significant difference in mean scores for the aspect experience with ICT usage among student teachers and teachers.
- There is no significant difference in mean scores for the aspect ICT use in curriculum among student teachers and teachers.
- There is no significant difference in mean scores for the aspect aid in organization and administration among student teachers and teachers.
- There is no statistically significant difference in the proficiency in using ICT among student teachers and teachers teaching arts and science subjects.
- There is no significant difference in the knowledge about scaffolding through ICT among student teachers and teachers in education.
- There is no significant correlation between proficiency in using ICT and knowledge about its use in scaffolding.
- There is no significant correlation between proficiency in using ICT and knowledge about scaffolding strategies.
- There is no significant correlation between proficiency in using ICT and knowledge about ICT enabled teaching tools.
- There is no statistically significant association between age and experience aspect of proficiency in ICT usage.
- There is no statistically significant association between age and challenges aspect of proficiency in ICT usage.

REVIEW
OF
LITERATURE

CHAPTER 2

REVIEW OF LITERATURE

A literature review is critical and in depth evaluation of previous research. Review of literature is a summary voting of recognized authorities and the previous research providing evidence that the researcher is familiar with what is already known and what is still unknown and interested (Best & Kahn, 2007). The review of literature pertaining to the study ***"Proficiency in using ICT and its role in scaffolding in Education among student teachers and teachers"*** is reviewed under the following headings:

2.1. Awareness about ICT usage

2.2. Accessibility to ICT

2.3. ICT use in curriculum

2.4. Purpose of using ICT in classrooms

2.5. Required ICT skills for Pedagogues

2.6. Challenges of ICT usage

2.7. ICT enables scaffolding

2.7.1. Role of ICT in scaffolding

2.7.2. Teaching tools used in learning

2.1. Awareness about ICT usage

Natarajan (2003) found that developments in information technology have facilitated the emergence of new electronic devices media and formats. An attempt has been made in this study to identify usage of Information Communication Tool among the library professionals in Tamil Nadu. Nearly 175 questionnaires were distributed among the library

professionals in Tamil Nadu. Nearly 170 responses (97%) were received. It is found that all the respondents are using in one-way or the other various types of ICT Media tools. The library and information scenario is changing and there is a paradigm shift from printed publications to formless data, from ownership of documents to access to information, intermediary to end user model of services, location specific libraries to virtual libraries. Azeer (2003) explained about digital library and how it is designed and implemented. In this study, he highlighted design issues like hardware, software, and storage of search engines, accessibility and security had a direct influence on the awareness about ICT Usage. Ali (2004) assessed that out of the seven libraries in Delhi included in his study. He discussed the need of training for library professionals to make use of the ICT because ICT awareness decreasing day by day. His findings included four were using locally designed packages whereas the others three used branded software. Gulati (2004) discussed the status of information and communication technologies usage in Indian libraries with special reference to special libraries and the efforts made by various institutions to propagate e-information products and services.

The emergence of ICTs as learning technologies has coincided with a growing awareness and recognition of alternative theories for learning. Wang et al (2008) found in their study that teachers needed to attain more ICT skills to introduce ICTs before their students as well as to develop global awareness. Swamy (2010) conducted a study about the correlation of Internet awareness and competence among high school students and teachers. He found that the MahitiSindhu project had significantly enhanced the awareness of Internet among the teachers who were involved with the project and the training programme was able to create awareness regarding Internet competence in the high school students. Adebowale (2012), found that only a small percentage of teachers possess a high level of awareness on ICT. Sasikala (2010) found in the study that there was no significant difference between Male and Female B.Ed students in their ICT awareness. Gulhane (2011) revealed that there was no significant difference between the theoretical and application awareness in the concept of ICT among male and female teacher trainees. Khedekar and Magre (2012) found that there was no significant difference in awareness about Information and Communication Technology of secondary students with respect to gender.

ICT improves student engagement, supports learning in a variety of ways, and is both a tool and process for new ways of thinking and learning. For example, simulations are powerful learning tools. Nicholas et. al. (2003) conducted a study in the UK to examine the web use for health information and advice. More than 1300 people were surveyed. The study showed that 66% of the respondents accessed the Internet from home, 28% from work place and the remainder (6%) used a combination of both work place and home. Bilawar (2004) mainly focused on the nature of communication technology and highlighted various modes of mass communication through computer and the internet, thereby having impact on libraries and communication services.

Schools can use a diverse set of ICT tools to communicate, create, disseminate, store, and manage information. This involves the teachers using digital technology, communication tools and/or accessing, managing, integrating, evaluating and creating information in order to function in a knowledge society. (European Commission, 2018).

The N.C.F. 2005 had also highlighted the importance of ICT in school education and it also stated that "ICT if used for connecting children and teacher with scientist working in universities and research institutions would also help in demystifying scientist and their work". Therefore, teachers have to accept the demands of modern world and modify their old concepts and methods according to the needs of learners, otherwise the teachers will become out-dated in the coming future and it will deteriorate the quality of education.

Various researches reveal that learners, who are adopted by technological facilities regularly, display greater learning achievements than the ones that are not adopted. In one study, it is discovered in his study that 75 researches commented on the following outcomes: Learners that adopted computers in their courses like math, natural science, and social science were marked considerably greater on assessments in these courses. Learners that adopted simulation software in science also scored greater mark. The discoveries also showed that primary school learners that adopted computer software in reading were marked considerably greater on reading scores. (Kulik, 1994).

Prensky (2001) described in his study that digital natives have expanded their whole lives bounded by technologies like computers, mobile phones and other tools of digital era. He further stated that the digital beliefs and surroundings, which the natives grew up in, had transformed the manner the way they perceive in education. Digital natives depend greatly on communicating and being interactive through technological tools in education to gathered information. Nevertheless, their perceptions are in disagreement with the suggestions of that efficient teaching plan by the instructor other than technology is a proper way of attaining

superior education. In the research of McNicol(2014), with 94 primary students in four Midlands colleges showed the continuous impact of home, institutions and ways of technological tool adoption in teaching and learning. The degree of outside college adoption of technological tools was also viewed as pertinent.

In the study of Davis et al., (1989), it is established a research of action relating to reasons‟ (ICT reception) to examine the purpose of why most individuals adopt PCs, and to analyse their perception to them. They have experimented technology acceptance (TAM) model with 107 adult users that had been adopting an administrative system for 14 weeks. They discovered that individual's PC usage were connected to their purpose of using PCs, and perceived importance were also powerfully connected to this purpose. Since the old days of adopting small microcomputers, there have been statements of learners remaining quite longer on the assignment, growing their dedication to education, attaining more via the usage of PCs and also being passionate about computer usage in their classes.

Becta (2001) analyzed that learners are usually more on task and show more optimistic moods while they are dealing with the technology-related tasks related. Moreover, Becta (2004) is also stated that learners with little levels of inspiration and moods of doubt concerning their learning abilities can display a more optimistic conduct during teaching by adopting PCs than during conventional teaching. On the other hand, Harris (2002), unveiled a range of optimistic influences of ICT tools on learners, together with improved capability to work individually, improved self-confidence in interacting with colleagues outside the college and family spheres, improved appearance at class and improved group activities and collaborative skills. Learners who adopt ICT in college felt more fulfilling in class, they were more inspired to learn and possess high personal-confidence and self-esteem. It is obvious that via many experimental researches on the concept of using ICT tools in education with the inspirational influence of such tools will have a significant impact on learner's perception to learning and maintains a constructive influence on student's accomplishment.

2.2. Accessibility to ICT

More recent statistics for the United States indicate that, the end of 2002 connected 166 million people connected to the Internet, representing 59 percent of the population (CyberAtlas, 2003). Becker (2000) conducted a study on the Internet use by 2,500 teachers from public and private schools of U.S. The study revealed that 90% of the teachers had Internet access. A majority of the teachers with 59% response had Internet access at home. A majority of the teachers (68%) used the Internet to find information resources for preparing their lessons. The Web supports many forms of learner interactivity and engagement, and provides access to a vast repository of resources (Mioduser&Nachmias, 2002; Oliver &McLoughlin, 1999). According to Indian studies, The various kinds of ICT products available and having relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counseling, interactive voice response system, audiocassettes and CD ROMs etc have been used in education for different purposes (Sharma, 2003).

ICT allows students to investigate more thoroughly the real world. They can more readily access information sources outside the classroom and can use tools to analyse and interpret such information. Information may be accessed through online systems or through data logging systems. It also makes it easier for individuals to interact and gain expert knowledge with a very short time, thus making the acquisition of knowledge to take place easily within a very short period of time (Amalnik, et al.,2015).

Recent developments in ICT have drastically affected educational procedure for improved quality of education offered to students. ICT resources in instructional delivery in schools will serve a dual purpose and more efficient classroom instruction (Nzewi, 2009; Umoren, 2006).

By the end of 2002, 48 countries in the world had Internet populations of 1 million or more (Cyber Atlas, June 11). The United States leads the world in Internet technology and usage. Overall, it was estimated that 143 million Americans (54 percent of the American population) were using the Internet, up from 45 percent in August 2000. The survey done in 2007 in two highly ICT enabled states Gujarat and Karnataka highlighted that access to government school teachers to ICT tools outside schools is in general low. The access of private school students to such devices is comparably better. It also shows that one of the challenges to be met is also of digital divide in private and Government schools and

moreover in rural and urban schools also (Bhardwaj&Vivek, 2007). India has been ranked a low 131 out of 167 nations on a global index that measures the level of information and communication technology access, even as the number of households with Internet and computer has increased in the country over the last five years. The percentage of households with computer in India was 13 percent in 2014, more than doubling from 6. 1 per cent in 2010, while the percentage of households with Internet access was 15.33, growing three fold from 4.2 in 2010. Further the percentage of individuals using the Internet is grown to 18 per cent in 2014 from 7.5 per cent in 2010 in the country. (The Hindu; December, 2015). The infusion of ICT into schools around the world creates strong pressure on teachers to integrate it into the class and use it for improving learning and increasing achievements (Kozma, et al, 2003).

According to Geer and Sweeney (2012) in order to use technology effectively, teachers need to be trained in using technology and they need to develop a good understanding of it. Teacher candidates need opportunities to practice effective technology integration strategies in supportive contexts during the B.Ed. course; teachers also need opportunities to learn about new technologies and ways to integrate them effectively in their classroom. Consequently teacher educators must acquire fresh knowledge of ICT before they can prepare their teacher trainees to meet the demands and challenges of the 21st century.

Ezeoba (2007) carried out an investigation of ICT availability in schools in Onitsha on 100 nursery school teachers which revealed that the media availability average was less than 20% over 50%. It also found out that the degree of utilization in instructional delivery was that teachers used mostly books and over 60% did not use ICT resources at all.

The efficacy of ICT in higher education has been proved beyond reasonable doubt. It has been known to enhance educational opportunities of individuals and groups constrained from attending traditional universities as well as the use of computers as tutors for drills and practise as well as instructional delivery (Umoren, 2006).

2.3. ICT use in curriculum

The Internet has been implemented in higher education teaching to such an extent that some argue we may be witnessing the formation of a new culture of learning (Bullock &Ory, 1999). Internationally there have been many surveys on the internet use and most of them find that internet usage is most prevalent among younger and more educated people (Bashir, et al., 2008). The internet use as an instructional tool in higher education is rapidly increasing. The internet's capability to provide student's quick access to government documents, scholarly list serves and databases located geographically-removed institutions makes it a valuable information source for students. Most of the students use this technology for course related reading and research needs also (Benson, 1994). It is reported that ease of work and time saving are the reasons of internet use among students. Obviously, the integration of internet as a teaching tool in academic courses has grown rapidly. The assessment framework envisaged ICT literacy as comprising six key processes; Accessing information, managing information, evaluating, developing new understanding, communicating with others and using ICT appropriately (MCEETYA, 2007). Thus, ICT involves using digital technology, communication tools and/or accessing, managing, integrating, evaluating and creating information in order to function in a knowledge society. What is more, most 21st century skill lists include ICT and ICT-related skills (European Commission, 2018).

Higgins (2003) suggested the need for flexibility in curriculum and assessment to accommodate technological change, although by 2008 it seemed clear that ICTs have brought about changes in the curriculum as the developing technologies provide new avenues for accessing knowledge. ICT can help students to learn and teachers to teach more effectively, although that there is not a simple message in such evidence that ICT will make a difference simply by being used (Higgins, 2003). Analysis of the emerging body of literature on the effective use of interactive whiteboards in teaching and learning was conducted by the British Educational Communications and Technology Agency. The analysis indicated that interactive whiteboards can have positive effects on teaching and learning in general, and provide benefits for teachers and for students. The report notes that positive impacts depend on the ways in which interactive whiteboards are used, and that, although the literature on this technology is emergent, and further research, both qualitative and quantitative, will be needed, there was evidence of good practice and positive outcomes across the curriculum. (Becta, 2004).

Cradler (2002) gave seven requirements for effective use of ICT in education: It includes; Suiting technology to education goals and standards, Having a vision for the use of technology to support curriculum, Providing for both in-service and pre-service training, Ensure access to appropriate technology, Provide for administrative support for technology use, Providing time for teachers to plan and learn how to integrate technology, Providing for on-going technique support for technology use.

Information and Communication Technology (ICT), impacts on educational standards only when there is fertile background for making efficient use of it. Earlier it was argued that there is a two-way relationship between ICT and the curriculum where ICT may be used to assist in conveying the curriculum but at the same time may change the content of the curriculum. Further research has shown that the effectiveness in the use of ICT to support learning is a function of the curriculum content and the instructional strategy such that when appropriate content is addressed using appropriate strategies students and teachers will benefit (Cradler, 2002).

Studies by Niess (2005) and Forbes (2011), for example, illustrated that focusing pre-service teachers on the integration of different technologies helped them consider how this integration supported a particular curriculum focus. They also pointed out a lack of research that could help increase teachers' understanding of the potential for specific ICTs to support teaching and learning. This lack is a significant consideration in terms of the subject-specific needs science teachers face in eliciting and shifting students from every day to scientific understandings of the how the world works.

Worldwide research has shown that ICT can lead to improved student learning and better teaching methods. A report made by the National Institute of Multimedia Education in Japan, for instance, proved that an increase in student exposure to educational ICT through curriculum integration has a significant and positive impact on student achievement, especially in subject areas such as mathematics, science, and social study. (ELMO, 2017).

Bottino (2003) mention that the use of ICT can improve performance, teaching, administration, and develop relevant skills in the disadvantaged communities. It also improves the quality of education by facilitating learning by doing, real time conversation, delayed time conversation, directed instruction, self-learning, problem solving, information seeking and analysis, and critical thinking, as well as the ability to communicate, collaborate and learn

2.4. Purpose of using ICT in classrooms

Many Web-based learning activities in the late were based providing information in lecture mode. Course materials were posted on the Web for students to download and to study on an individualized basis. Bork (2001) claimed that although an enormous amount of material for Web-based learning is developed, there is little empirical consideration of the learning effectiveness of these materials. Indeed, we are currently witnessing the development of huge amounts of Web-based learning materials and contents that have become a major component in many academic courses. In another study, the centrality of contents in Web supported academic courses can be seen by the examination of the most accessible tools by lecturers who implemented the Internet in their teaching. The objective of this research was to learn about the common obstacles, supports, and experiences as well as the tools used among early adopters of the Web as a teaching resource. The findings indicate that many college instructors already have extensive online teaching experience. (Bonk, 2001). It is typical to see Web pages for courses in all fields taught at universities and colleges providing course notes and related resources as supplements to courses that are delivered in traditional classrooms (Zaiane, 2001).

The Internet is mainly used for information transferring from the teacher to the student. However, the mere posting of academic materials on the Web may not result in students utilizing these materials to enhance their learning or course understanding (Cummings, et al., 2002). Bork (2001) claimed that although an enormous amount of material for Web-based learning is developed, there is little empirical consideration of the learning effectiveness of these materials. Educators using Web-based learning environments are in urgent need for no intrusive and automatic ways to get objective feedback from learners to better follow the learning process and appraise the effectiveness of online course structure (Zaiane, 2001).

Learning approaches using contemporary ICTs provide many opportunities for constructivist learning through their provision and support for resource-based, student centered settings and by enabling learning to be related to context and to practice (Berge, 1998; Barron, 1998). One of the most vital contributions of ICT in the field of education is- Easy Access to Learning. With the help of ICT, students can now browse through e-books, sample examination papers, previous year papers etc. and can also have an easy access to resource persons, mentors, experts, researchers, professionals, and peers-all over the world.

This flexibility has heightened the availability of just-in-time learning and provided learning opportunities for many more learners who previously were constrained by other commitments (Young,2002). Wider availability of best practices and best course material in education, which can be shared by means of ICT, can foster better teaching. ICT also allows the academic institutions to reach disadvantaged groups and new international educational markets.

Kulik's (1994) meta-analysis study revealed that, on average, students who used ICT-based instruction scored higher than students without computers. The students also learned more in less time and liked their classes more when ICT-based instruction was included. Fuchs and Woessman (2004) used international data from the Programme for International Student Assessment (PISA), they showed that while the bivariate correlation between the availability of ICT and students' performance is strongly and significantly positive, the correlation becomes small and insignificant when other student environment characteristics are taken into consideration. Attwell and Battle (1999) examined the relationship between having a home computer and school performance, their findings suggest that students who have access to a computer at home for educational purposes, have improved scores in reading and math.

Becker (2000) found that ICT increases student engagement, which leads to an increased amount of time students spend working outside class. Coates et al., (2004) showed that students in on-campus courses usually score better than their online counterparts, but this difference is not significant here. ICTs especially computers and Internet technologies enable new ways of teaching and learning rather than simply allow teachers and students to do what they have done before in a better way.

2.5. Required ICT skills for Pedagogues

Pedagogy describes the collected practices, processes, strategies, procedures, and methods of teaching and learning. It also includes knowledge about the aims of instruction, assessment, and student learning. Innovative uses of ICT continue to evolve: for example, teachers can provide new learning opportunities for students by using interactive whiteboards, or electronic discussion board systems. Overall, the effective use of ICT in schools is planned, structured and integrated. The gains in students learning when using ICT

simulations were further enhanced when teachers actively scaffold or guided students through the ICT simulations (Hogarth et al., 2006).

Getting educated is solely dependent upon the individual teacher's role to set conditions and generate environments for learning. The recent curriculum framework 2005 as proposed by NCERT (National Council of Educational Research and Training), India focuses on the issues of; connecting knowledge to life outside, shifting from rote learning to constructing knowledge, providing a wide range experiences for the overall development of a child, and bringing flexibility in the examinations.

Every teacher should know how to use technology, pedagogy and subject area content effectively in their daily classroom teaching. It is clear that merely introducing technology to the educational process is not enough. One must ensure technological integration since technology by itself will not lead to change. Rather, it is the way in which teachers integrate technology that has the potential to bring change in the education process. For teachers to become fluent in the usage of educational technology means going beyond mere competence with the latest tools to developing an understanding of the complex web of relationships among users, technologies, practices, and tools.

Beaudin and Hadden (2004) revealed in their study that techno-pedagogical skill foster the students for further development, attainment of learning outcomes and maintain the context of designing classroom based resources through the use of ICT by the teachers. Therefore, techno-pedagogy method was a necessary component of teacher education. Koehler and Mishra (2005) found in their study that good teaching was not simply adding technology rather the introduction of technology causes the representation of new concepts and requires developing sensitivity to the dynamic, transactional relationship among technology, pedagogy, content and knowledge.

Sathiyaraj and Rajasekar (2013) found in their study that the techno-pedagogical competency needs to be improved in order to equip teachers to face the students belong to the digital era and also to face the challenges in the modern classroom.Monsivais, et al., (2014) revealed in their study that the integration of ICTs in the classroom depends on the teachers' ability to scaffold the learning environment by using effective ICT-based pedagogies. Lee and Tsai (2010) found that meaningful use of ICT in the classroom requires the teachers to integrate technological affordances with pedagogical approaches for the specific subject matter to be taught. Yurdakul (2011) revealed in his study that pre-service teachers need to

provide opportunities to get practical knowledge and skills to use current technology during their training process. Techno-pedagogical skills knowledge carried out based on to increase the effectiveness and efficiency of learning and teaching process for professional development by technology integration (Archambault&Crippen, 2009).

When teachers are digitally literate and trained to use ICT, their expertise can lead to higher order thinking skills, provide creative and individualized options for students to express their understandings, and leave students better prepared to deal with ongoing technological change in society and the workplace (Goodwin, 2012). Trautmann and MaKinster (2010) pointed out that, although developing the skills to use specific ICT is important for teachers, they also need to develop a vision of how and when they can best use these technologies in their teaching. Research studies show that most teachers do not make use of the potential of ICT to contribute to the quality of learning environments, although they value this potential quite significantly (Smeets, 2005).

Harris (2002) conducted case studies in three primary and three secondary schools, which focused on innovative pedagogical practices involving ICT. Harris (2002) concludes that the benefits of ICT will be gained when confident teachers are willing to explore new opportunities for changing their classroom practices by using ICT.

Many studies have been conducted with regard to the attitude of teachers towards use and interations of technology have revealed the importance of attitudes for learning to use technologies (Davidson & Ritchie, 1994). These findings were further supported by Francis-Pelton&Pelton, 1996). Several studies have found that individuals' attitudes toward computers may improve as a result of well-planned instruction (Kluever, et al., 1994).

As reported by Larose F, in their study, the level of computer literacy of the teaching staff is satisfactory but there is little transfer of these competencies to teaching practices (Larose F., et al. 1999). Efforts are required on the part of teachers to make use of the available facilities for the best use in teaching /learning.

According to Bandura (1982), people acquire information about efficacy from four sources: performance attainments, vicarious experiences of observing the performances of others, verbal persuasion, and physiological states from which people partly judge their capability, strength, and vulnerability. This information would help an individual assess his/her performance and then generate self-appraisals of his/her ability. When the concept of

computer-efficacy is applied to the domain of learning to use computers in teaching, hands-on computer experience becomes an important component in effective instruction at the pre-service level. Research has shown a high correlation between efficacy judgments and subsequent performance (Bandura, 1982).

2.6. Challenges of ICT usage

Student performance improves with time when using ICT, but low access to ICT and low confidence in using ICT corresponds to low performance. A Techno-pedagogical skill in Teacher Education is a challenging task because mediated communication demands more of perfection on the part of teacher educators with ICT skills. The four most common mistakes in introducing techno-pedagogical skill into teaching are i) installing learning technology without reviewing student needs and content availability; ii) imposing technological systems from the top down without involving faculty and students; iii) using inappropriate content from other regions of the world without customizing it appropriately; and iv) producing low quality content that has poor instructional design and is not adapted to the technology in use (UNESCO,2002).ICT in education has the potential to transform teaching. However, this pot ential may not easily be realized, as Dawes (2001) underlined when he stated,problems arise when teachers are expected to implement changes in what may well be adverse circumstances

Balanskat, Blamire, and Kefala (2006) argue that although teachers appear to acknowl edge the value of ICT in schools, they continue encountering obstacles during the processes of adopting these technologies into their teaching and learning. A quantitative research design was used to collect the data randomly from a sample of 100 secondary school teachers in the state of Melaka, Malaysia. Overall, the key issues and challenges found to be significant in using ICT tools by teachers were: limited accessibility and network connection, limited technical support, lack of effective training, limited time and lack of teachers' competency. Moreover, the results show that use of ICT tools by male teachers in the classroom is higher compared to female teachers. It is hoped that the outcome of this research provides proper information and recommendation to those responsible for integrating new technologies into the school teaching and learning process.

Many studies have been conducted to investigate the challenges to technology integrat ion in education (Alwani, 2005).

Only a few teachers are using ICT as teaching and learning tools. This is because the challenges outweigh the benefits (Bingimlas, 2009). Therefore, this study is expected to generate information on the teachers' perceptions and challenges of integrating ICT tools in the teaching and learning process.

Current research has shown that the level of this barrier differs from country to country. In the developing countries, research reported that teacher's lack of technological competence is a main barrier to their acceptance and adoption of ICT (Pelgrum, 2001). In Syria, for example, teacher's lack of technological competence has been cited as the main barrier (Albirini, 2006). Likewise, in Saudi Arabia, a lack of ICT skills is a serious obstacle to integration of technologies into science education (Alwani, 2005).Empirica (2006) produced a report on ICT use in European schools. The data used for the report came from the head teachers and classroom teacher's survey carried out in 27 European countries. The findings show that teachers who do not use computers in classrooms claim that 'lack of skills' is a constraining factor preventing them from using ICT for teaching.

In Sicilia's study (2005), Technical problems were found to be a major barrier for teachers. These technical barriers included waiting for websites to open, failing to connect to the Internet, printers not printing, malfunctioning computers, and teachers having to work on old computers. "Technical barriers impeded the smooth delivery of the lesson or the natural flow of the classroom activity".

In Turkey, Toprakci (2006) found that the lack of technical support was one of two significant barriers to ICT integration in science education in schools and might be considered "serious". In Saudi Arabia, science teachers would agree to introduce computers into teaching, except that they believe they will encounter problems such as technical service or hardware problems (Almohaissin, 2006).

Idoko and Ademu (2010) in an investigation of the challenges of ICT for teaching/learning as perceived by agricultural science teachers in 210 secondary schools from the three educational zones in Kogi State also found that ICT facilities were not available in secondary schools.

The act of integrating the use of ICT into teaching and learning is a complex process and one may encounter a number of difficulties. Different categories have been used by researchers and educators to classify the problems in use of ICT in educational institutions

and several studies have divided the problems into extrinsic and intrinsic categories. Ertmer (1999), referred to extrinsic problems as first-order and cited access, time, support, resources and training and intrinsic problems as second-order and cited attitude, beliefs, practices and resistance. The extrinsic problems to institutions rather than individuals and intrinsic problems pertain to teachers, administrators and individuals.

Another perspective presents the obstacles in the use of ICT in educational institutions as pertaining to material and non-material conditions (Pelgrum, 2001). The material conditions may be the insufficient number of computers and copies of software. The non-material obstacles include teachers‟ insufficient ICT knowledge and skills, the difficulty of integrating the use of ICT in instruction, and insufficient teacher time. However, since the purpose of the paper is to find the present and future problems in use of ICT, this study focuses on the teacher-level and institution-level problems.

Many researches into the problems of integrating ICT in education found that teachers reluctant to new technology were a significant problem. Watson (1999),argued that integrating the new technologies into educational settings requires change and different teachers will handle this change differently. According to him considering different teachers‟attitudes to change is important because teachers‟ beliefs influence what they do in classrooms.

According to Beggs (2000), one of the top three problems to teachers‟ use of ICT in teaching was the lack of training. According to Becta, (2004), the issue of training is certainly complex because it is important to consider several components to ensure the effectiveness of the training. These were time for training, pedagogical training, skills training, and ICT use in initial teacher training. Providing pedagogical training for teachers, rather than simply training them to use ICT tools, is an important issue. According to Balanskat et al (2006), limitations in teachers‟ ICT knowledge makes them feel anxious about using ICT in the classroom and thus do not have confident in using it in their teaching.

2.7. ICT enables scaffolding

The scaffolding teaching strategy provides individualized support based on the learner's ZPD (Chang, et al., 2002). In scaffolding instruction a more knowledgeable other provides scaffolds or supports to facilitate the learner's development. The scaffolds facilitate a student's ability to build on prior knowledge and internalize new information. The activities provided in scaffolding instruction are just beyond the level of what the learner can do alone (Olson & Pratt, 2000). The more capable other provides the scaffolds so that the learner can accomplish (with assistance) the tasks that he or she could otherwise not complete, thus helping the learner through the ZPD (Bransford, et al., 2000).

Vygotsky defined scaffolding instruction as the "role of teachers and others in supporting the learner's development and providing support structures to get to that next stage or level" (Raymond, 2000). An important aspect of scaffolding instruction is that the scaffolds are temporary. As the learner's abilities increase the scaffolding provided by the more knowledgeable other is progressively withdrawn. Finally the learner is able to complete the task or master the concepts independently (Chang, et al., 2002). Therefore the goal of the educator when using the scaffolding teaching strategy is for the student to become an independent and self-regulating learner and problem solver (Hartman, 2002). As the learner's knowledge and learning competency increases, the educator gradually reduces the supports provided.

Passive learning occurs when students use their senses to take in information from a lecture, reading assignment, or audiovisual. Traditional lecture is not an effective learning environment for many of our students because so many students do not participate actively during a traditional lecture. This is the mode of learning most commonly present in classrooms whereas active learning involves the student through participation and investment of energy in all three phases of the learning process (input, operations, and feedback). This type of learning is more apt to stimulate higher cognitive processes and critical thinking.

Some studies investigated effects of support types (e.g., process support versus content support) on students' learning (Dekker and Elshout-Mohr 2004). However, it may not be the type of support that matters, but the quality of the support (e.g., in terms of contingency). Diagnosing or evaluating students' understanding enables contingency and this is effective. Chiu (2004) for example found that when supporting small groups with the subject-matter, evaluating students' understanding before giving support was the key factor in how effective the support was. Although evaluation is not necessarily the same as

contingency, it most probably facilitates contingency. To be able to be contingent, a teacher needs to evaluate or diagnose students' understanding first.

Teachers have also used scaffolding strategies to engage students in research work and learning. In this context, scaffolding facilitates organization of and focus for students' research (McKenzie, 2000).

More specifically, scaffolding refers to support that is contingent, faded, and aimed at the transfer of responsibility for a task or learning (Van de Pol et al. 2010). Contingent support (Wood et al. 1976) represents support that is tailored to a student's understanding. Via fading, i.e., decreasing support, the responsibility for learning can be transferred which is the aim of scaffolding. However, this transfer is probably more effective when implemented contingently. Because contingency is a necessary condition for scaffolding, we focus on this crucial aspect.

2.7.1. Role of ICT in scaffolding

In the educational setting, scaffolds may include models, cues, prompts, hints, partial solutions, think-aloud modeling and direct instruction (Hartman, 2002). According to McKenzie, scaffolding provides clear direction and reduces students confusion – Educators anticipate problems that students might encounter and then develop step by step instructions, which explain what a student must do to meet expectations, Clarifies purpose – Scaffolding helps students understand why they are doing the work and why it is important, Keeps students on task – By providing structure, the scaffold lesson or research project, provides pathways for the learners. The student can make decisions about which path to choose or what things to explore along the path but they cannot wander off of the path, which is the designated task, Clarifies expectations and incorporates assessment and feedback – Expectations are clear from the beginning of the activity since examples of exemplary work, rubrics, and standards of excellence are shown to the students, Points students to worthy sources – Educators provide sources to reduce confusion, frustration, and time. The students may then decide which of these sources to use, Reduces uncertainty, surprise, and disappointment – Educators test their lessons to determine possible problem areas and then refine the lesson to eliminate difficulties so that learning is maximized (McKenzie, 2000).

Stone (1998) identifies a move from an emphasis on relations in which the adult is directing to an emphasis on mutuality. This trend can be discerned in the terms used to describe the scaffolding process: guided participation (Rogoff, 1990), instructional conversation (Tharp and Gallimore, 1988) and guided co-operative learning (Brown and Palinscar, 1989). The findings of "Day and Cordon (1993) and Kao (1996) that the scaffolding instruction method had better direct and transferring effects than general teaching methods" (Chang, Chen, & Sung, 2002).

Collins et al. (1997) point out that the potential of ICT is rarely realised because the effective use of software is dependent on the teacher providing appropriate support or 'scaffolding' for learning. Whatever the suggested benefits of a particular type of software (or hardware), it is when the teacher assists and guides the child's learning that these benefits are fully realised (Mercer and Fisher, 1997). Medwell (1998), also, argues that talking books are used most effectively to support reading with the teacher, not as a replacement for the teacher.

Students are guided and supported through learning activities that serve as interactive bridges to get them to the next level. Thus the learner develops or constructs new understandings by elaborating on their prior knowledge through the support provided by more capable others (Raymond, 2000). Studies have actually shown that in the absence of guided learning experiences and social interaction, learning and development are hindered (Bransford, et al., 2000). In assisting children's performance teachers need to have a clear view of learning goals and recognise that their role is that of supporting learners in such a way as to allow them gradually to do more for themselves. The amount of assistance offered, and the manner in which support is given, will vary from child to child, across time and in relation to the difficulty of the task (Bruner, 1985).

ICT should help teachers and learners to communicate and collaborate without boundaries, make learners autonomous and allow teachers to bring the whole world into classroom activities. It is ultimately important to understand the roles of ICT in promoting educational changes. A basic principle is that the use of ICT changes the distribution and ownership of information resources in the space of teaching and learning and thus changes the relationship among educational participants (Zhu, Z.T, 2003). The role of the computer in supporting educationally valuable and collaborative activities has been reported in a number of recent studies, influenced by the sociocultural perspective. In particular, Mercer and Fisher

(1997) examine the role of the teacher in supporting children's learning through ICT. They consider how teachers scaffold children's learning at the computer and argue that contextual factors are a highly significant influence on this process. For Wegerif and Scrimshaw (1997), the sociocultural perspective is centrally concerned with the role of computers in supporting the talk between teachers and learners that carries the development of understanding in the classroom.

Leu (2000) suggests that "the rapid appearance in many of the classrooms of networked information and communication technology (ICT), such as the Internet, requires us to fundamentally redefine one's understanding of the literacy curriculum". Also, as Daiute (2000) point out, children need to be taught critical literacy so that they are aware of the values in all texts and can evaluate and make use of texts within appropriate contexts.

The role and expertise of teachers are critical because teachers are at the front line of designing and delivering the learning experience. It has been well argued that just making technology available in schools does not mean that teachers will make use of the technology, nor will it necessarily be used effectively (Cuban, 2003).

The most common form of collaborative learning in the classroom environment is the group writing experience. Classroom teachers are using technological tools such as wikis, blogs and classroom webpages to post school news and short stories. Structured collaborative activities using these kinds of tools encourage students to form ideas, share thoughts and write together. Research in the primary school setting highlights the power of embedding these tools for writing activities that promote exchanges between students and require them to write in a formal, content-focused and depersonalised way (Warschauer, 2010).

2.7.2. Teaching tools used in learning

India has a billion-plus population and a high proportion of the young and hence it has a large formal education system. The demand for education in developing countries like India has skyrocketed as education is still regarded as an important bridge of social, economic and political mobility (Amutabi and Oketch, 2003). There exist infrastructure, socio- economic, linguistic and physical barriers in India for people who wish

to access education (Sharma, 2003). This includes infrastructure, teacher and the processes quality. There exist drawbacks in general education in India as well as all over the world like lack of learning materials, teachers, remoteness of education facilities, high dropout rate etc (UNESCO,2002). Innovative use of Information and Communication Technology can potentially solve this problem. Internet usage in home and work place has grown exponentially (McGorry, 2002). ICT has the potential to remove the barriers that are causing the problems of low rate of education in any country. So, It can be used as a tool to overcome the issues of cost, less number of teachers, and poor quality of education as well as to overcome time and distance barriers (McGorry, 2002).

Research evidence on information and communication technology (ICT) use over the past two decades shows a growth in the availability of ICT in schools. It also highlights, amongst other things, that ICTs can facilitate a move toward a learner-centered approach to teaching (Means & Olsen, 1994). However, especially if teachers simply use ICTs to replace more traditional teaching tools or merely add them into existing practices in a superficial manner, a learner-centered approach is not easy to achieve (Oliver & Herrington, 2000).

According to Chandler and Sweller (1996), the use of ICT tools creates an additional cognitive load related to the tools to be learned. If learners are not experienced users of ICT, then ICT integration will make considerable demands on learners' cognitive processing activities.

A study done by Ghazali et al. (2009) was meant to discuss the students' attitudes towards the texts used. The study came to conclude that the students had positive attitudes towards the text selection. Those studies have shown that attitudes play an important role in students' learning process. Few studies have been conducted in regards to teachers and ICT. Salehi and Salehi's study (2012) involving 30 high school English teachers in Iran revealed that majority of the respondents had never implemented ICT in the classroom or they preferred to use it very little. Further, it was also revealed that teachers' attitude contributed to the factors that hinder from using ICT in teaching activities as well as insufficient technical support and little access to Internet and shortage of time.

Using ICT tools help to offer the opportunities to develop higher order thinking skills. Kelman cited in Ali (2012) stated that higher order thinking skills can be enhanced by using

technology. It should be noted that the advent of the digital and information age has made the development of critical and creative thinking, and higher-order thinking skills vital to future success (Ali, 2012). This indicates that the advancement in ICT benefits students as well as the teachers to develop the higher order thinking skills and not merely depend on the lower order thinking skills.

ICT provides opportunities to access an abundance of information using multiple information resources and viewing information from multiple perspectives, thus fostering the authenticity of learning environments. ICT may also make complex processes easier to understand through simulations that, again, contribute to authentic learning environments. Thus, ICT may function as a facilitator of active learning and higher-order thinking (Alexander, 1999; Jonassen, 1999). The use of ICT may foster co-operative learning and reflection about the content (Susman, 1998). Furthermore, ICT may serve as a tool to curriculum differentiation, providing opportunities for adapting the learning content and tasks to the needs and capabilities of each individual pupil and by providing tailored feedback (Mooij, 1999).

As Stoddart and Niederhauser (1993) point out, ICT may fit into a spectrum of instructional approaches, varying from traditional to innovative. Another aspect which may of course influence the use of ICT is access to technology. This refers not only to the number of computers, but also to the placement of the equipment, e.g. in the classroom or in a computer room. Kennewell et al. (2000) feel it is essential that computers be placed in the classroom, in order to maximize the opportunities for curriculum activity. ICT environment improves the experience of the students and teachers and to use intensively the learning time for better results. The ICT environment has been developed by using different software and also the extended experience in developing web based and multimedia materials. ICTs have an important role to play in changing and modernizing educational systems and ways of learning.

ICT helps in providing a catalyst for rethinking teaching practice (Flecknoe,2002) developing the kind of graduates and citizens required in an information society (Department of Education, 2001); improving educational outcomes (especially pass rates) and enhancing and improving the quality of teaching and learning (Wagner, 2001). ICT can help deepen students' content knowledge, engage them in constructing their own knowledge, and support the development of complex thinking skills (Kozma, 2005; Kulik, 2003). Studies have

identified a variety of constructivist learning strategies (e.g., students work in collaborative groups or students create products that represent what they are learning) that can change the way students interact with the content (Windschitl, 2002).

The Sutton Trust and Education Endowment Foundation have produced a Teaching and Learning Toolkit, with a focus on how resources can be used effectively and cost effectively to improve the attainment of disadvantaged students. It is designed to inform decision-making and to maximise the benefit of school spending. Each theme in the Toolkit is scored according to its cost and its potential impact on attainment, estimated in additional month's progress which might expect the students to make from a particular approach, against a benchmark of average student progress over one year.

ICT applications are becoming indispensable parts of contemporary culture, spreading across the globe through traditional and vocational education. In Indian scenario, mainly education system has three tiers primary (including nursery and preprimary), High school or secondary level (High and senior secondary levels) and the college or higher level (including college, university levels). In all these levels of education ICT can be utilized for better teaching learning process and improving quality of education. Using multimedia in education results in the increasing productivity and retention rates, because people remember 20% of what they see, 40% of what they see and hear, but about 75% of what they see and hear and do simultaneously (Sharmila et. al, 2012). Interactive whiteboard helps teachers to structure their lessons, supports collaborative learning, can help to develop student's cognitive skills, enables ICT use to be more integrated into classroom.

METHODOLOGY

CHAPTER 3

METHODOLOGY

Research methodology is a way to systematically solve the research problem (Kothari, 2005). It includes the procedures by which researchers go about their work of describing, explaining and predicting phenomena.

In the present study, ***"Proficiency in using ICT and its role in scaffolding in Education among student teachers and teachers",*** the proficiency level of both student teachers and teachers are assessed. The methodologies adopted for the present study are discussed under the following headings:

3.1 Nature of the study

3.2 Selection of area

3.3 Selection of sample

3.4 Selection of tool

3.5 Conduct of the study

3.6 Analysis and interpretation of Data

3.1 Nature of study

Qualitative comparative research design was employed for the investigation. Qualitative research is primarily exploratory research. It is used to gain an understanding of underlying reasons, opinions and motivations. It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research (Defranzo, 2011). The major purpose of comparative research is to find out why the cases are different, to reveal the general underlying structure which generates or allows such a variation.

In this study, the investigator evaluates the proficiency in using ICT of both student teachers and teachers and the role of ICT to enable scaffolding in education also assessed.

3.2 Selection of area

This study is confined to six schools and three colleges in Ernakulam district. Ernakulam District has the most number of schools in Kerala after Trivandrum District. The district has a total of 88 government schools, 178 privately aided schools and 57 unaided schools. The urban area of Kochi has 34 government schools, 67 private aided schools and 31 unaided schools. Ernakulam District has the most number of B.Ed. Colleges. Around 26 B.Ed. colleges situated in the urban area of Ernakulam district. So, the paucity of information with regard to the Proficiency of teachers in using ICT coupled with the maximum number of B.Ed. colleges prompted the investigator to launch the study in Ernakulam district.

Consent was taken from the respective authorities to conduct the study. The schools and colleges were selected on the grounds of ease of accessibility of the investigator which forms the basis to assess and compare the proficiency in using ICT among the selected sample. The months of study coincided with the period where student teachers were placed for internship in schools and hence the investigator approached the schools to collect data from student teachers at the site of their training and from teachers who taught there.

The school chosen for the investigation were Government girls H.S.S. & Government boys H. S. Tripunithura, Government H.S.S. for girls, SRV Government H. S, St. Albert's H. S. and St. Teresa's H. S. Ernakulam. The colleges selected were St. Joseph College of teacher education for Women, Ernakulam, MG University College of teacher education, Tripunithura, and SahodaranAyyappan Memorial College of Education, Poothotta.

3.3 Selection of sample

Sample is a small unit of population that is selected for observation and analysis. The selection criteria of the sample is based on the availability of ICT in schools and kind of approaches they were used. The sample comprised of student teachers undergoing internship in schools and teachers from school and few student teachers from a B.Ed. College.

The selection criteria were based on purposive random sampling, which is a non-probability sampling technique. Non-probability sampling is a sampling technique where the odds of any member being selected for a sample cannot be calculated. A purposive sample

also referred to as a judgemental or expert sample. The main objective of a purposive sample is to produce a sample that can be logically assumed to be representative of the population.

The sampling frame is the population of student teachers and teachers from different colleges and schools in Ernakulam district include categories of male and female of different ages, studying or working in arts and science subjects.

The chosen sample size was 120, with 60 student teachers and 60 teachers from three colleges and six schools respectively in Ernakulam district. From the 60 teachers participated in the study, 53 were female teachers and only 7 were male teachers.The student teachers and teachers were in the age group of 21- 60 years. Student teachers were in the age group of 21-29 years, teachers were in the age group of 30-45 and 46-60 years of age.

3.4 Selection of tool

Step-1: Formulation of Questionnaire

Questionnaire is the heart of the survey operation. Closed structured questionnaire in which definite concrete and predetermined questions were prepared by the investigator to conduct the research.The questionnaire consisted of aspects to measure the proficiency of ICT usage such as purpose of using ICT, required ICT skills, experience with ICT usage and ICT use in curriculum. It also included statements to know ICT aid in organisation and administration, whether ICT supported pedagogical activities and also to know if ICT enabled scaffolding which is the basis of Vygotsky's theory of Cognition. The researcher reviewed books, journals, newspapers, e-books for obtaining relevant data and information pertaining the topic to prepare the questionnaire provided in Appendix 1(A).

Step- 2: Development of Booklet

Knowledge about various ICT enabled scaffolding strategies are required to modify the pedagogical methods in schools. An attempt was made to prepare a booklet comprising of various ICT enabled teaching tools which could promote scaffolding in learning is attached in Appendix 2.

3.5 Conduct of the study

The method selected for conducting the study is Survey Method. After receiving permission from the concerned authorities, questionnaires were distributed among randomly selected 60 student teachers from colleges and 60 teachers from schools. The investigator was able to collect data from student teachers at school sites where they were present for their teaching training. The selected samples were made to fill their copies in their Institutions. Some were sent home to be filled for their convenience. The filled questionnaires were collected back from the student teachers and teachers with the help of teachers in charge of each Institution. The investigator also incorporated the developed tool in Google Forms to conduct the study. Ten student teachers submitted their questionnaire through Google form which is attached in Appendix 1(B).

3.6 Analysis and interpretation of Data

The data collected from the survey were compiled and analysed using statistical software named SPSS Statistics 20.

Firstly, descriptive analyses of the items were examined. Parametric tests including Pearson's correlations, t – test and ANOVA were used to investigate the various hypothesis of the study. Percentage analysis was used to describe the demographic profile, accessibility to ICT, ICT enables scaffolding, ICT enables scaffolding strategies facilitate learning, ICT enabled teaching tools promote scaffolding in learning of the sample. Pearson's product-moment correlation coefficient was computed to assess the relationship between proficiency in using ICT and knowledge about its use in scaffolding; scaffolding strategies and about ICT enabled teaching tools.

Independent Sample T- test was used to find out the difference in mean score in proficiency in ICT usage among student teachers and teachers and also proficiency of teachers teaching arts and science subjects.

ANOVA was used to compute the differences in age group of student teachers and teachers and their experience with ICT usage and about their challenges in ICT usage. Normalized total scores of proficiency in using ICT were taken as the dependent variable for conducting the analysis.

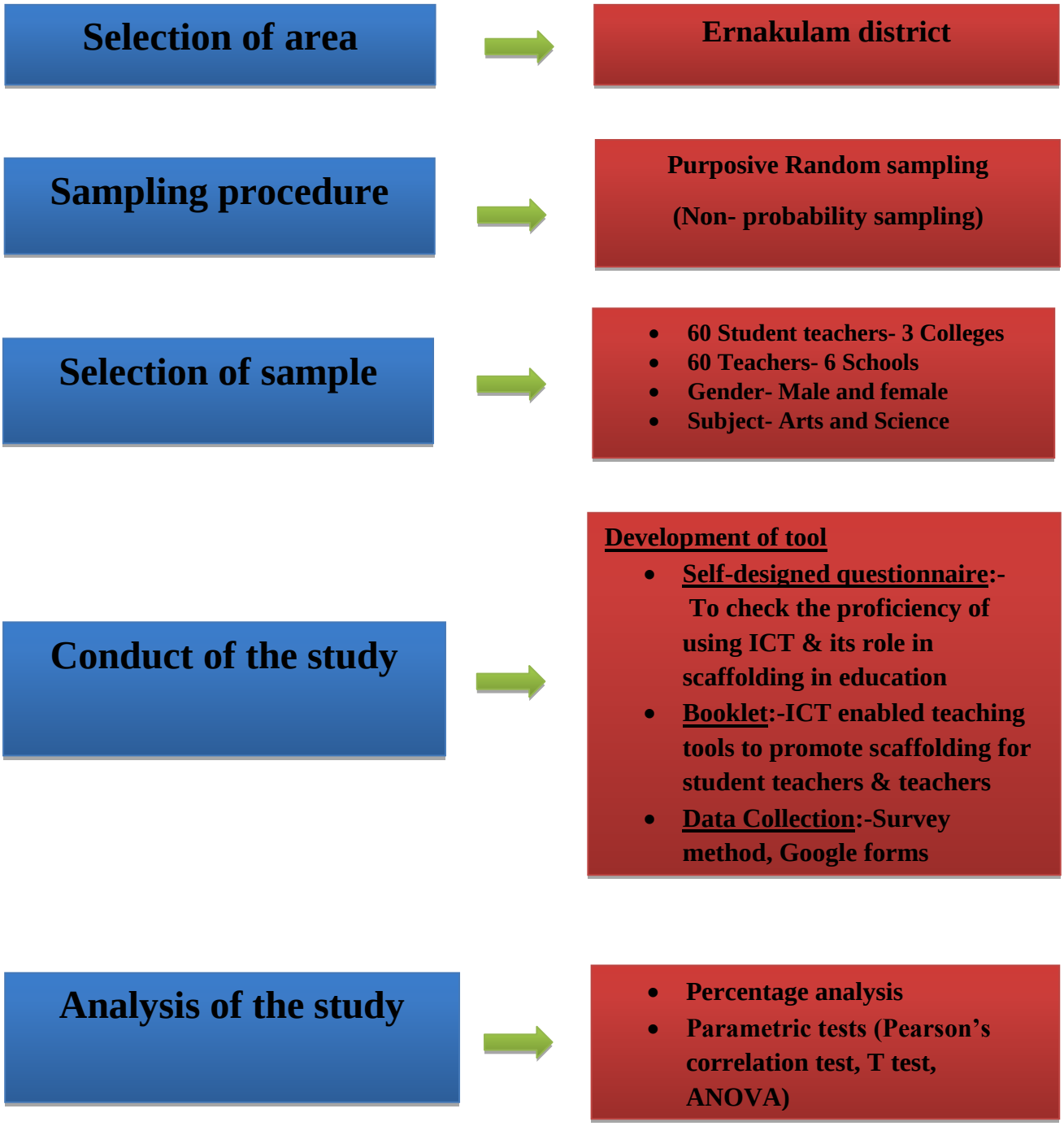

Figure 2

Research design

RESULTS
AND
DISCUSSION

CHAPTER 4

RESULTS AND DISCUSSION

ICT is an electronic means of capturing, processing, storing, communicating information. The use of ICT in the classroom teaching-learning is very important for it provides opportunities for teachers and students to operate, store, manipulate, and retrieve information, encourage independent and active learning, and self-responsibility for learning such as distance learning, motivate teachers and student teachers to continue using learning outside school hours, plan and prepare lessons and design materials such as course content delivery and facilitate sharing of resources, expertise and advice. This versatile instrument has the capability not only of engaging students in instructional activities to increase their learning, but of helping them to solve complex problems to enhance their cognitive skills, thus enabling scaffolding in learning process (Jonassen& Reeves, 1996).

The results of the study titled ***"Proficiency in using ICT and its role in scaffolding in education among student teachers and teachers"*** are discussed under the following headings:

4.1 Demographic Profile of the sample

4.2 Accessibility to Information and Communication Technology

4.3 Proficiency in using ICT among student teachers and teachers

4.4 Proficiency in using ICT among student teachers and teachers teaching arts and science subjects

4.5 Scaffolding through ICT in education

4.6 Correlation between proficiency in using ICT and scaffolding in education among student teachers and teachers

4.7 Age and experience aspect of proficiency in ICT usage

4.8 Age and challenges aspect of proficiency in ICT usage

4.1 Demographic Profile of the sample

The sample for the study constituted student teachers and teachers from arts and science subjects respectively. The student teachers and teachers were from the schools and colleges of Ernakulam district. Out of 120 sample, 60 were student teachers and 60 were teachers. The demographic profile of the sample included age, gender, subject and it is presented in Table 1.

Table 1

Demographic profile of the sample

Category	Age (years)			Gender		Subject	
	21-29 %	30-45 %	46-60 %	Male %	Female %	Arts %	Science %
Student teachers n=60	100	0	0	0	100	31	68
Teachers n=60	0	53.3	46.6	11.6	88.3	53	46

It is evident from the table 1 that among 120 sample who constituted the study: 60 were student teachers and remaining 60 sample were teachers. All student teachers were female while in the case of teachers, 88.3% were female and 11.6% were male. The student teachers belonged to the age group of 21- 29 years of age and among teachers 53.3% of sample belonged to the age group of 30-45 years and 46.6% to the age group of 46-60 years. 31% and 68% of student teachers belonged to arts and science subject of teaching respectively and 53% and 46% of teachers belonged to arts and science subject of teaching respectively.

Some studies revealed that gender differences did not influence teachers knowledge of ‘Computer Assisted Language Learning’ (CALL), a lot of studies indicated that gender

influenced the effective incorporation of CALL in teaching. For instance, many researchers argue that male teachers tend to use computers in language teaching, as they were more competent in computer skills (Hassan et al., 2013).

4.2 Accessibility to Information and Communication Technology

The use of technologies in the classroom is essential for providing opportunities for teachers to learn to operate in an information age. Organizations that provide accessibility to new technologies prepare the 21st century work force. The accessibility to Information and Communication Technology among sample is discussed under the following sub headings:

4.2.1 Use of computer at school among student teachers and teachers

The use of computer at school among student teachers and teachers who took part in the study is given in Figure 3.

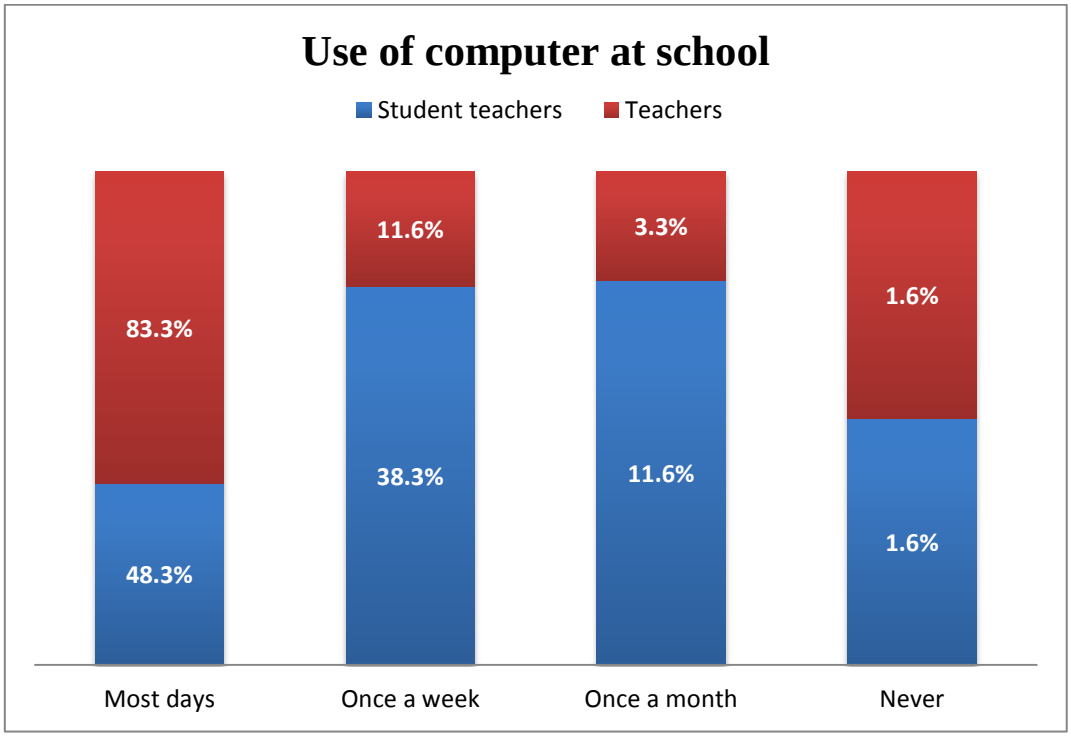

Figure 3

Use of computer at school among student teachers and teachers

Figure 3 shows that among the 60 student teachers, 48.3% used the computer at school on most days; 38.3% used in once a week; 11.6% used once a month and 1.6% never used computer at school. Among the 60 teachers, 83.3% used the computer at school most of the days; only 11.6% of teachers said that they used only once a week and 3.3% and 1.6% confided that they used ICT once a month or never used it all respectively.

There were studies which focused on the use of computer at school among teachers. Most of the sample used computers on most days which is in line with one of the studies which examined a comprehensive investigation of 300 Central school teacher's use of computers in India. It revealed that teachers often used computers to update subject knowledge and teaching skills, develop lesson plans, prepare additional instructional material, notify relevant information via internet and prepare question banks (Bhalla, 2013).

4.2.2 Accessibility to various ICT applications

ICT is applied to serve as a means of improving efficiency in the educational process. ICT is any device and application used to access, manage, integrate, evaluate, create and communicate information and knowledge. The following table 2 depicts the accessibility to various ICT applications.

Table 2

Accessibility to various ICT applications

Accessibility to various ICT applications	Student teachers %	Teachers %
Access to computer at home	93.3	90
Access to e-mail	96.6	95
Accessibility to Internet in school	88.3	100
Access to projector screen	80	95

Table 2 shows that among the 60 student teachers who responded, 93.3 % had access to computer at home; 96.6 % had access to e-mail; 88.3% had access to Internet in school and 80% of them used projector screen. Out of the 60 teachers who responded, 90% accessed to computer at home; 95% had access to e-mail; 100% were accessed Internet in school and 95% of teachers used projector screen in classrooms.

Maheswari&Arulchelvan (2012), propounded that many teachers have expressed their opinion that incorporating ICT in teaching is time consuming (78%) and needs access to a lot of infrastructure (82%).

4.3 Proficiency in using ICT among student teachers and teachers

ICT Framework project developed by UNESCO embraces purpose of using ICT, required ICT skills, challenges, experience with ICT usage and its use in curriculum and administration as various aspects of proficiency in using ICT among teachers which is discussed under the following headings:

4.3.1 Purpose of using ICT among student teachers and teachers

There is an emerging broad consensus about the benefits that can be brought to classroom education through appropriate use of evolving information and communication technologies. The purpose of using ICT covers practically all areas of activity in which knowledge and communication play a critical role. The various purpose of using ICT among the selected sample is discussed below.

Table 3

Purpose of using ICT among student teachers and teachers

Purpose of using ICT	Student teachers N= 60		Teachers N= 60	
	M	SD	M	SD
Helps in school administration	4.22	0.958	4.45	0.769
Recording marks using spread sheet andtyping exam papers	4	1.120	3.78	1.043
Engage in social networks to share notes on folders	3.82	1.372	4.08	0.962
Finding information and resources in internet	4.63	0.802	4.40	0.887
Developing digital content for learners	4.23	0.871	3.98	0.892
Total	**20.90**	**3.922**	**20.70**	**3.529**
t value	**0.294**			
p value	**0.770**			

It can be inferred from the table 3 that the mean of student teachers and teachers for the purpose of using ICT is 20.9 and 20.7 respectively and standard deviation is 3.92 and 3.52 respectively. The obtained t value using SPSS is 0.294 at the degree of freedom 118 and the p value is 0.770.The obtained p value is greater than the level of significance, so the null hypothesis is accepted. Hence at 95 percent confidence interval, there is no significant difference in the mean scores of purpose of using ICT among student teachers and teachers.

4.3.2 Required ICT skills among student teachers and teachers

The knowledge in word processing application, acquisition of additional knowledge about a subject by logging into websites, creating e- content modules through presentation slides, management of ICTs are required ICT skills which is depicted in Table 4.

Table 4

Required ICT skills among student teachers and teachers

Required ICT skills	**Student teachers N= 60**		**Teachers N= 60**	
	M	SD	M	SD
Create and maintain blogs, websites, word processor	4.05	0.852	3.53	1.157
Participate in social networks to use in projects & collaboration between classrooms	3.92	1.094	3.82	1
Create presentation slides with the use of video & audio clips	4.53	0.747	4.07	0.861
Use of E-Newspapers & E-Books	3.82	1.017	3.37	1.104
Using and maintaining projectors	4.15	0.988	4.27	0.899
Total	**20.47**	**3.367**	**19.05**	**3.652**
t value	**2.209**			
p value	**0.029***			

An independent-samples t-test was conducted to compare required ICT skills among student teachers and teachers. It can be inferred from the table 4 that the mean of student teachers and teachers for the required ICT skills is 20.47 and 19.05 respectively and standard deviation is 3.367 and 3.652 respectively. The obtained t value using SPSS is 2.209 at the degree of freedom 118 and the p value is 0.029 at 95 percent confidence interval. So, the null hypothesis which states that ‘there is no significant difference in mean scores for the aspect

required ICT skills among student teachers and teachers' is rejected. There is a significant difference in the mean scores of required ICT skills among student teachers and teachers.

Study by (Liomaki, et al, 2001) reveals that inuse of ICT-related pedagogical practices, a small percentage of teachers demonstrated the required skills to use ICT in their daily classes.

4.3.3 Challenges of ICT usage among student teachers and teachers

The challenges of ICT usage among student teachers and teachers covers less access to ICT and its equipments, inadequate technical support, improper functioning of ICT tools that are discussed in Table 5.

Table 5

Challenges of ICT usage among student teachers and teachers

Challenges of ICT usage	**Student teachers N= 60**		**Teachers N= 60**	
	M	SD	M	SD
Less access to ICT	2.73	1.274	2.25	1.002
Inadequate technical support	2.77	1.212	2.50	1.050
Insufficient knowledge about ICT	2.58	1.293	2.33	1.020
Unavailability of latest ICT equipments	2.88	1.209	2.43	1.226
Improper functioning of ICT tools	2.87	1.241	2.25	0.950
Total	**13.83**	**5.215**	**11.77**	**4.519**
t value	**2.320**			
p value	**0.022***			

An independent-samples t-test was conducted to compare challenges of ICT usage among student teachers and teachers. There was a significant difference in the scores for challenges of ICT usage among student teachers (M= 13.83, SD= 5.215) and challenges of ICT usage among teachers (M= 11.77, SD= 4.519); t (118) = 2.320, p= 0.022). The null hypothesis which states that 'there is no significant difference in mean scores for the aspect challenges of ICT usage among student teachers and teachers' is rejected. Therefore there is a significant difference in the challenges of ICT usage among student teachers and teachers.

This is in line with the results of a study conducted by Balanskat, et al (2006) which shows that in Denmark, many teachers still chose not to use ICT and media in teaching situations because of the challenges like less access, insufficient knowledge, improper functioning and integration of ICT.

4.3.4 Experience with ICT usage among student teachers and teachers

Experience with ICT usage include efficiency in logging to network, incorporating varied ICT enabled teaching strategies, adoption of various multimedia options to develop content. Increased experience with ICT is directly related to increased confidence. The difference in experience with ICT usage among student teachers and teachers are discussed in Table 6.

Table 6

Experience with ICT usage among student teachers and teachers

Experience with ICT usage	**Student teachers N= 60**		**Teachers N= 60**	
	M	SD	M	SD
Increased ability to teach using ICT	4.33	0.795	4.38	0.865
Improved ability to log into network	4.33	0.795	4.37	0.712
Knowledge about teaching strategies using ICT tools	4.25	0.876	4.32	0.854
Proficiency in using multimedia	4.17	0.977	4.07	0.899
Good speed in typing keyboard	4.02	1.142	3.95	0.982
Total	**21.10**	**3.333**	**21.08**	**3.451**
t value	**0.027**			
p value	**0.979**			

An independent-samples t-test was conducted to compare experience with ICT usage among student teachers and teachers. It can be inferred from the table 6 that the mean of student teachers and teachers for the experience with ICT usage is 21.10 and 21.08 respectively and standard deviation is 3.333 and 3.451 respectively. The obtained t value using SPSS is 0.027 at the degree of freedom 118 and the p value is 0.979.The obtained p value is greater than the level of significance, so the null hypothesis is accepted. Hence at 95

percent confidence interval, there is no significant difference in the mean scores of experience with ICT usage among student teachers and teachers.

A study by Rosnaini (2010), "Impact of training and experience in using ICT on in-service teacher's basic ICT literacy" found that majority of the teachers had moderate basic ICT knowledge and skills, and perceived ICT positively. Formal ICT training and increased ICT experience influences the teachers knowledge, skills, attitude and confidence in their usage.

4.3.5 ICT use in curriculum among student teachers and teachers

The use of ICT such as Creation of PPTs, 3D visualization technologies, exchange documents, accessibility to various applications are integrated in curriculum. The difference between ICT use in curriculum among student teachers and teachers are discussed in Table 7.

Table 7

ICT use in curriculum among student teachers and teachers

ICT use in curriculum	**Student teachers N= 60**		**Teachers N= 60**	
	M	SD	M	SD
Creation of PPTs to support teaching and use of search engine	4.57	0.789	3.72	0.993
ICT enables 3D visualization technologies & subject related videos	4.15	0.732	3.55	1.171
Provide supporting studies in interested areas	4.40	0.669	4.08	0.809
Exchange documents to integrate projects	3.85	1.005	3.70	1.124
Accessibility to various applications (Moodle, MOOC, You Tube) to support teaching	3.73	1.219	3.47	1.033
Total	**20.70**	**2.970**	**18.52**	**4.253**
t value	**3.260**			
p value	**0.001***			

An independent-samples t-test was conducted to compare ICT use in curriculum among student teachers and teachers. There was a significant difference in the scores for ICT use in curriculum among student teachers (M= 20.70, SD= 2.970) and ICT use in curriculum among teachers (M= 18.52, SD= 4.253); t (118) = 3.260, p= 0.001). The null hypothesis which states that 'there is no significant difference in mean scores for the aspect ICT use in curriculum among student teachers and teachers' is rejected. Hence at 95 percent confidence interval, there is a significant difference in the mean scores of ICT use in curriculum among student teachers and teachers.

Tanveer (2011) explored the teacher's use of e-learning tools in the language classroom. The research concluded that though ICT has great potential to be integrated in classroom teaching.

4.3.6 Aid in organisation & administration among student teachers and teachers

ICT aids in organisation & administration by making teaching flexible, convey messages, use of various assessment models, makes assignment and test correction easy, documentation of lesson plans, helps in reference and thus widens the knowledge about multimedia usage. Table 8 depicts the mean and standard deviation of ICT usage and its aid in organisation & administration.

Table 8

Aid in organisation & administration among student teachers and teachers

Aid in organisation & administration	Student teachers N= 60		Teachers N= 60	
	M	SD	M	SD
Makes teaching flexible with backup lesson plans	4.37	0.736	4.37	0.843
Convey messages through video/audio records during teaching	4.30	0.908	4.40	0.906
Use of various assessment models like quiz, periodic test, assignment	4.28	0.904	4.28	1.059
Documentation of lesson plans & references	3.92	1.046	4.52	0.813
Get knowledge about multimedia usage	4.47	0.724	4.15	0.840
Total	**21.33**	**3.018**	**21.72**	**3.425**
t value	**-0.650**			
p value	**0.517**			

It can be inferred from the table 8 that the mean of student teachers and teachers for the aid in organisation & administration are 21.33 and 21.72 respectively and standard deviations are 3.018 and 3.425 respectively. The obtained t value using SPSS is -0.650 at the degree of freedom 118 and the p value is 0.517.The obtained p value is greater than the level of significance, so the null hypothesis is accepted. Therefore there is no significant difference in the aid in organisation & administration among student teachers and teachers.

Figure 4 summarizes the aspects of proficiency in ICT usage among student teachers and teachers.

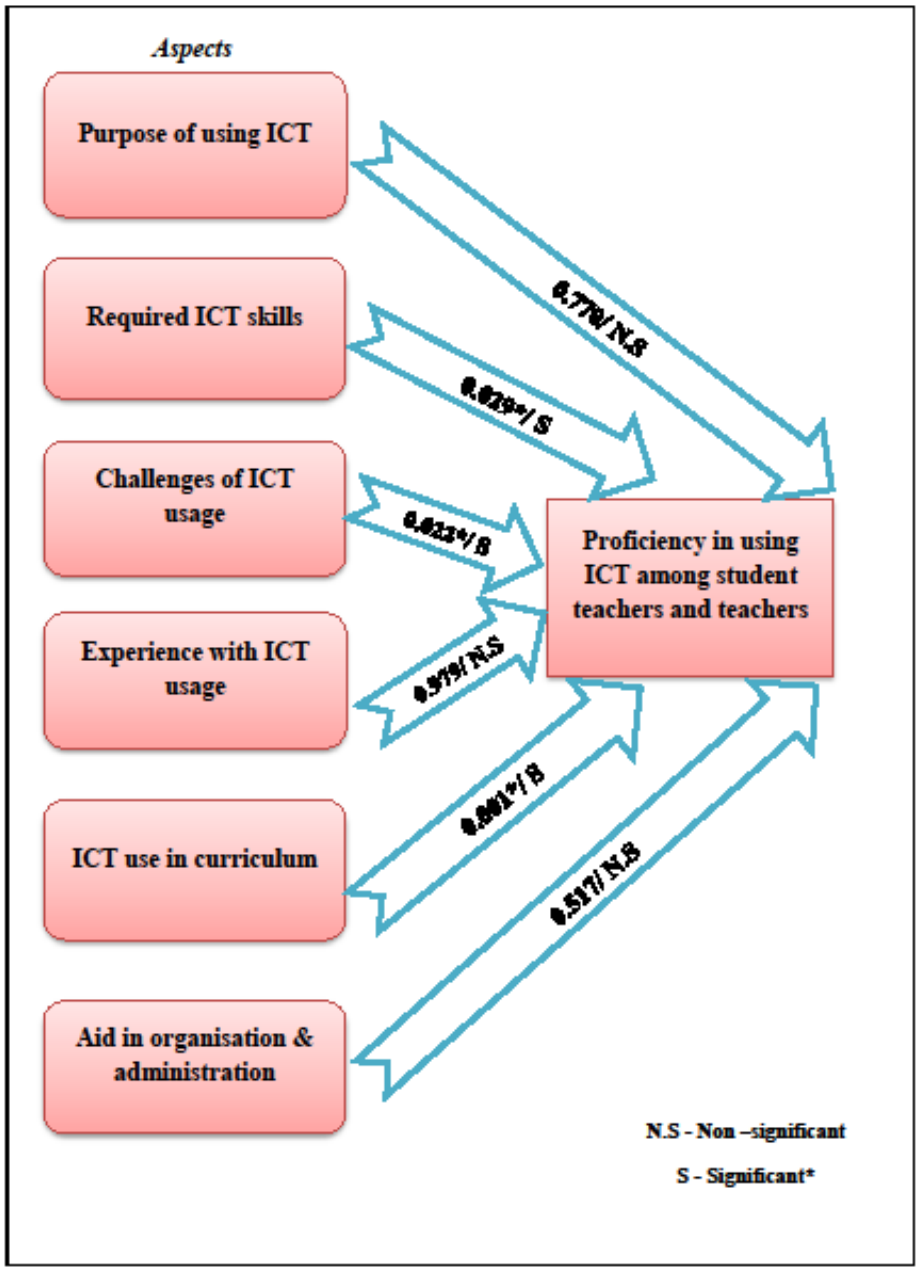

Figure 4

Proficiency in using ICT among student teachers and teachers

Kamalnayan (2008) in their study on “Implications of Information Technology for teacher education and research” found that bulk of the teacher preparation is neither prepared to use technologies not has it updated its knowledge on technological developments. Universities and teacher education institutions would require a significant commitment to provide training for faculty staff, and to provide resources. Unless substantial effort is made on the part of universities, teacher educators and trainees alike will be deprived of the joy of using ICT.

Administrators need training on ICT in order to integrate ICT effectively in teaching learning, thus many institutions today provide training to teachers and administrators so that they can improve their skills in use of ICT for teaching-learning and their administrative work(Guma Aliet al, 2013).

4.4 Proficiency in using ICT among student teachers and teachers teaching arts and science subjects

Arts and science teachers have different aptitude and skills and the proficiency in using ICT of the selected sample was compared between arts and science subject teachers which is tabulated below.

Table 9

Proficiency in using ICT among teachers teaching arts and science subjects

Proficiency in using ICT among teachers	**Arts**		**Science**		**p value**	**Significant/ non-significant**
	Mean	**SD**	**Mean**	**SD**		
Purpose of using ICT	20.39	4.181	21.10	3.331	0.303	NS
Required ICT skills	19.22	4.012	20.16	3.174	0.153	NS
Challenges of ICT usage	**11.65**	**4.820**	**13.65**	**4.937**	**0.028***	**S**
Experience with ICT	21.39	3.539	20.87	3.263	0.404	NS
ICT use in curriculum	19.61	4.133	19.61	3.590	0.999	NS
Aid in organisation & administration	21.59	3.419	21.48	3.090	0.854	NS

An independent-samples t-test was conducted to compare proficiency in using ICT among student teachers and teachers teaching arts and science subjects. It can be interfered from the table 9 that there is exist significant difference in the challenges faced by student teachers and teachers teaching arts and science subjects (Arts: M= 11.65, SD= 4.820; Science: M= 13.65, SD= 4.937). The obtained p value is 0.028 for challenges of ICT usage

which is significant at 95 percent confidence level. Hence the null hypothesis is rejected only in challenges aspect of ICT usage.

There were no significant difference found in other aspects of proficiency in using ICT among student teachers and teachers teaching arts and science subjects.

This is substantiated by the study conducted by Sekar&Lawrence in 2015, which reveals that there is no significant difference between the science and arts B.Ed. students in their attitude towards ICT.

4.5 Scaffolding through ICT in education

4.5.1 ICT enables scaffolding

Scaffolding facilitates a student's ability to build on prior knowledge and internalise new information. The knowledge about the respondents about how scaffolding activities support learners beyond the level of what they can do alone isillustrated in Figure 5.

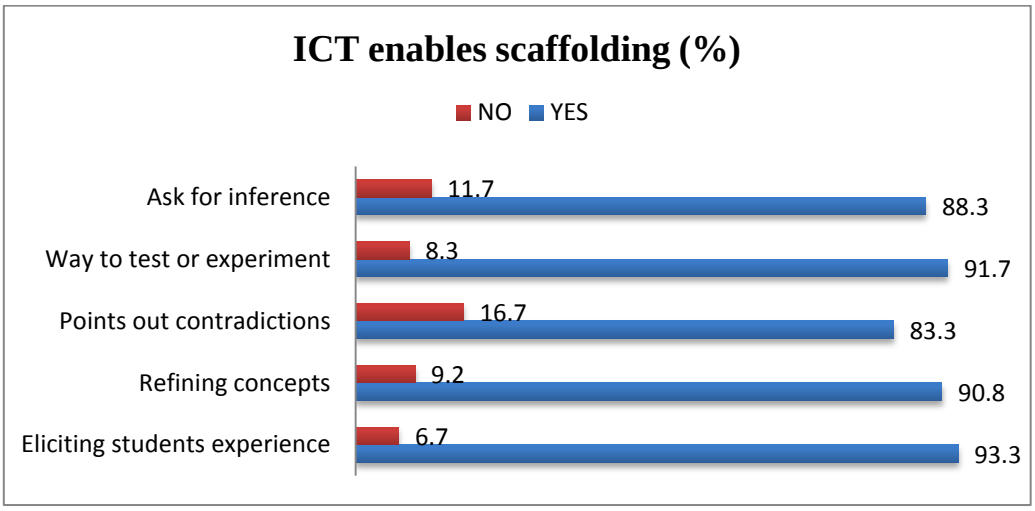

Figure 5

ICT enables scaffolding

Figure 5 gives details about the knowledge of teachers with regard to ICT enabling scaffolding. Eighty eight percent of sample responded that ICT enabled the teachers to bring inference about concepts. About 91, 83, 90 and 93 percent of sample opined that ICT was a way to test or experiment, point out contradictions, refining concepts and eliciting students experience respectively.

Information Technology in Education Study (Law,et al., 2008) that involved 28 countries in Africa, Asia, Europe, North America and South America, researchers have shown that technology has been changing classroom practices and learning processes.

4.5.2 ICT enables scaffolding strategies facilitate learning

There are many scaffolding strategies that facilitate learning namely signposting, questioning techniques, paraphrasing, analogy, bridging etc. The knowledge about few of them is imperative for teachers which is displayed in Figure 6.

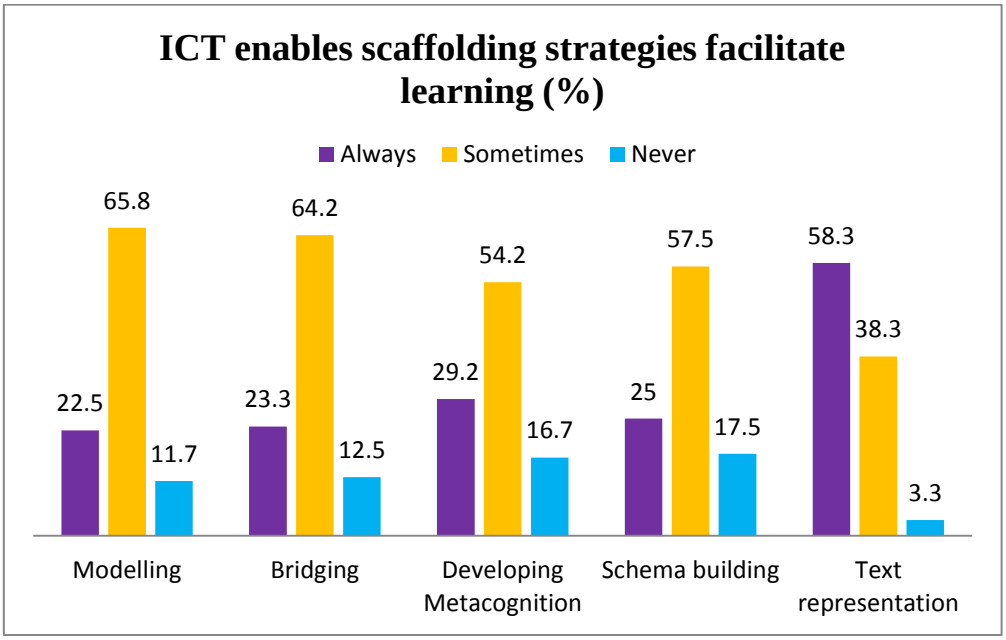

Figure 6

ICT enables scaffolding strategies facilitate learning

Figure 6 shows the details about the knowledge of student teachers and teachers with respect to scaffolding strategies. About 65, 64, 54, 57 percent of the respondents said that ICT sometimes facilitated modelling, bridging, developing metacognition and schema building respectively. 58% of sample reported that ICT always facilitated representation of the text.

The mechanisms for assisting learner cognition through the ZPD have been extended greatly by technology applications. Originally, the teacher's role was conceived as providing

scaffolded assistance through modelling, contingency management, cognitive structuring and feedback (Tharp &Gallimore, 1988).

4.5.3 ICT enabled teaching tools promote scaffolding in learning

Education systems around the world face new challenges from the rapid developments in technology and society's transition towards an information and transition society. The need for students to learn with sustained interests is met by the different tools which facilitate learning. The knowledge about these tools in imperative for classroom teaching and its use by the respondents is illustrated in Figure 7.

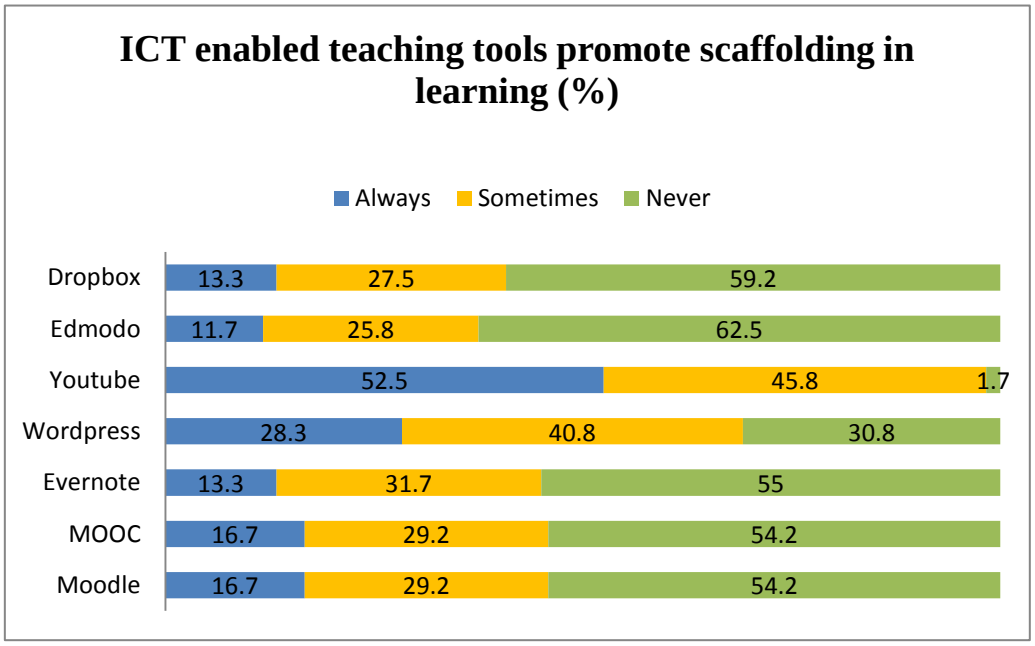

Figure 7

ICT enabled teaching tools promote scaffolding in learning

Figure 7 shows the details about the knowledge of student teachers and teachers about ICT enabled teaching tools that promoted scaffolding in learning. Among 120 sample who responded in the study, 16.7 % rated always, 29.2 % reported sometimes and 54.2 % of sample never used Moodle and MOOC. When asked about Evernote, 13.3 % said always, 31.7 % rated sometimes and 55 % never knew about evernote. With regard to Wordpress, 28.3 % answered always, 40.8 % responded as sometimes used, 30.8 % were never aware about Wordpress. Fifty two percent of the sample always used YouTube, 45.8 % sometimes used and 1.7 % never used YouTube as a scaffolding tool in classroom learning. With regard

to Edmodo, 11.7 % always used, 25.8 % of sample used sometimes and 62.5 % never knew about Edmodo. 13.3 % always used Dropbox, 27.5 % of sample responded sometimes and 59.2 % never used Dropbox as a teaching tool.

A study found that teachers build confidence towards the use of technology through proper facilitation using the required electronic equipment, training and resources like PPTs, 3D visualization, Moodle and YouTube video to make teaching interesting (Tanveer, 2011).

4.6 Correlation between proficiency in using ICT and scaffolding in education among student teachers and teachers

4.6.1 Correlation between proficiency in using ICT and knowledge about its use in scaffolding

To find if there is any correlation between proficiency in using ICT among student teachers and teachers and their knowledge about its use in scaffolding, Pearson's correlation coefficient was calculated which is depicted in Table 10.

Table 10

Correlation between proficiency in using ICT and knowledge about its use in scaffolding

Variables	N	M	SD	p	r
Proficiency in using ICT	120	136.13	15.216	**0.002***	**0.274**
Knowledge about its use in scaffolding	120	9.48	1.004		

A Pearson product-moment correlation coefficient was computed to assess the relationship between proficiency in using ICT and knowledge about its use in scaffolding. There was a correlation between the two variables [r = 0.274, n = 120, p = 0.002]. Correlation is significant at the 0.01 level (2-tailed) at 99 percent confidence level, although it is a weak positive relationship. The null hypothesis which states that 'there is no significant correlation between proficiency in using ICT and knowledge about its use in scaffolding' is rejected. So, there is a significant correlation between proficiency in using ICT and knowledge about its use in scaffolding.

Collins et al. (1997) point out that the potential of ICT usage is rarely realised because the effective use of software is dependent on the teacher providing appropriate support or 'scaffolding' for learning.

4.6.2 Correlation between proficiency in using ICT and knowledge about scaffolding strategies

The correlation between proficiency in using ICT and knowledge about scaffolding strategies are discussed in Table 11.

Table 11

Correlation between proficiency in using ICT and knowledge about scaffolding strategies

Variables	N	M	SD	p	r
Proficiency in using ICT	120	136.13	15.216	**0.001***	**0.293**
Knowledge about scaffolding strategies	120	10.97	2.365		

A Pearson product-moment correlation coefficient was computed to assess the relationship between proficiency in using ICT and knowledge about scaffolding strategies. There was a correlation between the two variables [r = 0.293, n = 120, p = 0.001]. Correlation is significant at the 0.01 level (2-tailed) at 99 percent confidence level, although it is not strong correlated. The null hypothesis which states that 'there is no significant correlation between proficiency in using ICT and knowledge about scaffolding strategies' is rejected. Hence, there is a significant correlation between proficiency in using ICT and knowledge about scaffolding strategies.

Cook and Finlayson (1999) have suggested that teachers need to make decisions about the use of ICT before children are involved and that these advanced decisions about how software supports the learning activity can be termed 'pre-scaffolding'.

4.6.3 Correlation between proficiency in using ICT and knowledge about ICT enabled teaching tools

The correlation between proficiency in using ICT and knowledge about ICT enabled teaching tools discussed in Table 12.

Table 12

Correlation between proficiency in using ICT and knowledge about ICT enabled teaching tools

Variables	N	M	SD	p	r
Proficiency in using ICT	120	136.13	15.216	**0.000***	**0.329**
Knowledge about ICT enabled teaching tools	120	12.35	4.010		

A Pearson product-moment correlation coefficient was computed to assess the relationship between proficiency in using ICT and knowledge about ICT enabled teaching tools. There was a correlation between the two variables [r = 0.329, n = 120, p = 0.000]. Correlation is significant at the 0.01 level (2-tailed) at 99 percent confidence level. The null hypothesis which states that 'there is no significant correlation between proficiency in using ICT and knowledge about ICT enabled teaching tools' is rejected. So, there is a significant correlation between proficiency in using ICT and knowledge about ICT enabled teaching tools.

A study by Eady&Lockyer (2013), pointed that classroom teachers are using technological tools such as wikis, blogs and classroom webpages to post school news and short stories. Structured collaborative activities using these kinds of tools encourage students to form ideas, share thoughts and write together.

4.7 Age and experience aspect of proficiency in ICT usage

Analysis of variance is conducted when there is more than two variables. The selected sample constituted student teachers and teachers with in different age groups. The difference in age of student teachers and teachers and experience with ICT usage were discussed in Tables 13 a, 13 b and 13 c.

The computed descriptive ANOVA of the selected sample belonging to three age group and their experience aspect of proficiency of ICT usage is depicted in Table 13 a and 13 b.

Table 13 a

Descriptive Statistics for age and experience aspect of proficiency in ICT usage

Age (years)	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
21-29	60	21.10	3.333	.430	20.24	21.96	13	25
30-45	32	**22.31**	**2.934**	.519	21.25	23.37	15	25
46-60	28	19.68	3.507	.663	18.32	21.04	10	25
Total	120	21.09	3.378	.308	20.48	21.70	10	25

Table 13 b

Analysis of Variance of age and experience aspect of proficiency in ICT usage

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	103.610	2	51.805	**4.832**	**.010**
Within Groups	1254.382	117	10.721		
Total	1357.992	119			

A one-way between subjects ANOVA was conducted to compare the effect of age and experience aspect of proficiency in ICT usage. There was a significant effect of age and experience aspect of proficiency in ICT usage at $p< 0.05$ level for the conditions [$F= 4.832$, $p = 0.010$]. The mean scores of all categories, which are 21- 29 years ($M= 21.10$, $SD= 3.333$), 30-45 years ($M= 22.31$, $SD= 2.934$) and 46-60 years ($M= 19.68$, $SD= 3.507$). Hence the null hypothesis is rejected which states that 'there is no statistically significant association between age and experience aspect of proficiency in ICT usage'. The results suggest that there was a significant effect of age and experience aspect of proficiency in ICT usage.

It can be inferred from the table 13 b that the huge F value 4.832 is strong evidence that the mean score of student teachers and teachers and the experience aspect in proficiency with ICT usage is not equal in the three age category. It is substantiated by means plot depicted in figure 5 that age group 30-45 years have more proficiency in experience.

Table 13 c depicts the Tukey HSD Test for Multiple Comparisons of age. Tukey post Hoc is used to find which of the age group has statistically significant difference in the mean score of the experience aspect in proficiency of ICT usage.

Post Hoc Tests

Table 13 c

Tukey HSD Test for Multiple Comparisons of age

Dependent Variable: Experience with ICT usage

(I) AGE	(J) AGE	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
21-29 years	30-45	-1.212	.717	.213	-2.91	.49
	46-60	1.421	.749	.144	-.36	3.20
30-45 years	21-29	1.212	.717	.213	-.49	2.91
	46-60	**2.634***	.847	**.007**	.62	4.65
46-60 years	21-29	-1.421	.749	.144	-3.20	.36
	30-45	**-2.634***	.847	**.007**	-4.65	-.62

It is evident from the table 13 c that the mean score of experience aspect of proficiency in ICT usage for the sample belonging to 30-45 years of age was significantly different than the sample belonging to the age group of 46-60 years (p= 0.007) at 0.05 significance level. However, sample belonging to 21-29 years of age did not significantly differ from sample belonging to 30-45 and 46-60 years of age group. The mean difference is depicted in figure 8 which reveals the means plot of age and experience aspect of proficiency in ICT usage.

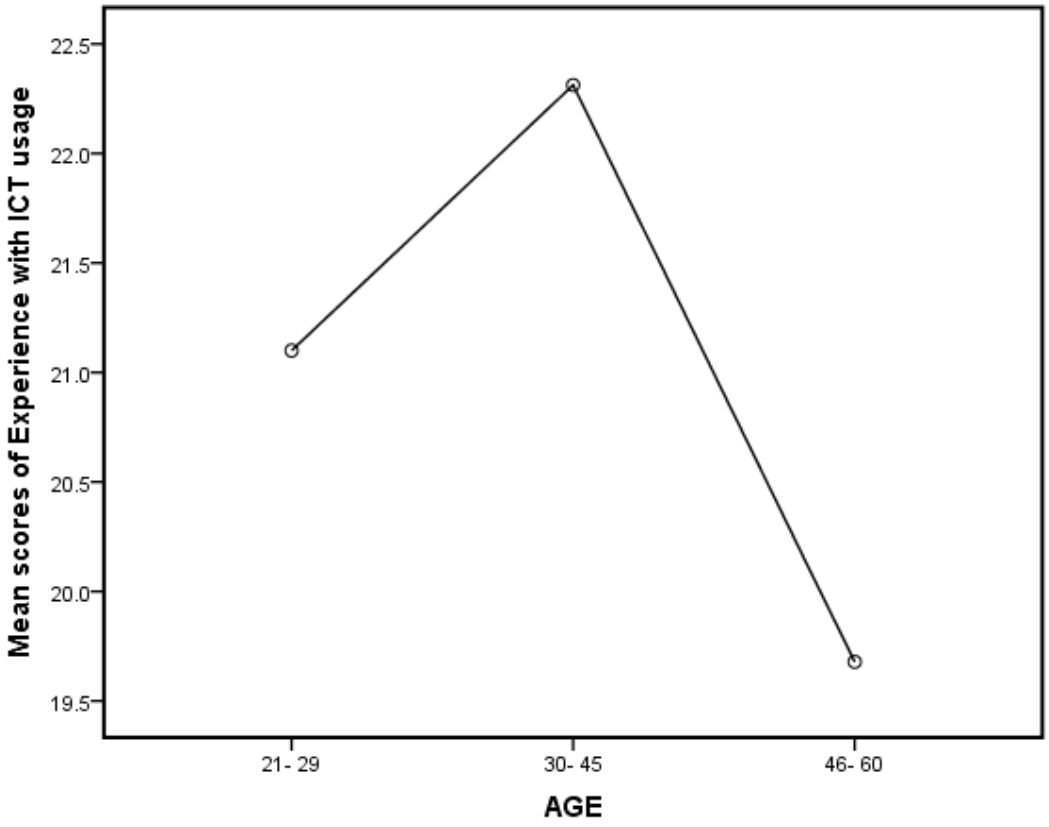

Figure 8

Means Plot of age and experience aspect of proficiency in ICT usage

Student teachers belonging to age group 21-29 years had a moderate level of experience with ICT usage than other age categories. 30- 45 years had a greater experience with ICT which constituted primarily teachers. Also, teachers included in the age range between 46-60 years had less experience with ICT usage. This may be because of lack of awareness to new technologies and ICT applications.

This is substantiated by the study by Lau &Sim (2008) conducted a study on the extent of ICT adoption among 250 secondary school teachers in Malaysia. Their findings revealed that older teachers frequently use computer technology in the classrooms more than the younger teachers. The major reason could be that the older teachers having rich experience in teaching, classroom management and also competent in the use of computers can easily integrate ICT into their teaching.

4.8 Age and challenges aspect of proficiency in ICT usage

The difference in age and challenges of ICT usage student teachers and teachers are discussed in Tables 14 a, 14 b and 14 c. The computed descriptive ANOVA of the selected sample belonging to three age group and their challenges aspect of proficiency of ICT usage is depicted in Table 14 a and 14 b respectively.

Table 14 a

Descriptive Statistics for age and challenges aspect of proficiency in ICT usage

Age (years)	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
21-29	60	**13.83**	**5.215**	.673	12.49	15.18	5	25
30-45	32	9.88	4.950	.875	8.09	11.66	5	23
46-60	28	**13.93**	**2.721**	.514	12.87	14.98	5	19
Total	120	12.80	4.968	.454	11.90	13.70	5	25

Table 14 b

Analysis of Variance of age and challenges aspect of proficiency in ICT usage

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	373.510	2	186.755	**8.523**	**.000**
Within Groups	2563.690	117	21.912		
Total	2937.200	119			

A one-way ANOVA between sample belonging to different age groups was conducted to compare the effect of age and challenges aspect of proficiency in ICT usage. There was a significant effect of age and challenges aspect of proficiency in ICT usage at $p < 0.05$ level for the three conditions [$F=8.523$, $p = 0.000$]. The mean scores of all categories are 21- 29 years (M= 13.83,SD= 5.215), 30-45 years (M= 9.88, SD= 4.950) and 46-60 years (M= 13.93, SD= 2.721). Hence the null hypothesis which states that 'there is no statistically significant association between age and challenges aspect of proficiency in ICT usage' is rejected. The results suggest that there was a significant effect of age and the challenges aspect of proficiency in ICT usage among the sample.

The huge F value 8.523 depicted in table 14 b is a strong evidence that the mean scores of student teachers and teachers and the challenges aspect in proficiency with ICT is not equal in the three age categories considered.

Table 14 c depicts the Tukey HSD Test for Multiple Comparisons of age. Tukey post Hoc which is used to find which of the age group has statistically significant difference in the mean score of the challenges aspect in proficiency of ICT usage.

Post Hoc Tests

Table 14 c

Tukey HSD Test for Multiple Comparisons of age

Dependent Variable: Challenges of ICT usage

(I) AGE	(J) AGE	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
21-29 years	30-45	**3.958***	1.025	**.001**	1.53	6.39
	46-60	-.095	1.071	.996	-2.64	2.45
30-45 years	21-29	**-3.958***	1.025	**.001**	-6.39	-1.53
	46-60	**-4.054***	1.211	**.003**	-6.93	-1.18
46-60 years	21-29	.095	1.071	.996	-2.45	2.64
	30-45	**4.054***	1.211	**.003**	1.18	6.93

It is evident from the table 14 c that the mean scores of challenges of proficiency in ICT usage of sample belonging to 21-29 years of age was significantly different than the sample belonging to the age group of 30-45 years (p= 0.001) at 95% confidence level. Also there is a significant difference between mean scores of sample belonging to 30-45 years and 46-60 years of age group (p= 0.003). However, 21-29 years of age group did not significantly differ from the age group of 46-60 years. The mean difference is depicted in figure 9 means plot.

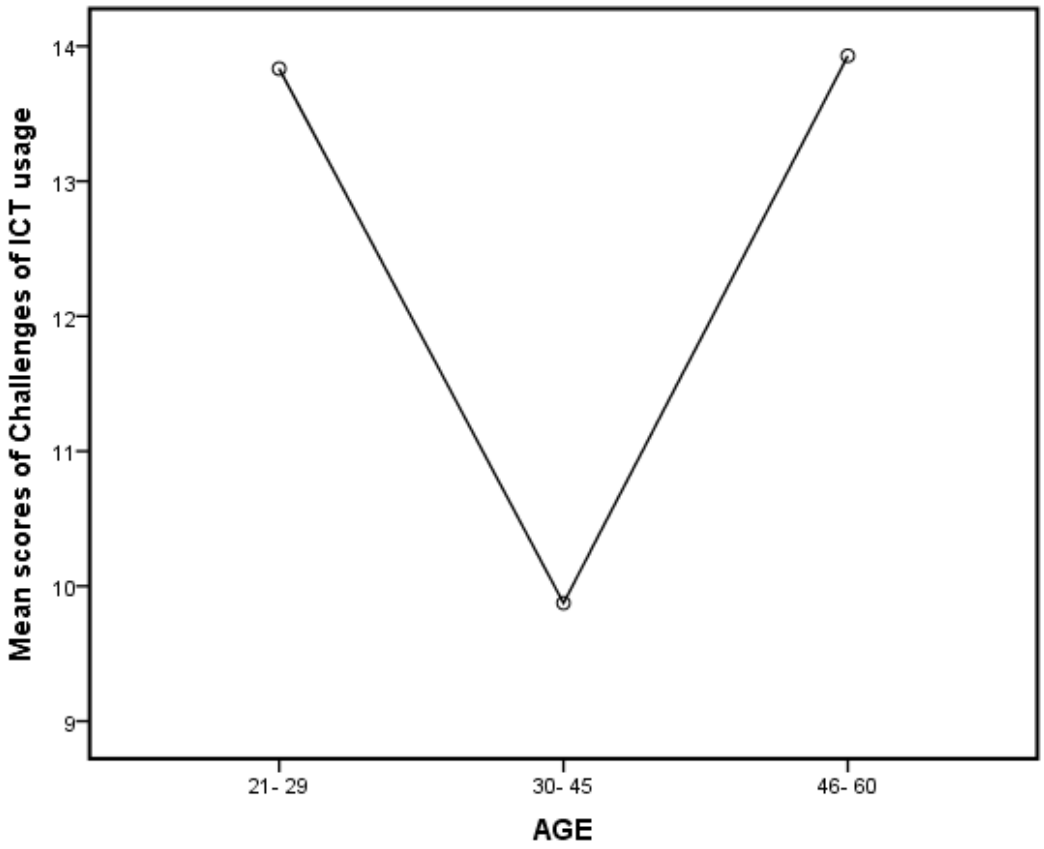

Figure 9

Means Plot of age and challenges aspect of proficiency in ICT usage

Student teachers with an age range between 21-29 years had greater challenges of ICT usage. Also, teachers included in the age range between 46-60 years had high challenges of ICT usage. The sample belonging to 30- 45 years of sample had less challenges of ICT usage those included in the other age category. This may be because of the teacher's greater

experience with ICT in the school. Moreover, teachers in 30- 45 age range may have more awareness, years of experience and proficiency in using ICT.

During the conduct of study, many of the teachers who are in their late 40 confided that they have not received any formal training in computers and have learned to use computers while on the job. They said they had lot of difficulty in the beginning but as they started using it, it become simple and enhanced their teaching.

This is substantiated by the findings of the study by Maheswari&Arulchelvan (2012) thatmost teachers still prefer books and are more comfortable reading printed editions than e-books.

Teachers under age 35 are more likely (64%) than teachers whose age is 55 and older (44%) to describe themselves as “very confident” when it comes to using new digital technologies (Kristen et al, 2013).

SUMMARY
AND
CONCLUSION

CHAPTER 5

SUMMARY AND CONCLUSION

ICT is mostly presumed to be a platform and catalyst of trending educational change. The importance of technology and its adoption has widely turned out to be a norm in the conventional classroom for both teachers and learners. If technology is to be used effectively pedagogically, the proficiency in ICT usage is required in two areas: ICT skills for personal productivity (technical) and ICT use within his or her subject area (pedagogic). ICT has opened up a new model for professional development for teachers through the growth of e-communities, teacher nets, web based courses and online resources. ICT use can enable scaffolding to accommodate student's different levels of knowledge.

To explore the proficiency of ICT usage and the knowledge about its role in scaffolding, the researcher undertook a study titled, ***"Proficiency in using ICT and its role in scaffolding in education among student teachers and teachers"*** with the following aim:

Aim

To explore the aspects of proficiency in using ICT and to know the role of ICT in facilitating scaffolding in education among student teachers and teachers teaching in arts and science subjects with the following objectives:

Objectives

The general objectives of the study are outlined below:

- To explore the accessibility to various digital assistive ICT in education among student teachers and teachers.
- To comprehend the proficiency in using ICT among student teachers and teachers.
- To know the proficiency in using ICT among student teachers and teachers teaching arts and science subjects.
- To comprehend the knowledge about scaffolding through ICT among student teachers and teachers in education.
- To prepare a booklet on ICT enabled teaching tools to promote scaffolding in learning.

Specific objectives:

- To assess the correlation between proficiency in using ICT and knowledge about its use in scaffolding.
- To assess the correlation between proficiency in using ICT and knowledge about scaffolding strategies.
- To assess the correlation between proficiency in using ICT and knowledge about ICT enabled teaching tools.
- To understand the association between age and experience aspect of proficiency in ICT usage.
- To find the association between age and challenges aspect of proficiency in ICT usage.

Methodology

The chosen sample size was 120, with 60 student teachers and 60 teachers from three colleges and six schools respectively in Ernakulam district. The investigator developed a self-designed questionnaire consisting the aspects of proficiency in ICT usage such as purpose of using ICT, required ICT skills, experience with ICT usage and ICT use in curriculum. It also included statements to know ICT aid in organisation and administration, whether ICT supported pedagogical activities and also to know if ICT enabled scaffolding which is the basis of Vygotsky's theory of Cognition.

Findings

The findings of the study can be summarized as follows:

5.1 Demographic profile of the sample

- In the present study, 60 were student teachers and remaining 60 sample were teachers.
- Hundred percent of student teachers were female and in the case of teachers, 88.3% were female and 11.6% were male.
- Student teachers belonged to the age group of 21- 29 years of age and among teachers 53.3% of sample belonged to the age group of 30-45 years and 46.6% to the age group of 46-60 years.
- Thirty one percent and 68% of student teachers & 53% and 46% of teachers belonged to arts and science stream respectively.

5.2 Accessibility to Information and Communication Technology

- Among the 60 student teachers, 48.3% used the computer at school on most days; 38.3% used in once a week; 11.6% used once a month and 1.6% never used computer at school.
- Among the 60 teachers, 83.3% used the computer at school most of the days; only 11.6% of teachers used only once a week and 3.3% and 1.6% used ICT once a month or never used it all respectively.
- Among the 60 student teachers, 93.3 % had access to computer at home; 96.6 % had access to e-mail; 88.3% had access to Internet in school and 80% of them used projector screen.
- Out of the 60 teachers who responded, 90% accessed to computer at home; 95% had access to e-mail; 100% were accessed Internet in school and 95% of teachers used projector screen in classrooms.

5.3.1 Proficiency in using ICT among student teachers and teachers

- There is a significant difference in the mean scores for the aspect required ICT skills among student teachers and teachers (p= 0.029) at 0.05 confidence level.
- There is a significant difference in the mean scores for the aspect challenges of ICT usage among student teachers and teachers (p= 0.022) at 0.05 confidence level.
- There is a significant difference in the mean scores for the aspect ICT use in curriculum among student teachers and teachers (p= 0.001) at 0.05 confidence level.

5.3.2 Proficiency in using ICT among teachers teaching arts and science subjects

- There exist significant difference in the mean scores of challenges faced by student teachers and teachers teaching arts and science subjects (p= 0.028) at 95 percent confidence level.
- Teachers teaching science subjects had more challenges in ICT usage (M= 13.65, SD= 4.937).

5.4 Knowledge about scaffolding through ICT in education

- The result shows that 88% of sample responded that ICT brought about inference in the content learnt. About 91, 83, 90 and 93 percent of sample opined that ICT was a way to test or experiment, point out contradictions, refining concepts and eliciting students experience respectively.
- About 65, 64, 54, 57 percent of the respondents said that ICT sometimes facilitated modelling, bridging, developing metacognition and schema building respectively. 58% of sample reported that ICT always facilitated representation of the text.
- The study found that 54.2 % of sample never used Moodle, 59.2 % don't know about Dropbox, 29.2% of sample sometimes used MOOC, Only 11.7 % sample know about Edmodo, 55% of sample never used Evernote, 52.5% of sample in the study used YouTube, 28.3% of sample always used Wordpress.

5.5 Proficiency in using ICT and knowledge about scaffolding in education

- There is a statistically significant correlation between proficiency in using ICT and knowledge about its use in scaffolding ($r= 0.274$, $p= 0.002$) although it is a weak positive correlation.
- There is a statistically significant correlation between proficiency in using ICT and knowledge about scaffolding strategies ($r= 0.293$, $p= 0.001$).
- There is a statistically significant correlation between proficiency in using ICT and knowledge about ICT enabled teaching tools ($r= 0.329$, $p= 0.000$).

5.6 Age and aspect of proficiency in ICT usage

- There is a statistically significant association between age and experience aspect of proficiency in ICT usage.
- The sample included in the age group of 30- 45 years had a greater experience with ICT usage which included only teachers.

- Teachers included in the age group 46-60 years had less experience with ICT usage. This may be because of lack of awareness to new technologies and ICT applications.
- There is a statistically significant association between age and challenges aspect of proficiency in ICT usage.
- Student teachers belonging to age group 21-29 years had greater challenges of ICT usage. Also, teachers included in the age range between 46-60 years had high challenges of ICT usage.
- Sample belonging to the age group 30- 45 years had less challenges of ICT usage and those included in this category were only teachers. This may be because of the teacher's greater experience with ICT usage in the school.

5.7 Conclusion

The present study discusses the ***"Proficiency in using ICT and its role in scaffolding in Education among student teachers and teachers"***. It also analyse the association of student teachers and teachers demographic characters which included age, gender and subject.

The study concludes that though there is a general proficiency in using ICT among student teachers and teachers. They had good accessibility of ICT applications in both home and school. Student teachers found to have more required ICT skills and also they face challenges with ICT usage than teachers. The use of ICT in curriculum was more found in student teachers. Challenges with ICT become more common in teachers teaching arts and science subjects.

With regard to association of proficiency in using ICT and knowledge about scaffolding strategies on ICT, it can be concluded that proficiency and scaffolding of ICT have significant association with student teachers and teachers.

With regard to age with challenges and experience aspects, the study found that the challenges reduced with increasing experience of ICT usage among teachers. Both student teachers and teachers are not well aware of some of the ICT enabled teaching tools which scaffolds learning in education.

5.8 Limitations

- The study was limited to Ernakulam city, a highly metropolitan urban area and therefore the results may not be applicable in rural settings.
- The study has not focused in finding out how technology can be properly integrated into our daily classroom effectively and effort to disseminate knowledge about various sites to the selected sample was not undertaken.

5.9 Suggestions for Further Research

The study may expand to a larger area with a larger sample size to produce more accurate and bigger database.

5.10 Recommendations

The study puts forward the following implications:

- There is a need to spread awareness among student teachers and teachers regarding the ICT enabled teaching facilities.
- There is a need to sensitize the student teachers and teachers about the purpose of using ICT in education. That is, new competencies in the curricula and in assessment.
- A proper pre-service and in-service training helps the student teachers and teachers to reduce the challenges with ICT usage and thus enable a culture of lifelong peer teaching.
- There should be a focus on teachers teaching arts and science subjects in schools to improve their proficiency of using ICT by motivating and rewarding teachers.

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APPENDICES

APPENDIX 1(A)

Questionnaireon Proficiency in using ICT and its role inscaffolding in Education among student teachers and teachers

Demographic profile:-

Category : Student teacher ☐ Teacher ☐

Age :

Gender : Male ☐ Female ☐ Other ☐

Subject :

Institution :

1) Accessibility to Information and Communication Technology (ICT)

1. How often do you use computer at school?

   Most days ☐ Once a week ☐ Once a month ☐ Never ☐

2. Access to computer at home. YES ☐ NO ☐

3. Do you have e-mail address? YES ☐ NO ☐

4. Accessibility to internet in school. YES ☐ NO ☐

5. Access to projector screen. YES ☐ NO ☐

2) Purpose of using ICT in classrooms

	Purpose of using ICT in classrooms	Always	Often	Sometimes	Rarely	Never
1.	Helps in school administration					
2.	Recording marks using spread sheet andtyping exam papers					
3.	Engage in social networks to share notes on folders					
4.	Finding information and resources in internet					
5.	Developing digital content for learners					

3) Required ICT skills for teachers /student teachers

	ICT skills required for student teacher	Always	Often	Sometimes	Rarely	Never
1.	Create and maintain blogs,websites,word processor					
2.	Participate in social networks to use in projects & collaboration between classrooms					
3.	Create presentation slides with the use of video & audio clips					
4.	Use of E-Newspapers & E-Books					
5.	Using and maintaining projectors					

4) Challenges of ICT usage

	Challenges in using ICT	Always	Often	Sometimes	Rarely	Never
1.	Less access to ICT					
2.	Inadequate technical support					
3.	Insufficient knowledge about ICT					
4.	Unavailability of latest ICT equipments					
5.	Improper functioning of ICT tools					

5) Experience with ICT usage

	Experience with ICT usage	Always	Often	Sometimes	Rarely	Never
1.	Increased ability to teach using ICT					
2.	Improved ability to log into network					
3.	Knowledge about teaching strategies using ICT tools					
4.	Proficiency in using multimedia					
5.	Good speed in typing keyboard					

6) ICT use in Curriculum

	Use of ICT in Curriculum	Always	Often	Sometimes	Rarely	Never
1.	Creation of PPTs to support teaching and use of search engine					
2.	ICT enables 3D visualization technologies& subject related videos					
3.	Provide supporting studies in interested areas					
4.	Exchange documents to integrate projects					
5.	Accessibility to various applications (Moodle, MOOC, You Tube) to support teaching					

7) Aid in organisation & administration

	Does ICT aid in organisation and administration in teaching?	Always	Often	Sometimes	Rarely	Never
1.	Makes teaching flexible with backup lesson plans					
2.	Convey messages through video/audio records during teaching					
3.	Use of various assessment models like quiz, periodic test,assignment					
4.	Documentation of lesson plans & references					
5.	Get knowledge about multimedia usage					

8) ICT support pedagogy activities

	How often ICT support pedagogy activities?	Everyday	Weekly	Rarely
1.	Opportunity for browsing e-library			
2.	Access with higher education departments (NCERT, CBSE to use teaching tools)			
3.	Show live drills			
4.	Pre-service& In-service training to improve teaching methods			
5.	Concurrent and periodic evaluation of teaching methods			

9) ICT enables Scaffolding

A	How ICT enables scaffolding?	YES	NO
1.	Eliciting students experience		
2.	Refining concepts		
3.	Points out contradictions		
4.	Way to test or experiment		
5.	Ask for inference		

B	Whether ICT enables the following scaffolding strategies that facilitate learning?	Always	Sometimes	Never
1.	Modelling			
2.	Bridging			
3.	Developing Metacognition			
4.	Schema building			
5.	Text representation			

C	Does the following ICT enabled teaching tools promote scaffolding in learning?	Always	Sometimes	Never
1.	Moodle			
2.	MOOC			
3.	Evernote			
4.	Wordpress			
5.	You Tube			
6.	Edmodo			
7.	Dropbox			

APPENDIX 1 (B)

GOOGLE FORM

APPENDIX 1(B)

Proficiency in using ICT and its role in scaffolding in Education among Student teachers and teachers

Questionnaire

* Required

1. **Email address** *

2. **Category** *
Check all that apply.
- [ ] Student teacher
- [ ] Teacher
- [ ] Other:

3. **Age** *
Mark only one oval.
- ◯ 21-29 years
- ◯ 30-45 years
- ◯ 46-60 years
- ◯ Other:

4. **Gender** *
Check all that apply.
- [ ] Male
- [ ] Female
- [ ] Other
- [ ] Other:

5. **Subject** *
Mark only one oval.
- ◯ Arts
- ◯ Science
- ◯ Other:

1) Accessibility to Information and Communication Technology (ICT)

6. **1. How often do you use computer at school?** *
Mark only one oval.
- ◯ Most days
- ◯ Once a week
- ◯ Once a month
- ◯ Never

7. **2. Access to computer at home.** *
Mark only one oval.

- Yes
- No

8. **3. Do you have e-mail address?** *
Mark only one oval.

- Yes
- No

9. **4. Accessibility to internet in school.** *
Mark only one oval.

- Yes
- No

10. **5. Access to projector screen.** *
Mark only one oval.

- Yes
- No

2) Purpose of using ICT in classrooms

11. *
Mark only one oval per row.

	Always	Often	Sometimes	Rarely	Never
Helps in school administration.					
Recording marks using spread sheet and typing exam papers					
Engage in social networks to share notes on folders					
Finding information and resources in internet					
Developing digital content for learners					

3) Required ICT skills for teachers /student teachers

12. *
Mark only one oval per row.

	Always	Often	Sometimes	Rarely	Never
Create and maintain blogs, websites, word processor					
Participate in social networks to use in projects & collaboration between classrooms					
Create presentation slides with the use of video & audio clips					
Use of E-Newspapers & E-books					
Using and maintaining projectors					

4) Challenges of ICT usage

13. *

Mark only one oval per row.

	Always	Often	Sometimes	Rarely	Never
Less access to ICT					
Inadequate technical support					
Insufficient knowledge about ICT					
Unavailability of latest ICT equipments					
Improper functioning of ICT tools					

5) Experience with ICT usage

14. *

Mark only one oval per row.

	Always	Often	Sometimes	Rarely	Never
Increased ability to teach using ICT					
Improved ability to log into network					
Knowledge about teaching strategies using ICT tools					
Proficiency in using multimedia					
Good speed in typing keyboard					

6) ICT use in Curriculum

15. *

Mark only one oval per row.

	Always	Often	Sometimes	Rarely	Never
Creation of PPTs to support teaching and use of search engine					
ICT enables 3D visualization technologies & subject related videos					
Provide supporting studies in interested areas					
Exchange documents to integrate projects					
Accessibility to various applications (Moodle, MOOC, You Tube) to support teaching					

7) Aid in organisation & administration

16. *

Mark only one oval per row.

	Always	Often	Sometimes	Rarely	Never
Makes teaching flexible with backup lesson plans					
Convey messages through video/audio records during teaching					
Use of various assessment models like quiz, periodic test, assignment					
Documentation of lesson plans & references					
Get knowledge about multimedia usage					

8) ICT support pedagogy activities

17. *

Mark only one oval per row.

	Everyday	Weekly	Rarely
Opportunity for browsing e-library			
Access with higher education departments (NCERT, CBSE to use teaching tools)			
Show live drills			
Pre-service & In-service training to improve teaching methods			
Concurrent and periodic evaluation of teaching methods			

9) ICT enables Scaffolding

18. **A. How ICT enables scaffolding?** *

Mark only one oval per row.

	Yes	No
Ask for inference		
Eliciting students experience		
Way to test or experiment		
Refining concepts		
Points out contradictions		

19. **B. Whether ICT enables the following scaffolding strategies that facilitate learning?** *

Mark only one oval per row.

	Always	Sometimes	Never
Modelling			
Bridging			
Developing Metacognition			
Schema building			
Text representation			

20. **C. Does the following ICT enabled teaching tools promote scaffolding in learning?** *

Mark only one oval per row.

	Always	Sometimes	Never
Moodle			
MOOC			
Evernote			
Wordpress			
You Tube			
Edmodo			
Dropbox			

Send me a copy of my responses.

APPENDIX 2

BOOKLET

SCAFFOLDING STRATEGIES USING ICT

ICT stands

for "Information and Communication Technologies"

ICT refers to technologies that provide access to information through telecommunications

SCAFFOLDING STRATEGIES USING ICT

GOOGLE SHEETS

SUNCALC

EDMODO

MATHS FORMULA FREE

WIKIPEDIA

MOODLE

QR CODE GENERATOR

MOOC

EVERNOTE

SQUID

MINDOMO

QUICK GRAPH

YOUTUBE

WORDPRESS

DROPBOX

SCAFFOLDING STRATEGIES

- Scaffolding facilitates a student's ability to build on prior knowledge and internalise new information.
- Scaffolding activities support learners beyond the level of what they can do alone.

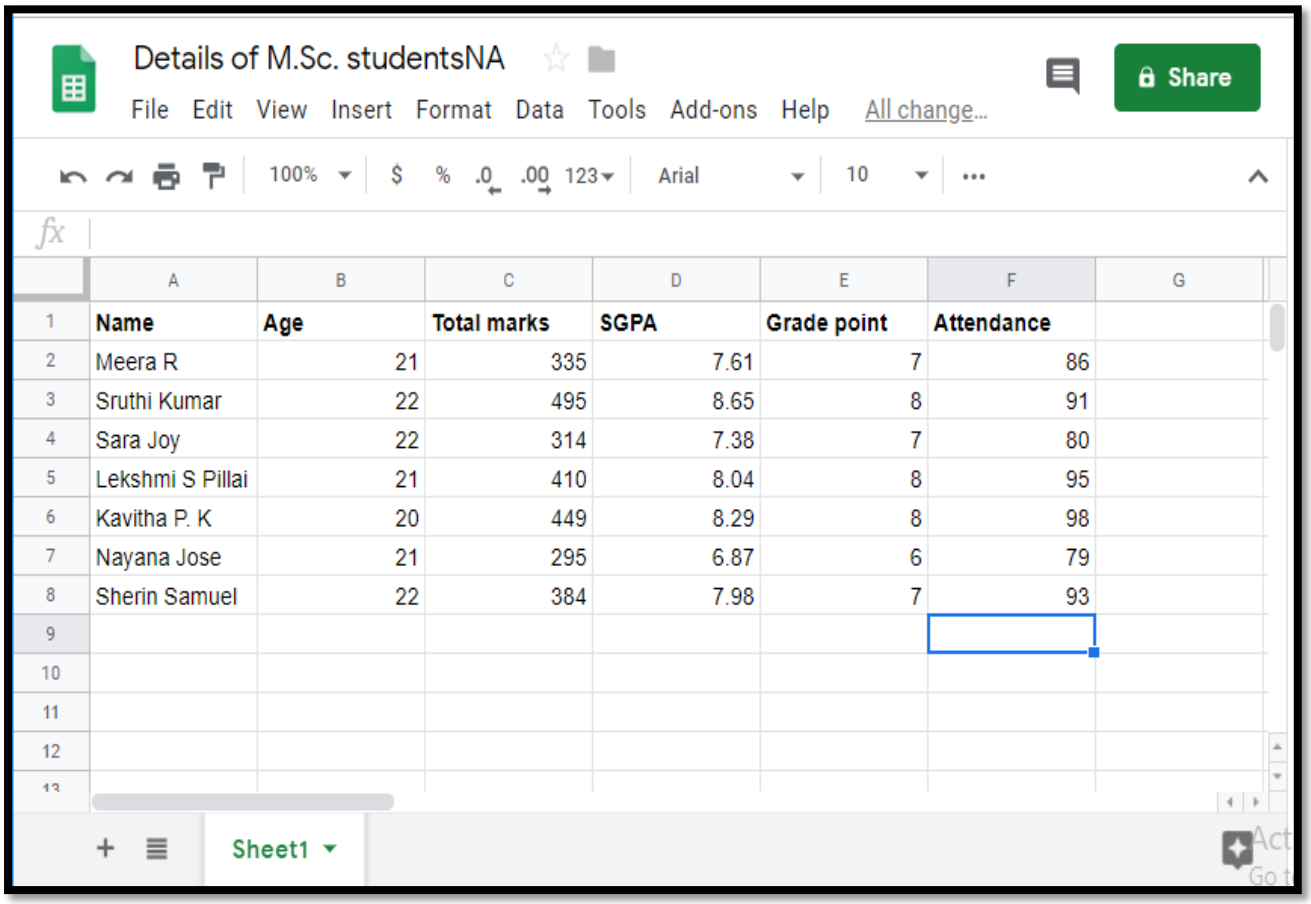
- Vygotskian concept of zone of proximal development (ZPD) provided an important starting point for approaches to understand the role of experienced adults and peers in productive learning activities.

- ICT is closely linked to the concept of scaffolding strategies in the education system.

GOOGLE SHEETS

Google Sheets is a spreadsheet program included as part of a free, web-based software office suite offered by Google within its Google Drive service. The service also includes Google Docs and Google Slides , a word processor and presentation program respectively.

The app is compatible with Microsoft Excel file formats. The app allows users to create and edit files online while collaborating with other users in real-time.



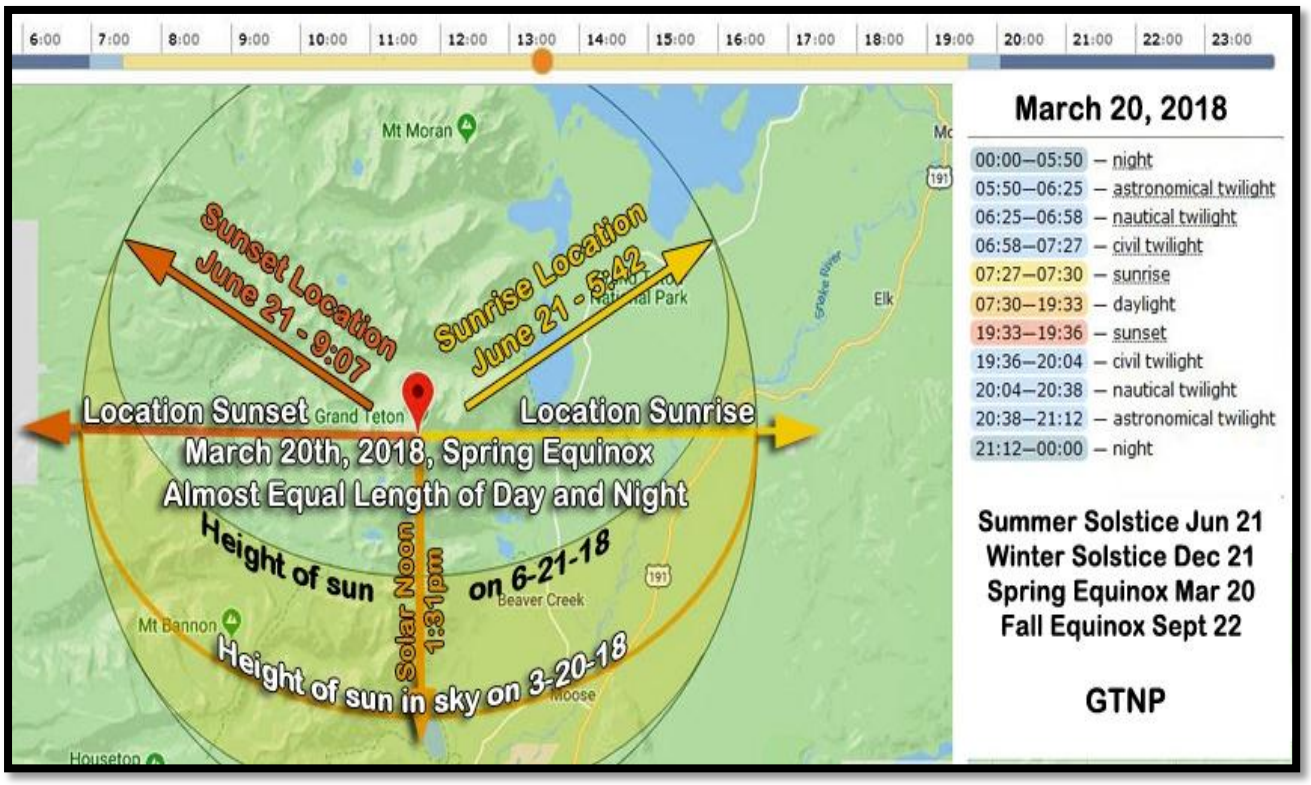
	A	B	C	D	E	F	G
1	**Name**	**Age**	**Total marks**	**SGPA**	**Grade point**	**Attendance**	
2	Meera R	21	335	7.61	7	86	
3	Sruthi Kumar	22	495	8.65	8	91	
4	Sara Joy	22	314	7.38	7	80	
5	Lekshmi S Pillai	21	410	8.04	8	95	
6	Kavitha P. K	20	449	8.29	8	98	
7	Nayana Jose	21	295	6.87	6	79	
8	Sherin Samuel	22	384	7.98	7	93	
9							
10							
11							
12							

GOOGLE SHEETS

SUNCALC

SunCalc is a little app that shows sun movement and sunlight phases during the given day at the given location.

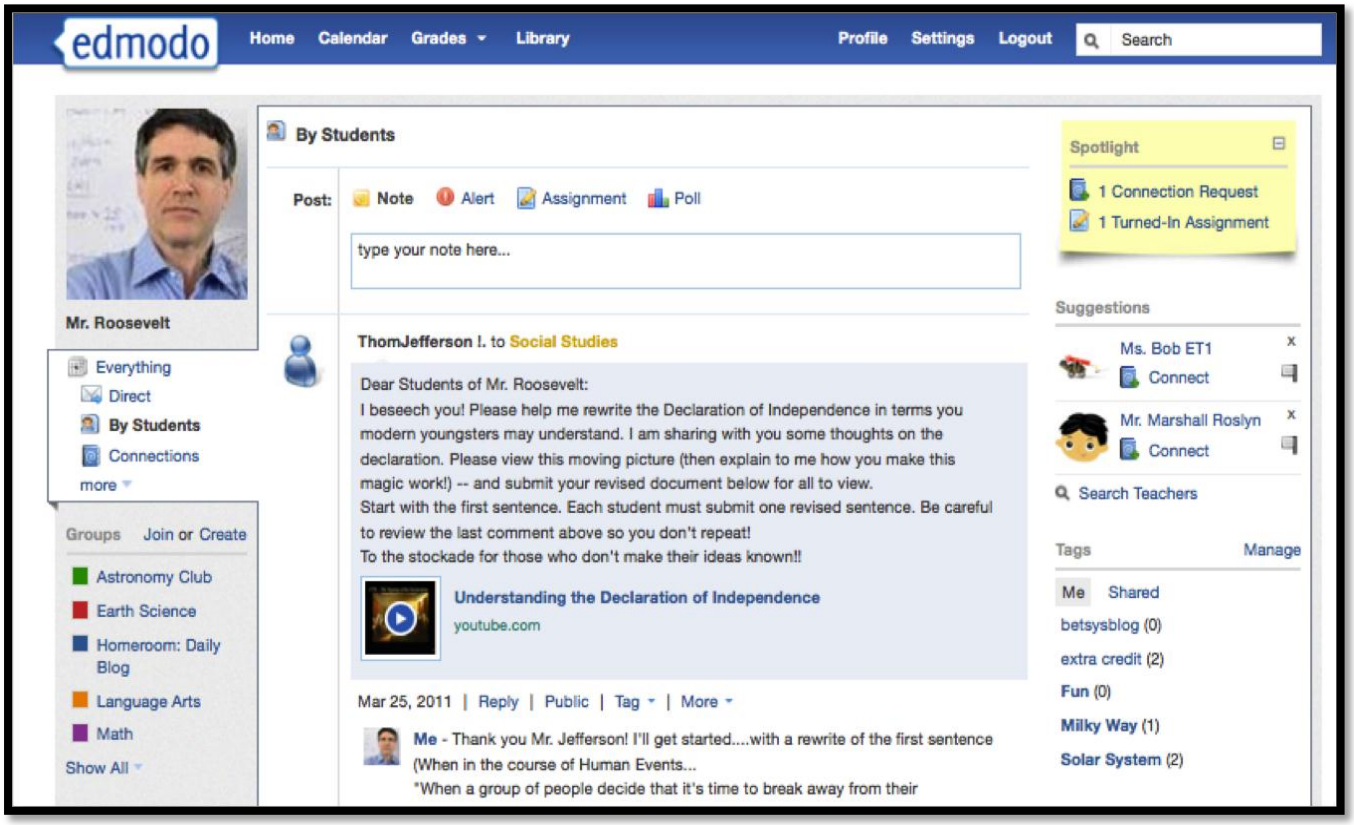
The user can see sun positions at sunrise, specified time and sunset. The thin orange curve is the current sun trajectory, and the yellow area around is the variation of sun trajectories during the year. The closer a point is to the center, the higher is the sun above the horizon. The colors on the time slider show sunlight coverage during the day.


6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Mt Moran
Sunset Location
June 21 - 9:07
Sunrise Location
June 21 - 5:42
Location Sunset
Grand Teton
Location Sunrise
March 20th, 2018, Spring Equinox
Almost Equal Length of Day and Night
Height of sun on 6-21-18
Solar Noon
1:31pm
Height of sun in sky on 3-20-18
Mt Bannon
Beaver Creek
Moose
Houseton
Elk
191
March 20, 2018
00:00–05:50 – night
05:50–06:25 – astronomical twilight
06:25–06:58 – nautical twilight
06:58–07:27 – civil twilight
07:27–07:30 – sunrise
07:30–19:33 – daylight
19:33–19:36 – sunset
19:36–20:04 – civil twilight
20:04–20:38 – nautical twilight
20:38–21:12 – astronomical twilight
21:12–00:00 – night
Summer Solstice Jun 21
Winter Solstice Dec 21
Spring Equinox Mar 20
Fall Equinox Sept 22
GTNP

SUNCALC

EDMODO

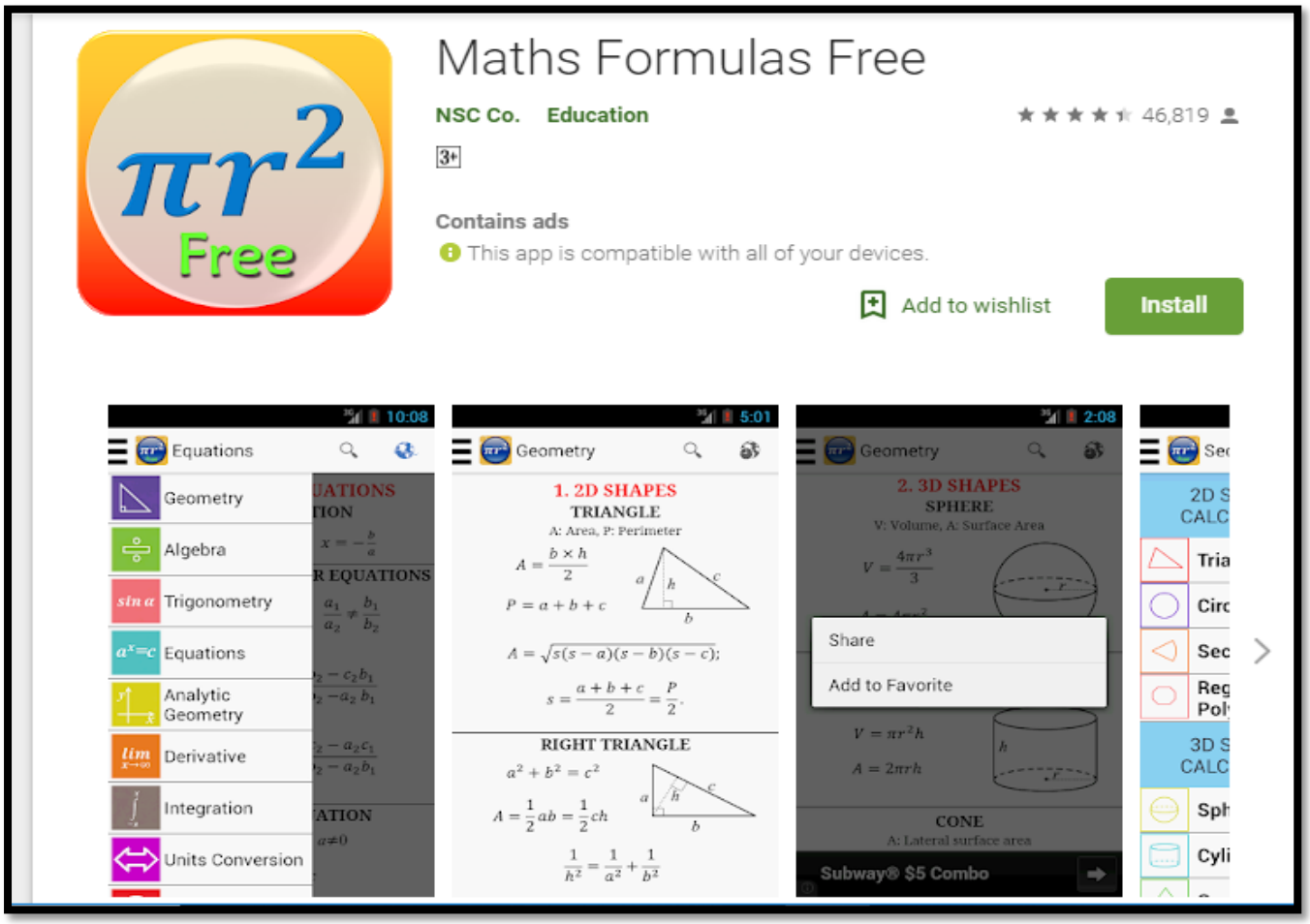
Edmodo is an educational technology company offering a communication, collaboration, and coaching platform to schools and teachers. The Edmodo network enables teachers to share content, distribute quizzes, assignments, and manage communication with students, colleagues, and parents. Edmodo is very teacher-centric in their design and philosophy, teachers and students spend large amounts of time on the platform, both in and out of the classroom.


edmodo
Home
Calendar
Grades
Library
Profile
Settings
Logout
Search
Mr. Roosevelt
Everything
Direct
By Students
Connections
more
Groups
Join or Create
Astronomy Club
Earth Science
Homeroom: Daily Blog
Language Arts
Math
Show All
By Students
Post:
Note
Alert
Assignment
Poll
type your note here...
ThomJefferson I. to Social Studies
Dear Students of Mr. Roosevelt:
I beseech you! Please help me rewrite the Declaration of Independence in terms you modern youngsters may understand. I am sharing with you some thoughts on the declaration. Please view this moving picture (then explain to me how you make this magic work!) -- and submit your revised document below for all to view.
Start with the first sentence. Each student must submit one revised sentence. Be careful to review the last comment above so you don't repeat!
To the stockade for those who don't make their ideas known!!
Understanding the Declaration of Independence
youtube.com
Mar 25, 2011 | Reply | Public | Tag | More
Me - Thank you Mr. Jefferson! I'll get started....with a rewrite of the first sentence (When in the course of Human Events...
"When a group of people decide that it's time to break away from their
Spotlight
1 Connection Request
1 Turned-In Assignment
Suggestions
Ms. Bob ET1
Connect
Mr. Marshall Roslyn
Connect
Search Teachers
Tags
Manage
Me
Shared
betsysblog (0)
extra credit (2)
Fun (0)
Milky Way (1)
Solar System (2)

EDMODO

MATHS FORMULA FREE

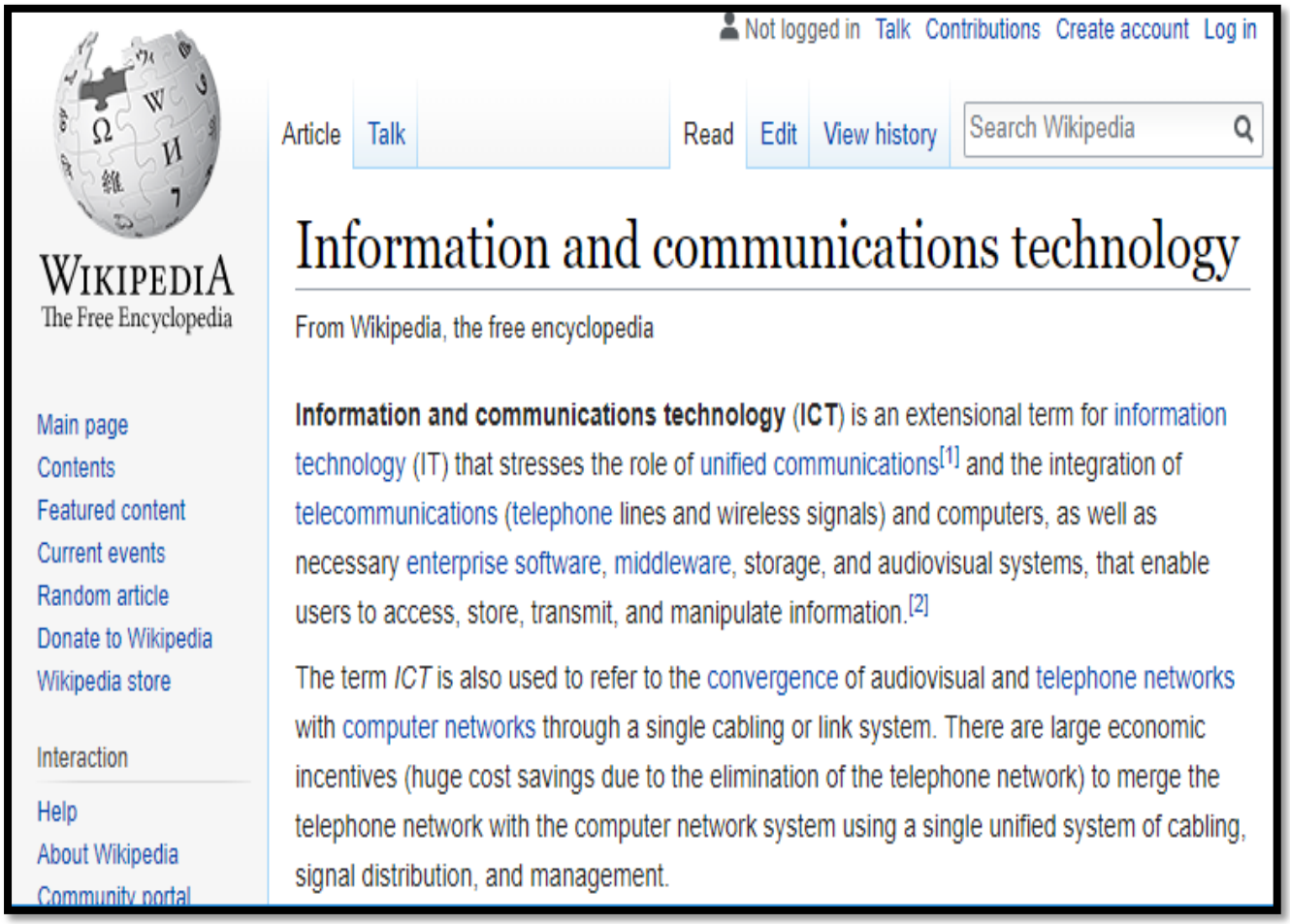
Maths Formula Free is one unique and comprehensive app that is particularly designed as a one-stop solution for College grade/Higher grade students and teachers. It lists out all the important formulas/topics in Algebra, Geometry, Trigonometry and Calculus. Regular review of this app will definitely help students and also teachers.



MATHS FORMULA FREE

WIKIPEDIA

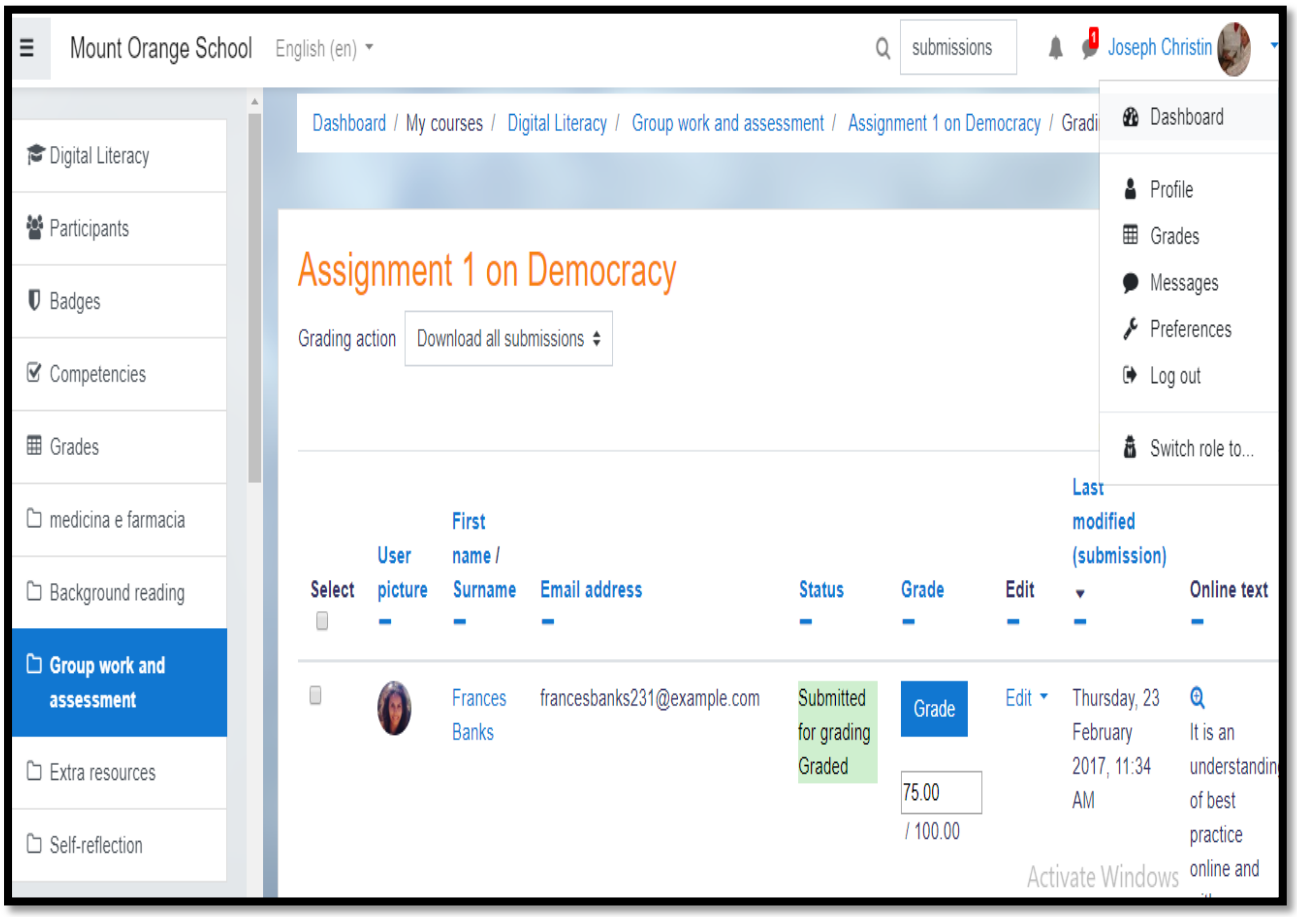
Wikipedia is a free, open content online encyclopedia created through the collaborative effort of a community of users known as Wikipedians. Anyone registered on the site can create an article for publication; registration is not required to edit articles.


Not logged in Talk Contributions Create account Log in
Article Talk
Read Edit View history
Search Wikipedia
WIKIPEDIA
The Free Encyclopedia
Information and communications technology
From Wikipedia, the free encyclopedia
Information and communications technology (ICT) is an extensional term for information technology (IT) that stresses the role of unified communications[1] and the integration of telecommunications (telephone lines and wireless signals) and computers, as well as necessary enterprise software, middleware, storage, and audiovisual systems, that enable users to access, store, transmit, and manipulate information.[2]
The term ICT is also used to refer to the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives (huge cost savings due to the elimination of the telephone network) to merge the telephone network with the computer network system using a single unified system of cabling, signal distribution, and management.
Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia
Wikipedia store
Interaction
Help
About Wikipedia
Community portal

WIKIPEDIA

MOODLE

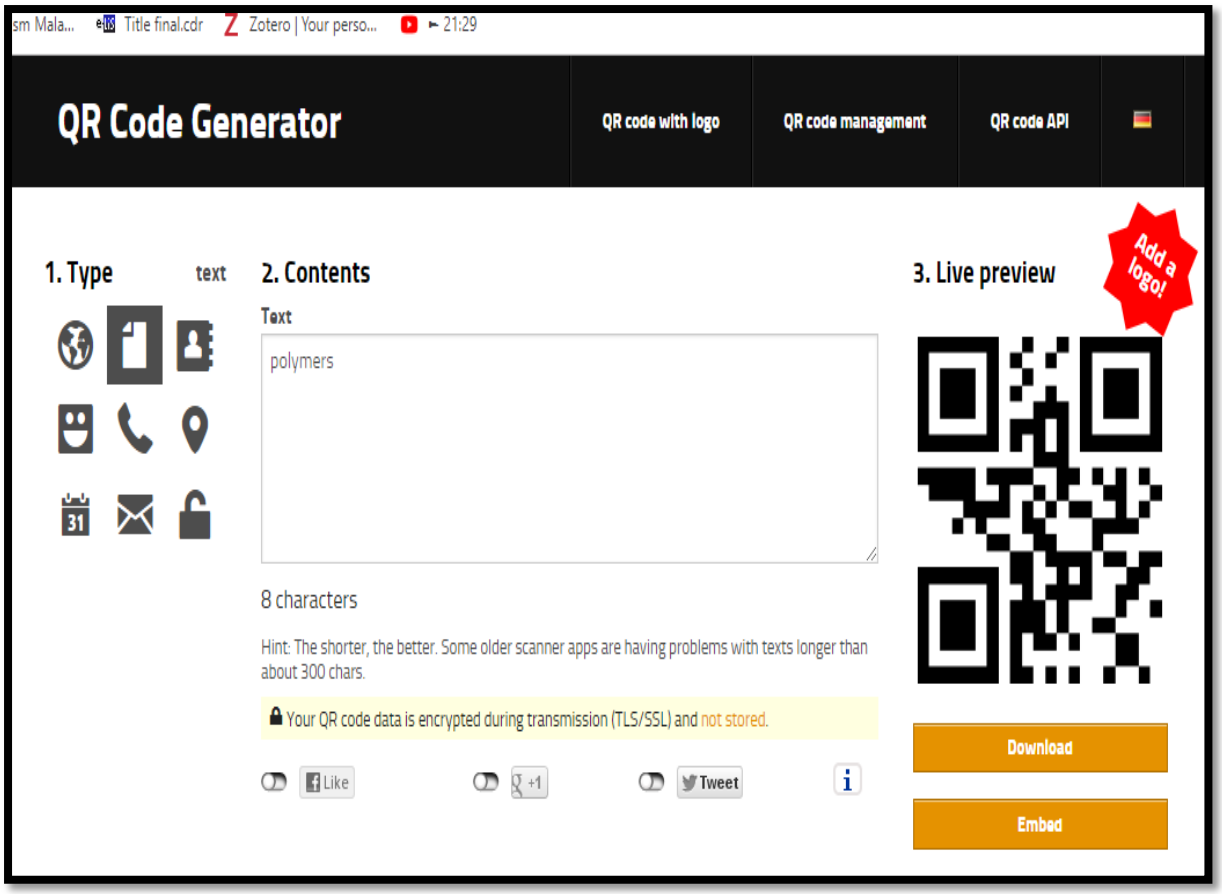
Moodle is an acronym for "Modular Object-Oriented Dynamic Learning Environment." It is an online educational platform that provides custom learning environments for students. Educators can use Moodle to create lessons, manage courses, and interact with teachers and students.


Mount Orange School
English (en)
submissions
Joseph Christin
Dashboard / My courses / Digital Literacy / Group work and assessment / Assignment 1 on Democracy / Gradi
Digital Literacy
Participants
Badges
Competencies
Grades
medicina e farmacia
Background reading
Group work and assessment
Extra resources
Self-reflection
Dashboard
Profile
Grades
Messages
Preferences
Log out
Switch role to...
Assignment 1 on Democracy
Grading action
Download all submissions
Select
User picture
First name / Surname
Email address
Status
Grade
Edit
Last modified (submission)
Online text
Frances Banks
francesbanks231@example.com
Submitted for grading
Graded
Grade
75.00
/ 100.00
Edit
Thursday, 23 February 2017, 11:34 AM
It is an understandin
of best practice
online and
Activate Windows

MOODLE

QR CODE GENERATOR

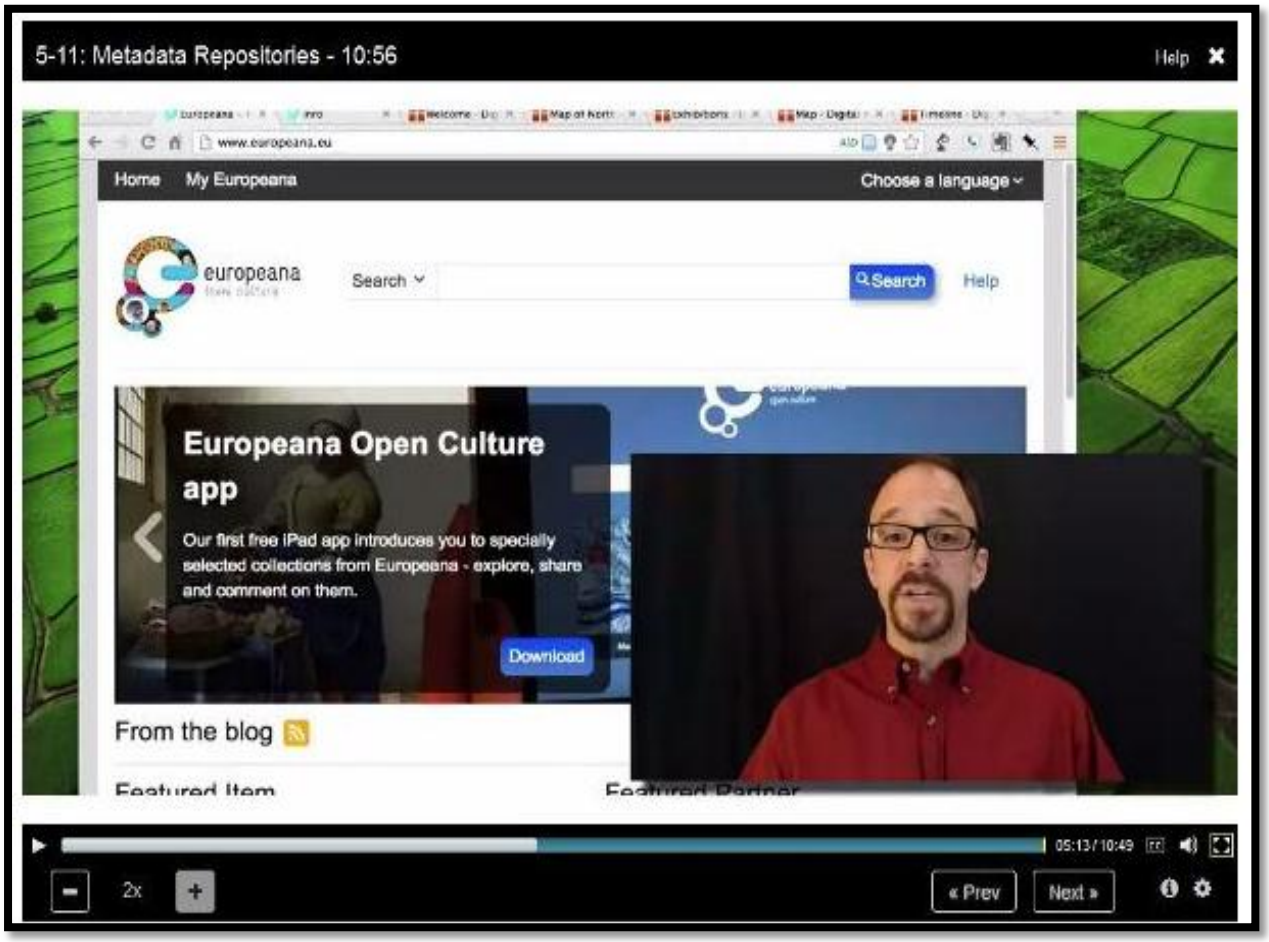
A QR code generator is a software which stores data into a QR code (for example a text or a website address). It may print one's free QR code or embed it on website to make it available to others.



QR Code Generator

MOOC

A massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web. Many MOOCs provide interactive courses with user forums to support community interactions among students, professors, and teaching assistants, as well as immediate feedback to quick quizzes and assignments.

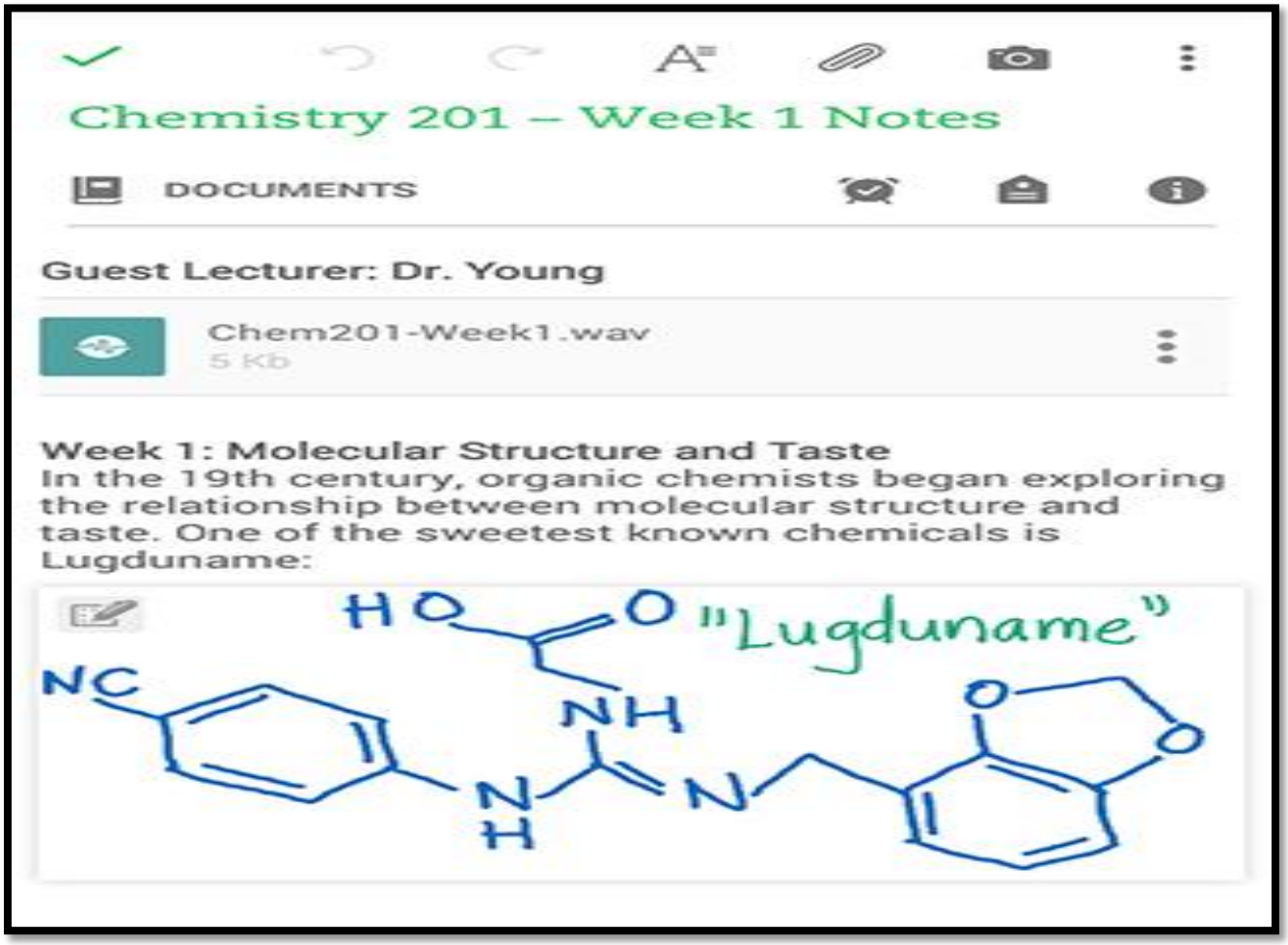

5-11: Metadata Repositories - 10:56
Help
www.europeana.eu
Home
My Europeana
Choose a language
europeana
Search
Search
Help
Europeana Open Culture app
Our first free iPad app introduces you to specially selected collections from Europeana - explore, share and comment on them.
Download
From the blog
05:13 / 10:49
2x
« Prev
Next »

MOOC

EVERNOTE

Evernote is a mobile app designed for note taking, organizing, task lists, and archiving. The app allows users to create notes, which can be formatted text, web pages or web page excerpts, photographs, voice memos, or handwritten "ink" notes. Notes can also have file attachments. They can be sorted into notebooks, tagged, annotated, edited, given comments, searched, and exported.

Evernoteis cross-platform, including support for iOS, Android, Microsoft Windows and macOS. Evernote is free to use with monthly usage limits, and offers paid plans for expanded or lifted limits.


Chemistry 201 – Week 1 Notes
DOCUMENTS
Guest Lecturer: Dr. Young
Chem201-Week1.wav
5 Kb
Week 1: Molecular Structure and Taste
In the 19th century, organic chemists began exploring the relationship between molecular structure and taste. One of the sweetest known chemicals is Lugduname:
"Lugduname"

EVERNOTE

SQUID

Squid allows users to take handwritten *notes* naturally on various devices. With *Squid* one can write just like on paper using an active pen, passive stylus, or your finger and easily mark up PDFs to fill out forms, edit/grade papers, or sign documents.

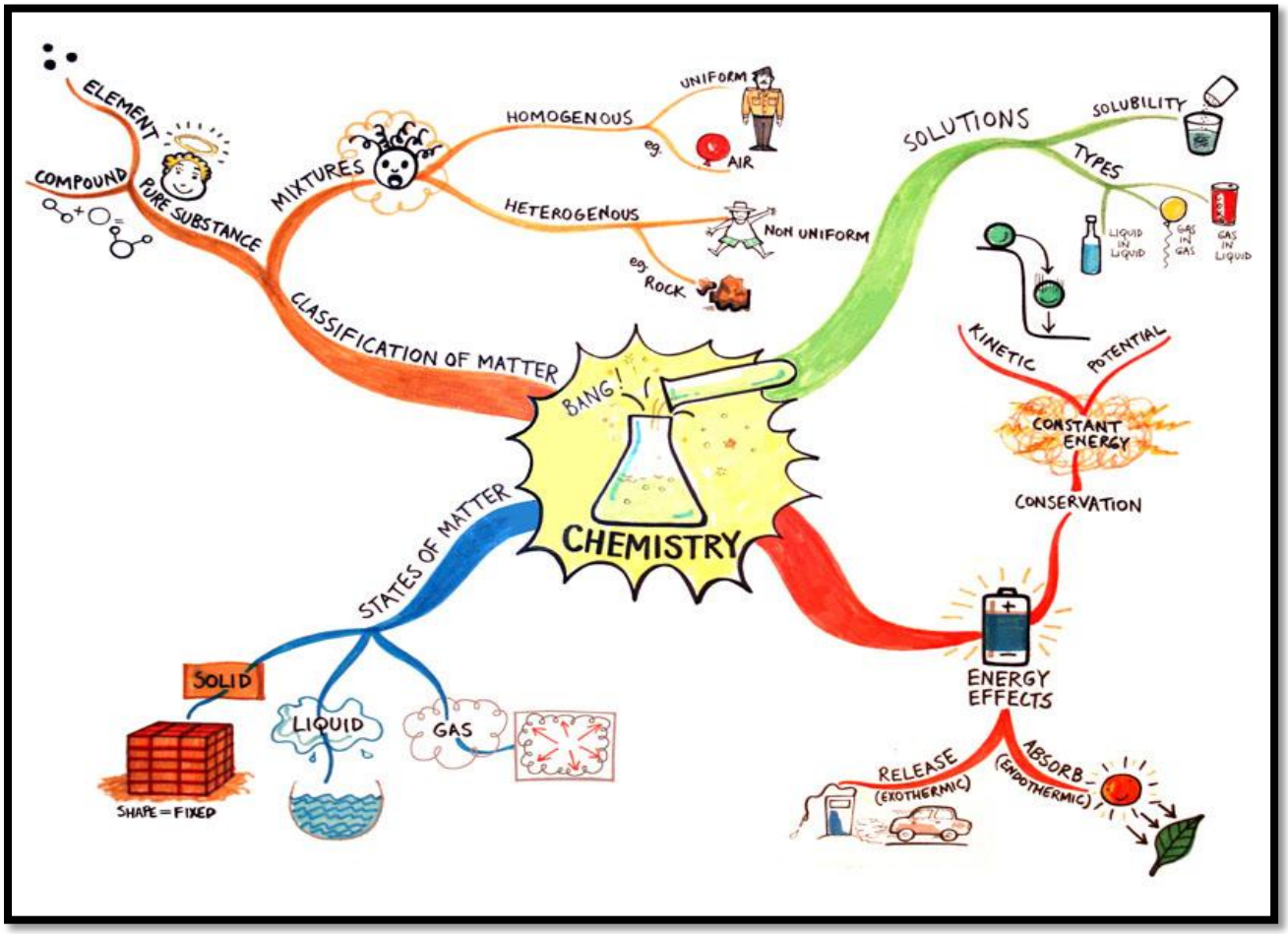
Squid takes special advantage of active pens on capable devices to provide natural, pressure sensitive handwriting. *Squid* is designed to be both powerful and simple to use, allowing one to take *notes* quickly and efficiently.


THE CEREBRAL CORTEX
BROCA'S AREA
FRONTAL LOBE
Hi PRODUCTION OF SPEECH & LANGUAGE
1) SELECTION OF WORDS
2) ORGANIZATION OF GRAMMATICAL FORMS
3) ARTICULATION OF SOUNDS FROM THE MOTOR SYSTEM
BRAIN COMPOSITION
75% H_2O
FURROW
LATIN: SULCUS
A DEPRESSION OR GROOVE CREATING A FOLDED

SQUID

MINDOMO (mind mapping)

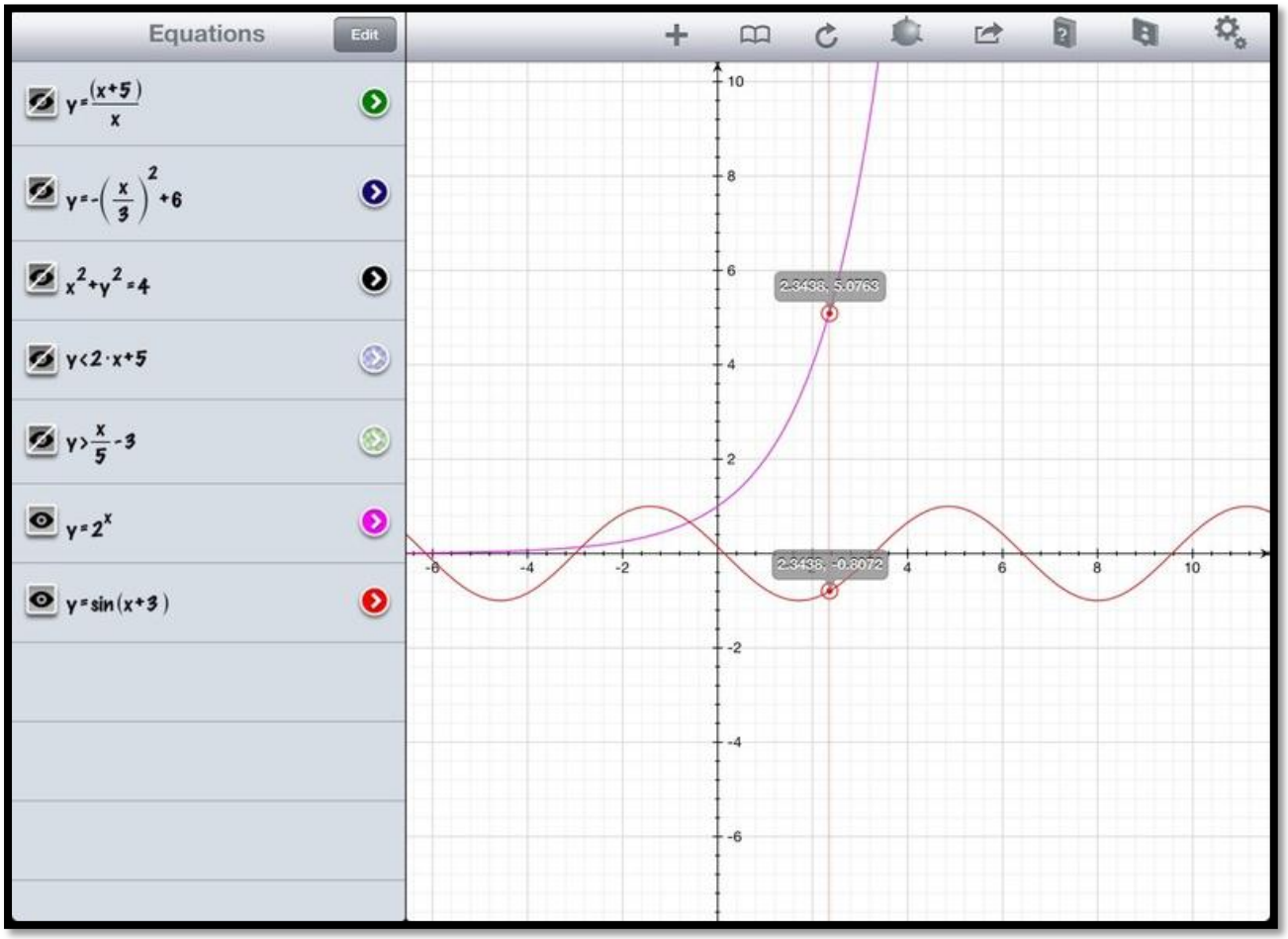
Mindomo is an online mind mapping, concept mapping and outlining *application*. *Mindomo* allows one’s to visually outline complex concepts, tasks and ideas. Mind mapping requires students to explore information and decide what's important and how it connects with what they already know.


CHEMISTRY
BANG!
CLASSIFICATION OF MATTER
ELEMENT
COMPOUND
PURE SUBSTANCE
MIXTURES
HOMOGENOUS
UNIFORM
eg.
AIR
HETEROGENOUS
NON UNIFORM
eg. ROCK
STATES OF MATTER
SOLID
SHAPE = FIXED
LIQUID
GAS
SOLUTIONS
SOLUBILITY
TYPES
LIQUID IN LIQUID
GAS IN GAS
GAS IN LIQUID
KINETIC
POTENTIAL
CONSTANT ENERGY
CONSERVATION
ENERGY EFFECTS
RELEASE (EXOTHERMIC)
ABSORB (ENDOTHERMIC)

MINDOMO

QUICK GRAPH

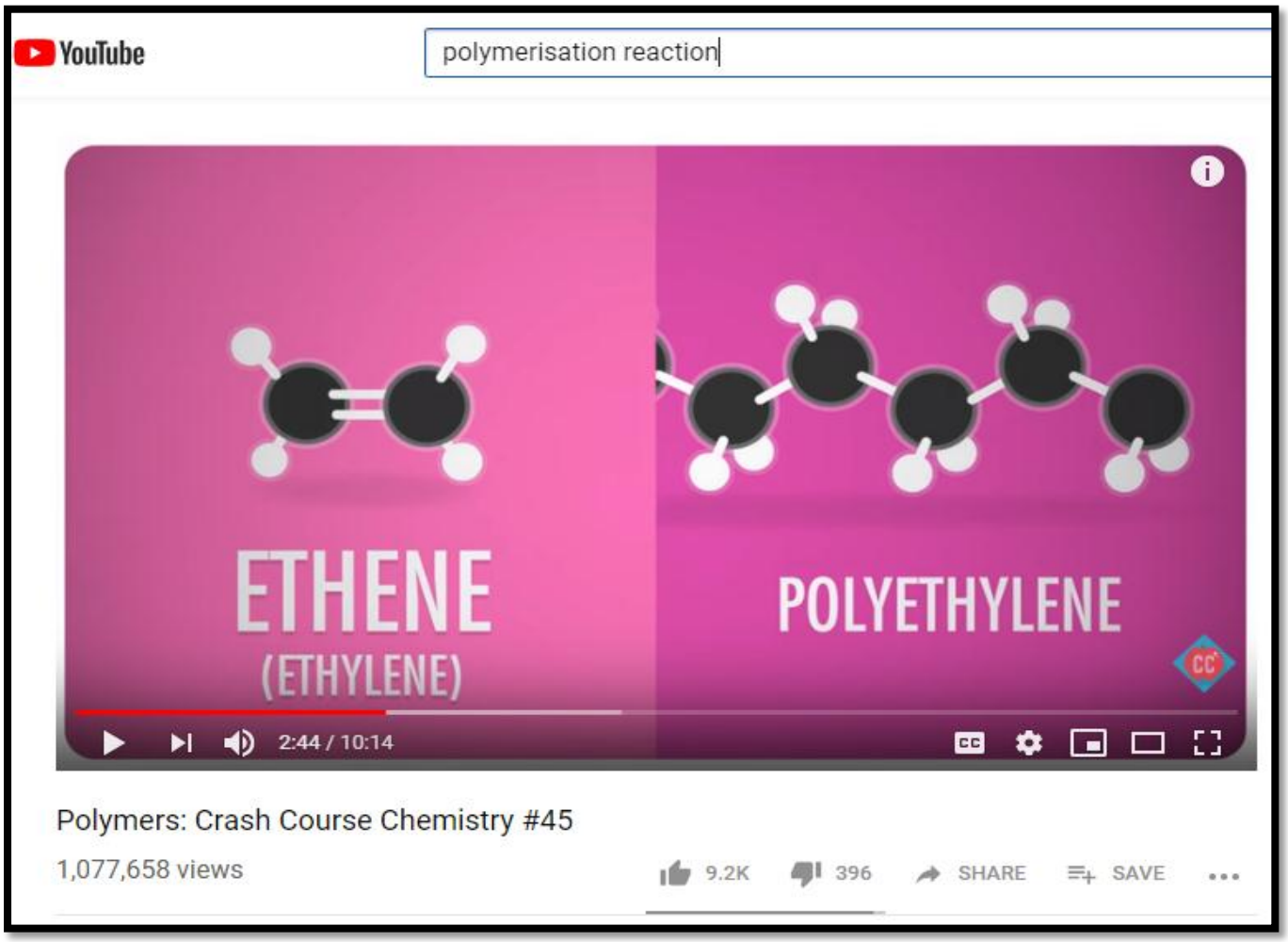
Quick Graph is a detailed graphing calculator that plots points, graphs lines, equations, and shapes on a coordinate plane, as well as a 3-dimensional plane. Quick Graph can be used in formal learning environments where the teacher teaches the lesson, and students use the app to practice and strengthen skills learned.


Equations
Edit
y=(x+5)/x
y=-(x/3)^2+6
x^2+y^2=4
y<2·x+5
y>x/5-3
y=2^x
y=sin(x+3)
2.3438, 5.0763
2.3438, -0.8072

QUICK GRAPH

YOUTUBE

YouTube allows users to upload, view, rate, share, report, comment on videos, and subscribe to other users. It offers a wide variety of user-generated and corporate media videos. Available content includes video clips, TV show clips, short and documentary films, audio recordings, live streams, and other content such as video blogging, short original videos, and educational videos.

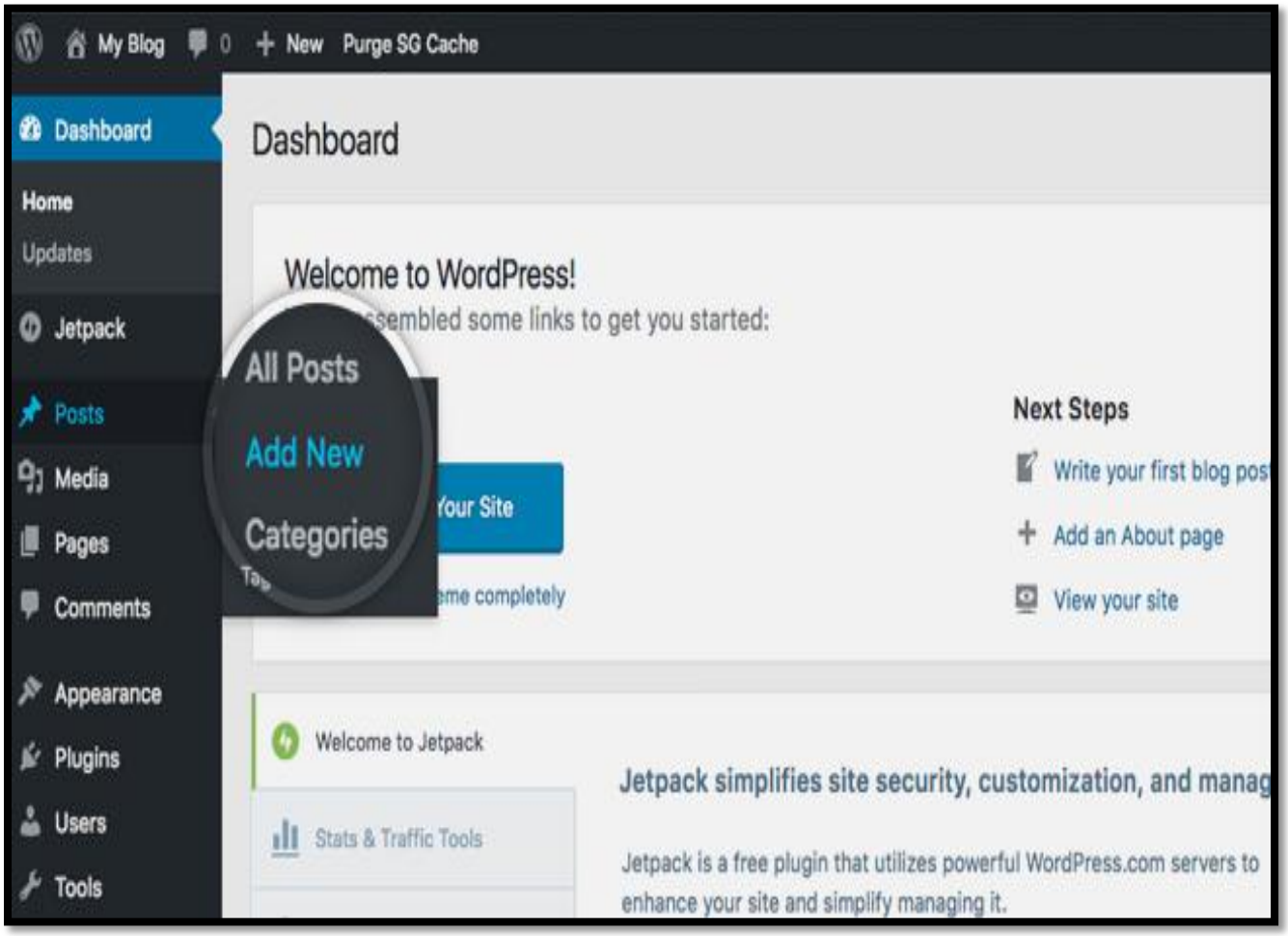

YouTube
polymerisation reaction
ETHENE
(ETHYLENE)
POLYETHYLENE
2:44 / 10:14
Polymers: Crash Course Chemistry #45
1,077,658 views
9.2K
396
SHARE
SAVE

YouTube

WORDPRESS

WordPress is a piece of software which has become the most widely used content management system and is used for setting up blogs. It allows users to create and edit websites through a central administrative dashboard, which includes a text editor for modifying content, menus and various design elements. Users can write posts into the software and other people reading the post can write comments about it.

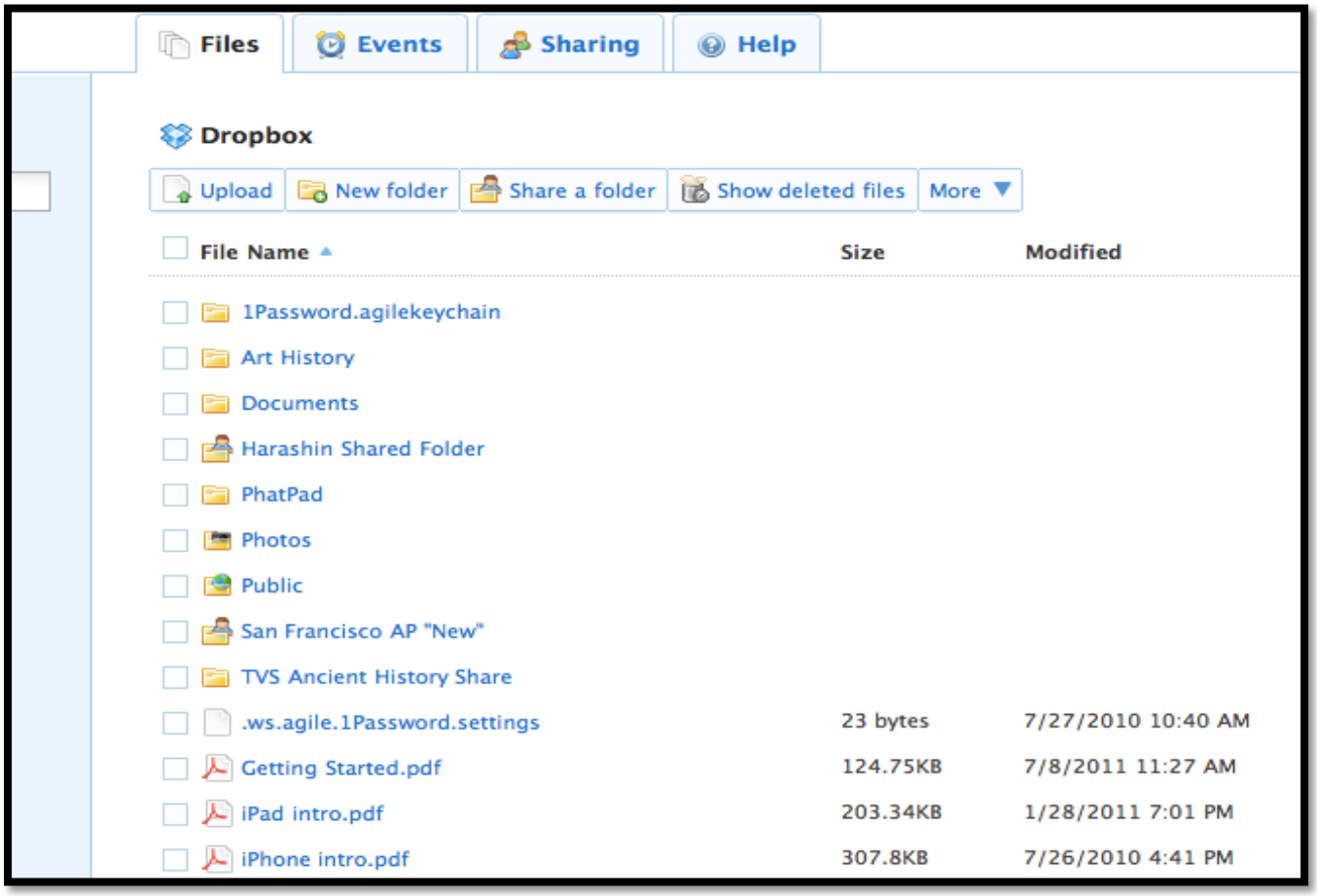
‘


My Blog
0
New
Purge SG Cache
Dashboard
Home
Updates
Jetpack
Posts
Media
Pages
Comments
Appearance
Plugins
Users
Tools
Dashboard
Welcome to WordPress!
All Posts
Add New
Categories
Next Steps
Write your first blog pos
Add an About page
View your site
Welcome to Jetpack
Stats & Traffic Tools
Jetpack simplifies site security, customization, and manag
Jetpack is a free plugin that utilizes powerful WordPress.com servers to enhance your site and simplify managing it.

WordPress

DROPBOX

Dropbox can create a special folder on the user's computer, the contents of which are synchronized to Dropbox's servers and to other computers and devices where the user has installed Dropbox, keeping the same files up-to-date on all devices. Dropbox can be a great teaching or learning tool and this will introduce to the students easily.


Files
Events
Sharing
Help
Dropbox
Upload
New folder
Share a folder
Show deleted files
More
File Name
Size
Modified
1Password.agilekeychain
Art History
Documents
Harashin Shared Folder
PhatPad
Photos
Public
San Francisco AP "New"
TVS Ancient History Share
.ws.agile.1Password.settings
23 bytes
7/27/2010 10:40 AM
Getting Started.pdf
124.75KB
7/8/2011 11:27 AM
iPad intro.pdf
203.34KB
1/28/2011 7:01 PM
iPhone intro.pdf
307.8KB
7/26/2010 4:41 PM

Dropbox

Compiled by

Anna Mariam Raj

II M. Sc. Child Development

Department of Home Science & Centre for research

St. Teresa's College, Ernakulam

Kerala, 682011

Supervised by

Smt. Leena George

Assistant Professor

Child Development

Department of Home Science & Centre for research

St. Teresa's College, Ernakulam

Kerala, 682011