Use of Technology in Arabic Language Teaching at the University of Dhaka: Observation and Recommendations

(Submitted to the University of Dhaka in partial fulfillment of the requirement for the degree of Master of Philosophy in Arabic)

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University of Dhaka

The Holy Verse

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

يُؤْتِي ٱلْحِكْمَةَ مَن يَشَآءُ ۚ وَمَن يُؤْتَ ٱلْحِكْمَةَ فَقَدْ أُوتِىَ خَيْرًا كَثِيرًا ۗ وَمَا يَذَّكَّرُ إِلَّآ أُوْلُواْ ٱلْأَلْبَبِ ﴿٢٦٩﴾

سورة البقرة

"He gives wisdom to whom He wills, and whoever has been given wisdom has certainly been given much good. And none will remember except those of understanding". *Surah Al- Baqarah (2:269)*

Declaration

I do hereby declare that I am the sole author of this research paper entitled "Use of Technology in Arabic Language Teaching at the University of Dhaka: Observation and Recommendations". I have not submitted this dissertation or any of its parts anywhere else for any purpose.

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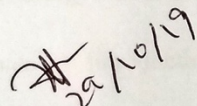Dept. of Arabic, University of Dhaka
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Certificate

This is to certify that the thesis entitled *Use of Technology in Arabic Language Teaching at the University of Dhaka: Observation and Recommendations* prepared by Mohammed Zahirul Haque, a research fellow of the Department of Arabic, University of Dhaka (Reg. No: 89/2013 – 2014) for the degree of MPhil has been completed under my supervision. This dissertation has been an original research work and, so far I know, no research work on the same subject under the same title was undertook by anyone. I have gone through the prepared thesis and allow it to be submitted to the University of Dhaka for obtaining the degree of MPhil.

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তত্ত্বাবধায়ক
আরবী বিভাগ
ঢাকা বিশ্ববিদ্যালয়

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Abstract

Technology, comprising of science and engineering, is the basement of modern development in human civilization of this era. In the age of modern science, we are naturally accustomed to extensive use of technology in our daily life. The 21st century is considered as the blessing of ICT. All the sectors of a country such as education, health, agriculture, business, travel, transport, industry etc. cannot work appropriately without the use of technology. Many applications are now being used in all those sectors to automate the process and ease human life. Using technology in a particular task is saving much time that might take many hours or years to complete manually. In consequences, human activities have become very fast and efficient that they can spend their valuable time in other tasks.

Educational Technology refers to the appropriate use of scientific or programmed tools which facilitate educators and learners to disseminate knowledge among wide range of people with efficiency and effectiveness, and create much learning stimulus as well. It aims to advance education easing the learning processes and expanding performance of the educational system(s) as it relates to effectiveness and/or efficiency. Modern educational technology tools are being developed embedded with AI, AR, and VR to ensure the best quality of educational tools so that it can engage teachers and learners collaboratively and efficiently to ease the teaching and learning process.

As technology is improving continuously, and integrating with education, Educational Technology is emerging as a new field of study. Our attempts in this dissertation are to study and point out educational technology as an emerging field of study for knowledge and to study the

status of using technology in Arabic language teaching at the university of Dhaka, as well as how the condition of Bangladesh be adapted to educational technology in education system. This dissertation consists of two main study points. The first point includes the study of educational technology and the condition of its use in Bangladesh and the second point includes quantitative data analysis and recommendations. Discussions have been divided into eight chapters. Each chapter goes with particular topic. Before starting all the chapters, we have mentioned The Holy Verse, Declaration, Certification, Table of Contents, Acknowledgement, Abstract, Introduction, Literature review, and Methodology. The Chapters are as follows:

Chapter 1 discuses about the basic study regarding Technology including the definition of Technology, difference among science, engineering, and technology, different types of technologies, relation between language and technology, and about linguistics and language technology.

Chapter 2 sheds light on Educational Technology with a broad discussion about the definition of Educational Technology, scope and goals of Educational Technology including the importance, theories, and practices of educational technology as well as comparative study of Educational Technology and Instructional Technology.

Chapter 3 talks about two main components of Educational Technology, such as Hardware and Software including their huge discussion. Hardware discussion is equipped with explanation and familiarity of many latest educational technology devices. Software discussion

includes why and who need to use educational technology software, trends in ET (Educational

Technology), categories and types of ET and a popular list of Educational Technology software.

Chapter 4 discusses broadly about the evolution of Web including the evolution of Web

from Web 1.0 to Web 5.0 with their definitions, basic elements, characteristics, various gradual

technological improvements, and future possible technologies.

Chapter 5 discusses about the professional development of Teachers and about various

challenges towards professional development of the teachers.

Chapter 6 elaborates broadly about the Educational Technology in Bangladesh

perspective. It includes the history of educational technology in Bangladesh, Growth of ICT

education in various stages such as primary, secondary, diploma, and undergraduate levels. It

also discusses about the latest development and changes in education system of Bangladesh with

massive IT infrastructures and challenges in ICT of Bangladesh.

Chapter 7 discusses the use of educational technology in Arabic language at the

University of Dhaka, based on quantitative data analysis of survey questionnaire. It discusses

about how investigation was designed and implemented in sample selection and data was

collected. Then, it analyzed the survey responses and figured out the result into two sections such

as Analysis of Teachers' responses, and Analysis of Students' responses based on the various

categories of the questions.

In Chapter 8, recommendations of the research based on the data, collected from teachers and students, and descriptive and exploratory discussion of the secondary sources have been presented.

Towards the end of the thesis we have presented the conclusion, list of tables, list of figures, appendices, and references. Appendices include the questionnaires used for survey campaigns, abbreviations, and indexes.

Keywords: UTALT, Educational Technology, E-learning, Language Technology, Usage of technology, IoT, Semantic Web, Artificial Intelligence, Virtual Reality, Augmented Reality, Distance learning, Sensory web, BS-1.

Introduction

Educational Technology is revolutionizing the process of language teaching in this modern world. It is contributing spontaneously to second language acquisition. With the integration of technology in education, language learning has become more convenient and available for all anywhere in the world. It has made the language learners closer to native people. Now, learners can watch and hear simultaneously to the people of target language by means of technology.

Language is a sole medium to communicate from one side to another. The definition of language was limited previously with human language, but this term now includes communication protocol or way to exchange information from one object to another. For example, computer has some special languages those are used to interact with one another. That may be a human or another machine. Previously human learnt to operate machine; but nowadays, machine is learning human to operate human. Interesting? Let's see how. Maybe you have heard about Artificial Intelligence (AI). Machine learning is the main notion of Artificial intelligence. Experts says-

"Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves." (ExpertSystem, 2017)

According to the definition, AI enabled computer programme always learning experience from human interaction with computer, gathering data, analyzing data through neural network and behaving or predicting to human needs. All these things happen through a defined process (algorithm) in the computer. The most apparent example we can mention here is Robot that can

interact with human as like human in most cases. This AI programme is actually always learning to provide the most accurate information based on the existing data in it. Neural network of AI follows the processes how human learning happens. According to the education neuroscience, "learning is a process by which neurons join by developing the synapses between them. Knowledge is arranged hierarchically, with new knowledge being linked to existing neural networks" (Brückner, Educational Technology, 2015).

Computer program is understanding human voice and interpreting it instantly with other languages. Previously, we saw google translation could translate a text to another language, and could read the written text paragraph; but now these kinds of services have made more improvement based on AI to understand human voice and instantly translate to another language. Google translator is one of the most popular educational technology tools used by more than 500 million active users every month (Brooks, 2016) .

There are numerous educational technology tools have been already developed and actively being used by educators, teachers, students, researchers at the universities, and various academic and non-academic institutions. People are getting huge benefits from these emerging technologies. The department of Arabic at the university of Dhaka is one of the key departments which is providing graduate and post graduate programs in Arabic language and literature. Its constantly playing significant role in Arabic language teaching is our main discussing point. This research aims to analyze the current situation of the department and understand the improvement points for further development from the view point of the educational technology.

Literature Review

Over the last two decades, technology has brought a massive and rapid change in every sector of human life, especially the education sector. Revolutionary changes started gradually from the education sector respectively and spread out other sectors. Educational technology has made a great improvement in teaching, learning, collaborating, and interacting between teachers and students. So, educational technology is being adapted by the department of languages at the universities in home and abroad and even by other departments of a university. So, we have aimed Arabic language here to determine how the university of Dhaka, especially the department of Arabic is adapting educational technology in teaching Arabic language and their regular courses as well as how educational technology is emerging as a field of study and adjusting in the education system in their regular curricular activities.

Trends of the world:

There are many educational technology tools, hardware and software, have been already developed to make learning environment interesting, pleasant, interacting, and collaborative. Integration of technology in language teaching and learning has made radical change which we dreamed before or even it was out of our dream in some cases. Now the latest technology tools are being developed with AI (Artificial intelligence), AR (Augmented Reality), VR (Virtual Reality) which is replacing the old style of learning, communicating, and knowledge sharing platform. The history and theoretical development of educational technology derived from the advance research of educational psychology and development of science and technology in parallel. Whenever any new technology invented, it was adapted in education system anyway if there were any benefit to education or related to education. Such as smartboard, google

translation tool (text & voice), virtual classroom system, virtual learning environment (VLE), learning management system (LMS), etc.

Trends of Bangladesh:

The history of Educational technology as part of ICT started through the initiative of e-learning or distance learning programme. "In Bangladesh, e-learning was first introduced as early as 1960s as a Radiobroadcast followed by a pilot project School Broadcasting Program (SBP) in 1980s" (Islam & Selim, 2006). Hence there were many initiatives in the development of education system. Consequently, Bangladesh Open University (BOU) was established in 1992 as the first and only national distance learning university in Bangladesh which was a great sign of educational technology advancement and adaption in the country (Islam & Selim, 2006). Formal education in computer was first started in 1984 with the establishment of Computer Science and Engineering Department in Bangladesh University of Engineering and Technology (Lawyers & Jurists, 2019).

Government has established a massive ICT infrastructure for the development of digital Bangladesh goal and they concentrated on education, healthcare, transportation, communication, and various industries. Bangladesh launched its first satellite "Bangabandhu Satellite-1" into orbit on May 11 from the Kennedy Space Center in Florida (Shariful, 2018) which will support to provide, along with other services, high speed internet and communication protocol in the rural and distance area of Bangladesh such as coastal bay area.

With the support of a2i[1], Access to information programme founded in 2007, the government has initiated many projects in the development of educational technology in the country. Such as starting from 2010, the Ministry of Education has established 23,333 multimedia classrooms in secondary schools and Madrasas. Furthermore, schools have included another 7,000-plus more MMC[2] facility by their own means. Now, almost 100% secondary schools have at least one multimedia classroom. In addition, the Ministry of Primary and Mass Education has decorated 15,000 MMC in primary schools. Multimedia classroom includes one projector, one laptop, a set of speakers with internet package at least for one year. Main objective of this MMC is to leverage cognitive attainment of learners using up to date knowledge, examples and audio-visual contents. (Islam M. R., 2019).

A teachers' portal was launched on May 16, 2013 by there are now above 344,000 teachers registered and 150,000 audio-visuals contents have been developed and made available in this portal. all those contents can be accessed for free. On February 1, 2018 governement launched "Konnect" (www.konnect.edu.bd), an adolescent's portal that is mostly a student' portal. Now there are above 280,000 students in Konnect that is a platform allowing wide range of edutainment contents created by various partner organizations as well as crowd sourced by learners. Konnect will enrich young minds with extra-curricular books, films, fun experiments, comics and games that promote healthy and safe usage of internet (Islam M. R., 2019).

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[1] Access to information in Bangladesh or a2i is a UNDP and USAID-supported Access to Information Programme ran from the Prime Minister's Office of Bangladesh.
[2] Multimedia classroom

With the development of this current technology trends in education sector and in the world education notion, how the University of Dhaka, especially the department of Arabic is adjusting their curriculum and courses. How's the ratio status of current ICT skills of both teachers and students and their interest to adapt new technology and implement them in education. What's the educational technology and how it is evolving as a field of study? There are already education experts started talking about educational technology with their innovation, research, adapting technology and exploring more potentialities in the field. In this dissertation, we will try to study all these questions and their answers based on quantitative research data models, descriptive, and exploratory methods.

Methodology

This research will be developed on the basis of quantitative, exploratory, and descriptive research methodology. Page layouts, paragraphs, references, bibliographies, footnotes, figures, tables, and appendices will be written in modern APA (American Psychological Association) format, latest 6th edition.

Objectives:

The objectives of this research aim

- ✓ To understand the present situation of using technologies in Arabic language teaching and learning at the University of Dhaka, especially at the department of Arabic

- ✓ To understand the situation of Arabic language teachers and learners in the department of Arabic from the point of views of educational technology.

- ✓ To know about Educational Technology as a field of study and subject matter that can be exciting to avid & expert learners and explore their potentialities in the field.

- ✓ To have a solid understanding and recommendations of integrating educational technology in language teaching and learning environment.

- ✓ To know the current integration and development status of educational technology in the education system of Bangladesh

Procedures:

Following the quantitative process, the analytical data has been gathered through the survey questionnaires, divided into two question papers. One question paper for the teachers of the department of Arabic, DU and another question paper for the students of the same department. Teachers were invited randomly to participate in the survey campaign and requested to answer the questions individually. Each teacher received a single sheet of questionnaire with multiple pages in hard paper. Around ten teachers attended in the campaign. We invited the students from different years and semesters to respond to the questionnaire. We provided online URL link of the questionnaire, designed in Google Forms, to the students so that they could respond conveniently. According to the supervisor instruction, some questions were translated into Bengali language for sound comprehension of the purposes. There were around 42 students participated in the survey campaign. Beside the questionnaire, we tried to get individual feedbacks from the students about various issues related to the research through one to one procedure.

In accordance with the research topic, we also used secondary data sources from various resources. The data sources we used are as follow:

➢ Books on technology, educational technology, language teaching and learning

➢ Educational technological journals

➢ Educational Summit magazines, and report

➢ Research and thesis papers

➢ Related conference publications and papers

➢ Interview papers of technology experts

➢ Video podcast

➢ Reliable wikis, blog, websites, reports, newspapers

➢ Scientific journals

➢ Educational technology presentations

➢ Related topics, published in the prominent universities

The paper has been written after collecting primary data and exploring key concept from the primary and secondary data sources with reliable source information.

Chapter – 1: Introduction to Technology

This chapter discusses about the basic introduction to Technology, such as the definition of technology, differences between science, engineering, and technology, different types of technologies, relation between language and technology, and linguistics and language technology.

1. **Definition of Technology**

The term "Technology" originated in **early 17th century**: from Greek *tekhnologia* 'systematic treatment', from *tekhnē* 'art, craft' + *-logia*. Noun (plural technologies)

The application of scientific knowledge for practical purposes, especially in industry: advances in computer technology. (Definition, n.d.)

Here are some dictionary entries for *technology*:

- ❖ "Theoretical knowledge of industry and the industrial arts".
- ❖ "The application of science to the arts". (Funk & Wagnall's, 1946)
- ❖ "Science of the industrial arts; practical arts collectively". (Oxford, 1969)
- ❖ "The methods for using scientific discoveries for practical purposes, esp. in industry". (John, 2002)
- ❖ "Knowledge, equipment, and methods that are used in science and industry". (Cambridge, 2002)
- ❖ "New machines, equipment and ways of doing things that are based on modern knowledge of about science and computers". (Longman, 2003)
- ❖ "The branch of knowledge concerned with applied sciences". (OxfordOnline, 2004)

These entries cover just over fifty years, and disclose an ongoing change in meaning. The idea of arts drops out, while science is augmented to include science and computers. In this way, since the noun describes technology in practical use, its meaning now covers new or emerging kinds of technology. As a noun, therefore, technology does not denote a single, unchanging and

specific thing. It denotes, rather, a very general category of things - which includes a very wide range of other things, some of which change over time.

The definitions of technology in Wikipedia:

The word **technology** refers to the making, modification, usage, and knowledge of tools, machines, techniques, crafts, systems, and methods of organization, in order to solve a problem, improve a preexisting solution to a problem, achieve a goal, handle an applied input/output relation or perform a specific function. It can also refer to the collection of such tools, including machinery, modifications, arrangements and procedures.

According to the American Heritage Science Dictionary, technology is the use of scientific knowledge to solve practical problems, especially in industry and commerce. To put it simply, it means that anything that uses information from the field of science and math to solve problems (equations, real-life, programming, etc.) is technology. (Bolognaking, n.d.)

Naturally, the definition varies from person to person. So, the general definitions above apply for technology.

Actually, the above is a better definition of engineering. As a definition, it does not adequately cover older and simpler technologies. There can be no doubt that the invention of the wheel was a technological leap forward, but it is uncertain how much science or math went into it.

Looking at the etymology of the word, it comes from "teknos", a craft, and "logos", knowledge. What the word means is a method of getting something done.

❖ Technology is a way in which the quality of human life is improved with the introduction of new products. Technology is, by all means, a double-edged blade. It is a tool after all. Technology is neither good nor bad. The way it is utilized determines its attribute.

The world has changed so much and technology was, and still is, the main driving force behind it. Technology has made the world a much better place to live in. The conveniences brought to us by technology is just so hard to ignore that many people today cannot just imagine life without their cell-phones, television sets, or the Internet, for that matter. Finally, we can say: Technology is the application of scientific knowledge for practical purposes where people find their lifestyle more convenient and comfortable.

2. **Science, engineering, and Technology**

The distinction between science, engineering and technology is not always clear. Science is the reasoned investigation or study of phenomena, aimed at discovering enduring principles among elements of the phenomenal world by employing formal techniques such as the scientific method. Technologies are not usually exclusively products of science, because they have to satisfy requirements such as utility, usability and safety.

Engineering is the goal-oriented process of designing and making tools and systems to exploit natural phenomena for practical human means, often (but not always) using results and

techniques from science. The development of technology may draw upon many fields of knowledge, including scientific, engineering, mathematical, linguistic, and historical knowledge, to achieve some practical result (Wikipedia, Technology, 2013).

Technology is often a consequence of science and engineering — although technology as a human activity precedes the two fields. For example, science might study the flow of electrons in electrical conductors, by using already-existing tools and knowledge. This new-found knowledge may then be used by engineers to create new tools and machines, such as semiconductors, computers, and other forms of advanced technology. In this sense, scientists and engineers may both be considered technologists; the three fields are often considered as one for the purposes of research and reference (Wikipedia, Technology, 2013).

3. Different types of technologies

Technology has spread out every industry and shaped a new world. There are many areas that have been greatly influenced by the use of technology. A lot of enhancement and productivity has been realized as a result. Though there are many views, both negative and positive, about technology, the bottom line is the impact it has had on many growing industries.

Technology is classified in many ways in which technology is utilized. To provide a comprehensible approach, we will list the technology as the following types:

3.1. Medical technology – this refers to more than just procedural methods used to treat patients during surgery or for life support. Medical technology goes outside hospital surroundings. There are those who need medical attention even in their homes or whilst working so as to carry

on their daily activities effectively. Individuals with hearing impairments can have this corrected through the use of cochlear implants. Those who have missing limbs – legs, arms – can get implants as well and go about life normally. Seniors sometimes run short of breadth thus they need oxygen supply which is also available. For example, artificial limbs and hip and knee implants can help people function in the environment. Cochlear implants can often improve the hearing of people with auditory nerve damage. Some devices provide respiratory assistance through oxygen supplementation and mechanical ventilation. Others, such as cardiorespiratory monitors and pulse oximeters are used as surveillance devices that alert an attendant to a potential vitality problem. Nutritive assistive devices can assist in tube feeding or elimination through ostomies. Intravenous therapy can be provided through medication infusion and kidney function can be assumed by kidney dialysis machines. Medical technology supports and ensures continuity of life (Edward, 2000).

3.2. Administrative technology – this type of technology usually indicates to equipment and other resources used to maintain everyday activities in offices and office buildings. These include printers, photocopiers, fax machines, telephones, industrial vacuum cleaners, etc (Edward, 2000).

3.3. Instructional technology – Although there are differing opinions about the nature of instructional technology, the Commission on Instructional Technology (1970) provided the following definition:

"Instructional technology is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in

human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction" (To improve learning)**.**

This encompasses technologies that are used to teach, learn and communicate particular ideas efficiently. These include television, computers, computer software, the internet, videotapes and video recording devices, among others. All these are necessary because they deliver information and communicate in different ways. Each technology is utilized based on the subject matter and the proposed result.

3.3.1. Television

There are both complete channels and individual shows that can be accessed via cable and/or satellite. Cable programs are less expensive and require "lower tech" equipment, but satellite programs are generally more timely, specialized and can be interactive (i.e., programs are broadcast live and participants and program hosts/guests can interact via telephone, fax and/or e-mail. See the Public Broadcasting Service [PBS] site, an American organization that offers specialized learning programs via cable, satellite broadcast and more recently, online.) Dotto's Data Cafe is an example of an "edutainment" show available on cable. It is a Canadian "how to" show about technology and is broadcast weekly on Canadian Learning Television, a specialty cable channel dedicated, as the name suggests, to learning (Herod, 2000).

3.3.2. Tape and Videocassette Recorders

Tape recorders are particularly useful for students who have an auditory learning style (i.e., learn best by listening). For example, if you are teaching homonyms (i.e., words that sound alike,

but are spelled differently such as *they're, their* and *there*) to a student with an auditory learning style, you might tape yourself reading various sentences. The student would have to listen to the tape and when they hear the homonym, write the correct spelling based on how the word is used. In addition to taping class activities, there is an increasingly wide range of audiotapes and videotapes available for use in literacy instruction (Herod, 2000).

3.3.3. Computer and Computer Peripherals

The versatility of the computer warrants a full section and therefore, is covered in a divided section. There are also many "peripherals" (equipment that is used in coincidence with a computer) available and new ones being developed daily, but the fundamentals include printers, as well as scanners, digital cameras (both of which can be used to generate many different styles of electronic student portfolios), and data projectors (Herod, 2000).

3.4. Assistive technology –Assistive technology employs the use of various types of services and devices designed to help people with disabilities function within the environment. Assistive technologies include mechanical, electronic, and microprocessor-based equipment, non-mechanical and non-electronic aids, specialized instructional materials, services, and strategies that people with disabilities can use either to

> ➢ assist them in learning,
>
> ➢ make the environment more accessible,
>
> ➢ enable them to compete in the workplace,
>
> ➢ enhance their independence, or
>
> ➢ otherwise improve their quality of life.

This is essential in our society. It is mainly used to aid those within the community who have disabilities, whether a learning disability, physiological or psychological. This type of technology utilizes specialized equipment, teaching materials and services that will enable these individuals perform and function within their surroundings. Assistive technologies may include commercially available or "home-made" devices that are specially designed to congregate the idiosyncratic need of a particular individual (Blackhurst & Lahm, 2000). Examples include eyeglasses, communication aids, alternative computer keyboards, adaptive switches, and services such as those that might be provided by speech/language pathologists.

3.5. Information technology – Information technologies provide access to knowledge and resources on a wide range of topics. The Internet, and its WWW (World Wide Web) component, is the most prominent example of information technology. The Educational Resources Information Center (ERIC)[3] is another example. The ERIC system enables people to search and locate much of the world's educational literature on a given topic. This is to instill knowledge through use of vital resources and materials. The most utilized form of information technology currently is the internet.

The above-mentioned technologies can be used independently or together. They are all necessary and important for the development of a community and a nation as a whole. However, over reliance on technologies should be observed. They are meant to assist us develop not vegetate

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[3] http://www.eric.ed.gov/

and become inactive. Through the use of aforementioned technologies, we should grow, cultivate ourselves and our environment (Admin, 2011).

4. Relation between language and technology

The history of language and technology is not as old as the history of language, but is accurately as old as the history of recorded language. It means at first the recording of language was by the use of symbols - pictograms and ideograms.

4.1. The history of technologies for writing

In the present world we take for approved the availability of writing materials, resources and their implements. But only the writing has a history. Some of the most ancient writing in the world that has survived today appears on large blocks of stone. This may be a appropriate material for significant documents that are meant to be stable. But people looked for a way to make texts more portable early in the history of writing.

Between 4000 B.C. and 3500 B.C. the Sumerian people who lived Around the Tigris and Euphrates rivers smooth river clay abounds found a way to use this clay as a writing material. To begin with, they used picture language, not unlike the writing of Egypt. Over the period, in an evolution we can mark out in surviving proof, the Sumerians simplified their pictures into fundamental patterns of a few lines (Andrew, 2005).

The improvement of this fundamental writing was also determined by the technology used to create marks in the clay. It was a tool rather similar to a pencil but without a lead, and not

sharpened. The writer would press a corner of the end into the clay, making a wedge-shaped line. The writers immediately found that by combining five or six such lines or strokes, in an array of vertical and horizontal positions, they could generate a range of signs to cover all objects and ideas about which they would like to write.

For many reasons, however, stone and clay are not practical materials. For example, if someone wants to be able to write down a long story, and keep it in a moveable form - how can one do this using stone as a writing material? The explanation to this problem came from another part of the ancient world, Egypt. The writing of Egypt, like that of the Sumerians, began as a picture language. Here, too, the pictures became stylized over time, but less so, because the Egyptians had a more flexible means of writing. Their writing material was papyrus (a kind of reed, which grows in marsh areas). The soft pith from within the tough stems was cut into long strips. These were laid side by side to form a first layer, after which a second layer was laid on top, at right angles to the first. Both layers were hard-pressed collectively, releasing a natural gum, which bonded the strips jointly to figure paper sheets. These were glued together to form much longer sheets, which were rolled up for carrying (Andrew, 2005).

The implement of writing used by the Egyptians was a reed, frayed at the end, to form a brush. Later, the Greeks would change this with a split reed, forming a nib. The nib enables the writer to control a flow of ink to a finer point. The ink was a mixture of gum and a coloring agent - soot or lampblack. The scroll was to have a long history and widen far beyond Egypt. For the manufacturer, which had a virtual monopoly of the commercial supply it was a precious product for foreign trade.

The Egyptians used the familiar hieroglyphics for writing on the stone. They soon understood that writing on paper could be swifter if they simplified the writing to a script. Carving on stone is easier using straight lines, but with a brush and paper, rounded strokes are possible. Apart from having to dip the pen in ink every so often the scribe could write continuously (rather as we do with modern pens). The writing on papyrus developed into a more rounded script in a style known as cursive (which means "running" in Latin). This form of writing also took its name from the *hieros* or priest and is called hieratic script. It marks a kind of evolution in the development of writing, between hieroglyphic and alphabetic script. The Phoenicians are the people traditionally credited with the move to a system of characters to correspond to sounds, rather than whole words - in effect, an alphabet. This development meant that a fairly small number of symbols could be used, in combinations, to represent all the words in a spoken language. This was a step of genius, which some languages have never taken. From this point, it is feasible to trace the evolution of different writing systems that use alphabets (again the name, "alphabet", comes from Greek) (Andrew, 2005).

Papyrus was the most widespread material but from the earliest times when they wrote the books of the Law, the Hebrew scribes would also use leather. From about 200 B.C. onwards another material appeared - which was parchment. The skins of goats and calves were shaved, split, bleached, hammered and polished to form a smooth writing surface. This was a more expensive writing material than papyrus, but longer lasting.

The first books were scrolls, up to thirty meters in length, formed by pasting together papyrus sheets. For reading, these were unrolled from one end, and rolled up from the other, to

present a manageable portion of text to the reader. The Romans developed a different kind of book type. This was made of wooden tablets, coated with wax, in which the writer cut letters with a stylus. These tablets were bound with leather thongs that passed through holes in the wood. It is easy to see how this gave us our modern book form. The only big difference was that for many years these books were written entirely by hand - which is why they are called manuscripts (Andrew, 2005).

4.2. Typesetting and printing

While writing has a long history, stretching over hundreds of years, printing is comparatively a recent invention. Printing with portable clay type revealed in China in the 9th century AD. But the western tradition, from which modern typesetting derives, begins in 1436 in Germany with the printing press of Johannes Gutenberg. This used replaceable wooden and later metal, letters. Initially these were limited in number so that Gutenberg had to set up a page, print multiple copies, and then take it down, in order to set up the next page. In 1452 Gutenberg produced a printed version of the Latin Bible (Andrew, 2005).

At first Printing was a costly way to publish books, and for many years after its discovery more books were published in manuscript (hand-copied) than printed form. Over the centuries the process became faster and more perfect. The greater availability of type eventually made it possible to leave pages set up. In the 19th century, Charles Dickens and others were able to publish novels serially in reasonably cheap installments - perhaps for the first time bringing considerable printed texts to a mass readership.

Printing may be seen as having two important effects on language in the west.

❖ First, it is an agent of mass literacy - by providing appropriate and affordable texts in large numbers it encouraged and supported ordinary people in learning to read.

❖ Second, it is an agent of standardization. Following the publication of Dr. Johnson's dictionary in 1755, and also prescriptive books on grammar, such as Robert Lowth's (1762), publishers came to use house styles, which more or less established certain written forms as a standard (Andrew, 2005).

5. Linguistics and language technology

To be able to turn linguistics into a hard science, Chomsky [1957] [4]assigned a mathematical connection to the intuitive idea of a "language". He projected to identify a language with a set of sentences: with the set of grammatically correct utterance forms that are possible in the language. The goal of descriptive linguistics is then to characterize, for individual languages, the set of grammatical sentences explicitly, by means of a formal grammar. And the goal of explanatory linguistic theories should then be, to find out the universal properties which the grammars of all languages share, and to give a psychological explanation of these universals (Remko, 1990).

In this case, linguistic theory is not directly concerned with describing the actual language use in a language community. Although we may think that there is a relation between the language users' grammaticality intuitions and their actual language behavior, we must make a sharp difference between these.

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[4] Chomsky: Author of "Syntactic *Structures*". The Hague: Mouton, 1957.

On the one hand the language system may propose potentials which are seldom or never used. On the other hand, the actual language use involves mistakes and sloppinesses which a linguistic theory should not essentially account for. In Chomsky's terminology: linguistics is concerned with the linguistic *competence* rather than the actual *performance* of the language user. Or, in the words of Saussure, who had emphasized this distinction before: with *langue* rather than *parole*.

Chomsky's work has constituted the methodological paradigm for almost all linguistic theory of the last few decades. This comprises not only the research tradition that is explicitly aiming at working out Chomsky's syntactic views. The perspective summarized above has also determined the goals and methods of the most important alternative approaches to syntax. Now we may ask: how does language technology relate to this language-theoretical paradigm?

Relatively few language technologists invoke Chomsky's ideas explicitly; but their methodological assumptions tend to be implicitly based on his paradigm. Of course, there are also important differences between the theoretically oriented and the technologically oriented language research. Compared to theoretical linguistics, language-technological research has usually been more descriptive, and less concerned with the universal validity and the explanatory power of the theory. In developing a translation system or a natural-language database-interface, the descriptive adequacy of the grammar of the input language has obviously a higher priority than gaining insights about syntactic universals. Equally evident is the observation that the syntactic and semantic rules developed for a language-technological application must be articulated in a strictly formal way, whereas the results of theoretical research may often take the form of essayistic reflections on different variations of an informally presented idea (Remko, 1990).

We thus see a complementary relation between theoretical linguistics and language technology. The theory is concerned, often in an informal way, with the general structure of linguistic competence and Universal Grammar. In language technology one attempts to specify, in complete formal detail, descriptively sufficient grammars of individual languages. Therefore, language-technological work will ultimately be of substantial theoretical importance: the theoretical speculations about the structure of linguistic competence can only be validated if they give rise to a formal framework which permits for the requirement of descriptively sufficient grammars. Because theoretical linguists do not appear particularly interested in this boundary condition of their work, the application-oriented grammar-development activities constitute a useful and necessary complement to theoretical linguistic research.

Language-technological work has shown in the meantime that for the development of theoretically interesting grammars, computational support is indispensable. Formal grammars which state some non-trivial phenomena in a partially correct way lean to get very complex -- so complex, that it is complicated to imagine how they could be tested, maintained and extended without computational tools.

There is another reason why language technology is remarkable for linguistic theory: language-technological applications engage systems which are proposed to work with some form of "real language" as input. Implementing a competence grammar will therefore be not enough in the end. One also needs software which deals with possibly related performance phenomena, and this software must interface in a passable way with the competence grammar. The possibility of complementing a competence-grammar with an account of performance phenomena is another state line condition of present linguistic theory which does not obtain a lot of concentration in

theoretical research. Language-technological research may also be of theoretical importance here (Remko, 1990).

There are thus many opportunities for motivating interactions between language theory and language technology; but until newly such interactions did not often happen. For a long time, language technology has developed in comparative segregation from theoretical linguistics. This segregation came owing to Chomsky's formulation of his syntactic insights significantly used the notion of a "transformation" -- and many found this a computationally repellent notion, especially for analysis-algorithms. Computational linguists felt that they needed to develop substitute methods for language description which were more straightly attached to locally visible properties of *surface structure*, and therefore easier to implement; this gave rise to improved Transition Networks and enriched context-free grammars. After the heydays of Transformational Grammar were over, there has been an incredible rapprochement between language theory and language technology. Because enriched context-free grammars, which are considered computationally pretty, acquired theoretical respectability.

Chapter – 2: Introduction to Educational Technology

This chapter discusses massively about the definition of Educational Technology, Scope of Educational Technology, Goals of Educational Technology, Significance of Educational technology, Theories and practices of Educational technology with board analysis of Behaviorism, Cognitivism, and Constructivism, and implications constructivism for teaching as well as a comparative discussion and understanding of Educational Technology and instructional Technology.

1. **Definition of Educational Technology**

The definitions of educational technology come from educators with technology. They emphasize on learning with the aid of technology which is continuously developing day by day and contributing in the history of education. Educational technology is a broad field. Consequently, one can find many definitions, some of which are contradictory. Educational technology can be measured either as a design science or as a collection of different research interests addressing basic issues of learning, teaching and social organization. However, there are a few features on which most researchers and practitioners might agree:

✓ Use of technology is principled: Technology means the systematic application of scientific knowledge to practical tasks. Therefore, educational technology is based on theoretical knowledge drawn from different disciplines (communication, education, psychology, sociology, philosophy, artificial intelligence, computer science, etc.) plus experiential knowledge drawn from educational practice.

✓ Educational technology aims to advance education. Technology should ease learning processes and expand performance of the educational system(s) as it relates to effectiveness and/or efficiency.

We can get the following definitions of educational technology.

❖ *"Educational technology is the considered implementation of appropriate tools, techniques, or processes that facilitate the application of senses, memory, and cognition to enhance teaching practices and improve learning outcomes"*. (Aziz, 2010)

❖ *"Educational technology, sometimes termed EdTech, is the area of technology that deals with facilitating e-learning, which is the learning and improving performance by creating, using and managing appropriate technological processes and resources".* (Wikipedia, Wikipedia: educational technology, n.d.)

❖ *"The study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources".* (Adams, 2004)

❖ *A complex, integrated process involving people, procedures, ideas, devices, and organization, for analyzing problems, and devising, implementing, evaluating and managing solutions to those problems, involved in all aspects of human learning.* (Glossary of Terms)

Above all, Educational Technology is an instrumental and programmed framework which enhances teaching and learning procedures effectively and is updated with the latest invention of research and development.

2. Scope of Educational Technology

Educational technology refers to the use of both physical hardware and educational theoretics. It encloses several domains, including learning theory, computer-based training, online learning, and, where mobile technologies are used, m-learning. Accordingly, there are several discrete aspects to narrate the intellectual and technical development of educational technology:

- Educational technology as the theory and practice of educational approaches to learning
- Educational technology as technological tools and media that assist in the communication of knowledge, and its development and exchange

- Educational technology for learning management systems (LMS), such as tools for student and curriculum management, and education management information systems (EMIS)

- Educational technology itself as an educational subject; such courses may be called "Computer Studies" or "Information and Communication Technology (ICT)"

Hence educational technology makes it easier to develop the teaching, learning, testing and training activities in terms of attaining educational goals. (Brückner, Educational Technology, 2015)

3. Goals of Educational Technology

Educational technology study always had a determined agenda. At times it only aims at improved competence or effectiveness of existing practice, but normally it aims at pedagogical change. While it can be considered as a design science it also addresses essential issues of learning, teaching and social organization and consequently makes use of the full series of modern social science and life sciences methodology. Collins said about the goal of educational technology:

"Technology provides us with powerful tools to try out different designs, so that instead of theories of education, we may begin to develop a science of education. But it cannot be an analytic

science like physics or psychology; rather it must be a design science more like aeronautics or artificial intelligence. For example, in aeronautics the goal is to elucidate how different designs contribute to lift, drag maneuverability, etc. Similarly, a design science of education must determine how different designs of learning environments contribute to learning, cooperation, motivation, etc". (Collins, 1992)

"Educational technologists would not therefore consider the computer as just another piece of equipment. If educational technology is concerned with thinking carefully about teaching and learning, then a computer has a contribution to make irrespective of its use as a means of implementation, for the design of computer-based learning environments gives us a new perspective on the nature of teaching and learning and indeed on general educational objectives". (O'Shea, 1983)

4.   Significance of Educational Technology

Dr Bhabagrahi Biswal and Dr Srutirupa Panda mentioned nine importance of educational technology in their book "Educational Technology Paper X". (Panda & Biswal, pp. 8-12)

Access to variety of learning resources: In the era of technology. ET aids plenty of resources to enhance the teaching skills and learning ability. With the help of ET now it is easy to provide audio visual education. The learning resources are being widens and widen. Now with this vivid and vast technique as part of the ET curriculum, learners are encouraged to regard computers as

tools to be used in all aspects of their studies. In particular, they need to make use of the new multimedia technologies to communicate ideas, describe projects, and order information in their work.

Immediacy to information: ET has provided immediacy to education. Now in the year of computers and web networks the pace of imparting knowledge is very fast and one can be educated anywhere at any time. New IT has often been introduced into well-established patterns of working and living without radically altering them. For example, the traditional office, with secretaries working at keyboards and notes being written on paper and manually exchanged, has remained remarkably stable, even if personal computers have replaced typewriters.

Any time learning: Now in the year of computers and web networks the pace of imparting knowledge is very fast and one can be educated. One can study whenever he wills irrespective of whether it is day or night and irrespective of being in India or in US because of the boom in ET.

Collaborative learning: Now ET has made it easy to study as well as teach in groups or in clusters. With online we can be united together to do the desired task. Efficient postal systems, the telephone (fixed and mobile), and various recording and playback systems based on computer technology all have a part to play in educational broadcasting in the new millennium. The Internet and its Web sites are now familiar to many children in developed countries and among educational elites elsewhere, but it remains of little significance to very many more, who lack the most basic means for subsistence.

Multimedia approach to education: Audio-Visual Education, planning, preparation, and use of devices and materials that involve sight, sound, or both, for educational purposes. Among the devices used are still and motion pictures, filmstrips, television, transparencies, audiotapes, records, teaching machines, computers, and videodiscs. The growth of audio-visual education has reflected developments in both technology and learning theory. Studies in the psychology of learning suggest that the use of audio-visuals in education has several advantages. All learning is based on perception, the process by which the senses gain information from the environment. The higher processes of memory and concept formation cannot occur without prior perception. People can attend to only a limited amount of information at a time; their selection and perception of information is influenced by past experiences. Researchers have found that other conditions being equal, more information is taken in if it is received simultaneously in two modalities (vision and hearing, for example) rather than in a single modality. Furthermore, learning is enhanced when material is organized and that organization is evident to the student. These findings suggest the value of audio-visuals in the educational process. They can facilitate perception of the most important features, can be carefully organized, and can require the student to use more than one modality.

Authentic and up to date information: The information and data which are available on the net is purely correct and up to date. Internet, a collection of computer networks that operate to common standards and enable the computers and the programs they run to communicate directly provides true and correct information.

Online library: Internets support thousands of different kinds of operational and experimental services one of which is online library. We can get plenty of data on this online library. As part of the IT curriculum, learners are encouraged to regard computers as tools to be used in all aspects of their studies. In particular, they need to make use of the new multimedia technologies to communicate ideas, describe projects, and order information in their work. This requires them to select the medium best suited to conveying their message, to structure information in a hierarchical manner, and to link together information to produce a multidimensional document.

Distance learning: Distance Learning, method of learning at a distance rather than in a classroom. Late 20th-century communications technologies, in their most recent phases multimedia and interactive, open up new possibilities, both individual and institutional, for an unprecedented expansion of home-based learning, much of it part-time. The term distance learning was coined within the context of a continuing communications revolution, largely replacing a hitherto confusing mixed nomenclature—home study, independent study, external study, and, most common, though restricted in pedagogic means, correspondence study. The convergence of increased demand for access to educational facilities and innovative communications technology has been increasingly exploited in face of criticisms that distance learning is an inadequate substitute for learning alongside others in formal institutions. A powerful incentive has been reduced costs per student. At the same time, students studying at home themselves save on travel time and other costs. Whatever the reasoning, distance learning widens access for students unable for whatever reason (course availability, geographical remoteness, family circumstances, individual disability) to study alongside others. At the same time, it appeals to students who prefer learning at home. In addition, it appeals to organizers of

professional and business education, providing an incentive to rethink the most effective way of communicating vital information.

Better accesses to children with disabilities: Information technology has brought drastic changes in the life of disabled children. ET provides various software and technique to educate these poor peoples. Unless provided early with special training, people profoundly deaf from birth are incapable of learning to speak. Deafness from birth causes severe sensory deprivation, which can seriously affect a person's intellectual capacity or ability to learn. A child who sustains a hearing loss early in life may lack the language stimulation experienced by children who can hear. The critical period for neurological plasticity is up to age seven. Failure of acoustic sensory input during this period results in failure of formation of synaptic connections and, possibly, an irremediable situation for the child. A delay in learning language may cause a deaf child's academic progress to be slower than that of hearing children. The academic lag tends to be cumulative, so that a deaf adolescent may be four or more academic years behind his or her hearing peers. Deaf children who receive early language stimulation through sign language, however, generally achieve academically alongside their hearing peers.

The integration of information technology in teaching is a central matter in ensuring quality in the educational system. There are two equally important reasons for integrating information technology in teaching. Pupils must become familiar with the use of information technology, since all jobs in the society of the future will be dependent on it, and information technology must be used in teaching in order to improve its quality and make it more effective.

Specific Significance:

- access to variety of learning resources

- immediacy to information

- anytime learning

- anywhere learning

- collaborative learning

- multimedia approach to education

- authentic and up to date information

- access to online libraries

- teaching of different subjects made interesting

- educational data storage

- distance education

- access to the source of information

- multiple communication channels: e-mail, chat, forum, blogs, etc.

- access to open courseware

- better accesses to children with disabilities

- reduces time on many routine tasks

5. Theories and practices of Educational Technology

There are three main theoretical schools or philosophical frameworks have been developed in the educational technology literature. These are Behaviorism, Cognitivism and Constructivism. Each of these schools of thought is still present in today's study but they have revealed as the Psychology literature has evolved.

5.1. Behaviorism

This theoretical framework was developed in the early 20th century with the animal learning experiments of Ivan Pavlov[5] , Edward Thorndike[6] , Edward C. Tolman[7] , Clark L. Hull[8] , B.F. Skinner[9] and many others. Many psychologists used this theory to explain and experiment that is parallel to human learning. Behaviorism usually combines elements of philosophy, methodology, and psychological theory.

B.F. Skinner wrote widely on improvements of teaching based on his practical analysis of Verbal Behavior and wrote "The Technology of Teaching", an attempt to disperse the myths fundamental modern education as well as support his system he called programmed instruction. Ogden Lindsley[10] also developed the Celeration learning system similarly based on behavior analysis but quite different from Keller's and Skinner's models.

In Behaviorism everything that moves is rated, analyzed and judged against a set of criteria. Performance data, progress data and gender gaps are analyzed to the Nth degree so we can better understand our institution, students. The technologies those are currently contributing to behaviorism are big data, machine learning, artificial intelligence and the software tools, developed based on those technologies. Jon Tait[11] said "Your analysis should be able to detect

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[5] Ivan Pavlov was a famous Russian physiologist (1849 – 27 February 1936).

[6] Edward Lee "Ted" Thorndike was an American psychologist (August 31, 1874 – August 9, 1949).

[7] Edward Chace Tolman was an American psychologist (April 14, 1886 – November 19, 1959).

[8] Clark Leonard Hull was an influential American psychologist (May 24, 1884 – May 10, 1952).

[9] Burrhus Frederic "B. F." Skinner was an American psychologist, behaviorist, author, inventor, and social Philosopher (March 20, 1904 – August 18, 1990).

[10] Ogden R. Lindsley (b. August 11, 1922, in Providence, Rhode Island - d. October 10, 2004) was an American psychologist.

[11] Jon is a deputy headteacher working in a large and diverse secondary school in the UK with over 10 years experience in Behaviour, Attendance, Raising Achievement, Professional Development and leading on Teaching & Learning. As well as being a Microsoft Innovative Educator, Jon regularly talks and writes about innovative ways to use technology in education on his own Edutait blog and in 2015 delivered a talk on the world-famous TED stage, talking about 'The Future of Learning'.

trends in student behaviour in terms of which day of the week things are more likely to happen, the time of day (e.g. Do you have more problems in a morning or afternoon), the subjects or teachers that have seen spikes in behaviour and even as detailed as the position in the class that these behaviours are coming from." (Tait, 2019)

5.2. Cognitivism

Cognitive science has changed on how educators consider learning. Since the very early beginning of the Cognitive Revolution of the 1960s and 1970s, learning theory has undergone a grand deal of transform. Much of the experimental framework of Behaviorism was retained even though a new prototype had begun. Cognitive theories look beyond behavior to elucidate brain-based learning. Cognitivists consider how human memory works to sponsor learning.

After memory theories like the Atkinson-Shiffrin memory model and Baddeley's Working memory model were established as a theoretical framework in Cognitive Psychology, new cognitive frameworks of learning began to appear during the 1970s, 1980s, and 1990s. It is vital to reminder that Computer Science and Information Technology have had a key influence on Cognitive Science theory. The Cognitive concepts of working memory (formerly known as short term memory) and long-term memory have been facilitated by research and technology from the ground of Computer Science. Another most important influence on the field of Cognitive Science is Noam Chomsky. Today researchers are focusing on topics like Cognitive load, Information Processing, and Media psychology Theory. In addition, psychology as practical to media is easily considered in studying behavior. The area of media psychology is both cognitive and affective and is central to accepting educational technology. So, Cognitivism deals with learning as "all

processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used" by the human mind.

5.3. Constructivism

Constructivism is a learning theory or educational philosophy that many educators began to consider in the 1990s. One of the primary tenets of this philosophy is that learners develop their own sense from new information, as they interact with reality or others with different perspectives.

Constructivist learning environments need students to apply their previous knowledge and experiences to formulate new, related, and/or adaptive concepts in learning. Under this structure the role of the teacher becomes that of a mentor, providing guidance so that learners can assemble their own knowledge. Constructivist educators must make sure that the prior learning experiences are suitable and related to the concepts being taught. David H. Jonassen[12] (1997) suggests "well-structured" learning environments are useful for novice learners and that "ill-structured" environments are only helpful for more advanced learners. Educators utilizing technology when teaching with a constructivist viewpoint should choose technologies that strengthen prior learning perhaps in a problem-solving environment.

Constructivism in education is an epistemological perspective of learning that discussed on how students deliberately create (or "construct") knowledge out of their experiences. Emphasis

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[12] David Jonassen (Sep, 1947 – Dec, 2012) was an American educational reformer whose ideas have been influential in instructional design and educational technology. Although he is best known for his publications about constructivism, he also wrote about computer-based technologies in education and learning with media.

is given on agency and prior "knowing" and experience of the learner, which is often decided by their social and cultural contexts of the environment. While Behaviorist models of learning may help understand what students are doing, educators also need to know what students are thinking, and how to enrich what students are thinking (Seifert & Sutton, 2009) .

5.3.1.   Implications of constructivism for teaching

There are strategies that teachers can use for giving students constructive assignments. For now, let me just mention momentarily two of them. One strategy that teachers often find beneficial is to organize the content to be learned as systematically as possible, because doing this allows the teacher to choose and plan learning activities that are more effective. One of the most widely used frameworks for organizing content, for example, is a classification scheme proposed by the educator Benjamin Bloom[13], published with the somewhat impressive title of Taxonomy of Educational Objectives: Handbook #1: Cognitive Domain. Bloom's taxonomy, as it is usually called, presents six kinds of learning goals that teachers can apply in principle expect from students, ranging from simple recall of knowledge to complex evaluation of knowledge.

Category or Type of thinking	Definition
Knowledge	Remembering or recalling facts, information, or procedures
Comprehension	Understanding facts, interpreting information
Application	Using concepts in new situations, solving particular problems
Analysis	Distinguishing parts of information, a concept, or a procedure

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[13] Benjamin Samuel Bloom (Feb, 1913 – Sep, 1999) was an American educational psychologist who made contributions to the classification of educational objectives and to the theory of mastery learning.

Synthesis	Combining elements or parts into a new object, idea, or procedure
Evaluation	Assessing and judging the value or ideas, objects, or materials in a particular situation

Table 1: Type of thinking that teacher can apply as principle of learning goals among students

A second strategy may be coupled with the first. As students gain experience as students, they become able to think about how they themselves learn best, and teacher can whip up such self-reflection as one of the goals for their learning. These differences allow teacher to transfer some of the responsibilities for arranging learning to the students themselves. For example, a teacher may be able not only to plan activities that support comparing species in the context of biology research, but also to plan ways for the student to think about how he or she might learn the same information solitarily. This self-assessment and self-direction of learning often defined by the name of metacognition[14]—an ability to think about and regulate one's own thinking.

6. Educational Technology and Instructional Technology

The terms educational technology and instructional technology may seem to be similar and interchangeable, but they in fact have significant subtle differences, when it is understood to an educator it can make the differences in planning and implementation of instruction. The analysis between educational technology and instruction technology are actually discovered at the roots of Their definitions. Education is described as the "activities and resources that support learning". This means to all activities and resources both planned and unplanned that contribute

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[14] Metacognition is "cognition about cognition", "thinking about thinking", "knowing about knowing", becoming "aware of one's awareness" and higher-order thinking skills. (Wikipedia)

to a student's learning irrespective of whether the learning is intentional or unintentional. On the other hand, instruction refers to " activities structured by someone other than the learner and oriented toward specific ends" (AECT, 2004, p. 1) . Instruction is part of the education as a whole but instruction, unlike education, is cautiously mapped out in every detail. Educational technology is defined as "the study and ethical practice of facilitating learning and improving performance by creating using, and managing, appropriate technological processes and resources" (AECT, 2004, p. 3) . The application of theory, technology, and psychology to achieve the goal of education and enhance the learning of individuals is nothing but educational technology.

Educational technology:

- Is responsible for Development of teaching and learning

- Applies theories of instruction, learning, behavioral and cognitive psychology to assessment, design, implementation, and evaluation of instructional material.

- Applies research, theory, technologies, and psychology to solve instructional and performance problems.

- The particular approach used to achieve the ends of education.

Educational technologist:

- Design instruction

- Produce instructional materials

- Manage instructional computing services or learning resources collections.

- Apply theories of cognition and research to utilize technology for the benefit of the learner.

Instructional Technology is defined as "the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning" (Seels & Richey, 1994, p. 1) . Hence instructional technology refers to the use of technological processes as a tool specifically for teaching and learning which facilitates access to information of all types. It is a broad term and deals with the process of using technology for instruction. It explains the technologies that facilitate access to information of all types. Its functions are Acquisition, processing, storage, and dissemination of information in all of its forms and Evaluation, management, and integration of instruction with tools available. However instructional technologist:

    (i)   Identify and analyze problems of instructional design.

    (ii)   Devise and implement solutions to those problems.

    (iii)   Integrate people, procedures, ideas, and devices for the purpose of providing tools which enhance the learning process.

As a result, it would seem that Instructional and Educational Technology are synonymous. The simple definition for each makes the distinction of their difference: Instructional Technology is the tool. Educational technology is the procedure for using that tool (Panda & Biswal, p. 15) .

Contrast the characteristics of educational technology and Instructional technology

Educational	Instructional
Teaches about technology as a content area	Teaches with technology (uses technology as a tool)
Key words: integration and education	Key words: learning environments, instructional systems and process
Shape curriculum or solve performance	Focus more on the development and creating of the learning system that involve some type of technology

Primary Goal: Technological literacy for everyone	Primary Goal: To enhance the teaching and learning process
Concerned with the broad spectrum of technology (How humans have designed and innovated the natural world)	Primarily concerned with the narrow spectrum of information and communication technologies

Table 2: educational technology vs Instructional technology

Chapter -3: Components of Educational Technology

This chapter includes a broad discussion and explanation about the two main components of Educational technology, such as hardware and software. In the hardware part, it discusses about many latest hardware or devices those are contributing in Educational Technology. In the software part, it discusses about some key important issues of education software, such as why use education software, who use education software, trends in education software, potential issues with education software. Then it discusses about many software tools categorizing & typing and making a most popular education software list.

The educational technology composed of mainly two components such as hardware and software. Both hardware and software are equally important for effective application of educational technology. For example, an interactive computer programme is worthless without suitable educational programme. Both hardware and software are complementary to each other. (Panda & Biswal, pp. 12-13)

Hardware:

Hardware denotes technology in education that involves electronic devices based on scientific principles and techniques. Its origin is in Physical Sciences & Applied Engineering and it is based on the concept of Service. It adopts a Product-oriented Approach. It is concerned with the production and utilization of audio-visual aid material [such as charts, models, slides, filmstrips, audio cassettes, etc.], sophisticated instruments and gadgets [such as radio, television, films, projectors, tape-recorders, video player, teaching machines, computers, etc.] and mass media. Hardware Technology utilizes the products of Software Technology [such as teaching strategies, teaching learning material, etc.] for its functioning. Hardware technology has the potential to hand over the educational benefits to the mass with greater ease and economy Too much use of technical gadgets may mechanize the process of teaching-learning as the Hardware approach tries to enter education from outside, operating more in isolation than in combination.

Software:

Software denotes technology of education which involves a systematic, scientific application of appropriate scientific research both from physical science, social science such as psychology and sociology, philosophy, management studies etc. to solve educational problems. It

is sometimes referred to as Teaching Technology, Instructional Technology or Behavior Technology. Its origin is in Behavioral Sciences and the applied aspects of Psychology of learning. It is a Process-oriented Approach. It utilizes the knowledge of the Psychology of Learning to produce learning material, teaching – learning strategies, etc. [Software Technology] for the betterment of the process of teaching-learning It does not provide direct services to its users. Instead, it helps in the production of various Software materials which are used for developing the hardware appliances. It includes teaching strategies, learning material, evaluation tools, teaching models, programmed instruction, etc. Software technology does not require any aid form the hardware technology for its delivery. It becomes more useful and productive when assisted by the Hardware Technology. Software technology does not have mass appeal and is costlier in the long run, as compared to hardware technology.

1.   Educational Technology Hardware

Educational technology tools can be divided into two:

1) Educational Hardware/ devices and

2) Educational Software/programs

Educational hardware/ devices are continuously improving and its list is increasing with innovation and adding new devices. There are some significant devices list that have been developed to support Educational Technology till now.

1.1. Computers:

Computer has been always considered as a prime educational technology device that support teachers and students to complete various types of educational assignments. To prepare students for the future, they need to experience the tools that await them in higher education and beyond. Versatile machines equipped to work in education and professional environments let students experience the full scope of applied technology. With these laptops, desktops, and Chromebooks, educators open doors to everything from fundamental keyboarding to advanced drafting and programming. With the advent of technology, computer has got different types of shapes and sizes for various purposes.

1.1.1. Desktop computer: A desktop computer is a personal computer designed for regular use at a single location on or near a desk or table due to its size and power requirements. The most common configuration has a case that houses the power supply, motherboard (a printed circuit board with a microprocessor as the central processing unit (CPU), memory, bus, and other electronic components), disk storage (usually one or more hard disk drives, solid state drives, optical disc drives, and in early models a floppy disk drive); a keyboard and mouse for input; and a computer monitor, speakers, and, often, a printer for output. The case may be oriented horizontally or vertically and placed either underneath, beside, or on top of a desk (Wikipedia, Desktop computer, 2019).

Figure 1: Personal desktop computer with mouse, keyboard, and monitor.

1.1.2. Laptop computer: Laptop computers, also known as notebooks, are portable

computers that you can take with you and use in different environments. They include a screen,

keyboard, and a trackpad or trackball, which serves as the mouse. Because laptops are meant to

be used on the go, they have a battery which allows them to operate without being plugged into a

power outlet. Laptops also include a power adapter that allows them to use power from an outlet

and recharges the battery (Christensson, 2019) .

Figure 2: Apple laptop computer, source: www.google.com/images

1.1.3. Tablet PC: A tablet PC is a portable PC that is a hybrid between a personal digital assistant (PDA) and notebook PC. Equipped with a touch screen interface, a tablet PC usually has a software application used to run a virtual keyboard. However, many tablet PCs support external keyboards (Techopedia, 2019) . So, A tablet is a wireless, portable personal computer with a touchscreen interface. The tablet form factor is typically smaller than a notebook computer, but larger than a smartphone.

Figure 3: Tablet PC 'iPad' from Apple Inc'

1.1.4. Personal Digital Assistant (PDA): PDA is a short form of personal digital assistant. It is a handheld device that combines computing, telephone/fax, Internet and networking features. A typical PDA can function as a cellular phone, fax sender, Web browser and personal organizer. PDAs may also be referred to as a palmtop, hand-held computer or pocket computer (Beal, PDA - personal digital assistant, 2019) .

Figure 4: The Palm TX was a personal digital assistant which was produced by Palm, Inc. It was announced and released as part of Palm's October 2005 product cycle, and was in production until March 2009. Source: Wikipedia

1.2. Mobile:

A mobile phone is a wireless handheld device that allows users to make and receive calls and to send text messages, among other features. The earliest generation of mobile phones could only make and receive calls. Today's mobile phones, however, are packed with many additional features, such as web browsers, games, cameras, video players and even GPS navigational systems (Techopedia, 2019) . Mobile phones which offer greatly advanced computing capabilities including 3G/4G/5G network support, Touch screen capabilities, high quality camera, are referred to as smartphones. Modern smartphones are equipped with many sensors, processor, RAM, and extended memory support that is like a small handy version of computer.

Figure 5: Evolution of mobile phones, to an early smartphone. Source: https://en.wikipedia.org/wiki/Mobile_phone

1.3. Multimedia Projector:

A multimedia projector is a compact, high resolution, full-color projector capable of projecting text, images, video and audio content. Typically, the projector will feature inputs for a computer, DVD player, VCR, CD player and storage device (White, 2019) .

Figure 6: Epson EX31 Multimedia Projector by Epson

1.4. Speakers:

"A device that converts analog audio signals into the equivalent air vibrations in order to make audible sound" (PC Magazine, 2019) . Speakers are popular output devices used with computer systems. They receive audio input signal from the computer's sound card and generate audio output in the form of sound waves. Most of the computer speakers are active speakers, that means they have an internal amplifier which facilitates to increase & decrease the volume, or amplitude of the sound. Speakers generally come in pairs, which allows them to produce stereo sound from two separate audio channels simultaneously.

Figure 7: A pair of speakers for notebook computers that are powered and audio-connected to the computer via USB. Source: https://en.wikipedia.org/wiki/Computer_speakers

1.5. Microphone:

A microphone, colloquially named mic or mike (/maɪk/), is a device – a transducer – that converts sound into an electrical signal. There are many use cases of Microphones such as telephones, hearing aids, public address systems for concert halls and public events, motion picture production, live and recorded audio engineering, sound recording, two-way radios, megaphones, radio and television broadcasting, and in computers for recording voice, speech recognition, VoIP, and for non-acoustic purposes such as ultrasonic sensors or knock sensors (Wikipedia, 2019) .

Figure 8: Shure Brothers microphone, model 55s, Multi-Impedance "Small Unidyne" Dynamic from 1951

1.6. Pen drive:

Pen drive is a small storage device shaped like a pen with built-in data storage that connects to a computer by a USB port. It is a portable data-storage device. Pen drives have replaced the floppy drives of old and have emerged as the most popular data-storage devices among consumers. Micro, lightweight and handy, a pen drive can be easily carried from place to place by students, professionals, academicians and independent tech consultants. It can be used to store any files such as graphics-heavy documents, photos, music files and video clips (Khan, 2019) .

Figure 9: SanDisk Ultra Dual SDDD3-128G-I35 USB 3.0 128GB Flash Drive

1.7. Interactive Displays:

There are several interactive displays now in the industry that facilitate to engage

students to a greater degree with technology in the classroom that encourages them to connect

directly with the material. Visually stunning, touch-responsive multimedia displays let educators

and students pull limitless resources into the classroom with a tap or swipe of their screens.

These days, teachers who are trying to engage their students of any age with chalk-and-talk are

not going to further their education. Students who grew up connected to the Internet with

knowledge and entertainment at their fingertips will simply like to disconnect them from a dry

lecture. Smartboards are the answer to help teachers make their lessons attractive to their

students and to help students stay connected to what they need for their future. There are three

best types of smartboard for educational institutions:

       1) interactive whiteboards,

       2) smartmarkers, and

3) touch screen monitors,

1.7.1. Interactive whiteboards: With this type of smartboard, you get an ordinary

whiteboard and a projector, usually mounted on the ceiling, that puts the content on the

whiteboard. There are two different types of electronic pen or stylus that allow you to move

images or write on the whiteboard. A smartboard with a projector is interactive with the pen, and

you can get superb software package to comply with your teaching needs. It requires somewhat a

darkened room, as the display may be washed out with too much ambient light. The image

intends to fade over time and could cause eye strain. Besides, the projector requires high

maintenance and uses a lot of electricity. There are two popular smartboards with projectors.

1.7.1.1. Smart Board M600 Series: The Smart Board M600 comes in a bundle with

everything you need for larger-than-life images from a very short distance. It has dual-touch

controls so that students can work jointly at the board. With this, one of the best smartboards for

the classroom, teacher can create interactive lessons and save them for another time. The M600

Series has a built-in audio and printing capability in interactive mode. It is packaged with the

board, projector, power cords and pens.

Figure 10: Smart Board M600 series- 77" Interactive whiteboard with Projector Bundle for Classroom

1.7.1.2. NIERBO HC40 Interactive Projector: The NIERBO HC40 Interactive Projector

is a mini portable projector that can be a great classroom device for interesting, interactive

teaching for students of any age or it can be used as a home theater. It offers an interactive

function of full 3D 4K for Android or Windows operating system.

NIERBO

Figure 11: NIERBO HC40 4K Interactive Portable Projector Full 3D LED DLP Android Wifi Projector for School Office Education

Either of these projectors is excellent for interactive whiteboard teaching & learning. They are easy to use and have a lot of smart features. The only disadvantage is lighting. Too much light on the board will make the images difficult to see (Emily, 2019).

1.7.2. Smartmarkers: Smartmarker is a light pen that allows to accurately control the cursor for quick selection of graphics and movement across a TV, computer monitor or projector screen. It provides the ability to expand lesson using the Internet in real time, and save each lesson for later use. It does require operator to sit or stand a bit awkwardly to be as accurate as you need to be, and this can result in wrist and back stress if there is a long session. It's up to teacher to make the smartmarker and screen an effective tool for teaching, or it will become just like a dry-erase whiteboard. There are three popular smartmarkers available.

1.7.2.1. GoTouch Basic 3.0: The GoTouch Basic 3.0 turns any screen or even a wall into

a smartboard. It connects to PC, smartphone or Mac. You control the cursor with the stylus and it

supports multiple users at the same time. If you don't have a Bluetooth connection, you may

need a dongle to go online with the GoTouch. The GoTouch uses a 4K infrared sensor that

transmits the graphics and the other components of the lesson to the screen via Bluetooth. No

wires are needed, as it has a battery. It is so small device that you can carry in your pocket or bag

(Emily, 2019).
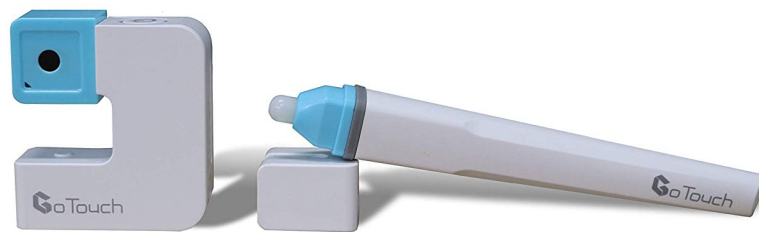
Figure 12: GoTouch Basic 3.0 interactive smartmarker

1.7.2.2. eBeam Smartmarker Complete: The eBeam Smartmarker Complete turns any

surface into an interactive whiteboard. It has four different colored light pens. They have

automatic Bluetooth pairing, and you can connect with anyone anywhere in the world in real

time and share lessons or discussions asynchronously. It will transform your writing into the font

of your choice and save all of your notes in the app, so you just have to print them. It does not

require any tool for mounting the screen to a magnetic whiteboard. If the surface isn't magnetic,

you can use the kind of mounting brackets that leave no trace when they're removed (Emily,

2019).

Figure 13: eBeam Smartmarker Complete

1.7.2.3. IPEVO IW2 Wireless Interactive Whiteboard System: The IPEVO IW2 Wireless

Interactive Whiteboard System is a small, inexpensive device that has three pieces and

transforms almost any flat surface into a smartboard. It doesn't require Wi-Fi, because it includes

a software app. It is wireless, lightweight and portable. The device includes an interactive pen, a

sensor cam, and a wireless receiver. It will show 3D objects, and only takes a few minutes to set

up devices and calibrate. It doesn't come with a computer or projector (Emily, 2019).

Figure 14: Ipevo IW2 Wireless Interactive Whiteboard System (CSW2-02IP)

1.7.3. Touch Screen Monitor: A smartboard with a touch screen monitor has a computer built in. Some monitors can be controlled with finger touch or with a stylus. It has a clear display that's not affected by ambient light. The display is a bit smaller than with a projector. It will take some time to learn how to operate this smartboard efficiently, but after all, it is one of the best smartboards for the classroom (Emily, 2019).

1.7.3.1. Google Jamboard: The Google Jamboard was developed by Google for real-time cloud interaction. It takes the whiteboard to the cloud, delivering a collaborative experience designed to unlock a team's creativity, in real-time, from anywhere. It's like a very large tablet with a 55", 4K touchscreen display that offers cross-platform support. You can use creative drawing tools, clip content from the web using Google Search and add images and content from Google Drive or your smartphone. You can drop the Jamboard into Hangouts, participate from your tablet or phone and work with multiple Jamboards within or beyond the walls of your company. All your work is saved in Google Drive and jams also retain their interactivity, so you

can pick up right where you left off and your ideas are not erased away. Moving and resizing

objects is natural, just like on your phone or tablet, and the stylus and eraser work without any

batteries or complicated pairing or setup. It is light, stable and on wheels with a single cable for

power. Everything else is wireless so you can plug it in, flip it on and start jamming right away. It

is designed to meet the highest standards of fidelity and responsiveness. It has Low latency touch

technology that delivers a lag-free experience (Google Cloud, 2019).

Figure 15: Google Jamboard. Source: https://gsuite.google.com/products/jamboard/

1.7.3.2. 50" Touch Force 4K UHD Monitor: The 50" Touch Force 4K UHD Monitor is

one of the best smartboards for educational institutions, especially for schools. It combines the

latest integrated reality technology with HD picture quality for a spectacular home theater or

awesome smartboard for the classroom. Stylus, touch, or motion can be used to interact with this

board. It has a 10-point ultra-fast response for up to 10 single-point users. It is the best solution

for a small preschool classroom technology (Emily, 2019).

Figure 16: 50" Touch Force 4K UHD Touch Screen Digital Display

1.8. E-book Reader/Kindle:

An e-reader, also called an e-book reader or e-book device, is a mobile electronic device

that is designed primarily for the purpose of reading digital e-books and periodicals (Wikipedia,

2019) . The e-book reader is typically designed to operate over long hours by consuming

minimal battery power. Most of the e-book readers depend on the e-ink technology for their

displays.
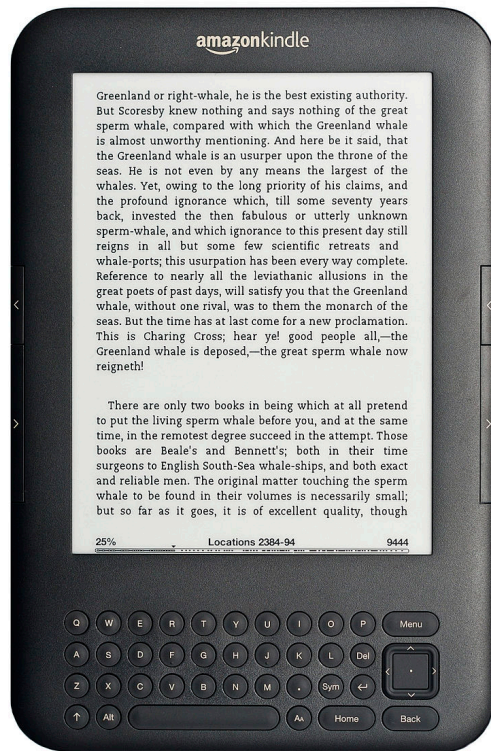
Figure 17: Amazon's Kindle Keyboard e-reader displaying a page of an e-book

1.9. Printer:

"A printer is a device that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper. Printers vary in size, speed, sophistication, and cost. In general, more expensive printers are used for higher-resolution color printing" (Rouse, Definition of Printer, 2019) . In computing, a printer is a peripheral device which makes a persistent representation of graphics or text on paper and make a hard copy of the information on paper. While most output is human-readable, bar code printers are an example of an expanded use for printers. Printer has a significant role in Educational Technology as it has

made a revolutionary change in printing and publications. So, it has a significant position after

paper in the history of Educational Technology.

There are a few different ways a printer can connect to and communicate with a computer to get

command on printable object. Today, the most common connection types are by USB cable or

via Wi-Fi. Besides, it can be connected with Cat 5, Firewire, MPP-1150, Parallel port, SCSI, and

Serial port (Nathan Emberton, 2019) .

Types of printers: There is a list of different types of computer printers. The most

common printers used with a computer are inkjet and laser printers.

- ❖ 3D printer
- ❖ AIO (all-in-one) printer
- ❖ Dot matrix printer
- ❖ Inkjet printer
- ❖ Laser printer
- ❖ LED printer
- ❖ MFP (multifunction printer)
- ❖ Plotter
- ❖ Thermal printer

3D Printer is one of the most revolutionary technology of the 21st century and the greatest

innovation in the history of printers.

History of various printers:

Mechanical printer: The first mechanical printer was invented by Charles

Babbage[15] in 1822 to use with the Difference Engine. Babbage's printer used metal rods

with printed characters on each rod to print text on rolls of paper that were fed through

the device (Nathan Emberton, 2019) .

Dot matrix printer: IBM[16] created the first dot matrix printer in 1957. However,

the first dot matrix impact printer was presented by Centronics[17] in 1970. To create letters

and images, the print head, which contains pins, sits over an ink ribbon. This ribbon rests

above a piece of paper. As the print head moves across the ribbon (generally

horizontally), the pins are pushed into the ribbon to imprint ink onto the page (similar to a

typewriter). As these pins print a series of dots, it is called Dot matrix printer (Nathan

Emberton, 2019) .

Inkjet printer: Inkjet printers was started being developed in the late 1950s, it

wasn't until the late 1970s that they were capable of reproducing decent digital images.

These higher quality inkjet printers were developed by multiple companies, including

Canon, Epson, and Hewlett-Packard. Inkjet printers are similar to dot matrix printers in a

sense that the images they create are composed of dots. However, the dots on an inkjet

printer are shot onto the page rather than using a ribbon and pins. In addition, the dots of

an inkjet printer are much smaller, and their print speed is faster (Nathan Emberton,

2019) .

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[15] Charles Babbage KH FRS (/ˈbæbɪdʒ/; 26 December 1791 – 18 October 1871) was an English polymath. A mathematician, philosopher, inventor and mechanical engineer, Babbage originated the concept of a digital programmable computer.

[16] International Business Machines Corporation (IBM) is an American multinational information technology company headquartered in Armonk, New York, with operations in over 170 countries. The IBM mainframe, exemplified by the System/360, was the dominant computing platform during the 1960s and 1970s.

[17] Centronics was an American manufacturer company of computer printers.

Laser printer: Gary Starkweather[18] invented the laser printer while working at Xerox[19] in the early 1970s by modifying one of their model 7000 copiers. However, it wasn't until 1984 when Hewlett-Packard[20] announced the HP LaserJet that laser printers became more widely available and affordable to all. The next year, Apple[21] introduced the Apple LaserWriter and it introduced PostScript[22] technology to the printer market. Laser printers are a more complex technology than their predecessors (Nathan Emberton, 2019) .

3D printer: The 3D printer was invented by Chuck Hull in 1984. 3D printers work by taking a digital blueprint of an object and reproducing three-dimensional object from a computer-aided design model, layer-by-layer using various materials such as plastic and metal alloys (Nathan Emberton, 2019) .

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[18] Gary Keith Starkweather is an American engineer and inventor most notable for the invention of the laser printer and color management. He received a B.S. in physics from Michigan State University in 1960 and an M.S. in optics from the University of Rochester in 1966.

[19] Xerox Corporation is an American global corporation that sells print and digital document products and services in more than 160 countries.

[20] The Hewlett-Packard Company or Hewlett-Packard (HP) was an American multinational information technology company headquartered in Palo Alto, California.

[21] Apple Inc. is an American multinational technology company headquartered in Cupertino, California, that designs, develops, and sells consumer electronics, computer software, and online services. It is considered one of the Big Four tech companies along with Amazon, Google, and Facebook.

[22] PostScript is a simple interpretive programming language with powerful graphics capabilities. Its primary application is to describe the appearance of text, graphical shapes, and sampled images on printed or displayed pages. It was the first device-independent Page Description Language (PDL).
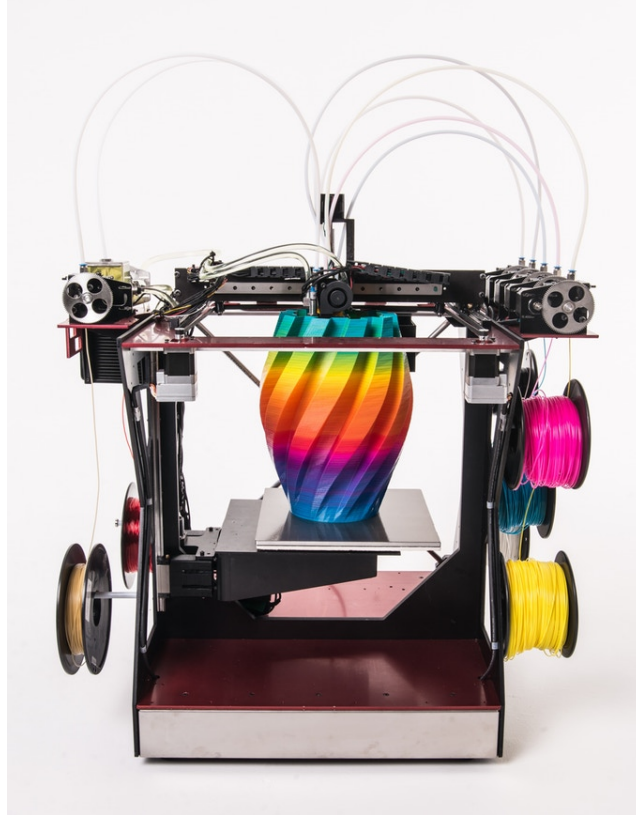
Figure 18: RoVa4D Full Color Blender 3D Printer- printing a 3D object.

1.10.   Scanner:

A scanner is an input device that scans documents such as photographs and pages of text. When a document is scanned, it is converted into a digital format. This creates an electronic version of the document that can be viewed and edited on a computer (Christensson, 2019) .

Figure 19: Epson Perfection V600 Scanner

1.11.   OCR:

Optical character recognition or optical character reader (OCR) is the mechanical or electronic conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo or from subtitle text superimposed on an image (Wikipedia, 2019) .

Figure 20: OCR is reading characters from book.

1.12. OMR:

OMR is the short form of optical mark recognition, the technology of electronically extracting intended data from marked fields, such as checkboxes and fill-infields, on printed forms. OMR technology scans a printed form and reads predefined positions and records where marks are made on the form. This technology is useful for applications in which large numbers of hand-filled forms need to be processed quickly and with great accuracy, such as surveys, reply cards, questionnaires and ballots (Beal, OMR - optical mark recognition, 2019) .
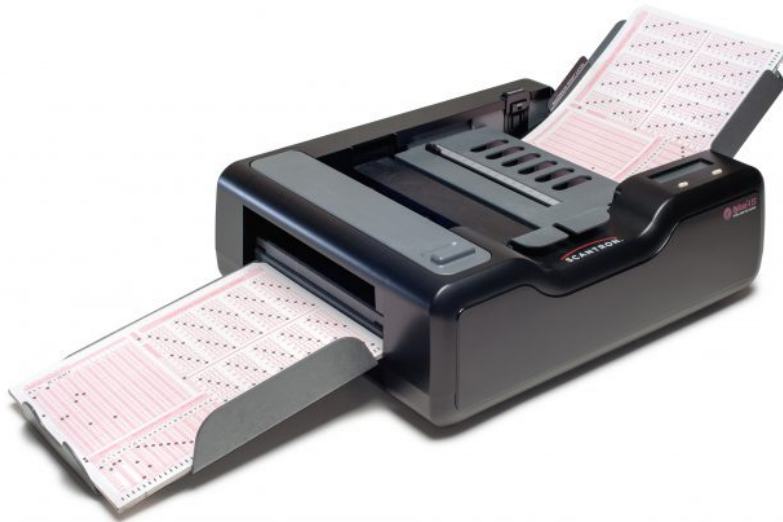
Figure 21: Optical Mark Recognition (OMR) Scanners | Scantron

1.13. Digitizer Tablet:

A digitizer tablet (also known as a digitizer or graphics tablet) is a tool used to transform hand-drawn images into a format suitable for computer processing. Images are typically drawn onto a flat surface with a stylus and then appear on a computer monitor or screen. Digitizer

tablets can also be utilized as an input device, receiving information represented in drawings and

sending output to a CAD (computer aided design) application and PC-based software like

AutoCAD (Rouse, Digitizer Tablet, 2019) .

Figure 22: Digitizer tablet Huion H610 PRO

1.14.   External Hard-drive:

An external hard drive is a portable storage device that can be frequently attached to a

computer through a USB or FireWire connection, or wirelessly. External hard drives usually

have high storage capacities and are often used to back up computers or serve as a network drive.

Figure 23: Transcend External Hard Drive 1TB 2.5" M2

1.15. Google glass:

Google Glass is a brand of smart glasses—an optical head-mounted display designed in

the shape of a pair of eyeglasses. It was developed by X (previously Google X) with the mission

of producing a ubiquitous computer. Google Glass displayed information in a smartphone-like,

hands-free format. Wearers communicated with the Internet via natural language voice

commands (Wikipedia, 2019) . Google glass is one of the best smart technology in the world that

is being used in various educational sector, especially in medical technology. It facilitates an

augmented reality experience by using visual, audio and location-based inputs to provide

relevant appropriate information. For example, upon entering an airport, a user could

automatically receive flight status information.

Figure 24: Google Glass Enterprise Edition 2

1.16.   Support Devices:

Some of the most vital pieces of hardware aren't conventional devices. They organize, protect, and power the technology with charging carts and cubbies that support the daily educational operation. Such as servers, routers, and networking equipment ensure teachers, students and staff can access information and collaborate through their devices.

2. Educational Technology Software

Education software is a massive, all-inclusive term used to mean any and all software intended to use in the education industry. The term comprises of everything from student information systems and classroom management software to reference management software and language learning software.

All of this software, however, is used with the target of creating some aspect of the education industry more efficient or more effective. A reputation of being one of the last places to adopt technology is schools, but as the digital transformation and adaptation has led to the reconstruction and rearrangement of industries in every sector, they too have commenced to embrace the inevitable. There are some kind of educational software those are used by nearly every educational institution and will become pervasive as the number of solutions and the range of capabilities of those solutions grow.

The scope of tools in the education industry is extending, particularly with the inflow of artificial intelligence software, Big data analytics platform and the private sector's recognition of the huge potential attached to developing education-specific software.

2.1. Why Use Education Software?

Education software is tremendously advantageous for teachers, administrators, students, and parents alike. Solutions in these categories facilitate users many benefits, from improved visibility and content dissemination to analytics and better communication channels. Smart content, enhanced communication, consolidation of data and information, and improved efficacy

and efficiency are all advantages that ensure the implementation of educational software in any institution and their class rooms (G2, 2019) .

2.1.1. Smarter Content - Education software has great potentiality to revolutionize the process in which content is created and demonstrated to students. Digital content embedded with artificial intelligence capabilities can offer material that acclimates to the students' knowledge levels. This "smart" content can be easily altered, distributed, and reused by different generations of students. Digital content encloses the extra bonus of teacher oversight and often contains built-in assessments that teachers can use to test, grade, and track student results (G2, 2019) .

2.1.2. Teacher, Parent, and Student Communication — Clear communication between teachers, parents, and students is important to the learning process. There must have a strong level of respect and trust that happens to properly educate students. Education software and apps help improve strong bonds between all parties through forums, portals, and other interactive elements. Parents and students have tools that promote easy communication and collaboration between themselves, teachers, and administrators (G2, 2019) .

Efficient and clear communication channels offer understanding between disparate parties that may otherwise be siloed. Students can ask teachers questions to clear up obscurity regarding course material and grading methods, and parents can have a transparent window into their children's regular performance.

2.1.3. Information Consolidation – There are various types of education software those are designed to combine related information in a centralized repository. Consolidating all related data within a single program permits for better oversight and the extraction of more accurate insights from that data. Administrators and educational professionals can monitor and utilize those insights to guide both teaching strategy at a lower level and administrative policy at a higher level (G2, 2019) .

2.1.4. Improved Efficiency and Efficacy — The goal of any educational institution is to become more efficient and effective, and education software helps organizations achieve these goals properly. Teachers can use resources such as classroom management software to limit distractions and improve concentration on course material. Administrators can leverage the insights presented by information systems to shape policy and administrative decisions. Education software also saves administrators and teachers a lot of time on administrative tasks, like grading, and gives them the opportunity to find more productive ways to improve their respective outputs (G2, 2019) .

2.1.5. Better Learning Environment – Education professionals are engaged with tasks that is to ensure understanding of class material by the students. The amount of available education applications, and the breadth of functionality they cover in concert, offers educators with the software tools necessary to create the best possible learning environment for their students. That may take the form of digital materials enhanced with AR/VR software in the classroom, the use of a learning management system, classroom management tools designed to keep students on task, or something else entirely. Teachers adjust their classrooms and alter their

teaching styles according to every group of students' needs. Education software facilitates

teachers change their learning environments by providing tools that can satisfy every learning

style (G2, 2019) .

2.2. Who Uses Education Software?

The groups of education software users are mainly teachers, students, parents, and

academic administrators. Each group utilizes education software to develop their educational

experience, reduce inefficiencies, and maintain proper communication. The most of the

educational software is designed for administrators and teachers to create content, share lessons,

manage classrooms, and house-school and student-related data. Students use software solutions

in a few categories to consume curated study content and lesson plans, take exams, and study.

Parents leverage the correlation to both administrators and teachers that these tools offer them, to

confirm that their child is getting the support they need and to stay on top of their student's

performance.

2.3. Trends Related to Education Software:

2.3.1. Use of AR/VR for Classroom: Augmented reality (AR) and virtual reality (VR)

technology is improving continuously. As it has been more affordable and its adoption is more

prevalent, IT vendors have been developing various applications specifically for the education

industry. Teachers are able to use virtual reality headsets to deliver extra reinforcement for

difficult concepts, increase regular teaching materials, or normally to introduce a cool piece of

technology that students will find interesting. AR/VR has a great potentiality to revolutionize the

classroom, providing teachers with a tool that they can utilize from home and stay with deep

understanding and increase retention of subject material (G2, 2019) .

2.3.2. Artificial Intelligence (AI) in the Classroom: Artificial intelligence has numerous

potential applications within the classroom. Artificially intelligent teaching assistants (AITAs)

are used in specific classrooms to reduce some of the workload for teachers and regular teaching

assistants. These digital teaching assistants control student questions that naturally take educators

much hours to sort through. As these AITAs are machine learning applications, the more

questions they handle and the wider the scope of topics they cover automatically, and in

consequences, the more perfect they become. Teachers can then use the extra hours freed up by

these applications to focus on other real value-adding tasks in regular activities (G2, 2019) .

2.3.3. Digital Materials: The digital transformation has incased the classroom, as

institutions look to hold digital teaching materials. Digital versions of materials are much more

flexible which is easily modified and distributed and can be embedded with additional features to

benefit students during their learning. These materials contain assessments, which can be graded

and analyzed by AI graders, and as a result, saving teachers valuable time (G2, 2019) .

2.4. Potential Issues with Education Software:

2.4.1. Privacy — Privacy is one of the largest issues facing by the education software

industry. The huge use of software throughout the education sector means more information is

congregated and housed by educational institutions. Especially in K–12 institutions, there are

privacy concerns raised by parents and communities who don't want every little piece of

information about their students gathered, combed through, and analyzed. As artificial

intelligence embeds its way into the classroom and the internet of things (IoT) collects and

transmits information about every single matter that happens within the classroom, the question

becomes how much data does an institution or school have the right to gather. That is just

because something is possible, does that mean it should be done? When it appears to minors, do

they have any privacy rights, or do those related to the parents? Should students have to opt in to

data sharing or opt out? These are all questions that is expected to be answered in the coming

years as education software and technology continues to rise and affect the industry (G2, 2019) .

2.4.2. Security — The more data and information an organization has on file, the more

attractive the possibility of stealing that information becomes for bad actors. While schools may

not be carrying the most precious information in the world, payment details and identity related

information, as well as penetrating personal student information, may be on file. For this reason,

security is vital in education software. Education software tends not to hype security as one of its

hallmarks, but that may change as more sensitive information is held in the applications of

educational institutions (G2, 2019) .

2.4.3. Distraction – As technology in the classroom becomes omnipresent, one of the

major issues becomes the potential for distraction. When students are armed with tablets and

other internet-connected devices, they are easily prone to be distracted from focusing on subject

material during class. What is the solution to this problem? Implementing classroom

management software, which allows teachers to monitor and block students from using

disallowed certain websites. Classroom management software has become an essential tool allowing teachers to ensure that their students are on task (G2, 2019) .

2.4.4. Improper Implementation – While this is an issue in every sector, one of the most obvious possible issues for education software is improper software selection and implementation. Incorporated in implementation is proper training for employees who will use the software, which is often disregarded by educational institutions who do not have enough devoted IT staff. If the wrong software is selected or it is implemented improperly, and the institution and its employees have no idea how to get proper advantage of the features the application provides, then there will likely be issues down the road. The way to avoid these issues is by ensuring a thorough vetting and selection process, proper implementation, and high-quality training presented for employees that will be using the software (G2, 2019) .

2.5. Categories of Educational Software:

More and more educational software companies, both online and offline, are appearing to help fill a need for more interactive, personalized educational experiences for students. Their benefits are numerous, and most importantly, education software is a cost-efficient solution for institutions who want to manage data and information about their students in an organized manner.

Online education software has become a crucial teaching tool for teachers to use as part of their

lessons. Their implementation in classrooms has enhanced performance of both the students and

teachers alike.

There are various types of educational software available for a variety of different subjects, but

educational software companies have now commenced to develop educational applications for

students and teachers to use as learning and teaching tool. For continuous development and

improvement of education software by many companies, it has been impossible to classify it all,

but there is a high-level view of the educational software industry looks like. Wikipedia

classified educational software into the following 8 categories.

   2.5.1. Courseware: "Courseware is a term that combines the words 'course' with

'software'. It was originally used to describe additional educational material intended as kits for

teachers or trainers or as tutorials for students, usually packaged for use with a computer"

(Wikipedia, 2019). The meaning and usage of the term has extended and can refer to the entire

course and any added material when used in reference an online or 'computer formatted'

classroom. Many companies are using the term to define the entire "package" consisting of one

'class' or 'course' bundled together with the various lessons, tests, and other material needed. The

courseware itself can be in various formats: some are only available online, such as Web pages,

while others can be downloaded as PDF files or other types of document. Many forms of

educational technology are now enclosed by the term courseware. Courseware has been

approximately as long as computer labs have been set aside for student use. It includes any

software that is intended to instruct the student, and can come in the form of a teacher kit or a

tutorial for students. Courseware has been enriched and expanded upon greatly in just a couple

decades, and some courseware can teach whole subjects with excellent precision. The idea of

what courseware could be has also been stretched, as it now includes software delivered online.

But when software development companies mention to courseware, they are often labeling a

single course (of any subject) bundled with assessment materials and supplemental lessons.

   2.5.2. Assessment software: With the influence of environmental damage and the need

for institutions to become "paperless", more educational institutions were seeking alternative

process of assessment and testing, which has always conventionally been known to use up huge

amount of paper. Assessment software indicates to software with a primary purpose of assessing

and testing students in a virtual environment. Assessment software facilitates students to

complete tests and examinations using a computer, typically networked. The software then gives

scores to each test transcript and outputs results for each student. Assessment software is

available in many delivery methods. The most popular are self-hosted software, online software

and hand-held voting systems. Moodle is an example of open-source software with an

assessment module that is having popularity. Other popular worldwide assessment software

systems are Google Classroom, Assessment Master, Blackboard Learn, EvaluNet XT.

   2.5.3. Reference software: "Reference software is software which emulates and expands

upon print reference forms including the dictionary, translation dictionary, encyclopaedia,

thesaurus, and atlas. Like print references, reference software can either be general or specific to

a domain, and often includes maps and illustrations, as well as bibliography and statistics.

Reference software may include multimedia content including animations, audio, and video,

which further illustrate a concept. Well-designed reference software improves upon the

navigability of print references, through the use of search functionality and hyperlinks"

(Wikipedia, 2019) . Reference software has gone completely online, and there are few examples

of institutions who are still using proprietary pieces of software for reference purposes. This is

extremely a rapid amendment, as institutional computers were loaded up with dictionary and

encyclopedia software as recent as the early 2000s. That is not a case, as sites like Wikipedia

have made such software outdated. And further general research sites like Wikipedia, Google

Scholar and Lexis, most medical and science journals now publish online.

2.5.4. *Classroom aids:* "Some educational software is designed for use in school

classrooms. Typically, such software may be projected onto a large whiteboard at the front of the

class and/or run simultaneously on a network of desktop computers in a classroom. The most

notable are SMART Boards that use SMART Notebook to interact with the board which allows

the use of pens to digitally draw on the board. This type of software is often called classroom

management software" (Wikipedia, 2019). While teachers frequently prefer to use educational

software from other categories in their IT suites (e.g. reference works, children's software), a

whole category of educational software has grown up particularly intended to support classroom

teaching. Branding has been less important in this category than in those oriented towards home

users. The market for classroom aid technology and software has blasted in recent years, and

denotes one of the most promising advances to the classroom of the future. Classroom aids

contain impressive audio and visual technology, mixing the best of audio/video (A/V) and

courseware to create a much more engaging material. Classroom aids began with thin and

progressively archaic technology like the overhead projector, and soon developed into better-

quality digital displays and eventually interactive projectors and whiteboards (Data Projections, 2019) .

   2.5.5. Custom platforms: Some manufacturers regarded usual personal computers as an unsuitable platform for learning software for younger children and manufactured custom child-friendly pieces of hardware instead. The hardware and software are generally mingled into a single product, such as a child laptop-look alike. The laptop keyboard for younger children follows an alphabetic order rather than the qwerty order for the older ones. The most well-known sample is Leapfrog[23] products. These contain creatively designed hand-held consoles with a variety of pluggable educational game cartridges and book-like electronic devices into which a array of electronic books can be loaded. These products are more portable than laptop computers, but have a much more limited range of features, concentrating on literacy.

While conventional operating systems are designed for common usages, and are more or less customized for education only by the application sets added to them, a number of software manufacturers, especially Linux distributions, have sought to provide integrated platforms for specifically education such as "Edubuntu" " (Wikipedia, 2019).

   2.5.6. Corporate training and tertiary education: Prior educational software for the important corporate and tertiary education markets was designed to run on a single desktop computer (or an equivalent user device). In the years immediately following 2000, planners

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[23] LeapFrog Enterprises Inc is an educational entertainment and electronics company based in Emeryville, California. It designs, develops, and markets technology-based learning products and related content for the education of children from infancy through grade school.

decided to move to server-based applications with a high degree of standardization. This means that educational software runs primarily on servers which may be hundreds or thousands of miles away from the actual user. The user only receives tiny pieces of a learning module or test, served over the internet one by one. The server software decides on what learning material to deliver, collects results and displays progress to teaching staff. Another way of expressing this change is to say that educational software transformed into an online educational service (Wikipedia, 2019).

2.5.7. Specific educational purposes: There are highly particular niche markets for educational software that includes:

- ❖ Teacher tools and classroom management software (SMS) (remote control and monitoring software, file transfer software, document camera and presenter, free tools)
- ❖ Learning Management Systems (LMS)
- ❖ Students Information Systems (SIS)
- ❖ Driving test software
- ❖ Medical and healthcare educational software
- ❖ Language learning software
- ❖ Interactive geometry software
- ❖ Mind Mapping Software which provides a focal point for discussion, helps make classes more interactive, and assists students with studying, essays and projects.
- ❖ Designing and printing of card models for use in education - eg. Designer Castles for BBC Micro and Acorn Archimedes platforms

❖ Notetaking (Comparison of notetaking software)

❖ Typing tutors

❖ Software for enabling simulated dissection of human and animal bodies (used in medical and veterinary college courses)

❖ Spelling tutor software

❖ Reading Instruction

2.5.8. Video Game and Gamification: There is a notion to teach technology literacy through video games or more about a subject. Some operating systems and mobile phones include these features. A famous example is Microsoft Solitaire[24], which was developed to introduce users with the use of graphical user interfaces, especially the mouse and the drag-and-drop practice. "Mavis Beacon Touch Typing"[25] is a largely known program with built in mini-games to keep the user entertained while improving their typing skills.

Gamification is the use of game design elements in nongame contexts and has been shown to be effective in inspiring behavior change. By seeing game elements as "motivational affordances," and formalizing the relationship between these elements and motivational affordances. For example, Classcraft, Tovertafel (Wikipedia, 2019).

2.6. Types of Education Software:

Depending on the features of education software and their utilities, there are about 18 types of educational technology tools have been identified.

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[24] Solitaire is a computer game included with Microsoft Windows, based on a card game.
[25] Mavis Beacon Teaches Typing is an application software program designed to teach touch typing.

I. **_Infographics:_** This type of tools helps to create interactive and dynamic data visualization in charts, diagram, and variety of infographics. Popular free tools are amCharts, ChartBin, Google Chart Tool, Infogram, Gliffy, Easel.ly, Gapminder, Hohly, Linkspace, LucidChart, PiktoChart, Pixlr, Visual.ly, Wordle.

II. **_Text To Speech Tools:_** This type of tools helps to transform any text message to audio sounds. It can read out loud any web text or text document and make audio sound with a human voice. So, it seems someone is reading the text. Popular tools in this type are Announcify, Balabolka, Chrome Speak, DSpeech, FoxVox, Natural Reader, Odiogo, PowerTalk, SpeakingFox, Text to Voice, Text2Speech, Voki, WordTalk.

III. **_Digital Storytelling:_** "Digital Storytelling is a fantastic way to engage students, teachers and just about anyone else who has ever wanted to be the next Ken Burns or Steven Spielberg. There are many different definitions of "digital storytelling," but in general, all of them revolve around the idea of combining the longstanding art of telling stories with any of a variety of available multimedia tools, including graphics, audio, video animation, and Web publishing" (Digital Storytelling, 2019) . Such as Animoto, Capzles, Cartoonist, PicLists, Pixton, SlideStory, SmileBox, Storybird.

IV. **_Podcast:_** "A podcast is an episodic series of digital audio or video files which a user can download in order to listen. Alternatively, the word "podcast" may refer to the individual component of such a series or to an individual media file" (Wikipedia, 2019). Popular tools to make podcast are Ardour, Audacity, EasyPodcast, HuffDuffer, PodBean, Podomatic, SoundCloud, TalkShoe.

V.   ***Survey, Polls, and Quizzes Tools:*** With this type of tools educators and learners can create Survey, Polls, and Quizzes. Popular tools to do these tasks are Addpoll, Answergarden, Doculicious, FluidSurveys, Formsite, Google Forms, PollHost, SurveyMonkey, Wufoo.

VI.   ***Screen Capturing Tools:*** With this type of tools teachers can capture their computer screen and save it as video. There are various screen capture software that work offline, online, from browser and even on desktop software. Popular free screen capturing tools are Aviary, Clip2net, FastStone, KingKongCapture, Kwout, Screendash, Screenpresso, Websnapr.

VII.   ***Social Bookmarking Tools:*** Bookmarking is an online service which offer users to create and publicly share website bookmarks with other members of a community by simply tagging a web page with a web-based tool so one can easily access it later. Instead of saving Bookmarks to the web browser, This bookmarking tools are used to save them to the web. Popular tools are Symbalooedu, Pearltrees, Bibsonomy, Buddymarks, Evernote, Historio, Jogtheweb, Pinterest, Reddit, Sharetivity, Stumbleupon.

VIII.   ***Bibliography and Citation Tools:*** Bibliography management tools are also known as citation or reference management tools help to manage research sources and generate bibliographies in multiple citation formats. Popular tools are CitationGenerator, CitationMachine, CiteFast, Zotero, NoodleTools, RefWorks.

IX.   ***Sticky Notes Tools:*** Sticky Notes are an electronic version of a 3M Post-it™[26], which is a small, colored piece of paper (usually yellow) that can be stuck to

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[26] It is patent name that was registered for Sticky note trademark. It uses generally yellow color and the object is movable.

almost any place. Sticky Notes was first familiarized in Windows 7 and allows users to have electronic reminders posted on their screen. The image displays the available colors in Sticky Notes. Popular tools for Stikcy Notes are CorkBoard, HottNotes, Linoit, Padlet, Scrumblr, SimpleStickyNotes, Spaaze.

X. ***Photo & Image Editing Tools:*** Image editing means to modifying or improving digital or traditional photographic images using different procedures, tools or software. The images can be produced by scanners, digital cameras or other image-capturing devices may be good, but not perfect. Popular tools are Photopea, Aviary, Cacoo, CoSketch, Creately, CreativeDocs, Draw.io, Gikr, InkSpace, Photopeach, Pixlr, Reshade, ToonDoo.

XI. ***Testing and Quizzing Tool:*** Quizzing tool, also called quiz software, test maker software or assessment creator is a software that provides quizzes and tests. Most quiz software, come with sophisticated features for learner assessment, management and tracking, automatic test grading, certificate management and more. Popular testing and quizzing tools are Classmarker, ClassTools, EasyTestMaker, Yacapaca, JeopardyLabs, QuizSlides, What2Learn.

XII. ***Web Conferencing Tools:*** Web Conferencing is an online service by which someone can hold live meetings, conferencing, presentations and trainings via the internet particularly on TCP/IP connections. One can connect to the conference either by telephone or using one's computer's speakers and microphone through a VoIP connection. Popular tools are Anymeeting, BigBlueButton, Google Hangouts, Meetin.gs, MeetingBurner, Mikogo, Sync.in, TokBox, Zoho Metting, Zoom Meeting, Skype.

XIII.   ***Authoring Tools:*** Also known as authorware, a program that supports to write hypertext or multimedia applications. Authoring tools typically enable to make a final application merely by linking together objects, such as a paragraph of text, an illustration, or a song. By defining the objects' relationships to each other, and by rearranging them in a correct order, authors (those who use authoring tools) can create attractive and valuable graphics applications. Most authoring systems also allow a scripting language for more stylish applications (Beal, Authoring Tool, 2019) . Famous authoring tools are EasyGenerator, Microsoft LCDS, SmartBuilder, AuthorPoint, Document Suite 2008, Izzui, LessonWriter, Udutu, QuickLessons.

XIV.   ***Annotation Tools:*** The annotations can be thought of as a layer on top of the existing resource, and this annotation layer is generally obvious to other users who share the similar annotation system. In such situations, the web annotation tool is a type of social software tool. Popular annotation tools are Diigo, A.nnotate, BounceApp, Crocodoc, Markup.io.

XV.   ***Video Tools:*** Video tools helps to capture video on the web, edit and make video clips. There are various video tools to work with videos. The most popular are Ezvid, flashbackrecorder, CamStudio, WebinAria.

XVI.   ***PDF Tools:*** There are various tool to work with PDF file. With DPF tools, you can make pdf, edit pdf, sign pdf, and many others task can be done. Popular DPF tools are Adobe Reader XI, Doro PDF Writer, PDFill, BullZip PDF Printer, DoPDF.

XVII.   ***Music Tools:*** These tools help to create music files with editing, merging,

cropping and many other music manipulation options. The main service of music

tools is to have downloadable option for thousands of music file available on the

site. The Popular tools are ArtistServer, AudioFarm, Audionautix, Beatpick,

BrainyBetty, Bumpfoot, CashMusic, ccMixter, ccTrax, DanoSongs,

FreePlayMusic, FreeSound, Kompoz, Musopen, SonnyBoo.

XVIII.   ***Stock Photos Sites:*** Stock photos (stock photography) are professional

photographs of common places, landmarks, nature, events or people that are

bought and sold on a royalty-free basis and can be used and reused for

commercial design purposes (Beal, Stock Photo, 2019) . Popular sites are

PublicDomainPictures, FreeImages, Freefoto, FreeStockFor, FreePixels,

Morguefile, FreeDigitalPhotos, EveryStockPhoto, Pexels, UnSplash.

2.7. Popular Education Software Tools for Teachers and Learners

There are hundreds of digital education software tools have been created, even continued

to add new regularly, with the purpose of giving autonomy to the student, improving the

administration of academic procedures, encouraging collaboration, and facilitating

communication between teachers and learners. Ashutosh Chauhan[27] (Chauhan, 2019) mentioned

11 most popular tools for teachers and learners which is stated bellow.

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[27] Ashutosh Chauhan is a team lead in digital Marketing at eLuminous technologies

1. ***Edmodo:*** Edmodo is an educational tool that connects internally teachers and students, and is integrated into a social network. In this one, teachers can create online collaborative groups, administer and offer educational materials, measure student performance, and communicate with parents, among other functions. There are more than 34 million Edmodo users who connect to create a learning process that is more enriching, personalized, and aligned with the opportunities conveyed by technology and the digital environment. Official website: www.edmodo.com

2. ***Socrative:*** Designed by a group of entrepreneurs and engineers impassioned about education, Socrative is a system that facilitates teachers to create exercises or educational games which students can solve using mobile devices, whether smartphones, laptops, or tablets. Teachers can view the results of the activities and, depending on these, amend the subsequent lessons in order to make them more personalized and engagement. Official website: https://socrative.com/

3. ***Projeqt:*** Projeqt is a tool that provides various features to create multimedia presentations, with dynamic slides in which someone can embed interactive maps, links, online quizzes, Twitter timelines, and videos, among other options. During a class session, teachers can share with their students' academic presentations which are visually adjusted to different devices. Official website: https://projeqt.com

4. ***Thinglink:*** Thinglink offers educators to create interactive images with music, sounds, texts, and photographs. These can be shared on other websites or on social networks, such as Twitter and Facebook. Thinglink allows the option for teachers to create learning

methodologies that stimulate the curiosity of students through interactive content that can grow their knowledge. Official website: www.thinglink.com

5. *TED-Ed:* TED-Ed is an educational platform that facilitates creating educational lessons with the collaboration of teachers, students, animators—usually people who want to increase knowledge and good ideas. This website offers democratizing access to information, both for teachers and students. Here, people can experience an active involvement in the learning process of others. Official website: https://ed.ted.com

6. *cK-12:* cK-12 aims to reduce the cost of academic books for the K12 market in the United States and the world. To achieve its objective, this platform has an open source interface feature that offers creating and delivering educational material through the internet, which can be modified and contain videos, audios, and interactive exercises. It can be printed and comply with the necessary editorial standards in each region. The books that are created in cK-12 can be improved to the needs of any teacher or student. Official website: www.ck12.org

7. *ClassDojo:* ClassDojo is a tool that offers to improve student behavior: teachers provide their students with immediate feedback so that good disposition in class is 'rewarded' with points and students have a more responsive attitude towards the learning process. It sends real-time notifications to students, like 'Well Done Zahir!' and '+1', for working collaboratively. The information that is gathered about student behavior can be shared later with parents and administrators through the web. Official website: www.classdojo.com

8. *Participate:* This platform offers teachers and students to share and explore references and educational material. In Participate, one can gather information found on the internet

and then share it with the members of previously created groups, which offers the possibility to manage more effectively the academic content found online, improve research procedures, and have a digital record of what students accomplished during the course. Similarly, it provides the opportunity for teachers to arrange a virtual class with their students and create a portfolio where all the work carried out is stored. Official website: www.participate.com

9. ***Storybird:*** Storybird purposes to promote reading and writing skills among students through storytelling. With this tool, teachers can make interactive and artistic books online through a simple and easy to use interface. The stories made can be embedded in blogs, sent by email, and printed, among other options. In Storybird, teachers are also able to create projects with students, give constant feedback, and arrange classes and grades. Official website: https://storybird.com

10. ***Animoto:*** Animoto is a software tool that allows to create high-quality videos in a short time online even from any mobile device which is motivating students and helping improve academic lessons. Its interface is user-friendly and practical, allowing teachers to create audiovisual content that quenches to educational needs. Official website: www.animoto.com

11. ***Kahoot!:*** Kahoot! is an educational platform that is developed based on games and questions. With the help of this tool, teachers can create questionnaires, discussions, or surveys that complement academic lessons. The material is presented in the classroom and questions are responded by students while playing and learning at the same time. It promotes game-based learning, which improves student engagement and forms a dynamic, social, and fun educational environment. Official website: https://kahoot.it

Chapter – 4: Evolution of Web

This chapter studies about the evolution of Web and their different versions including their basic definitions, characteristics, elements, duration of evolution, and explain their details technological innovations and future expectations.

Since the first launches of website on the 6th of August 1991, a team of CERN engineers led by Sir Tim Berners-Lee[28] (Athow, 2019) , web designers have been experimenting with the way websites look. Early sites were completely text-based, with minimal images and no real layout to speak of other than headings and paragraphs. However, the industry advanced, ultimately bringing us table-based designs, then Flash, and finally CSS-based designs. WWW is the initial tool used by billions of people to share, read, and write information to interact with other people via internet. It has much progressed since its advent. The early stage of the web is defined as Web 1.0. The evolution of web from version 1.0 has reached to Web 3.0 and continues development to Web 4.0 and Web 5.0.
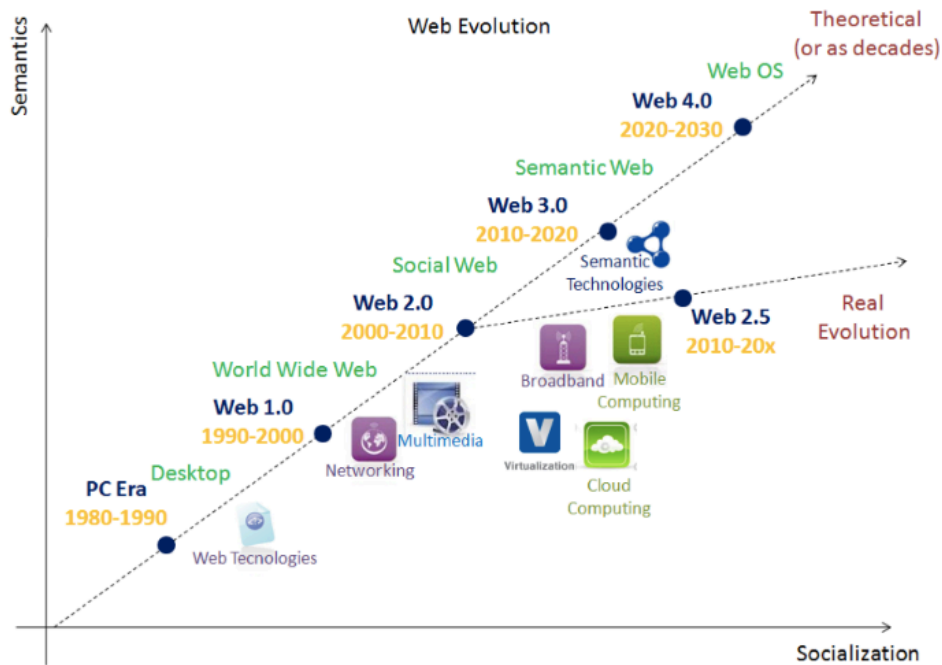
Figure 25: Evolution of Web. Source: http://www.mdpi.com/futureinternet/futureinternet-04-00852/article_deploy/html/images/futureinternet-04-00852-g001.png

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[28] Sir Timothy John Berners-Lee OM KBE FRS FREng FRSA FBCS, also known as TimBL, is an English engineer and computer scientist, best known as the inventor of the World Wide Web (www).

1. Web 1.0: The Basic Publishing and Transaction Medium

Web 1.0 started in the 1960s, as the most basic form, with text-only browsers, then appeared HTML that created pages more pleasing to the eye, and the first visual browsers like Netscape and Internet Explorer were invented. This Web was read-only as Tim Berners-Lee said, the user can't interact with the page content, it is limited to what the Webmaster uploads to the website. the early web facilitated us to search for information and read it. There was very little in the way of user interaction or content generation.

Figure 26: Lifecycle of Web 1.0 technologies. Source: https://www.slideshare.net/ThreeznoThreezno/perbedaan-we

1.1. Characteristics of Web 1.0: General design elements of a Web 1.0 site include

(Delgado, 2019):

- ❖ Static pages for the user's visit

- ❖ Content provided from server's filesystem, there was not any database system

- ❖ Pages were built using Server Side Includes (SSI) or Common Gateway Interface (CGI) instead of a web application written in a dynamic programming language such as Perl, PHP, Python or Ruby (Wikipedia, 2019).

- ❖ The use of HTML 3.2 era elements such as frames or framesets

- ❖ Own HTML extensions such as blinking and marquees, labels introduced during the browser wars

- ❖ Guestbooks

- ❖ GIF buttons

- ❖ HTML forms sent via e-mail - After filling the form or simply clicking the send mail it would launch email client software in user computer that send the data via email. "mailto" tag was introduced to achieve this goal (Wikipedia, 2019).

World Wide Web

The WorldWideWeb (W3) is a wide-area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an executive summary of the project, Mailing lists , Policy , November's W3 news , Frequently Asked Questions .

What's out there?
    Pointers to the world's online information, subjects , W3 servers, etc.
Help
    on the browser you are using
Software Products
    A list of W3 project components and their current state. (e.g. Line Mode ,X11 Viola , NeXTStep , Servers , Tools , Mail robot , Library)
Technical
    Details of protocols, formats, program internals etc
Bibliography
    Paper documentation on W3 and references.
People
    A list of some people involved in the project.
History
    A summary of the history of the project.
How can I help ?
    If you would like to support the web..
Getting code
    Getting the code by anonymous FTP , etc.

Figure 27: The first website, published by Tim Berners-Lee. Source: https://www.w3.org/History/19921103-hypertext/hypertext/WWW/TheProject.html

2. Web 2.0: The Social and Co-created Web

Web 2.0 refers to websites that emphasize on user-generated content, ease of use, participatory culture and interoperability for end users. It is also known as Participative or Participatory and Social Web. The term was invented by Darcy DiNucci[29] in 1999 and later popularized by Tim O'Reilly[30] and Dale Dougherty[31] at the O'Reilly Media Web 2.0 Conference in late 2004. The Web 2.0 framework only specifies the design and use of websites and does not place any technical demands or specifications on designers. The transition happened gradually and, consequently, no particular date for when this change happened has been given (Wikipedia, 2019).

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[29] Darcy DiNucci is an author, web designer and expert in user experience. DiNucci coined the term Web 2.0 in 1999 and predicted the influence it would have on public relations.

[30] Tim O'Reilly (born 6 June 1954) is the founder of O'Reilly Media (formerly O'Reilly & Associates). He popularised the terms open source and Web 2.0.

[31] Dale Dougherty (born 1955) is a co-founder of O'Reilly Media, along with Tim O'Reilly. While not at the company in its earliest stages as a technical documentation consulting company, Dale was instrumental in the development of O'Reilly's publishing business. He is the author of the O'Reilly book sed & awk.

The absence of active interaction of common users with the web directed to the birth of Web 2.0. The year 1999 was marked as the inauguration of a Read-Write-Publish era with notable contributions from LiveJournal[32] (Launched in April, 1999) and Blogger[33] (Launched in August, 1999). Now even a non-technical user can dynamically interact & contribute to the web using different blog platforms. If we stick to Berners-Lee's method of describing it, […] the Web 2.0, or the "read-write" web has the […] ability to contribute content and interact with other web users. This interaction and contribution have radically changed the landscape of the web. It has even more possibility that we have yet to see. The Web 2.0 appears to be a welcome response to a web user need to be more engaged in what information is available to them. But the web inventor Tim Berners Lee described the term as "Jargon[34]" (Laningham, 2019) that he replied to a podcast interview with IBM to clear the difference between web 1.0 and web 2.0 that –

" Web 1.0 was all about connecting people. It was an interactive space, and I think Web 2.0 is of course a piece of jargon, nobody even knows what it means. If Web 2.0 for you is blogs and wikis, then that is people to people. But that was what the Web was supposed to be all along. And in fact, you know, this 'Web 2.0,' it means using the standards which have been produced by all these people working on Web 1.0." (Anderson, 2019)

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[32] LiveJournal, is a Russian social networking service where users can keep a blog, journal or diary. American programmer Brad Fitzpatrick started LiveJournal on April 15, 1999, as a way of keeping his high school friends updated on his activities.

[33] Blogger is a blog-publishing service that allows multi-user blogs with time-stamped entries. It was developed by Pyra Labs, which was bought by Google in 2003. The blogs are hosted by Google and generally accessed from a subdomain of blogspot.com.

[34] Jargon is the specialized terminology associated with a particular field or area of activity. Jargon is normally employed in a particular communicative context and may not be well understood outside that context.

This era enabled the common user with a few new concepts like Blogs, Social-Media & Video-Streaming. Publishing user content is only a few clicks away! Few outstanding developments of Web 2.0 are Twitter, YouTube, eZineArticles, Flickr and Facebook.

So, Basically, the Web 2.0 is a dynamic process of technology improvement where two-way communication is performed. Formerly, there was one-way communication system. For example: reading a static web pages where there is no option for user to comment or like. In two-way system reader can like, comment, and maintained a authentication process with registration and login option.

Figure 28: Typology of Web 2.0 learning technologies. Source: https://www.researchgate.net/figure/Typology-of-Web-20-learning-technologies_fig1_272092566

2.1. Characteristics of Web 2.0: Instead of only reading a Web 2.0 site, a user is encouraged to contribute to the site's content by liking and commenting on published articles, or

creating a user account or profile on the site, which may permit added participation. By

increasing importance on these already extant capabilities, they encourage users to rely more on

their browser for user interface, application software ("apps") and file storage facilities. This has

been called "network as platform" computing.

Major features of Web 2.0 comprise

- ➢ social networking websites,

- ➢ self-publishing platforms (e.g., WordPress' easy-to-use blog and website creation tools),

- ➢ "tagging" (which allows users to label websites, videos or photos in some fashion),

- ➢ "like" buttons (which allow a user to show that they are satisfied by online content), and

- ➢ social bookmarking (Wikipedia, 2019).

Some scholars claim that cloud computing is an example of Web 2.0 because it is simply an

implication of computing on the Internet (Ryan, 2005) .

According to Best (Best, 2006), the characteristics of Web 2.0 are

- ➢ Rich user experience

- ➢ User participation

- ➢ Dynamic content

- ➢ Metadata

- ➢ Web standard – Valid markup and

- ➢ Scalability

Additional characteristics are

➢ openness

➢ freedom and

➢ collective intelligence by user participation

The above characteristics can also be regarded as important attributes of Web 2.0. Some websites require users to create user-generated content to have access to the website, to discourage "free riding". For example, creating new account by registration.

2.2. The key features of Web 2.0 include: (Wikipedia, 2019)

❖ Folksonomy[35] – free classification of information; enables users to communally classify and find information (e.g. "tagging" of websites, images, videos or links)

❖ Rich user experience – dynamic content that is responsive to user action (e.g., a user can "click" on an image to enlarge it or find out more information)

❖ User participation[36] – information flows two ways between the site administrator and site users by means of evaluation, review, and online commenting, likes. Site users also habitually create user-generated content for others to see (e.g., Wikipedia, an online encyclopedia that anyone can write articles for or edit)

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[35] Folksonomy is the system in which users apply public tags to online items, typically to make those items easier for themselves or others to find later.

[36] User Participation is Crowdsourcing which is a sourcing model in which individuals or organizations obtain goods and services, including ideas and finances, from a large, relatively open and often rapidly-evolving group of internet users; it divides work between participants to achieve a cumulative result.

❖ Software as a service (SaaS) – Web 2.0 sites developed APIs to enable automated usage, such as by a Web "app"[37] (software application) or a mashup[38]

❖ Mass participation – near-universal web access leads to differentiation of concerns, from the conventional Internet user base (who tended to be computer hackers and hobbyists) to a greater number of users.

3.   Web 3.0: The Semantic and Intelligent Web

It is quite difficult to answer the question "what is web3.0??", different Internet experts has their different attitudes and opinions to the future web. Major IT experts consider web3.0 as a semantic web and personalization. By extrapolating Tim Berners-Lee's explanations, web 3.0 is "read-write-execute." This is difficult to visualize in its abstract form. To illustrate, think semantic markup and web services.

Semantic markup indicates to the communication gap between humans and computerized applications. One of the biggest challenges of showing information on the web is that applications cannot deliver context to data, and, therefore, can't determine what is relevant. Through the use of some sort of semantic markup (or data interchange formats), data could be placed in a form not only accessible to humans via natural language, but also able to be understood and interpreted by software applications as well. (Getting, 2019)

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[37] In computing, a web application or web app is a client–server computer program that the client (including the user interface and client-side logic) runs in a web browser.
[38] A mashup (computer industry jargon), in web development, is a web page or web application that uses content from more than one source to create a single new service displayed in a single graphical interface.

A web service is a software that enables computer-to-computer interaction over the internet. Web services are not new and typically take the form of an application programming interface (API). The popular photography-sharing website Flickr offers a web service whereby developers can programmatically interface to search for images. There are thousands of web services. Blending semantic markup and web services can create a web 3.0 experience — applications that can speak to each other directly and interpret information for humans (Getting, 2019) .

Google CEO, Eric Schmidt described Web 3.0 with a great definition in a Digital Forum at Seoul:

"Web 3.0 will be "applications that are pieced together" – with the characteristics that the apps are relatively small, the data is in the cloud, the apps can run on any device (PC or mobile), the apps are very fast and very customizable, and are distributed virally (social networks, email, etc)". (Macmanus, 2019)

At the Technet Summit in November 2006, Jerry Yang, founder and president of Yahoo, described the following definition for Web 3.0:

"Web 2.0 is widely documented and discussed. The power of the Net has reached critical mass, with potential developers on the net, not only through hardware like game consoles and mobile devices but also through software architecture. You do not need to be to create a computer program. We are observing that what occurs in Web 2.0 and Web 3.0 will be a great extension of this, a true vehicle policy … the distinction between professional, semi-professional and consumers will create a blurring effect for business and network applications." (Santosh, 2019)

Similarly, Reed Hastings, founder and CEO of Netflix, at Technet Summit, summarized the differentiation and definition on Web 3.0 in a simple formula:

"Web 1.0 WAS Dial-up 50K average bandwidth, Web 2.0 is an average 1 megabit of bandwidth and Web 3.0 will be 10 megabits of bandwidth all the time, which will be the full video Web, And That will feel like Web 3.0". (Santosh, 2019)

3.1. Characteristics of Web 3.0: According to the definition, the present time we are passing is Web 3.0 and it is the prime era of Web 3.0. Four characteristics can be identified from the definition above.

3.1.1. Intelligence: Artificial Intelligence (AI) is the key characteristic of Web 3.0. It is the most promising feature for Web 3.0. Application is developed with AI capabilities that work intelligently with the use of Human-Computer interaction and intelligence. Different Artificial Intelligence (AI) based tools & techniques (such as, rough sets, fuzzy sets, neural networks, GPU, machine learning, etc.) is incorporated with the applications to work intelligently (Rajiv & Manohar, 2019). This indicates, an application based on Web 3.0 can directly do intelligent analysis, and bring optimal output on probability without much user intervention. Documents in different languages can be intelligently translated into other languages in Web 3.0. that's called datasets or AI data model. It helps us to work through natural language embedded with Natural Language Processing (NLP) technology. Therefore, users can use their native language for communication with the others around the world. This is basically Machine is learning regularly from user

data, generated by various interaction, and predicting or doing some task automatically on behalf of the user.

3.1.2. Personalization: Personal or individual preferences is considered during different activities and data analytics to provide personalized services such as information processing, search, formation of personalized portal on the web. Semantic Web is the core technology for Personalization in Web 3.0 (Rajiv & Manohar, 2019).

3.1.3. Interoperability: The terms Interoperability, collaboration and reusability are fundamentally interrelated. Interoperability indicates reuse, which is again a form of collaboration. Web 3.0 provides a communicative medium for knowledge and information exchange. When a person or a software program produces information on the Web and this information is used by another, then the creation of new form of information or knowledge takes place (Mathieu & Enrico, 2008). Web 3.0 applications are easy to customize & they can work independently on various kinds of devices. An application based on Web 3.0 is able to run on many types of Computers, Microwave devices, Hand-held devices, Mobiles, TVs, Automobiles and many others. Pervasive Web is the term used to describe this phenomenon where web is operable to a wide range of electronic devices.

3.1.4. Virtualization: Web 3D is revolutionary change in web advent with the integration of Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR). It uses high speed internet bandwidths and High-end 3D Graphics, which is better utilized for virtualization with 360-degree rotation. The trend for future web refers to the creation of

virtual 3-Dimensional environments where people can interact and collaborate as a

virtual person. For example, Second Life[39]

3.2. Technology trends in Web 3.0: There are some specific core technologies to support

Web 3.0. The following technologies have been identified as the core building blocks of next

generation web application in Web 3.0.

3.2.1.   *Semantic Web:*

The Semantic Web is an extension of the World Wide Web through standards by the

World Wide Web Consortium (W3C)[40].The standards support common data formats and

exchange protocols on the Web, most essentially the Resource Description Framework (RDF)[41].

According to the W3C,

"The term "Semantic Web" refers to W3C's vision of the Web of linked data. Semantic

Web technologies enable people to create data stores on the Web, build vocabularies, and write

rules for handling data. Linked data are empowered by technologies such as RDF, SPARQL,

OWL, and SKOS." (Semantic Web, 2019)

The Semantic Web is therefore considered as an integrator across different content,

information applications and systems. The extension of the World Wide Web that provides an

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[39] Second Life is an online virtual world, developed and owned by the San Francisco-based firm Linden Lab and launched on June 23, 2003. By 2013, Second Life had approximately one million regular users; at the end of 2017 active user count totals "between 800,000 and 900,000".

[40] The World Wide Web Consortium (W3C) is the main international standards organization for the World Wide Web (abbreviated WWW or W3). Founded and currently led by Tim Berners-Lee, the consortium is made up of member organizations which maintain full-time staff for the purpose of working together in the development of standards for the World Wide Web.

[41] The Resource Description Framework (RDF) is a family of World Wide Web Consortium (W3C) specifications originally designed as a metadata data model.

efficient & easier way to share, find and combine data & information from distinct sources is called Semantic Web. In the simplest terms, we can define Semantic Web as a relationship between things, described in a way which makes people and machines able to understand. Semantic Web is all about data integration. The Semantic Web transforms "display only" data to expressive information by using metadata. Ontologies[42], which contain the vocabulary, semantic relationships, and simple rules of inference and logic for a specific domain, are accessed by software agents. These agents find and combine data from various sources to provide relevant information to the user. One of the objectives of Semantic Web is to identify and deliver the exact required data that matches the keywords provided by the user. For example, if we search keyword datamining through Google, yahoo or any other search engines, millions of web pages show as search results out of which a few may have some related information and all other pages may be unusable. Web 3.0 in terms of Semantic Web is the third generation of World Wide Web in which machines have the ability to read Web contents like Human beings (can call data scrap) and also the ability to follow our instructions. For example, if we order to check the schedules of all the show timings of a film in theaters, for our preferred timings, within a 20 km radius, then it follows and provides the proper information in respect of our preferences (Rajiv & Manohar, 2019).

3.2.2.   The 3D Web:

There are few definitions for 3D Web. Wikipedia defines "Web3D was initially the idea to fully display and navigate Web sites using 3D. By extension, the term now refers to all interactive 3D content which are embedded into web pages' HTML, and that users can see

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[42] a set of concepts and categories in a subject area or domain that shows their properties and the relations between them. Source: Wikipedia

through a web browser" (Web3D, 2019) . EduTechWiki defines – "Web 3D refers to interactive 3D technology that one can use through a web browser. However, users are usually required to install a so-called plugin. Web 3D also can refer to technology that allows to browse the Web in 3D." (Web 3D technology, 2019)

This trend of the World Wide Web indicates to the formation of virtual 3-dimensional worlds on the Web. 3D graphics is extensively utilized in the development of Web 3.0 tools or applications. High speed Internet, quicker processing speeds, higher screen resolutions, 3D gaming technology and augmented reality are transforming the Web browsing into a 3D experience, where we actually move through the virtual corridors of the Web, as a virtual avatar of the real self. Recently several Internet-based elementary virtual worlds, such as Radar Networks, Second Life, IMVU, Active Worlds, and Red Light Center, have gained huge attention by the public worldwide. Users of these virtual worlds are increasing in a big way every day. These types of environments enable users to experience new things which they may never be able to have in their real life. Users make avatars on the Web and allow them to live in the virtual worlds. The residents or avatars of these virtual worlds can discover, interact with other residents, socialize, participate in different activities, create and serve different types of services. The possible interactions in these virtual worlds occur through text, chat messaging, audio chat, or od with video (Rajiv & Manohar, 2019).

3.2.3. The Social Web:

Social Web is defined as "The social web is a set of social relations that link people through the World Wide Web" (Halpin & Tuffield, 2019) . The social web includes how websites and software are designed and developed in order to help and promote social interaction. These

online social interactions conform the basis of much online activity incorporating online

shopping, education, gaming and social networking websites. "The social aspect of Web 2.0

communication has been to facilitate interaction between people with similar tastes." (Weber L. ,

2009) These tastes vary depending on who the target audience is, and what they are seeking for.

For persons working in the public relation department, the job is regularly changing and the

influence is coming from the social web. The influence, thought by the social network is large

and continuously changing.

     The Social Web explains the interaction of people with one another using the underlying

technologies of World Wide Web. Technology improvements in Web 3.0 is taking the current

social computing to a new stage called Semantic Social Computing or Socio-Semantic Web

which develop and utilize knowledge in all forms, e.g., content, models, services, & software

behaviors. Semantic Web and, in general, Artificial Intelligence technologies have embedded

underlying knowledge representations to information, tags, processes, services, software

functionalities and behaviors. The wisdom of crowds and predictive knowledge come not from

the consensus decision of the group, but from derive from the semantic and logical aggregation

of the ideas, thoughts, and decisions of each individual in the group. Instead of connecting

documents only, the Social Web 3.0 link people, organizations, and concepts automatically

(Rajiv & Manohar, 2019).

3.2.4.   *The Media Centric Web:*

     The most of traditional search engines offer search results on the basis of text inputs. Web

3.0 searches do not restrict them only to the text-based searches. Rather, Web 3.0 searches are

able to find out the associated similar media objects based on its features. The search engines are capable to take input(s) as a media or a multi-media object and are able to search out relevant media objects based on its features. For example, to search images about cars, we need to provide an input as an image of a car by uploading or giving URL link from web and the search engine are able to retrieve images of cars with similar features. The same kind of search possibilities should be applied with other media objects such as audio and video. The work in this direction is already going on. For some good examples of this kind of technology can be found on software like google image, and image search engine, google photos, photo sharing tool that allows to automatically tag images using face recognition (Rajiv & Manohar, 2019).

3.2.5.   *The Pervasive and Ubiquitous Web:*

Pervasive web is defined as "The official next generation of the web is what I call the pervasive web. The pervasive web speaks to the redistribution of what we know as the internet – browsers and computers interacting with data and service and even people – into a truly "always available" experience. The concept behind pervasive web is that you the user can access your information wherever you might be and interact with the global community wherever you might be, in whatever method is available. You know – the right content, at the right time, in the right place on the right device." (Brazell, 2019) for example, Twitter which is a favorite thing to blog about recently. Through Twitter, people can interact with each other and our world while sitting in front of the computers or while walking on the street via our cell phones. This is pervasive web. This is pervasive conversation. Facebook comes in quickly behind this by allowing folks to message each other and update their status messages from wherever they are.

Significant developments in technologies such as wireless communications, wireless

networking, mobile computing devices, software agents, artificial intelligence, enabling

technologies (e.g., Bluetooth, BANs, PANs, 802.11 wireless LANs), embedded systems,

wearable computers have steered to the evolution of Pervasive & Ubiquitous computing

platforms. Similarly, W3 defines "Ubiquitous Web is focusing on technologies to enable Web

access for anyone, anywhere, anytime, using any device." (Hoschka, 2019) This enables Web

access from mobile phones as well as other emerging environments such as connected TVs and

even automobiles. To allow the next generation of Web user interfaces, Web developer are

working on APIs for mobile devices and automobiles, VoiceXML and technologies for

multimodal interaction. According to Peter Robinson, Ubiquitous and pervasive computing may

be defined as the task of embedding small and mobile devices into existing IT and computing

infrastructures, so that it enables users to access and manipulate information where and when it

matters, even while on the move.

The scope and use of web services are not limited only to computers and mobiles but web

services are equivalently available in clothing, appliances, and in automobiles and much more.

We need not remind these services every time; they will work and perform their task themselves

cooperatively and automatically. For example, using the web services we can find windows and

curtains that check the weather and automatically open and close accordingly; home appliances

that understand our daily routines and preferences and communicate to each other to provide us

with a more comfortable living. As described above, Web services would play a significant role

in this direction and device embeddable system of light weight web services is required. The

communication between different types of devices and their control is possible with the help of

Service Oriented Architectures (SOA) and related technologies for ensuring cross-platform interoperability such as IoT devices and their internal network communication and central monitoring platform. (Rajiv & Manohar, 2019).

So, "Ubiquitous computing (or "ubicomp") is a concept in software engineering and computer science where computing is made to appear anytime and everywhere. In contrast to desktop computing, ubiquitous computing can occur using any device, in any location, and in any format." (Ubiquitous computing, 2019) A user interacts with the computer, which can exist in various forms, including laptop computers, tablets and terminals in everyday objects such as a refrigerator or a pair of glasses. The underlying technologies to accelerate ubiquitous computing include

- ❖ Internet- is the global system of interconnected computer networks that use the Internet protocol suite (TCP/IP) to link devices worldwide.

- ❖ advanced middleware - Middleware is computer software that offers services to software applications beyond those available from the operating system. It can be described as "software glue".

- ❖ operating system - An operating system (OS) is system software that administers computer hardware, software resources, and provides common services for computer programs.

- ❖ mobile code – Mobile code or Code mobility is the ability for running programs, code or objects to be migrated (or moved) from one machine or application to another. This is the process of moving mobile code across the nodes of a network as opposed to distributed computation where the data is moved.

❖ Sensors- Sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronic devices.

❖ Microprocessors- A microprocessor is a computer processor that incorporates the functions of a central processing unit on a single integrated circuit (IC), or at most a few integrated circuits.

❖ new I/O and user interfaces- input/output or I/O (or, informally, io or IO) is the communication between an information processing system, such as a computer, and the outside world, possibly a human or another information processing system.

❖ Networks- a digital telecommunications network which allows nodes to share resources and enables decentralized network (Peer to Peer) that dissolves the need for a centralized authority. Such as IPFS[43].

❖ mobile protocols – such as GSM, CDMA, WLL, GPRS.

❖ location and positioning- such as GPS

❖ new materials.

This paradigm is also explained as pervasive computing, ambient intelligence, or "everyware". Each term emphasizes slightly on different facets. When primarily regarding the objects involved, it is also known as physical computing, the Internet of Things, haptic computing, and "things that think". Ubiquitous computing touches on distributed computing, mobile computing, mobile networking, location computing, sensor networks, human–computer

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[43] The InterPlanetary File System (IPFS) is a protocol and peer-to-peer network for storing and sharing data in a distributed file system. IPFS uses content-addressing to uniquely identify each file in a global namespace connecting all computing devices.

interaction, context-aware smart home technologies, and artificial intelligence (Ubiquitous computing, 2019) .
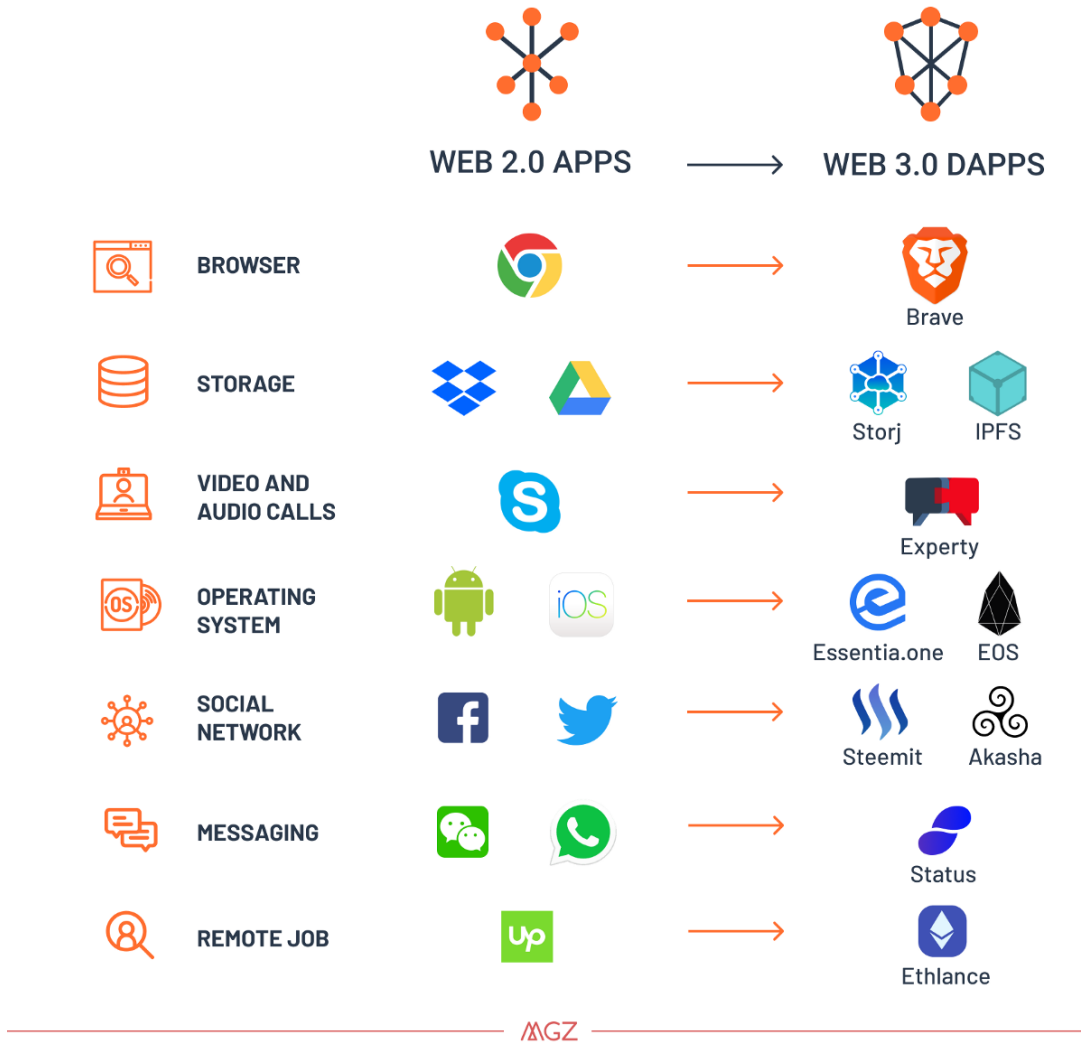
Figure 29: Evolution of Web 3.0 from Web 2.0 in a decentralized manner. Source: https://themerkle.com/wp-content/uploads/linkedin-cover.png

4. Web 4.0: The Symbiotic Web

Experts assumed that we are yet to enter into Web 4.0. Currently we are passing the Web 3.0. The anticipated timeframe might start from the year of 2020 and continues up to the year of 2030 with lots of development in the Technology and innovation. The web 4.0 is also known as the "Symbiotic Web" (Pariente, 2019) and it will be read-write-execution-concurrency web. It will connect all devices in the real and virtual world in real-time. The Web 4.0 is defined as

"Web 4.0 services will be autonomous, proactive, content-exploring, self-learning, collaborative, and content-generating agents based on fully matured semantic and reasoning technologies as well as AI. They will support adaptive content presentation that will use the Web database via an intelligent agent. Examples might be services interacting with sensors and implants, natural-language services, or virtual reality services." (Weber S. & Rech , 2019)

This represents the fourth phase in Web's evolution. The objective of Web 4.0 is to enhance it further sophistication and higher levels of intelligence. A software agent(s) roaming on the Internet or only residing on your computer could aim and communicate with other such agents and systems and work collaboratively to accomplish things on your behalf. It is also widely known as "intelligent Web" or "smart Web."

Web Squared: It indicates to the idea of using Web to tackle real-world problems. In 2009, Tim O'Reilly and John Battelle, created this term in order to encourage the idea that if we are going to solve the world's most pressing problems, we must put the power of the Web to work—its technologies, its business models, and perhaps most importantly, its philosophies of

openness, collective intelligence, and transparency. They said," It's time for the Web to involve the real world. Web meets World—that's Web Squared."

4.1. Characteristics of Web 4.0: It is expected that, according to Wim Hoogenraad (Hoogenraad, 2019), the new Web 4.0 will have the following characteristics:

❖ *Symbiotic Web:* Web 4.0 is known as the symbiotic web. The goal of the symbiotic web is the symbiotic interaction between man and machine. The boundary between man and machine will fade.

❖ *Always On:* This web environment must therefore be an "always on" connected world. Users can meet each other on the web real-time.

❖ *Web-OS:* The new web is a Web OS - the whole web is a single operating system where information flows from each point to another system.

❖ *Advanced Artificial Intelligence:* In the background, self-learning systems are learning to understand a user using advanced artificial intelligence.

❖ *Virtual Assistant:* It communicates with users in the same way that people communicate with each other. Assistant will support to perform many activities on behalf of a person. This assistant always learns from the user's regular activities, likes, dislikes, habits, and many other behavior analyses. Such as Google home, Amazon Echo.

❖ *Public Integrated Intelligence:* Web 4.0 will be an open, linked and intelligent web platform. AI will be embedded into various machines that will be used publicly. Devices will have inter connected and linked together with IoT solution and Blockchain will be more availably integrated with number platforms and bring everything more public.

❖ *Fast & Reliable:* The speed and reliability of Web 4.0 be greater than ever. High speed internet and network communication will be available to ensure reliability and accuracy. Such as Google driverless car, Uber driver less cars are experimental projects. These services will require high speed network, advanced AI enabled and highly secured technology to launch and we are expecting these services will be available in the near future.

4.2. Functions of Web 4.0: Stephen Lets mentioned few functions of Web 4.0. The details in the bellow.

4.2.1. The Internet of People:

When Web 4.0 becomes a mature system, it will construct a new symbiotic relationship between humans and machines. The emergence of Web 4.0 human – machine communication has already commenced.

The symbiotic relationship will augment to Web 4.0 by acting as a personal assistant or agent for the user. Through the use of facial recognition, an ultra-intelligent electronic agent (Jonathan & Elizabeth, 2019) will identify users whenever they log onto an internet connected device. The ultra-intelligent electronic agent will relentlessly be available. The user will control its' look and behavior via an avatar. Ask the agent a question and it will answer. It will also be intuitive of the user's needs. For example, possibly you are going to a convention and need to book a hotel room. Once you are registered for the convention, a window will pop up with few suggestions for hotels in the area based on your previous booking criteria and preferences. The

integration of Web 4.0 has been already stated in our everyday life. For example, when a user

visits YouTube or Amazon and creates an account, some recommendations for videos and books

are displayed based on the previous searches (Letts, 2019) .

4.2.2. The Internet of Daily Life:

Web 3.0 started the development of machine-readable content for Web 4.0. This indicates

that smart appliances will be linked to the Internet and will be capable of completing tasks

without human participation. For example, through the use of radio frequency identification tags

(RFID), your refrigerator will be able to track that it is running low on milk, and it will

communicate the grocery store to order more milk. Then, the refrigerator will send you a SMS

on your smart phone to pick up the milk on your way home from work. RFID tags are tracking

devices that are already used in cars, supply chain systems, automotive assembly and farming

(Letts, 2019).

The use of RFID tags will greatly rise in Web 4.0. It will design a living, connected web

of content, all linked to the Internet. Imagine having all food items tagged at the grocery store so

you do not have to unpack your order at the check-out. The cashier, if there is one, will simply

scan your whole cart and give you the grocery total. Web 4.0 will also enable grocery store

management to appropriately predict how many products they should carry. This will also

facilitate grocery stores to reduce the amount of wasted food, like perishables such as fruit and

vegetables. With the connected web, an individual, when traveling home, may pass a grocery

store and will be instantly notified to pick up something he or she may need, such as milk. With

the integration of Web 4.0 into daily life, even travel directions will be revolutionized. Google

Maps will soon cover mash-ups providing directions, narratives, and coordinates. It can offer instructions that lessen ten minutes of typical commuting time by providing alternative route. One of the most innovative characteristics of Web 4.0 will be the integration of social media into travel. For example, re-routing your way to work in order to bump into an old friend, or if taking a 'sick' day off of work, an individual may be able to avoid their boss. Both of these are examples of how Web 4.0 can augment social interaction (Letts, 2019) .

4.2.3. The Internet of Business:

As mentioned, the use of RFIDs is already commonplace in many industries, and is continuously growing. Another area that will be very different with Web 4.0 is retail shopping. With the development of 3D browsers, shoppers, via their avatar, will be able to travel virtually and interspatially through the web and go into showrooms and stores to browse for products they prefer. If they decide to purchase an item from the store, they would get a message on their device from their personal assistant letting them know if same item is less costly at another store. Experts believe that Web 4.0 will modernize customer service experience because of the complete control of the customer. Customers will access a particular website, such as Amazon or Ebay, and will use audio and video equipment to communicate their requests with a noted representative of the business (Letts, 2019).

Journalist Jean-Paul Edwards writes that companies will be able to establish internal links with other companies using Web 4.0 to offer new services at a lower price (Paul-Edwards, 2019) . Edwards mentions the merger of Comcast and AT&T, which link two different businesses for mutual benefit offering a low-cost home security system using the Internet and video

surveillance, enabling homeowners to continuously check in on their homes. Web 4.0 will allow

various types of companies to share information and combine their services for everyone (Letts,

2019) .

In addition, Edwards notes the influence on other services such as bus transportation

system. For example, Google Driverless cars that depends on signals from signs in order to

navigate buses on their respective routes. Although this could save money by eliminating the cost

of bus drivers, liability and legal issues still need to be tackled (Letts, 2019).

Building construction will also be exaggerated because buildings typically have 20-30

environmental systems, such as lighting and water. Web 4.0 will literally be the "Internet of

Things," as every appliance will be provided an IP address. Sensors will also be attached in the

building systems and appliances and will be able to detect if there any change happens. One

building that has already experimented with Web 4.0 in their building systems and appliances is

the Hotel 100 in Seattle, Washington (Letts, 2019).

4.2.4. The Internet of Medicine:

Healthcare reform has escaped Congress for more than two decades. It seems technology,

driven by the Internet of Things (IoT), could well make the largest transformation of all. In many

matters, IoT is just what the doctor ordered. It holds the key to lowering medical costs,

improving quality and making healthcare more personalized, accessible and affordable for

average patients. This is called the Internet of Medicine (IoM). From a financial standpoint, the

annual influence from IoM could soon exceed a trillion dollars a year — revenue, by the way,

that will increasingly depend on recurring revenue measures (O'Brien, 2019).

Biomedical chip implant technology, currently in its infancy, will emerge with Web 4.0 to

alleviate many diseases of the body. On October 2014, a woman in a Toronto hospital had partial

sight restored after a surgery that placed retinal implants in her eyes (Ubelacker, 2019) .

Biomedical chip implants bridge the gap between human and machine, allowing the machine to

connect with the brain and to restore function that was previously lost to disease. Another Web

4.0 example of the symbiosis of human and machine is the Braingate[44] Neural Interface System

which is being developed by a team of physicians, scientists and engineers from Brown

University. The goal of Braingate Neural Interface System is to re-enable the severely disabled,

and give them the ability to control a cursor on a computer screen or to type on a virtual

keyboard, simply by thinking about the movement of one's own hand (Letts, 2019).

Figure 30: This device is used for people with cervical spinal cord injury or brainstem stroke, signals from the motor cortex have been "disconnected" from the limb. Source: https://www.braingate.org/research-areas/movement-restoration/

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[44] Braingate is a research organization comprising of leading neurologists, neuroscientists, engineers, computer scientists, neurosurgeons, mathematicians, and other researchers – all focused on developing brain-computer interface (BCI) technologies to restore the communication, mobility, and independence of people with neurologic disease, injury, or limb loss.

The Internet of Things has great uses in many different industries; Tom Merritt[45] explains there are five ways IoT is being used in the medical field. IoT means a lot of different things, but one of its more remarkable applications is in medicine; given its reputation for insecurity, that can be troubling. (Merritt, 2019) The following five things you should know about IoT in medicine.

1. *It enables real-time monitoring of physical status:* Doctor can not only see a patient's heart rate, but also the glucose level, breathing rate, and much more. This can support them spot trends and get alerts to give care faster when necessary.

2. *Real-time monitoring of personal information:* This means actual personal status can be monitored at any moment. However, if not properly secured with good access controls and strong privacy policies, patient may be revealing a lot of information about themselves to people they don't want to.

3. *Detailed medical history:* Medical history of a patient will be more detailed than ever. If you have wearables tracking your vitals--along with maybe a pacemaker, CPAP[46], or glucose monitor--all that can create a clear picture of you in order to support a doctor better diagnose and treat you.

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[45] Tom is a columnist and an award-winning independent tech podcaster and host of regular tech news and information shows. Tom hosts Sword and Laser, a science fiction and fantasy podcast, and book club with Veronica Belmont. He also hosts Daily Tech News Show, covering the most important tech issues of the day with the smartest minds in technology.

[46] Continuous positive airway pressure (CPAP) is a form of positive airway pressure ventilator, which applies mild air pressure on a continuous basis to keep the airways continuously open in people who are not able to breathe spontaneously on their own.

4. *Accepting HIPAA agreement:* as your medical history is more detailed than ever. HIPAA[47] defends you from a lot of misuse. You have to opt to donate your data for it to be used--but you might be doing that. So, you should read the terms of services for all your wearables properly?

5. *Personalized advertisement display:* As your many personal information is shared, you might notice free device use comes with a price in ads area or relevant product will display that you might need. For example, some products might come on Facebook where you can be advertised to in a way that has never been possible before. It's a whole other thing to be the product because you accepted a free pacemaker or somehow in exchange for all your heart data being shared with an insurance company.

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[47] HIPAA stands for Health Insurance Portability and Accountability Act of 1996

Figure 31: It shows how medical technology will work with IoT integration. Source: https://www.techrepublic.com/article/top-5-things-to-know-about-iot-in-medicine/

5. **Web 5.0: The Sensory-Emotive Web**

Web 5.0 is known as "Sensory-Emotive Web" or "The Telepathic Web". For the most part, the WWW is an emotionally flat environment. The rise of virtual assistants that forecast your needs from your behaviors, without many cues, is a hint at the Intelligent Web to come. Web 5.0 will adapt applications to be able to interpret information on more complex levels, emotionally as well as logically. This is the Web that works in true symbiosis with daily life, without a thought, organically intertwined with what we do (Spisak, 2019) .

Web 5.0 is still an underground idea in progress and there is no exact definition of how it would be. Web 5.0 can be measured as Symbiotic web, decentralized i.e. it might not be possible

to have a Personal Server (PS) for any personal data or information stored on the net, and people will try to get interconnected via Smart Communicator (SC), like Smart phones, Tablets or Personal Robots i.e. will be represented as its own avatar inside the SC, which will be able to surf alone in the 3D Virtual world of the Symbiotic. The Symbiotic servers will be able to utilize a part of "memory and calculation power" of each interconnected SC, in order to calculate the billions and billions of data needed to build the 3D world, and to feed it's Artificial Intelligence browse alone. Currently the Web is "emotionally" neutral: do not feel the user perceives. The company Emotive Systems has created neurotechnology through headphones that enables users to interact with content that meets their emotions or change in real time facial expression an "avatar". (Khanzode, Dr. Ravindra , & D. Sarode, 2016)

Artificial Intelligence allows computers to communicate like a person, but the technology that enables them to think, reason, and respond on their own, in a human way, is not as far away as you might guess. Web 5.0 will also focus on the individual, perhaps allowing a website to convey a different experience for each different person. It could understand the emotions of an individual and respond appropriately, and it could detect sensitivities that enable more powerful interactions. Right now, Web 5.0 is a vision of the not-so-far-off future, but time will demonstrate what this new technology will truly bring for us (Spisak, 2019) .

Figure 32: Evolution of Education: Towards Sensory Emotive Web. Source: https://www.slideshare.net/rawoofunisha/evolution-of-education-towards-sensory-emotive-web

Chapter -5: Teacher Professional Development for ICT Integration

   This chapter explain about the professional development of teachers and their challenges to integrate ICT in education.

There is inclusive agreement that teacher professional development (TPD) is an essential element in educational change and reformation, especially for effective application of technology to advance learning and teaching. The research literature reports many examples of successful TPD but there still remain many challenges to wider and deeper success in the diversity of several contexts. In consequences of research and discussion point, a thematic working group identified many key challenges at EDUsummIT 2015 in Bangkok. The working group on TPD (TWG3[48]) at EDUsummIT 2015 in Bangkok had the presentations from previous meetings as background and was conscious of the challenges of confirming that TPD for ICT integration in education meets the needs of teachers across a wide variety of contexts and cultures. Lack of suitable TPD may intensify the digital gap that already exists at multiple levels between and within the countries and even within individual institutions. Hence, merely providing ICT does not certainly improve learning, but beyond access, it is how teachers use ICT that makes a difference, and TPD is critical to attaining valued outcomes. Followings are the challenges that were addressed to effective TPD based on different contexts.

1. **Challenges for TPD**

ICT implementation in education systems should be accomplished systematically, following evidence-based diffusion models. Technology utilization in fact, however, is far from being a means for systemic change: It rather accelerates "islands of innovation," based on stellar cases carried out by brilliant teachers, who practice innovative pedagogy using technology unrelated to TPD. Extending and diffusing these individual excellent practices may occur by constructing professional learning communities within institutions, in a model of networked

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[48] Thematic Working Group 3 (TWG3) formed in 2011 to work on TPD

communities of practice that facilitate sharing of experiences. Currently, allocation of resources for the improvement of the quality of teacher professional knowledge is inadequate in scope and in quality. At the same time, ICT is anticipated to change education, thereby encouraging 21st century skills. Hence, the need for effective TPD is very important, but we must assess what TPD would be most valuable and how it should be most efficiently delivered, so that the digital gap is overcome, and the gaps identified in usage and outcomes are concentrated.

Regulating teacher efficiency, particularly when using ICT, is challenging. Ministries of Education worldwide expect ICT to be used to develop the quality of education; nevertheless, there is deficient ICT-utilization to support teachers in attaining professional knowledge to improve their practice. Designing technology utilization for professional development may perform as a powerful means of assisting teachers' use of technology innovatively in the class room. These are few of numerous challenges to TPD for ICT in education. The EDUsummIT thematic working group identified the five challenges stated below as a focus for activity.

1.1. Challenge 1: Contextualization with sociocultural awareness:

Technology facilitates us to create, collect, store and use information; to connect with people and resources all over the world; to collaborate in creating knowledge; and to distribute and benefit from knowledge products. However, many people lack access to technology, resulting in a new form of exclusion often described as the "digital divide." Lack of access to the Internet is one of the most damaging forms of exclusion. However, there are lots of variations and levels of access. They proposed that those concerned should be thinking of a "gradation" instead of a divide between those who can use ICT to access, adapt and create knowledge and those who cannot. Hence, globalization should not imply homogenization of culture. TPD in

support of technology use in education should be both sensitive to, and enabling of, differences in historic, social, cultural, economic, and political contexts. Technology integration is also influenced by specific institutional cultures that require careful alignment of content and pedagogical knowledge. These differences should be seen as assets within TPD (Tondeur, Forkosh-Baruch, Prestridge, Albion, & Edirisinghe, 2016).

1.2. Challenge 2: Sustainability and scalability of PD:

Providing ongoing TPD about technology integration in education is challenging because of the large numbers of teachers to be reached and the need for frequent updates in response to continuous developments in ICT. Sustainability, meaning regular and long-lasting renewal and efficient use of available resources, and scalability, meaning capacity to reach all and disseminate ideas, are two key characteristics for success. Blockades for scaling and sustaining PD include social and cultural factors, lack of teachers' technological, pedagogical, and content knowledge, inadequate infrastructure, limitations of Internet diffusion, linguistic differences, and geographical separation.

Working with teachers to develop their knowledge, beliefs, and attitudes can build a sustainable culture that supports ICT as important to learning and teaching. Facilitating teachers to share their ideas and provide examples of their good practices, facilitates understanding, sharing and negotiating, and consequently transference into local settings (Prestridge & Tondeur, 2015). Opportunities for TPD available through online communities of practice, social networking and online environments can provide both sustainable and scalable results across geographical and cultural contexts (Tondeur, Forkosh-Baruch, Prestridge, Albion, & Edirisinghe, 2016) .

1.3. Challenge 3: Empowering pedagogy through ICT:

Supporting the effective application of technology to enhance learning and teaching in novel ways may serve as a foundation for successful TPD. Utilizing ICT in novel ways within TPD may facilitate innovative pedagogical practices that will, in turn, bring into practice innovative teachers who may affect the education system as a whole, thereby leveraging efforts in the field and establishing Professional Development 2.0 (Prestridge & Tondeur, 2015).

Education evolves in parallel with innovative pedagogical practices using technology so that innovative ICT-empowered pedagogies are emerging continuously. These include new approaches to content delivery and merging of content from different disciplines, which may in turn create a new curriculum. In short, what is expected of the TPD process (effective application of ICT to enhance learning and teaching), is not simply to be a process of transformation and/or innovation but a process of social change in the transaction of pedagogy and content. It is assumed that "history is on the side of change" (Cobb, 2007, p. 14) .

1.4. Challenge 4: Technology discernment:

Discernment, is a significantly more involving kind of approach to decision making for the leader. It does not rely on precedents, best practices, or benchmarking. It is to understand the self and organization in a holistic way, inviting constant self-evaluation and adjustments in order to make good judgments that serve the greater whole (Traüffer, Bekker, Bocarnea, & Winston, 2010). Educational decision makers—whether teachers, principals or policy-makers—have to make wise decisions about the selection and deployment of ICT and about the content and delivery of TPD to support applications of ICT in order to ensure that the outcomes are improved

education for all. Critical analysis of available data may not necessarily lead to a clear decision and may need an additional perceptive judgment, "psychological or moral in nature," called discernment.

(Trauffer, 2008) asserts that "discernment represents a multidimensional concept of decision making by logic and reason, by empathy gained through understanding, and by moral ethics" (p. 13) and "the ability to regulate one's thinking in the acquisition and application of knowledge to make decisions that are right, fair, and just" (p. 90). This notion is more than simple critical thinking required of an educational leader when deciding about the technological inputs, and can be described as technology discernment. The power of discernment when applied to the choice of technology in the form of products, services or processes involved in the TPD, can ensure the real working needs of the TPD participants are met and thus keep them engaged and motivated in a sustainable manner.

1.5. Challenge 5: Systemic and systematic TPD:

Professional development of teachers requires a lifelong learning approach, beginning with pre-service teacher education programs, and continuing throughout their professional lifespan. Several projects were showcased by thematic working group 3 (TWG3) in EDUsummIT 2015 focusing the importance of systemic approaches to change. In this respect, effective preparation of pre-service teachers for technology integration requires attention to (1) all the stakeholders at different levels in the education system and (2) local factors (cultural and structural), but also demands similar attention toward the relationships between the themes.

At the same time several TWG3 members emphasized on the importance of systematic (gradual and evolving) change efforts. This aligns with the results of (Seels, Campbell, &

Talsma, Supporting excellence in technology through communities of learners, 2003) who

concluded that it should take a long period with persistent reiterations to see considerable change

in technology integration. Underpinning this conclusion is the understanding that teacher

participation in the learning "process" and the development of learner autonomy (and self-

regulation, especially online) are considered outcomes of professional development (Prestridge

& Tondeur, 2015). Systematic PD also refers to the need for lifelong professional processes.

Chapter – 6: Educational Technology in Bangladesh perspective

This chapter discusses about Educational Technology in the perspective of Bangladesh. So, it talks about the history of educational technology in Bangladesh, growth of ICT education in various level of education such as primary, secondary, diploma, and undergraduate levels. It also discusses about the development of educational technology in Bangladesh and trends, changes after educational technology adaptation, universal access, current IT infrastructure of Bangladesh, and the challenges identified towards digital Bangladesh.

Bangladesh is a growing developing country with lots of potentiality in socioeconomic and education sector. The information technology sector in Bangladesh had its journey from nuclear research during the 1960s. Over the next few decades, the use of computer increased largely in Bangladeshi organizations, mostly with IBM mainframe computers. However, the sector only started to get considerable attention during the 1990s. Today the sector is still in a nascent stage, though it is revealing potential for development. the country has seen radical transformation in the arena of information and communication technology after declaring the "Digital Bangladesh" mandate by the ruling party of the government of the People's Republic of Bangladesh in 2008 (The daily Star, 2019). A massive adaption of ICT has been started after that declaration in all sectors including education, healthcare, and various industries with the cooperation of government and private initiatives.

1. **History of Educational Technology in Bangladesh:**

The history of modern educational technology implementation in Bangladesh started in 1962 before the birth of Bangladesh as an independent country in 1971. "Distance education was first introduced into Bangladesh area (formerly east Pakistan) when the Education Directorate was assigned with the responsibility for distribution of 200 radio receivers to educational institutions. This directed to the creation of an Audio-Visual Cell and later the Audio-Visual Education Centre (AVEC) in 1962." (Wikipedia, 2019)

IBM mainframe 1620 series was the first computer introduced in Bangladesh (then east Pakistan) in 1964. It was installed at the Dhaka center of the Pakistan Atomic Energy

Commission which is currently Bangladesh Atomic Energy Commission. The use of computer increased largely in the following years, especially after the independence of Bangladesh in 1971. More-advanced IT equipment commenced to be set up in different educational, research and financial institutions. A computer centre was established in 1979 at Bangladesh University of Engineering and Technology (BUET) (Wikipedia, 2019) . later it was renamed Department of Computer Science & Engineering. the centre has been playing a significant role in Bangladeshi IT education since its beginning.

Through the introduction of personal computers (PC), the use of computers witnessed a rapid growth in the late 1980s. In 1985, succeeding several individual initiatives, the first Bengali script in computers was invented, paving the way for more intense innovation in computer science and led to invent the Avro keyboard (Ahamed, 2010). In 1995, use of the Internet began and locally made software started to be exported (Wikipedia, 2019).

To define particularly the history of Educational technology as part of ICT started through the initiative of e-learning or distance learning programme. "In Bangladesh, e-learning was first introduced as early as 1960s as a Radiobroadcast followed by a pilot project School Broadcasting Program (SBP) in 1980s" (Islam & Selim, 2006).

After independence in 1971, mass education was regarded as a priority in the new nation. So, The School Broadcasting Programme (SBP) was started in 1978. The project was later expanded and transformed into the National Institute of Educational Media and Technology (NIEMT) in 1983. The NIEMT was renamed in 1985 as the Bangladesh Institute of Distance

Education (BIDE) which offered, apart from audio-visual materials, a Bachelor of Education (BEd) programme via distance learning validated by the University of Rajshahi. The success of BIDE inspired policymakers and educators to hold a major plan for founding an open university (Islam & Selim, 2006). The significant progress has been done after the establishment of the Bangladesh Open University (BOU) in 1992 as the first and only national distance learning university in Bangladesh.

"development in IT sector will be the primary key to a nation's success" (Lawyers & Jurists, 2019) . Understanding this truth upon observing the success history of some neighbor countries like India, Srilanka, Singapore, Thailand, Malaysia and many others, Bangladesh Government has newly declared IT as a thrust sector.

2. Growth of IT Education in Bangladesh:

Application of computers in education, communication, transportation, business, healthcare, industry, and in every other scope of life request wide introduction of computer education from primary to postgraduate level. IT has great influence in our social, commercial and domestic life and it can expressively contribute to the economy of a country that has been largely experienced in almost every developed country in the world. Formal education in computer was first started in 1984 with the establishment of Computer Science and Engineering Department in Bangladesh University of Engineering and Technology. Hence the IT education gradually extended to Bachelor, Higher Secondary and Secondary levels. Now ICT education is promoted greatly in Primary and Junior Secondary, Secondary and Higher Secondary, Diploma, Undergraduate and Postgraduate levels (Lawyers & Jurists, 2019).

2.1. Primary and Junior Secondary Level:

The first five years and the next three years of education represent the Primary and Junior Secondary level respectively. Bengali and English languages, Geography, History, General Science, Religion, and Mathematics are the major subjects taught at these levels. Students know, in a very small scale, about computer and grow their knowledge through their General Science text books, maximum cases they do not get computer to operate. No formal education on IT has been introduced at primary level. ICT subject has been introduced from (class six) Junior secondary level. Though a small number of city-based schools have a very limited computer laboratory facilities, yet they fail to make their students familiar with internet, emails and related educational technology because of the scarcity of nationwide telecommunication infrastructure and internet facilities. In addition, the teaching community of these levels have scarcity of the minimum level of IT training (Lawyers & Jurists, 2019).

2.2. Secondary and Higher Secondary Level:

The 9th and 10th year of a school & madrasah going students and the next two years of a college going student compose the Secondary and Higher Secondary level respectively. Computer Science education has been introduced as an optional subject for the Secondary level students from the beginning of 1994 in a limited number of schools. Many more schools have expressed their interest and the quantitative expansion of IT education in Secondary level is phenomenal. To encourage computer education at Secondary levels, Government is delivering one computer to each of the selected 396 schools of the country. Government has taken initiative to train the teaching staffs for effective and successful teaching of the subject (Lawyers & Jurists, 2019).

Board of intermediate and secondary education, Dhaka has introduced Computer Science education in 1991 as an optional subject. Only a very few colleges offered Computer Science course at that time. Nearly fifty colleges introduced Computer Science course as an optional subject for science stream students in the first quarter of 1994 and with the reduction of price of computer hardware. Computer Science subject has been introduced at Secondary level in vocational training institutes of the country in 1995 and the education has been gradually extended to higher secondary vocational training institutes (Lawyers & Jurists, 2019).

2.3. Diploma Level:

Twenty polytechnic institutes of the country are providing three-year Diploma course in Engineering subjects. School leaving students can get admission into this three-year Diploma course. Three polytechnics of the country started three years Diploma in Computer Engineering in1994 and at present approximately 400 students are taking admission in every year. Board of Technical Education has started a project for developing course materials for Computer Engineering Diploma. Bangladesh Open University is now providing three semester Diploma in computer applications (Lawyers & Jurists, 2019).

2.4. Undergraduate and Post Graduate Level:

2.4.1. National and Public Universities and Institutes: Bangladesh University of Engineering and technology (BUET) first started the formal education in Information Technology in 1984 by launching the Masters program in Computer Science and Engineering.

Undergraduate courses commenced from 1986 with the first intake in 1987. The primary

enrollment was 30 students per year which has been subsequently increased to 45 and now the

intake is 60 per year. It has been observed that with a very few exceptions the very best students

get enrolled in this department (Lawyers & Jurists, 2019).

Dhaka University started their one-year Masters program in Computer Science in 1993

with a total of 20 students. Now they offering BSc (Hons), master of science (MS), master of

philosophy (M.Phil.), and doctor of philosophy (PhD) programs with several years. There are

now 30 enrolments in software engineering and 60 enrollments in in computer science and

engineering in every new first year admission for BSc program (DU Admission, 2019) .

2.4.2. Private Universities and Institutes: Recently a number of private universities have

been established with Computer Science as their major department because of tremendous

demand of this subject among the college passing students. North South University (NSU), the

first private University in Bangladesh, launched undergraduate program in Computer Science in

1993 with 30 students in their first batch. Gradually many private universities started to launch

department of computer science and engineering for having an extensive demand for this subject.

Now all most every private university has a department of computer science and engineering

(Lawyers & Jurists, 2019).

3. **Latest development approach to Educational Technology:**

After the declaration of "Digital Bangladesh" and goal to achieve a nation of developed

country by 2041, the government of Bangladesh has taken many development initiatives in

several sectors. ICT based education and implementing ICT to make a digital Bangladesh is one of the major initiatives.

In 2018 Access to Information (a2i)[49] Programme organized a few workshops bringing education experts from ministries, directorates, NCTB[50], TTC[51], teachers, academician, technologists, futurists, designers, journalists, development partners and students together to discuss "Future Education". Experts have opined that a future learner should have attributes of "Being a Solution". A learner will be a solution in his/her personal, community and global life. To be a solution he/she should possess major 8 characteristics of behaviour that can be expressed in short as "6CAP" (Islam M. R., 2019) . So, that means a learner will be

1. Creative

2. Critical Thinker/Problem Solver

3. Collaborative

4. Communicative

5. Change Maker

6. Citizen (active and global)

7. Adaptive and

8. Productive.

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[49] Access to information in Bangladesh or a2i is a UNDP and USAID-supported Access to Information Programme ran from the Prime Minister's Office of Bangladesh
[50] NCTB stands for National Curriculum & Textbook Board
[51] TTC stands for Teachers' Training College

Besides, having subject knowledge and occupational training a learner should have 6CAP characteristics that will help him/her to adjust in a new environment and lead the country with others as a future leader.

To improve these characteristics in a learner, the teaching learning process, environment, resource, teacher, assessment and overall curriculum must be restructured. More precisely we have to focus on three most prioritized actions (Islam M. R., 2019). They are

1. formative assessment[52] along with interactive teaching learning method.

2. self-motivated and well-trained teachers.

3. visionary educational leaders to ensure quality education.

Experts also opined that to conduct technology based improved teaching teachers do not have to be super geniuses, subject specialists or a first-class graduate, rather they have to possess some characteristics and behaviors. They have to

1. love teaching.

2. know how to engage learners.

3. how to unleash their inner potentiality with quality test and feedback.

4. how to prepare young people for the future by embedding them with curiosity and life-long learning behaviors.

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[52] Formative assessment refers to a wide variety of methods that teachers use to conduct in-process evaluations of student comprehension, learning needs, and academic progress during a lesson, unit, or course.

So, visionary leaders need in every academic institution to ensure FA (formative assessment), TLM (teaching learning method), PBL (project-based learning), quality teachers and other green and clean school environment.

3.1. Multimedia classroom (MMC):

Starting from 2010, conducting with 410 schools with technical support from a2i, the Ministry of Education has now established 23,333 multimedia classrooms in secondary schools and Madrasas. Furthermore, schools have included another 7,000-plus more MMC facility by their own means. Now, almost 100% secondary schools have at least one multimedia classroom sources claimed. Also, the Ministry of Primary and Mass Education has decorated 15,000 MMC in primary schools. Gradually all schools will be brought under MMC facility. Multimedia classroom includes one projector, one laptop, a set of speakers with internet package at least for one year. Main objective of this MMC is to leverage cognitive attainment of learners using up to date knowledge, examples and audio-visual contents. The traditional teaching-learning materials could now be complemented with multimedia (i.e. audio-video) content materials developed by teachers both at home and abroad. This integration of ICT has facilitated teachers and students to conceptualize ideas and broaden their cognitive abilities through this visualization process (Islam M. R., 2019).

3.2. Teachers training:

MMC is largely supported with a training programme called Teacher-led Digital Content Development (TLCD). For the first time teachers have been assigned to develop digital content by their own capability and use those contents in MMC. It was a 12-day long ICT in Education

training programme that covers both ICT and pedagogic skills. The manual, teachers guide and Training of Trainers (ToT) programme was conducted by a2i. Then Ministry of Education (MoE) and Ministry of Primary and Mass Education (MoPME) have initiated large projects to train all teachers. Up to, approximately 250,000 primary and secondary teachers have been trained on TLCD. All those trained teachers now can access the internet, find out the appropriate information, images and videos, edit or customize resources and can combine collected information in a power-point presentation which is called content. Now every teacher is able to develop their own content confidently (Islam M. R., 2019).

3.3. Teachers' Portal:

Though teachers re trained to create content; but developing quality content is not easy always. It requires time, effort and money. So, it is quite difficult for a teacher to develop all the content by themselves but it is possible to add a few of their developed contents into a platform where thousands of other teachers add or modify quality contents and share these contents with each other.

To solve this barrier, the largest state-owned online educational content repository and professional development platform has been developed and named "Teachers Portal" (www.teachers.gov.bd). Hence the launch on May 16, 2013 by there are now above 344,000 teachers registered and 150,000 audio-visual contents have been developed and made available in this portal. all those contents can be accessed for free. Teachers Portal offer the services to access to quality content, peer-mentoring, self-paced learning through practice, peer-collaboration, and motivation through healthy contest. The portal aims to attain long-term engagement of teachers by proposing both intrinsic and extrinsic forms of human motivation.

Teachers feel intrinsically inspired from greater skills and professional development due to association, content sharing and mentoring with thousands of teachers across the country. Teachers get extrinsic inspiration from external, tangible rewards like "best-teacher competitions" and "best teacher of the week awards" that are held and awarded through the portal (Islam M. R., 2019).

3.4. E-learning platform:

A good requires good training. Not just need basic but regular different dimensional training for continuous professional development. But in a densely populated country like Bangladesh with one million teachers, it is difficult to reach all of them with the traditional face to face training model. To resolute this problem, a2i came up with a solution of e-learning platform and developed "Muktopaath" (www.muktopaath.gov.bd) which is an e-learning platform that has connected 118,000 learners of various target audience including teachers, students, unemployed youths, women, farmers, migrating workers, government employees and other professionals offering 22 courses so far (Islam M. R., 2019).

Every year "MuktoPaath" has the potential to train 600,000 migrant workers, 150,000 newcomer journalists on the basics of journalism, 350,000 primary school teachers and 400,000 secondary and high school teachers, trainers and education officers on different subjects, and more than 10 million unemployed youth with diverse skills. "Muktopaath" has received WSIS in 2018, the most prestigious ICT award in the world. It has also received The Sohel Samad Memorial Award in 2018 given by the Press Institute of Bangladesh (Islam M. R., 2019).

3.5. Digital Textbooks:

One main priority of quality education under SDG-4[53] is inclusiveness and equity, creating equal opportunity for each learner. There are around 50,000 children in Bangladesh who are visually impaired or completely blind; But they also deserve quality education with equal opportunity. The government of Bangladesh has great concentration and priority to provide learning opportunities for differently abled children. Considering this, the prime minister handed over digital textbooks of primary level and braille books to visually impaired students for the first time in the opening session of free book distribution ceremony in December 2014.

Subsequently, 9,152 Braille books on 111 different subjects of class 1 to class 12 have been provided to the visually impaired students on the first day of the school calendar by NCTB with the technical support of a2i. These books can be operated with AMIS[54] software or DD Reader. Moreover, Braille books can be printed easily with this software (Islam M. R., 2019).

3.6. Adolescent's portal:

On February 1, 2018 another historically significant event took place in the ICT education of Bangladesh with the launching of "Konnect" (www.konnect.edu.bd), an adolescent's portal. It is a dedicated platform for young minds cooperatively developed by Shahjalal Science and Technology University (SUST) and a2i. Here "Konnect" stands for connecting adolescents to improve their creativity, nourishing their talents and create healthy environment for cyber entertainment. Adolescents aged 13 to 18 years old are authorized to be

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[53] It refers to sustainable development goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
[54] AMIS is a free, open source DAISY playback software developed by the DAISY.

the members of Konnect platform. Now there are above 280,000 students as registered user. Konnect is a platform allowing wide range of edutainment contents created by various partner organizations as well as crowd sourced by learners. Konnect will enrich young minds with extra-curricular books, films, fun experiments, comics and games that promote healthy and safe usage of internet (Islam M. R., 2019).

4. Changes in education after adapting technology:

The use of technology in education has changed the scenario of higher education in Bangladesh. The changes we observe in our education –

a) Evolution in communication

b) Extended classroom communities

c) Interactive textbooks

d) Web-based research

The students and teachers from different public and private universities communicate in many different modalities as a result of technology improvement. The development in communication intensified the effective teaching and learning which has brought both the teachers and students very close to each other reducing the limitations of time and space. The notion of audience is being rapidly changed by the use of interactive tools such as skype, blog, twitter, Facebook and other online platforms. Teachers and students are using these platforms to discuss homework, post assignments and cooperate with peers as they work on projects as extended classroom communities.

Textbooks are no longer limited to only text and pictures. At present, web-based sites are being used as interactive textbooks including assignments, additional materials, animations, and videos to support teaching and learning. The emergence of web- based research has brought an incredible change in the higher education in Bangladesh. It used to take hours in the library for educationists to find a single information during research, now they spend more time digesting, thinking, learning, and synthesizing about new information (Mahmuda, 2016) .

The country has experienced exponential growth in internet connectivity & network connectivity, mobile phone usage, IT export earnings and use of ICT in education and accessibility of public services, driven by extensive digitization and automation in the public and private sectors and policy support.

5.   Towards universal access:

In 2008, there were only 20 million Bangladeshis had access to a mobile phone. As of January 2019, that number has risen to more than 157.544 million (BTRC, 2019) . The number of internet user in Bangladesh as of April stood at 86 million, while the rates of tele-density and internet-density were 91% and 50% correspondingly (Shariful, 2018). In accordance with the GSM Association, Bangladesh has the probability to be the 10th largest internet using country in the world by 2020. Almost all services comprising of education, health- nutrition, agriculture, birth-registration, allowances under social protection programs are now simply and comfortably provided to the doorsteps of intended beneficiaries through union information centers at union level, e-centers in 147 upazilas and village post offices, e-service centers in DC offices, and 254 agricultural information centers.

More than 18,434 government offices including 58 ministries or divisions, 240 government departments and 64 DC offices of the country are now connected with an integrated network infrastructure. Approximately 883 video conferencing systems have been installed for real-time communication, sending messages and information, and conducting meetings. According to the agenda of Digital Bangladesh, the government is trying to confirm greater transparency in its work through measures, for example, the introduction of e-filing in government offices, application of e-GP (e-Government Procurement) portal in the governance (Shariful, 2018) .

6. **Massive IT infrastructure:**

To build a sustainable development infrastructure the government has already planned to set up 12 IT parks at the district headquarters of Gopalganj, Mymensingh, Jamalpur, Rangpur and Barisal, Keraniganj in Dhaka, Comilla Sadar (South), Ramu in Cox's Bazaar, Chittagong Port, Singra in Natore, Companiganj in Sylhet, and the KUET Campus in Khulna. About 8,000km of optical fibre cable has been installed across the country to ensure fastest and high-speed internet connection. A second submarine cable has been installed in Kuakata through which Bangladesh will have 1,500GB/s bandwidth (Shariful, 2018) .

On June, 2018, Finance Minister AMA Muhith said in his budget speech: "We built an extensive essential IT infrastructure for delivering quick and easy services to the doorsteps of the common in particular those who are marginalized. With our sincere endeavor, mobile network

service could be introduced in all upazilas of three inaccessible hill districts, which is major leap

forward towards socio-economic development in this region." (Shariful, 2018)

Mustafa Jabbar, Posts, Telecommunications and Information Technology Minister and

inventor of Bijoy Bangla keyboard, recently said "all the union parishads across the country will

be brought under digital connectivity within one year. In addition, a digital laboratory will be

established in each of the educational institutions across the country,". (Shariful, 2018)

The government of Bangladesh has accelerated the development of mobile banking,

which launched in 2010. At the end of August, 2019, the average daily transactions through

mobile banking amounted for more than Tk 1,145.57 crore (Bangladesh Bank, 2019) .

The latest achievement of Bangladesh is to enter into the space age through successful

launching of the first satellite into space on 11th May, 2018, which gave Bangladesh a newer

height and history in using information technology. "Bangabandhu Satellite-1", first Bangladeshi

communications satellite, was launched into orbit on May 11 from the Kennedy Space Center in

Florida. The satellite increases coverage over Bangladesh and its territorial waters in the Bay of

Bengal, and can reach India, Nepal, Bhutan, Sri Lanka, the Philippines, Indonesia and parts of

Central Asia (Shariful, 2018). With this satellite, now Bangladesh will be able to provide high

speed DTH communication services, internet services, even in the distance rural area.

The Bangabandhu Satellite-1 (BS-1) is the first Bangladeshi communication orbiter and

is expected to meet the need of a satellite connectivity facility. Bangladesh's annual expenses for

satellite connectivity is $14m. The cost is owing to renting bandwidth from foreign operators.

After the BS-1 launch, it would be redundant. Private TV channel operators and Direct-to-Home

(DTH), alternative of cable television service providers, will be the key consumers of the

satellite, according to official sources. The weather department and the defense sector will also

get advantage from the satellite (Mamun, 2018) .

The BS-1 will help to carry uninterrupted telecommunication during disasters like

cyclone or tornado. It will also contribute greatly in telemedicine, e-learning, research and DTH

services. It will be capable of counting holdings and measure population density. The satellite

will contain VSAT private networks comprising of voice, data, video and internet services to the

banks, corporate offices etc. The service will be provided using Ku-Band in the Bangladesh and

the India Plus coverage regions and using C-Band beams, according the BTRC (Mamun, 2018) .
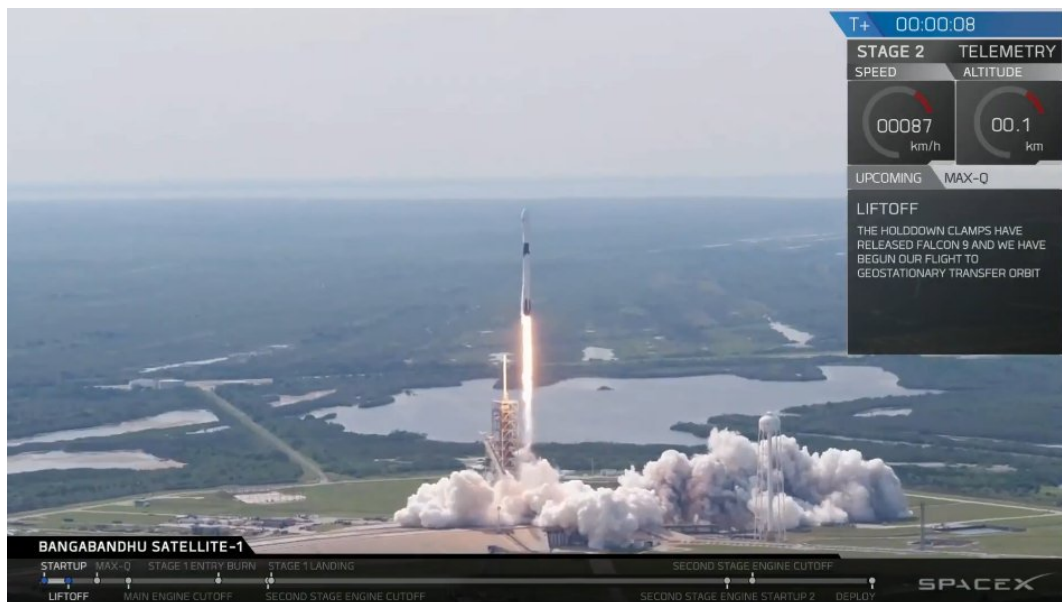
Figure 33: Launching moment of Bangabandhu Satellite-1 (BS-1) from Kennedy Space Center in Florida, on 12 May, 2018.
Source: https://twitter.com/SpaceX/status/995034521048403973

7. Current Challenges in ICT:

Public and private sectors are jointly working to achieve the goal of Digital Bangladesh. Yet there are still some challenges to meet the goal. State Minister for ICT Zunaid Ahmed Palak said our key obstacles are (Shariful, 2018)

a) Lack of skilled human resources

b) Gaps between educational institutions and industrial sectors

To make digital Bangladesh the current government has set four pillars –

a) Developing human resources

b) Connectivity

c) Encouragement in industrial sector

d) e-Governance

Government is working heavily on these challenges to make a successful Digital Bangladesh with development and sustainability.

Chapter – 7: Use of Educational Technology in Arabic

Language Teaching

This chapter includes the discussion about the usage of educational technology in the department of Arabic comprising of observation, designing data models, sample selection, data collection. It also includes data analysis and result of the teachers' and students' responses to the survey questionnaires respectively.

1. Observation

In order to implement educational technology in our education system especially at the University of Dhaka to teach Arabic language, we need to investigate the current situation of the institutions. The department of Arabic is an important and one of the early departments at the university. This department has many contributions to promote Arabic language and literature across the country for Arabic language teaching and learning; But in terms of educational technology and technology engagement of the department is still in adaption. They need to improve many things to comply with the modern departments who are working on language teaching and learning decorating with latest technological innovations and possibilities. We will know ins and outs of the department, that have come out through the investigation, to modernize it and the key areas that they need to concentrate to be an ideal hub of Arabic language teaching and learning in the country. As a department of Arabic, its goal is not only teaching Arabic language but also teaching Arabic literature and about their culture. With the advent of educational technology, all other language departments are adapting it and updating their classroom facilities, teaching styles, curriculums, decorating with modern technological hardware and software. They are having regular trainings, workshops, seminars on the new changes of educational and technological trends as well as supporting them to cope with new adaptation. We will know the department of Arabic, about the focus, attitudes, after the status of both teachers and students towards ICT. The investigations have been carried out for both teacher and students. We will know details of the investigations and their result in the following discussions.

1.1. Design the investigation:

1.1.1. Content and objective of the investigation:

1.1.1.1. The Basic Informatization Situation in the Department: As part of the basic informatization of the department, we wanted to know about the hardware and software of the department, such as the department's web address, and faculty, etc. For the hardware, needed to know the amount and the performance of multimedia classroom, the amount of the computer room, the performance of the computers, the ratio of student and computer, the hardware of the office, the performance of the campus website server. About the software, we needed to know the office-automation status and the instruction of the available resources for students.

1.1.1.2. The Situation of Usage of Hardware and Software: In this investigation we tried to figure out the frequency of usage of computer room and multimedia classroom, application ICT in preparing lessons, class lessons, homework and tutorship, evaluating the students, and management, etc.

1.1.1.3. Status of Teachers' ICT Skills: We planned to investigate the situation of ICT, especially educational technology, applied by teachers, such as using modern smart classroom hardware equipment, software tools to prepare lessons, design curriculum, delivering lectures, and using the tools in their research works and regular academic activities. This information has been collected from the questionnaire, provided among teachers, in which the data is analyzed through the quantitative method. A few information has been gathered from the discussion with teachers, and educators.

1.1.1.4. Teachers' Attitude and Perception towards educational technology: How teachers evaluate the educational technology, and their interest to implement ET in the classroom.

1.1.1.5. Status of Students' ICT Skills: We also planned to investigate the situation of ICT skill of the students, especially to know their skills on educational technology, such as using smart classroom hardware equipment, learning software tools to prepare their study notes, design presentation, learning habit and their regular academic activities with educational technology. We have collected this information from the questionnaire, designed for students, in which the data is analyzed through the quantitative method.

1.1.1.6. Students' Attitude and Perception towards educational technology: How students consider the educational technology, and their curiosity to learn it for their regular academic performance.

1.2.Sample Selection:

In accordance with the presentation above, we regarded the department of Arabic as sample unit. Referring to the objective requisite, we employed the principles as follows, we selected 29 survey questions for teachers, and 30 survey questions for students. The teachers were randomly invited to participate in the survey campaign based on different ages, and professional experience such as professor, associate professor, assistant professor, and lecturers. We also invited the students of different semesters and years to attend to the questionnaire online and offline. Majority of the students attended to the online campaign and responded to the questions spontaneously. Questionnaire were provided to the teachers offline and online; but most of the

teachers attended to the offline campaign and responded to the question very eagerly. For the

data collection, we provided two distinct questionnaires, one for teachers and one for students.

in the process of data collection which pertains to the present situation of the ICT applying by the

means of questionnaires, and personal discussions with the teachers. For the aspect of the attitude

and perception, data collection is mainly by the questionnaire and survey campaign. 10-15

persons participated randomly from teacher. On the other hand, there were 45 – 50 persons

attended form students.

1.3. Data collection:

The data has been collection from various sources. Main source of data collection was survey

questionnaires for teachers and students, peer reviews of the current situation of the target

sample, various online and offline journal, books, research papers, report, articles, website blogs,

wiki, online courses, video podcast and interview videos were remarkable source of the data

collection for this investigation and research.

2. Data Analysis & Result

We have used Google Forms[55] service, an education survey tool, to design the questionnaire, do

survey campaign, get responses from target people, analyze the data, and draw a visualized chart

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[55] Google Forms is a survey administration app that is included in the Google Drive office suite along with Google Docs, Google Sheets, and Google Slides.

diagram of the collected data. First, we will analyze the teachers' responses and then students' responses.

2.1. Analysis of Teachers' responses:

We provided questionnaire to a number of teachers and received valuable responses and feedbacks. Most of the teachers responded cordially to provided survey questions in paper. There were 10 teachers responded to the questions from various academic designations having different years of experience in teaching. The following analysis is stated based on each response to the questionnaire.

2.1.1. Teacher's Experience:

We have taken responses from teachers of different years of experience in education. Most of the teachers were 7 – 10 years and 10 – 20 years of professional experience in teaching and that was 30% + 30% of the total participants. 20% of Teachers were between 4 – 6 years of experience, and There were also 1 – 3 year and over 20 years of professional experience teacher who are 10% + 10% of the total participant. The following chart displays the detail view.
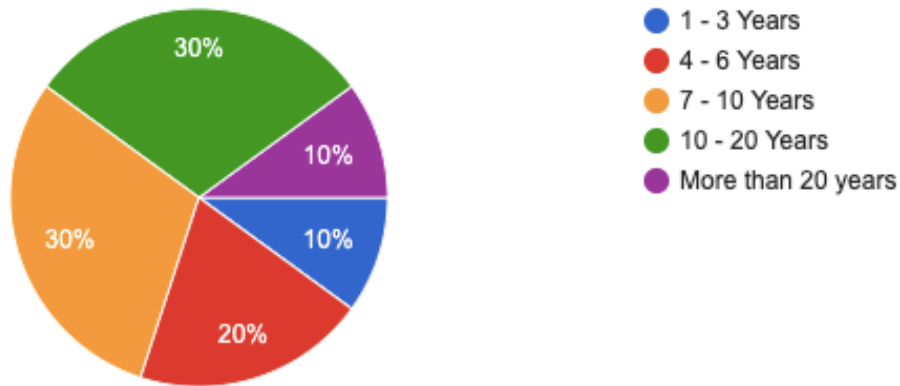
Figure 34: It displays the result of teachers on how long they have been in teaching profession.

2.1.2. Average Students in the class:

The number of students on average are 50 – 100 persons and more than 100 persons some time. Teachers responded to 80% times are more than 100 students per class and 20% time are 50 – 100 students in a class. The following diagram shows the response.
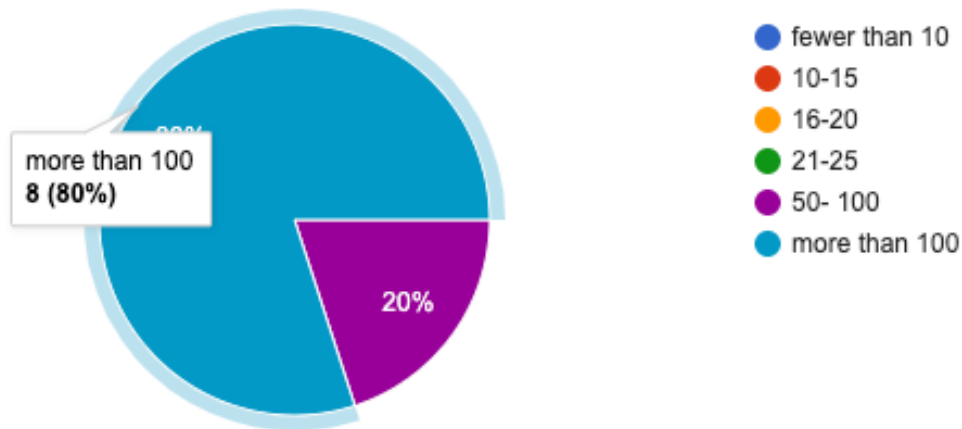
Figure 35: It shows the number of students become in a class on average

2.1.3. Teachers' perception of the students:

We asked teachers few points in this question to figure out their perception about their students and received some valuable statistics. This is to understand how teachers see, observe, consider, and evaluate the students' skills on ICT and a little comparison to their skills.

First point was "Most of my students have the skills to use institutionally specific technology (e.g., the module registration system, the VLE, the library search system)". We tried to understand here if teacher percept that their students are capable of using Virtual Learning environment, to register there, usage, and to use library search system such as online/ offline computerized catalogs. The result we received was exemplary. Among 10 respondents, one of the respondents strongly agreed on this point, 3 respondents agreed and 6 respondents disagreed on the point. There was no respondent to disagree strongly.

Second point was "Most of my students have the skills to use basic software programs and applications (e.g., MS Office, Google Apps, etc.)". Here we tried to understands if students have basic computer skills to operate computer, write documents, online, apps etc. from teachers' point of views. The result we have received are 6 respondents strongly agreed, 2 agreed, and 2 disagreed. There was none to strongly disagree on the point.

Third point was "Most of my students have adequate technology skills for discipline specific (Arabic field) software". With this point we tried to understand if the students have sufficient knowledge to use Arabic software, or any software tools those are needed in their regular study purposes in Arabic courses or any course material design related to Arabic. The

result appeared that 2 respondents agreed and 8 disagreed on the point. There was none to strongly agree or disagree on the point.

Fourth point was "My students look to me for technology support". We tried to measure here if students seek for help from their teachers when they are stuck with any technology related issue. In response, the result was that one respondent strongly agreed, 7 agreed, one agreed, and one strongly disagreed on the point.

Fifth point was "My students are more confident using technology than I am". Here we tried to determine if teacher assume that if their students are more efficient to use technology in some cases compared to teachers. The result was that 4 respondents agreed, 4 disagreed, and 2 strongly disagreed.

Sixth point was "My students ask me to use technology to enhance their learning". With this point we tried to figure out if the students request their teacher to use technology or design technology-based course material and present them in the class. That's mainly to understand if student have self-motivation to persuade their teachers and like to stay with latest educational technology trends. The statistics was that one respondent strongly agreed, 5 agreed, 3 disagreed, and one strongly disagreed.
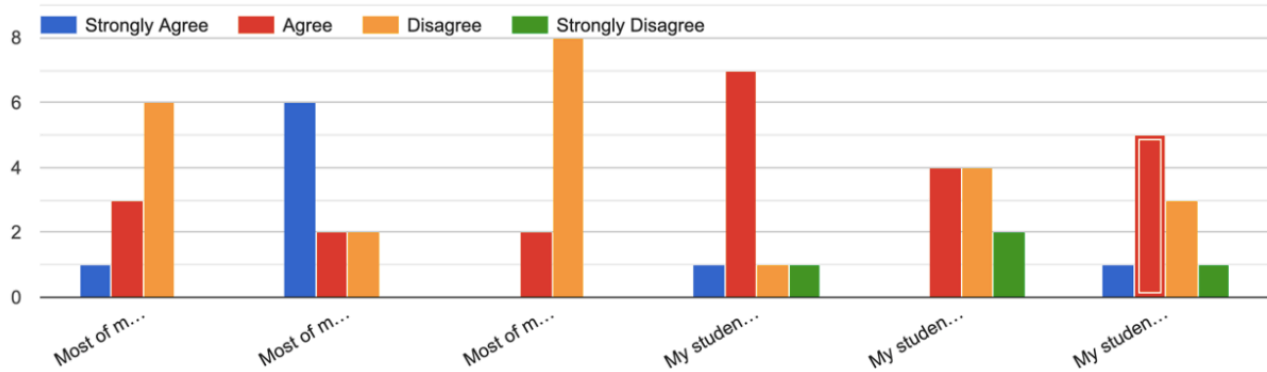
Figure 36: It shows number of responses to the points, asked to teachers

2.1.4. Educational Technologies used by teachers:

We asked teachers which educational technologies they are currently using in teaching and we received valuable responses from them. We listed few educational technology software those are most popular and demanding in regular academic and educational activities. Then asked the respondents to mark which they are utilizing. We have found 20 percent of the respondents are using Google classroom, 100 percent are Email, 80% are educational websites, 100% are using Microsoft word, excel, and PowerPoint. 70% of the respondents are used to Popular online libraries, 40 percent uses chat, 10 percent uses Moodle, 70 percent are used to social networking, 50 percent uses Google Docs, 30 percent uses blogging. 80 percent respondents use Wikis, 30 percent uses audio and video podcast. 40 percent used to audio, video, and other multi-media tools, 20 percent respondents use other subject specific software and 10 percent use SPSS software in their research work. The following chart shows detail of the responses.
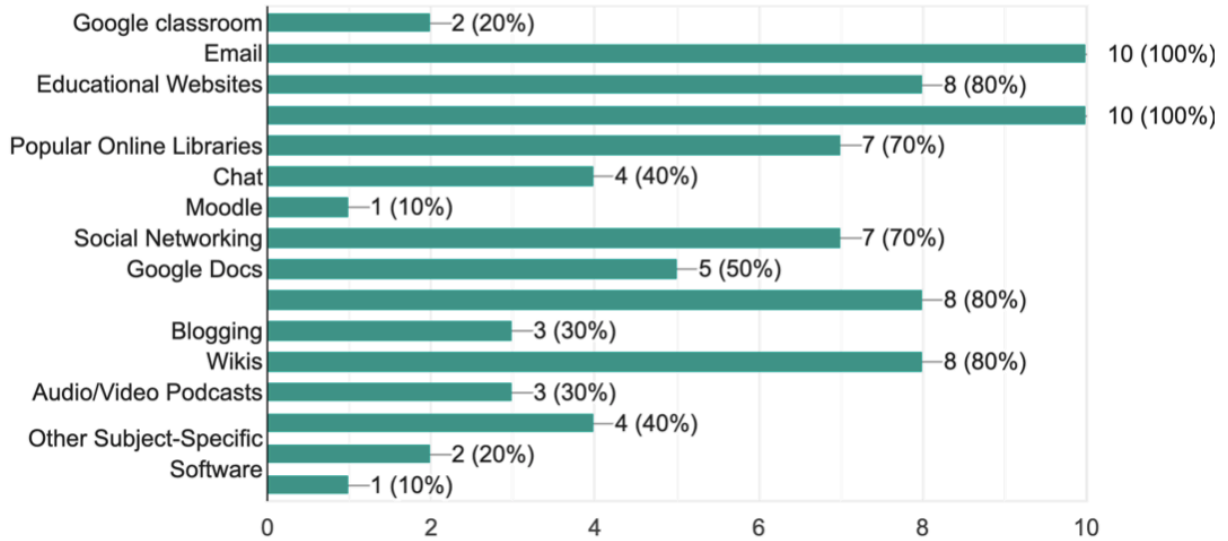
Figure 37: It shows which educational software technologies are being used by teachers in teaching

We also enlisted few educational technology hardware and asked teachers to respond what they are using currently in teaching from these technologies. We have had a precious statistic from their responses. We have found 70 percent of the respondents are using teacher-run computer work station (teacher's desk), 30 percent use student-run computer work station (Student's desk) during the class. 70 percent teachers use Multi-media projector in the class, 50 percent use VCR/ DVD player. 40 percent uses interactive whiteboard or somehow uses them outside of the class. Twenty percent respondent use computer lab, none uses mobile computer lab (portable lab or a lab that can be shifted to anywhere easily on mobility), 30 percent teachers use digital cameras, scanners, and video cameras. No teacher uses OCR (Optical Character reader) in the class, 50 percent use calculary somehow, 40 percent uses PDAs, cellphones, iPods, or other hand held devices. 40 percent teacher use digital printer and none uses 3D printer and digitizer in the class. The following chart shows detail statistics.
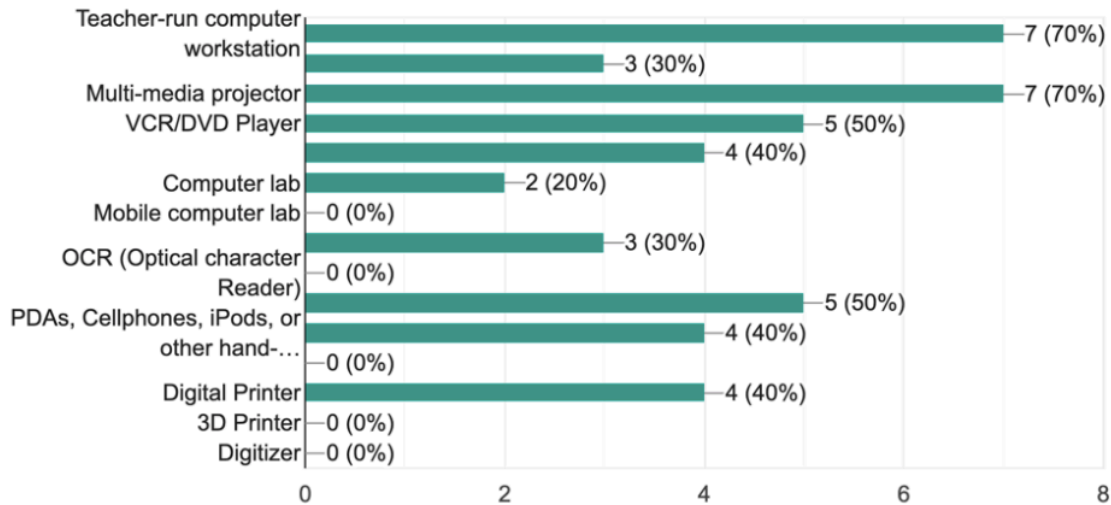
Figure 38: It shows which educational hardware technologies are being used by teachers in teaching

2.1.5. Teachers' more interest to Technologies:

We asked participant teacher to answer a question expressing their interest to learn more about some technologies that was enlisted and we have found tremendous interesting result from their response. We found 90 percent teachers are greatly interested to learn more about Google Classroom, 60 percent to Google docs, slides, forms, 30 percent to WebQuests, none to Microsoft Office (Word, Excel, PowerPoint), and 60 percent to digital photography, audio, and video making. We also noticed 50 percent of the respondents are more excited to learn more about Interactive education games, 40 percent about All social software, 20 percent about blog, 20 percent about Wikis, 30 percent about Podcasting, 50 percent about social networking, and 60 percent respondents are more interested to Interactive lesson/class material design.
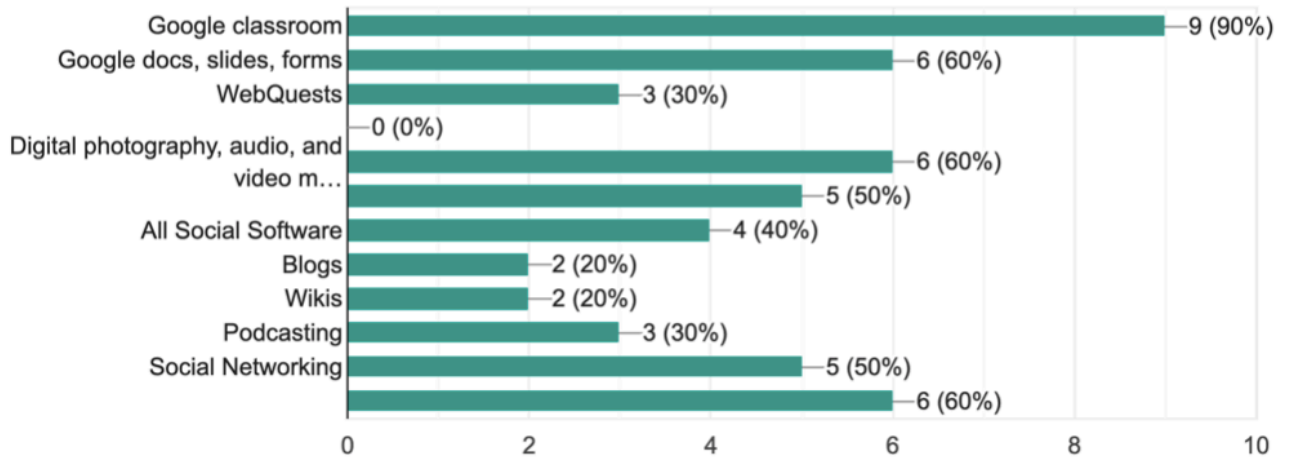
Figure 39: It shows which educational technologies are interesting to teachers to learn more about them

We also asked teacher to show their interest to various Google apps related to learning and teaching and we received huge interest from them to this. We found 90 percent teachers are very interested to lean them and 10 percent was moderately interested. We did not find none is interest to learn this apps.
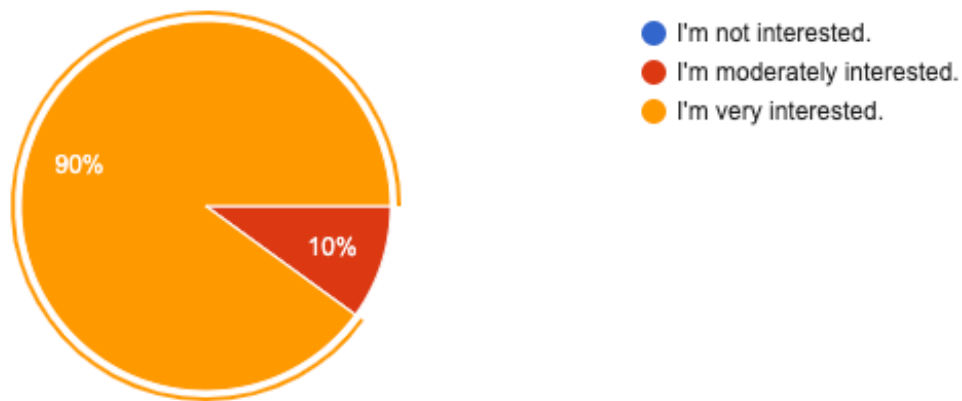
Figure 40: It shows teachers' interest to learn Google apps.

2.1.6. Teacher's Teaching Style:

We Enlisted few teaching styles from different point of views and asked teachers to respond to their preferred a style of teaching methodologies.

The first style was "Largely teacher-directed (e.g. teacher-led discussion, lecture)". We tried to find out here if teacher prefer to teach only teacher directed style, only his/her lecture, and there is no student's engagement in the class discussion. We have found that no teacher is interested to this style of teaching.

The second style, we mentioned was "More teacher-directed than student-centred". We tried to understand if teacher prefers to have more engagement of teacher than students' engagement. So, the style become more teacher directed rather than student centric. We received 20 percent teachers are interested to this style.

The third style was "Even balance between teacher-directed and student-centred activities". This means fifty-fifty engagement of both teachers and students in the class. We noticed great interest of teachers to this approach and 60 percent respondents preferred this style.

The fourth style was "More student-centred than teacher-directed". And we found no teacher preferred this style.

The fifth style was "Largely student-centred (e.g. cooperative learning, discovery learning)". This means there is more students' engagement in the class, they work together and

cooperatively in the classwork, innovative activities. And there has very little teacher

engagement, such as they play a role of instructor only in the class and students do all the things.

We found 20 percent teachers preferred this style of teaching.
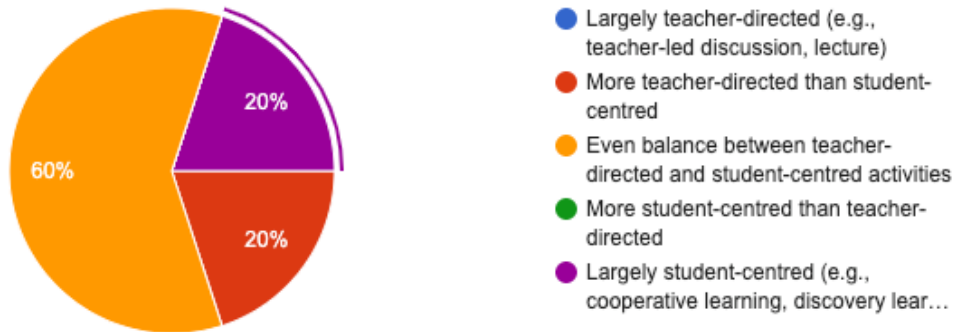
Figure 41: It shows teaching styles and the result of teachers' preferred style

2.1.7. Teachers' Proficiency in Computer Technologies:

We made 6 level of proficiencies of a computer user based on the capability to operate

computer programs and asked participant teachers to choose the level as they think of them. The

level was-

❖ Unfamiliar - I have no experience with computer technologies.

❖ Newbie - I have attempted to use computer technologies, but I still require help on

a regular basis

❖ Beginner - I am able to perform basic functions in a limited number of computer

applications

❖ Average - I demonstrate a general competency in a number of computer

   applications.

❖ Advanced - I have acquired the ability to competently use a broad spectrum of

   computer technologies

❖ Expert - I am extremely proficient in using a wide variety of computer

   technologies.

The result we received from the responses are 50 percent respondents are Average, 30 percent

respondents are Beginner, 10 percent respondents are Newbie, and 10 percent respondents

claimed their proficiency at Advanced level. We find none is Unfamiliar and Expert in this

investigation.
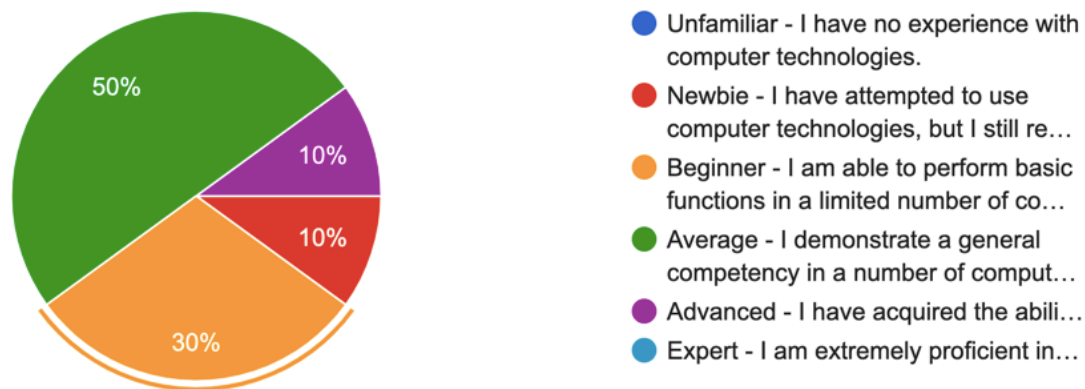
Figure 42: It shows levels of proficiency in computer skills and the responded result

2.1.8. Teachers' consent towards educational Technology:

We tried to understands teachers' view and their confidence to use educational technology in the classroom from different angle. In this question we enlisted few points and asked them to give their consent on the notion. We have found valuable feedback from them.

First point was "I am confident using technology in my teaching" and we received 60 percent of the respondents were agreed with it and the rest 40 percent disagreed and claimed they are not confidant about technology to use in teaching.

Second point was "I am a late adopter of using technology in my teaching". We tried to understand with this point why they were not confident to use technology in teaching. And we found 50 percent of the respondents consent they are late adopter and the rest 50 percent disagreed on the point.

Third point was "I experiment with technology in my teaching". Though they are not confident or late adopter, we tried to understand with this point if they try to use technology in the class and experiment with new possibilities. We figured out that 60 percent of the respondents agreed and the rest 40 percent not.

Fourth point was "I am not sure yet about the benefits of using technology in my teaching". We tried to understand deeply why technology engagement is lacking if they are confused about the benefits of technology or not. The result we get is that 30 percent of the

respondents are not sure about the benefits, and the rest 70 percent teachers know the benefits of using technology in the class.

Fifth point was "My institution encourages me to use technology in my teaching". We tried to understand in this point if teachers have inspirations from their institutions to use technology in the class. The result we found that 60 percent teacher think they get inspiration somehow from the institution and 40 percent respondents do not get inspiration.

Sixth point was "I think technology will be an essential part of teaching in the future". With this point we tried understand how the future view teachers is. Interestingly, we found everybody agreed on the point the all of them think that technology will be an important part of future education.

Seventh point was "I am an enthusiastic user of using technology to enhance my teaching". In this point we tried to understand how the enthusiasm of teachers is in improving their teaching skills with the usage of educational technology. The result we found is that 90 percent of the respondents are eagerly enthusiastic in the point, and 10 percent of the respondents are not enthusiastic in their point of views.

Eight point was "I think using technology in the classroom is a waste of time". Though we find lack of confidence, late adopter, lack of inspiration, confused about benefits and having much enthusiasm on technology, why it is not being used properly in the class. We tried to

understand if they consider it waste of time or time-consuming matter. The result, we received

from the respondents was unbelievable. Nobody thinks it is a waste of time.
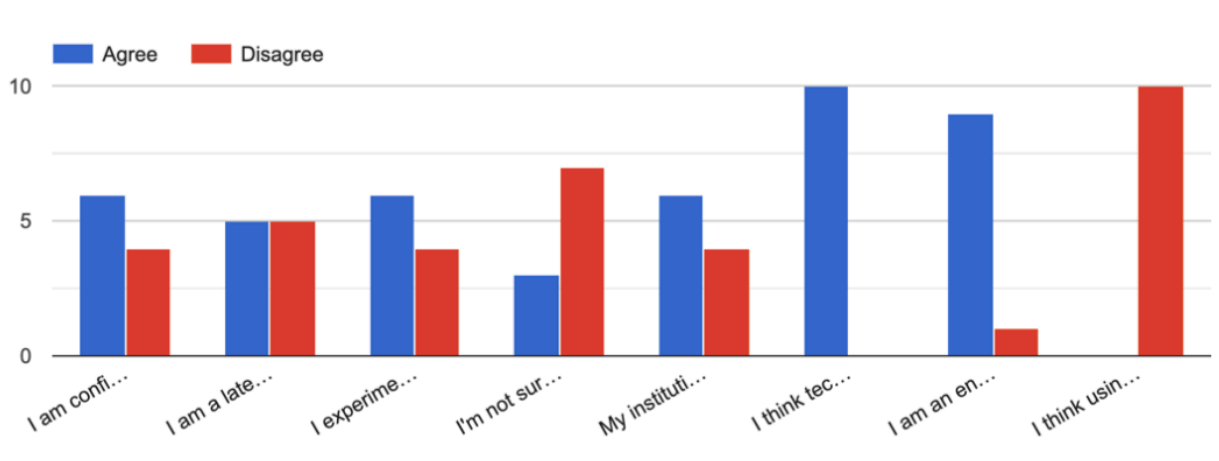
Figure 43: It shows teachers' views to use technology in teaching

2.1.9. How VLE is used by teacher:

We asked teacher if they use Virtual Learning environment (VLE) and how often that or

if they are familiar with VLE at least. The result we received was disappointing, 90 percent

respondents are not familiar with VLE and 10 percent respondents are familiar and somehow,

they use it weekly.
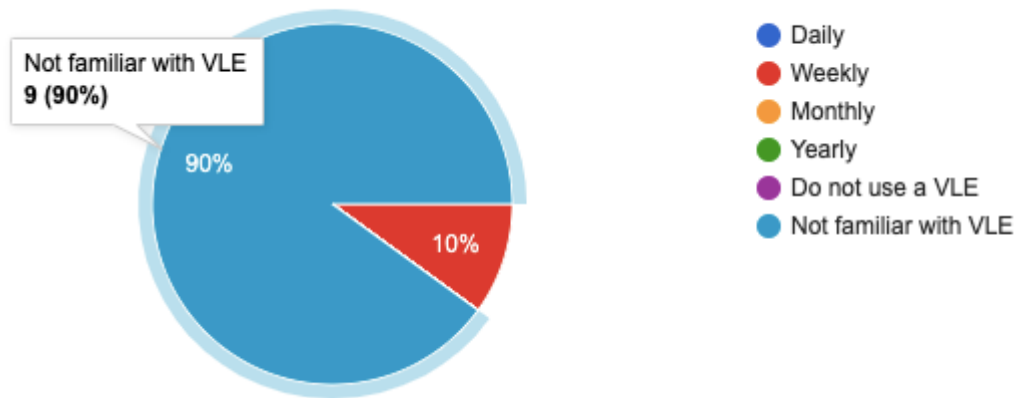
Figure 44: It show teachers' familiarity with VLE

2.1.10. Barriers of Teachers to use Technology in the classroom:

In this question, we enlisted few barriers that might be a potential cause to teachers for which they possibly face problems and refrain from using technology in the classroom. We asked individual participant to respond to each barrier if they experience.

Frist point was "Not relevant to my teaching or subject area". The response we received from teachers was that 10 percent respondents think it is not relevant to their subject area or related to teaching.

Second point was "Not sure of the possibilities". We tried to understand if any teacher think they are not sure about the potentialities of the technology usage in the classroom. In the result, we found surprisingly nobody think there are not possibilities.

Third point was "Lack of confidence". We received responses from 10 percent participants who think it is a barrier to use technology in the classroom.

Fourth point was "Lack of time to attend training". We got result that everybody has time to attend in the training. Nobody thinks they have lack of time.

Fifth point was "Do not have access to the technology". 30 percent of the respondents think they don't have access to the technology in the classroom.

Sixth point was "Lack of time to engage in technology-enhanced learning". We found 10 percent respondents think they have lack of time to engage in technology-enabled learning.

Seventh point was "Lack of training". 40 percent participants think they have lack of training to use technology in the classroom.

Eight point was "Do not like the technology". We tried to figure out if teachers do not like technology. Surprisingly, we found there is none dislikes technology.

Ninth point was "Lack of technical support". 90 percent teachers think they have lack of technical support in the classroom so that they can use technology properly in the class.

Tenth point was "Need more technology support". Though there is little support of technology in the class; but not enough as expected, everybody think they need more technical support and management in the class room facilities.

Eleventh point was "Need more time to develop technology-based lessons after support". It is true that it requires time to develop technology-based lessons and course materials. So, 80 percent teachers consider it as barrier to develop technology-based lessons plan.

Twelfth point was "Need support with connections/devices/technology issues". 70 percent attendees think they need support with connections, devices, and troubleshooting issues during the class.

Thirteenth point was "Not enough devices available". 90 percent participants think there is not enough available devices in the classroom facilities. So, it has been considered one the potential barrier to use technology in the classroom.

Fourteenth point was "Using ICT in teaching and learning not being a goal of our department". We tried to understand as ICT might not be a major subject in maximum department, do they consider it as barrier. Eventually we found 40 percent teachers consider it as barrier as it is not their goal to use ICT in teaching and learning.

The last point was "I use technology comfortably". We tried to know if teachers are using technology comfortably. Surprisingly, we have in the result that nobody it enjoying it and they are not using it comfortably.
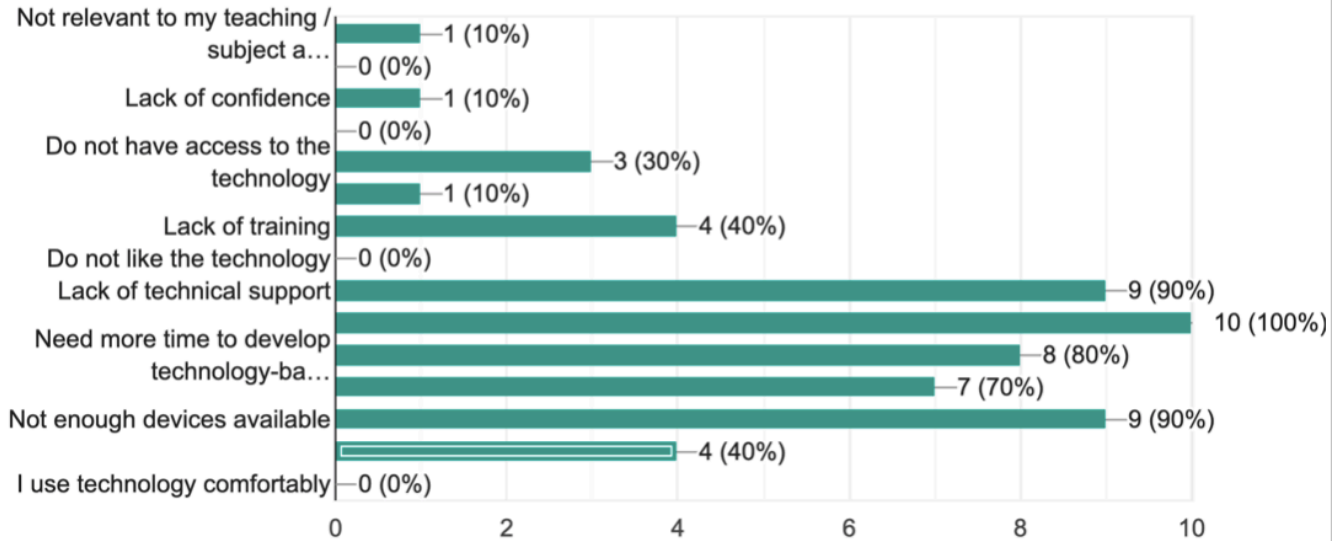
Figure 45: It shows the barriers of teachers to incorporate technology in the classroom

2.1.11. ICT Support in the class or Department:

Information and Communication Technologies (ICT) is an important course in any department to pertain up to date with latest trends of educational technology. ICT is taught in the department of Arabic as a separate subject or course and it is also integrated with several subjects as topic sometimes. The following diagram shows the response.
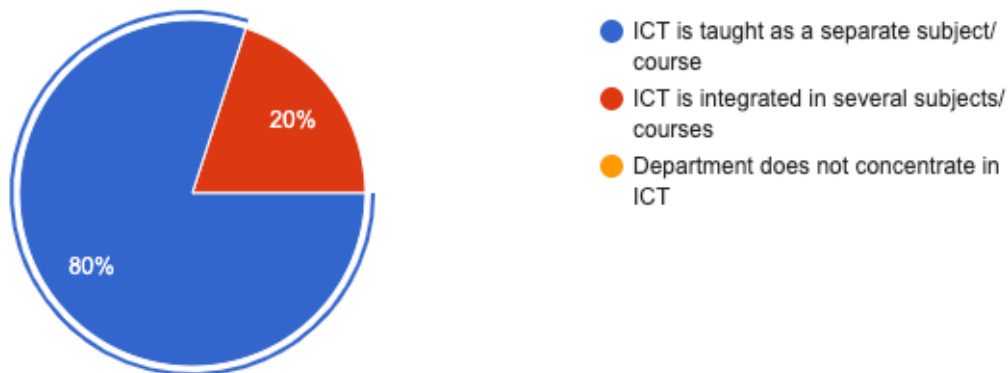
Figure 46: It shows how ICT is taught at the department of Arabic

The ICT support changes time to time at the department of Arabic. We tried to know who are providing ICT support in the department and teaching technological course, such as computer courses, database courses, and other IT courses. We have found that respondent teachers found ICT teacher as several stages. We also found that the ICT teacher is more knowledgeable and experienced, and sometimes, they are assigned as external teachers or course coordinator from other departments.
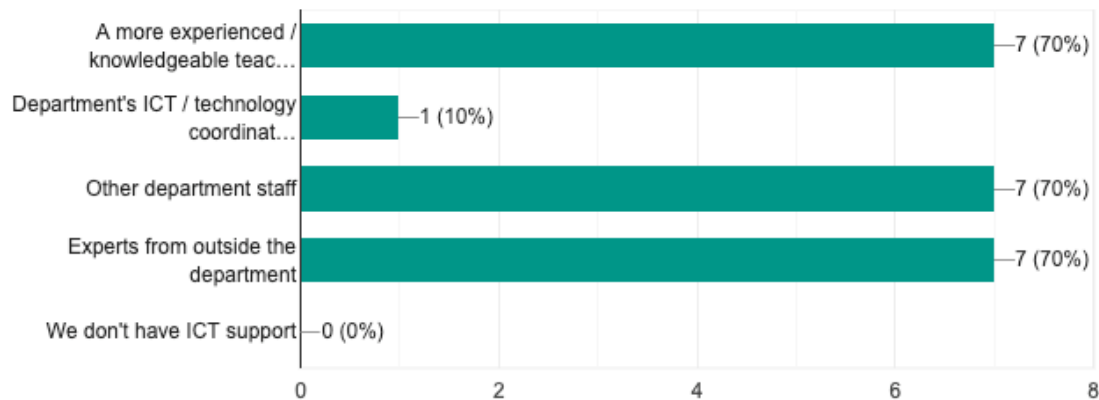
Figure 47: It shows who support ICT in the department of Arabic

2.1.12. Technology Facilities in the department:

We tried to know if the department of Arabic has some basic and related technological facilities for teachers, students, and other staffs.

2.1.12.1. Email Service: We asked teacher about email facility if university of department provide individual email address to teachers, students or other staff. We have got result that university provide email address to teachers only, not to students and other staffs.
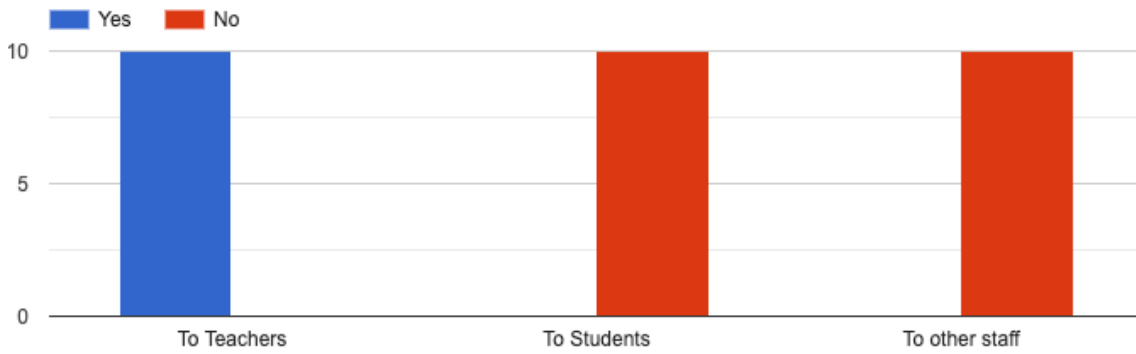
Figure 48: It shows who are getting email address facility from university

2.1.12.2. Device Maintenance Service: We asked teachers about the technological devices, whatever pertains there if they are managed properly. We found 80 percent respondent think they are not managed properly and 40 percent of them think department need more concentration to device management.
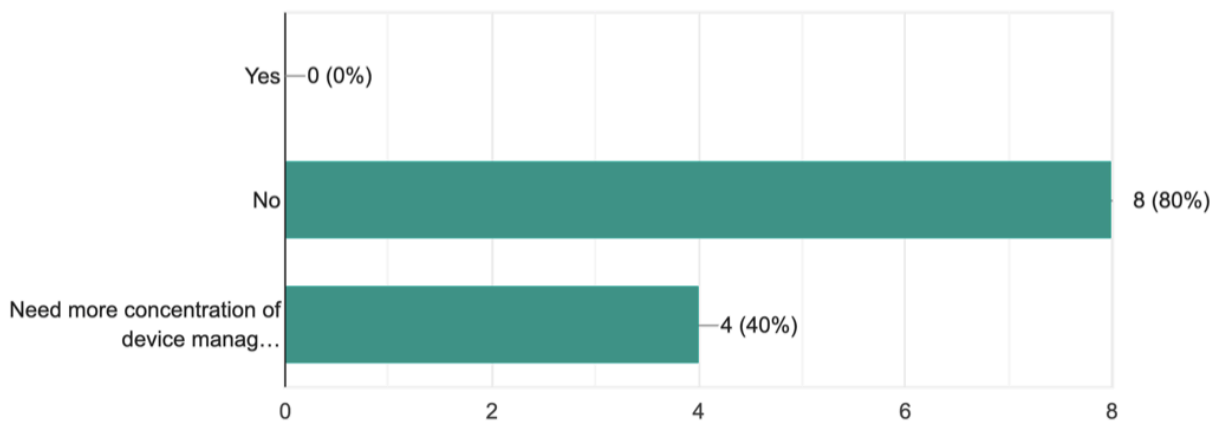
Figure 49: It shows what teachers think about device management in the department.

2.1.12.3. LMS Service: We asked teachers if there Learning Management System (LMS) support in the department. We found 90 percent respondents consider there is no LMS support and 10 percent respondents are not sure about this service in the department.
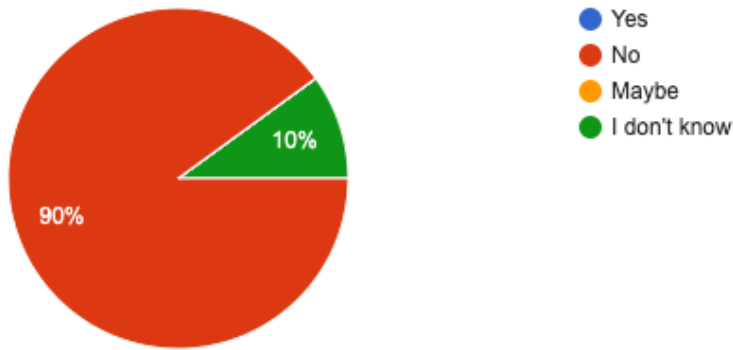
Figure 50: It shows the statistics of LMS support in the department

2.1.12.4. Computer Lab Facility: we asked teacher if they computer lab facility in the department, they al responded spontaneously that there is no computer lab facility currently in the department.
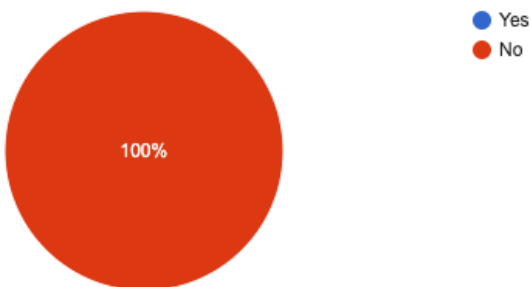
Figure 51: It shows teachers agreed on no computer lab facility

2.1.12.5. Modern Language Lab facility: we asked teacher if there is modern language lab facility in the department decorating with the technology of Virtual Reality (VR), Augmented Reality (AR). They all responded "No".
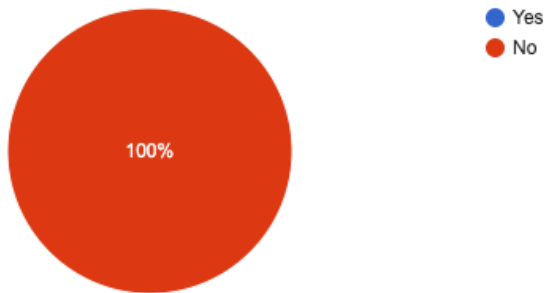
Figure 52: It shows teachers' responses about Modern language lab facility

2.1.12.6. Digital Library Catalog Service: To know about digital library or catalog system in the department we asked teachers about it and they all responded "No".
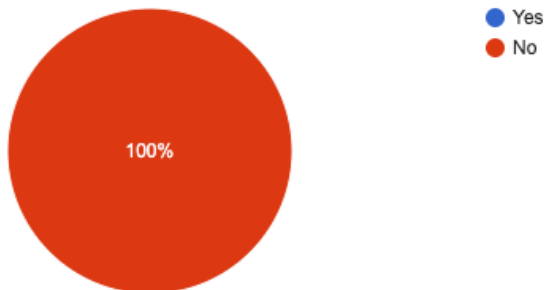
Figure 53: It shows if there is digital library facility in the department.

2.1.12.7. CMS Service: We asked teachers if the department uses any Content Management System (CMS) to manage various documents or resources of teachers and students. 80 percent of the participants responded "No" and 20 percent respondents don't know about it.
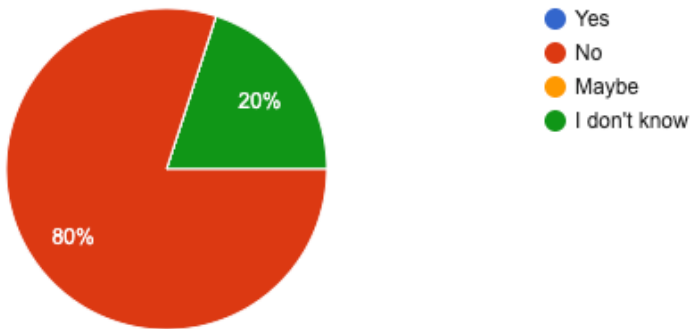
Figure 54: It show teachers' responses about CMS service in the department

2.1.13. Data Security Concern:

With this question we tried to know if teachers think data security is an important issue to use technology in the classroom. We have found responses from teachers that 80 percent teachers consider it as a potential risk about the security of data and 20 percent teacher were in the neutral position, they do not have clear consent about this point.
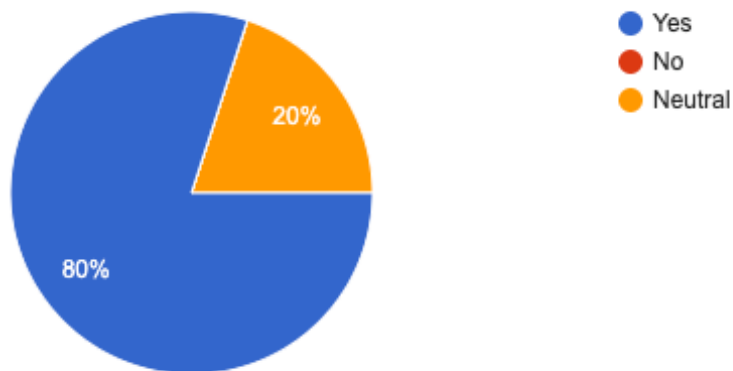
Figure 55: It shows teachers' concern about data security

2.1.14. Teachers attitudes towards technology:

We asked few random straight questions to teachers to understand their attitude toward technology.

2.1.14.1. Internet is a great source: We asked teacher if they think internet or web is a great source of knowledge worldwide to share and collaborate across the globe. They all agreed on this point that it is a great source no doubt.
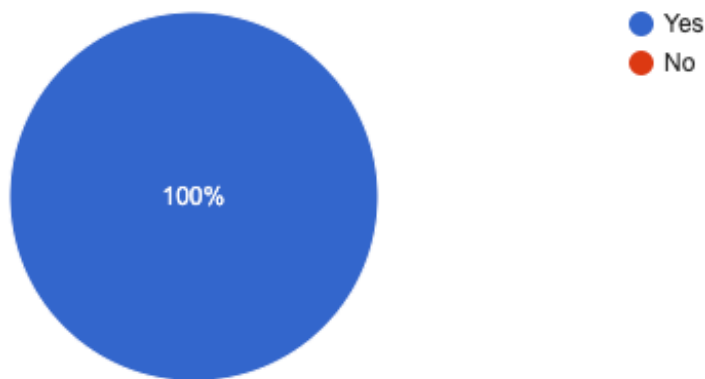
Figure 56: It shows teachers claim internet is a great source of knowledge worldwide

2.1.14.2. Technology changing education system: We also asked them if they think technology is changing our education system. It is important to know their thought on how they think about the revolutionary changes in education system by technology. They all responded "Yes" on the notion.
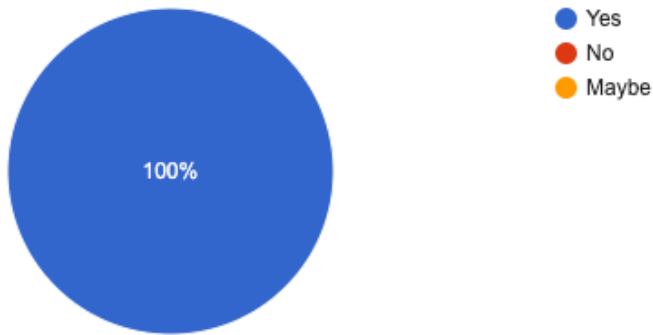
Figure 57: It shows teachers' responses to claim Technology is changing the education system.

2.1.14.2. Paperless is a good source of knowledge: We tried to know teachers views about paperless pdf books or eBooks if they think it is good source of knowledge sharing easily. 90 percent respondent it as a good source of knowledge sharing, and 10 percent responded think that it might be a good source, no strong opinion.
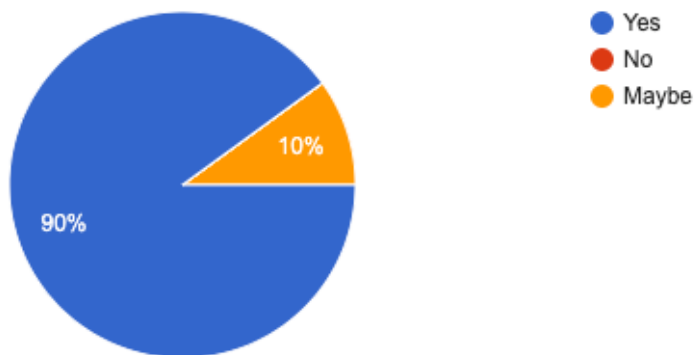
Figure 58: It shows how teachers consider pdf, eBooks are a good source of knowledge sharing

2.1.14.3. Faster information access: Technology engagement in education has made a revolutionary change in teaching and learning system, faster the communication and made resource available from anywhere in the world. We tried to understand if teachers' consent about

this notion. Supremely, all teachers consider it as the same as the notion. Resources have become

available for all teachers, students, researchers, and it made the access very faster for everyone.
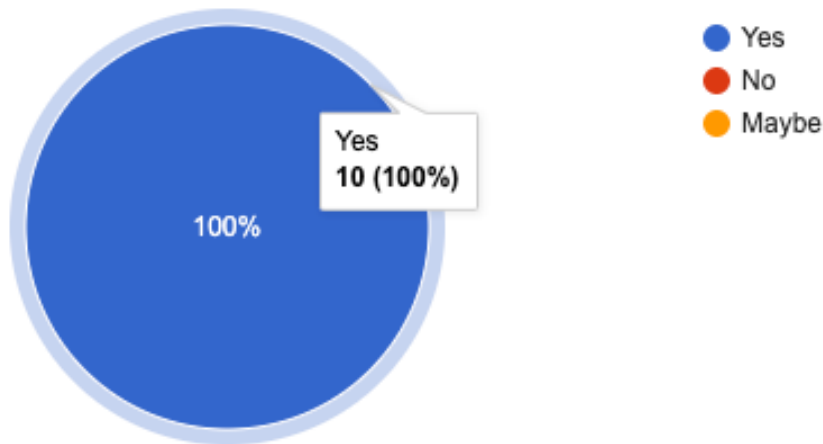
Figure 59: It shows the responses of teachers to consider technology engagement in education has made learning capability and information access faster.

2.1.14.4. Technology usage based on Students' device: We also asked teachers to

understand their interest to incorporate the use of technology in the classroom if the students

have individual access to laptop computer every day on the ration of one to one. 80 percent

teacher shows interest definitely to integrate technology in the classroom in this scenario. On the

other hand, the rest 20 percent teacher shows they most likely be interested to use technology in

this situation in the classroom. But nobody showed "Not at all" or "Not sure". So, it is

determined that moreover, teachers are very willing to integrate technology in the classroom.
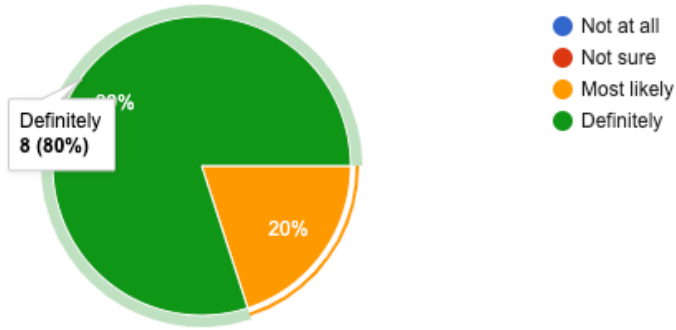
Figure 60: It shows teachers interest to use technology in the classroom if students have devices available

2.1.15. Teachers' feedbacks on survey:

We asked the respondents to add anything (suggestions or comments) at the ending part of the questionnaire. In consequences, we received few valuable feedbacks from them. They are bellow.

"প্রতিটি শ্রেণীকক্ষ প্রযুক্তি সমৃদ্ধ করা । প্রযুক্তি সহায়তার জন্য নির্দিস্ট কিছু ব্যক্তি রাখা। বিভিন্ন সময় শিক্ষকদের প্রযুক্তির প্রশিক্ষণ দেয়া ।" It means- every classroom should be decorated with technology, there should have few specific people to provide any support about technology, and teachers should be trained up in various times on technology.

"আশা করি তুমি এ কাজটি সম্পন্নকরে জন সমাজে উপস্থাপন করবে।" It means – Hope after completing you will publish this work for people.

"Yes, we need to have workshop to adapt learners' and teachers' to develop based quality."

"শিক্ষকদের অফিস কক্ষ প্রযুক্তি সজ্জিত করা ।" It means- teacher's office room should be decorated with technology.

"More technical support resources to be added at the office rooms of the faculty members. (e.g. WIFI, printer, scanner, etc.)"

"Technical support in the office of the academic stuff."

"Of course, teachers should use power point presentation in the class."

To sum-up the feedbacks we can say all teachers are supporting to use educational technology in their class room and office room. They also support to have regular training on the new technology they need to adapt to cope with the latest trends of educational technology and innovations as well as there should have responsible persons to provide maintenance support to look after the technology devices and software tools.

2.2. Analysis of Students' responses:

We provided questionnaire to many students and received valuable responses and feedbacks. Most of the students responded spontaneously to online link of the survey questions. There were 42 students responded to the questions from various semesters and years. The following analysis is stated based on each response to the questionnaire.

2.2.1. How students prepare presentation:

We asked students how they prepare class presentations. We enlisted a number of most popular software tools those are frequently used by teachers, students and other to prepare any type of presentation. And then asked students to mark their used tools. We have found that 78.6 percent students use Microsoft PowerPoint, 21.4 percent respondents use Microsoft Word, 7.1 percent use Google Docs, 7.1 percent use Google Slides. 2.4 percent students do their presentation by group, 2.4 percent use Audio records to prepare good presentation and 2.4 percent have done yet any presentation in the class. Each percent mentioned above are based on the total number of students. The detail chart is below.
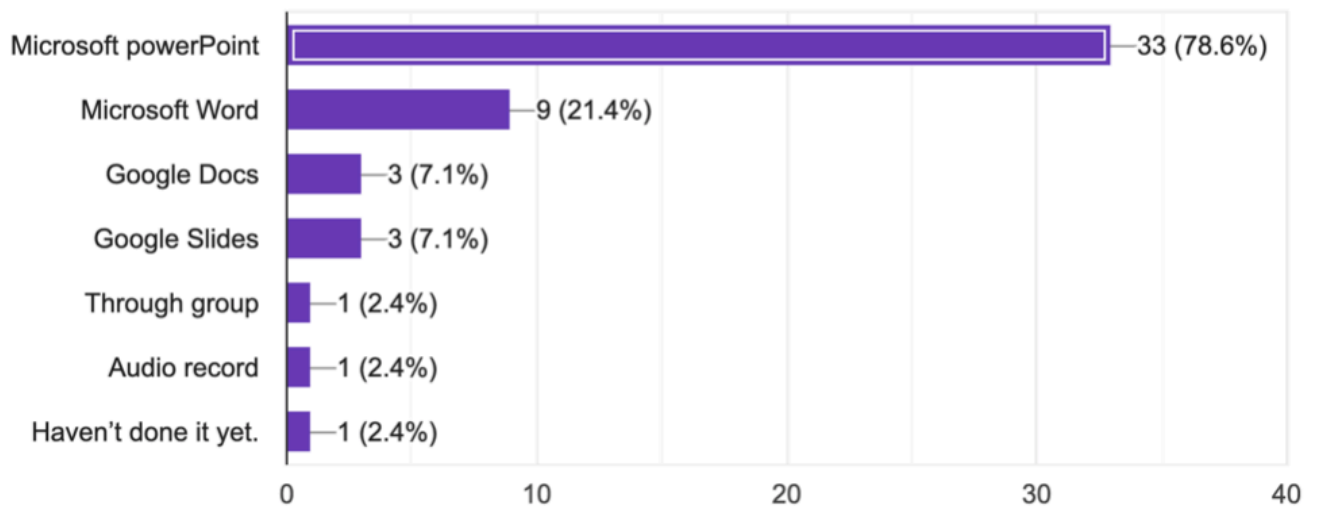
Figure 61: It shows the statistics of the usage of software tools to prepare class presentation by students.

2.2.2. How students prepare class notes:

We tried to understand how students prepare their class notes of study materials. So, we asked them if they use available websites, blog, articles, or online library books to prepare their

study or class notes. The result we found that 73.8 percent students use that online resources and

the rest 26.2 percent student does not use that.
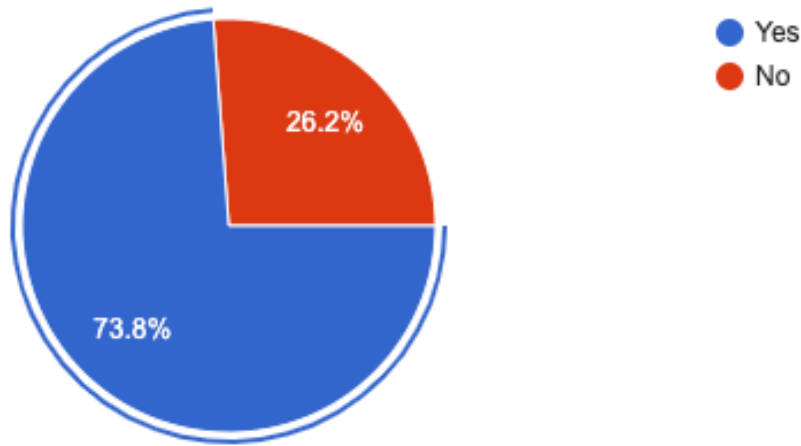
Figure 62: It shows the statistics online resource usage by students

2.2.3. Whether resources are available online:

We asked the students if they get the resource available online when they search for a

particular information related to their study topic. The result we found that 33.3 percent students

responded "Yes", 16.7 percent students responded "No", and 50 percent students responded "Not

always".
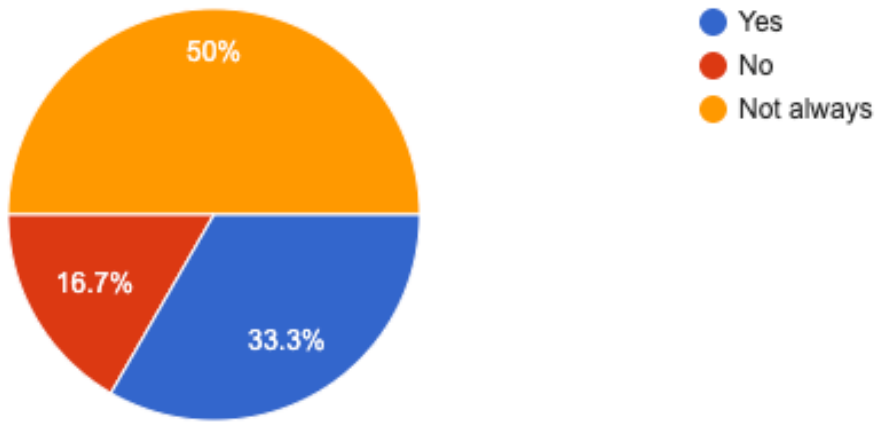
Figure 63: It shows if related resources are available online

2.2.4. Whether students like eBooks:

With this question we tried to understands if students like reading PDF or eBooks online of offline. We have found that 85.7% students like reading eBooks and PDF book, and 14.3% students do not like it. The details statistics is below.
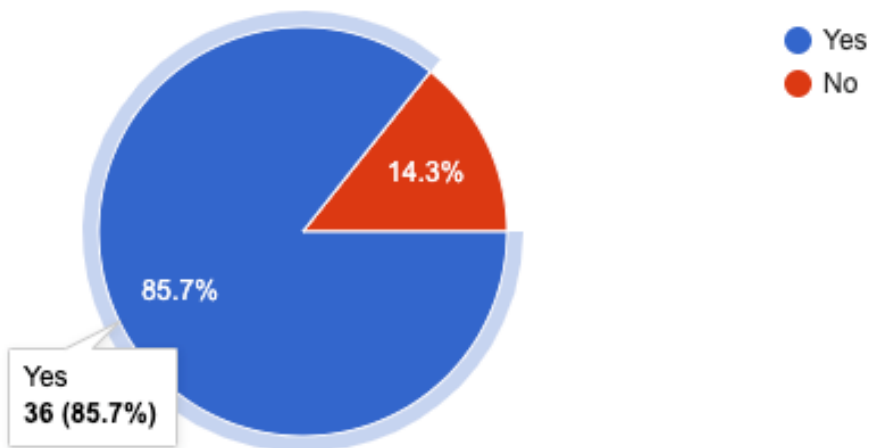
Figure 64: It shows how many students like and dislike reading pdf or eBooks

2.2.5. Where students like to read eBooks:

As we found that students like to read PDF/ e-Books, we also tried to understand which devices they prefer to read on. So, we asked them where do they like to read PDF / e-Books. We have received a valuable statistic that 4.8% students like to read on desktop computer, 35.7% students read on Laptop computer, 73.8% student prefer on Mobile devices, 4.8% students on iPad, and 11.9% students like to read on E-Book reader or Kindle book devices. The detail statistics of the responses is below.
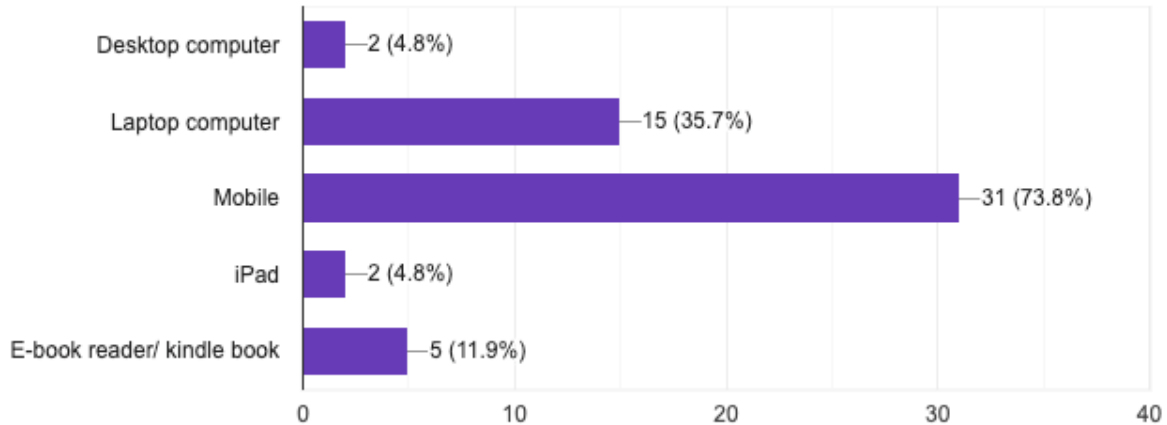
Figure 65: It shows where students like to read PDF or E-Books

2.2.6. Students' engagement with language club:

We tried to figure out of the students have association with language clubs and what languages. The result, we got from the statistics, is that 6 (14%) students are member of Arabic language club, 12 (28%) students are member of English language club, and 7 (17%) students are member of other language club. The rest percent of each language statistics are not member of the language club. The following chart displays the detailed statistics.
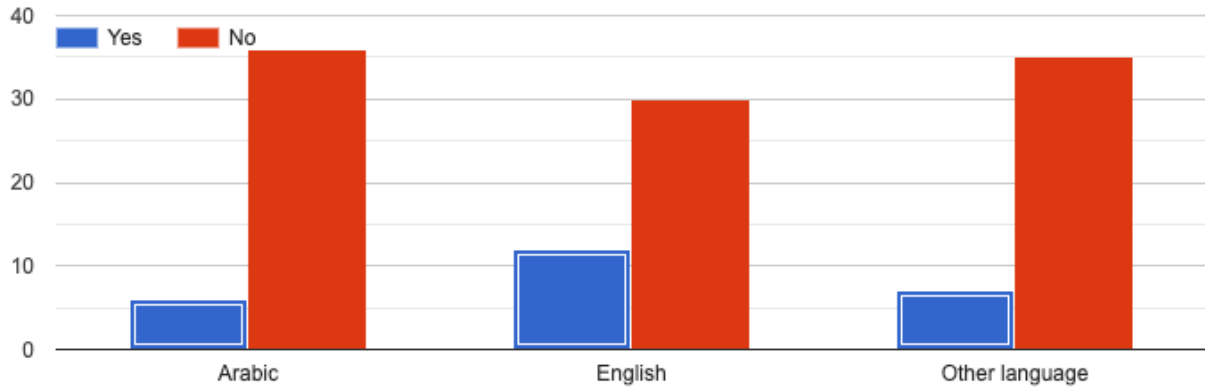
Figure 66: It shows students' engagement with language clubs

2.2.7. Perception of students to digital class materials:

We asked students if it is helpful for them if they get a soft copy of their teachers' lectures or presentation in the class. All participants responded to the question that 85.7% students consider it helpful, 11.9% students think it may be helpful, and 1% student think it is not helpful.
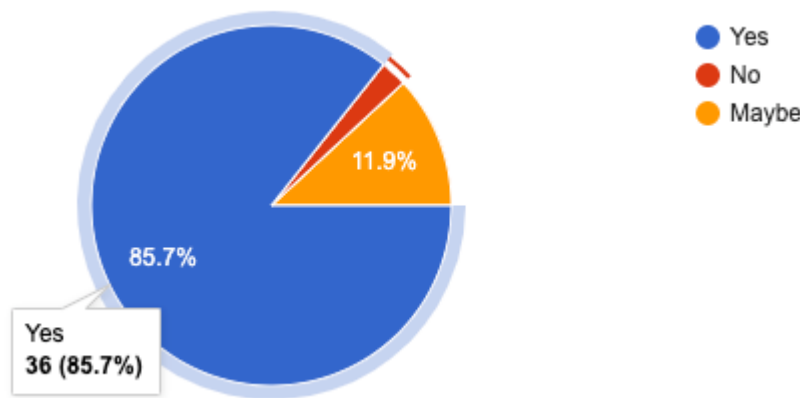
Figure 67: It shows how many students think soft copy of lecture is helpful

We asked students if their teachers provide digital materials as learning resources along with their class lectures. The responses, we received, is that 81% students consider few teachers provide, 11.9% students think teachers do not provide, and 7.1% students think every teacher

provide. That mean in 81% cases few teachers provide, 11.9% cases they do not provide, and 7.1% cases all teacher provide digital materials.
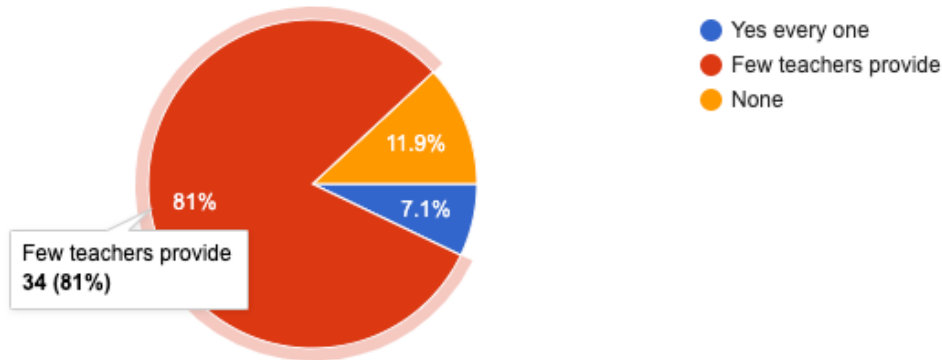
Figure 68: It shows how many teachers provide digital materials with class lectures

2.2.8. Students' understanding of plagiarism:

According to Wikipedia, the definition of plagiarism is "Plagiarism is the "wrongful appropriation" and "stealing and publication" of another author's "language, thoughts, ideas, or expressions" and the representation of them as one's own original work." (Wikipedia, 2019) . Oxford students dictionary also defined "Plagiarism is presenting someone else's work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement." (Oxford, 2019) .

as when students will work educational materials, they might take information and resources from online or various sources. So, it is important to know about plagiarism and how they can use other resources efficiently in their work. In consequences, we asked the students with this question that if they are familiar with plagiarism. The feedback we received from the

respondents is that 71.4% students are familiar with plagiarism and 28.6% students are not

familiar with it. The detail statistics is below.
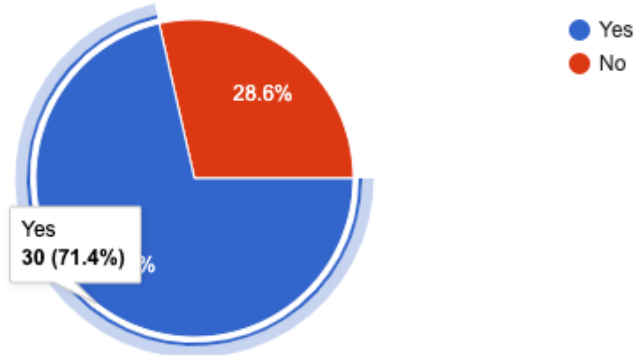
Figure 69: It shows statistics of how many students are familiar with plagiarism.

2.2.9. Seeking for technology support from teachers:

We have tried to figure out how many students seek for help from their teacher about

educational technology support. So, we asked them if they go to their teacher for getting

educational technology support to improve their learning approach. The response we have

received is that 28.6% students go to their teacher this purpose, and 71.4% students do not go to

their teacher for technology support.
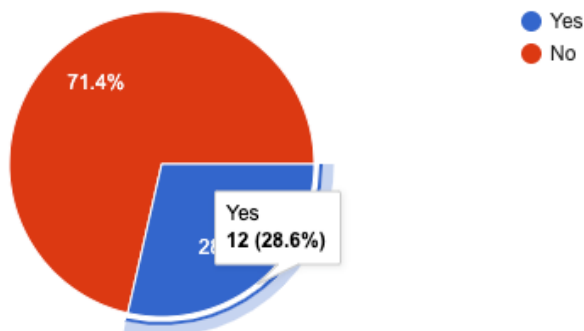
Figure 70: It shows how many students seek for help from their teachers about educational technology

2.2.10. What type of classes more attractive to students?

We have tried to find out what type of classes more attractive to students is and help them to pay more attention to class lecture and memorize is easily. We enlisted three type of lectures to define this. The first type we mentioned was "Only teachers" and we noticed 9.5% students consider it helpful for them to pay more attention to class. The second type we enlisted was "Only multi-media presentation" and the result appeared that 4.8% students think it is helpful for them. At the last type we mentioned "Lectures with multi-media presentation" and found the result that 85.7% students consider it helpful to pay more concentration in the class and memorize the lessons easily.
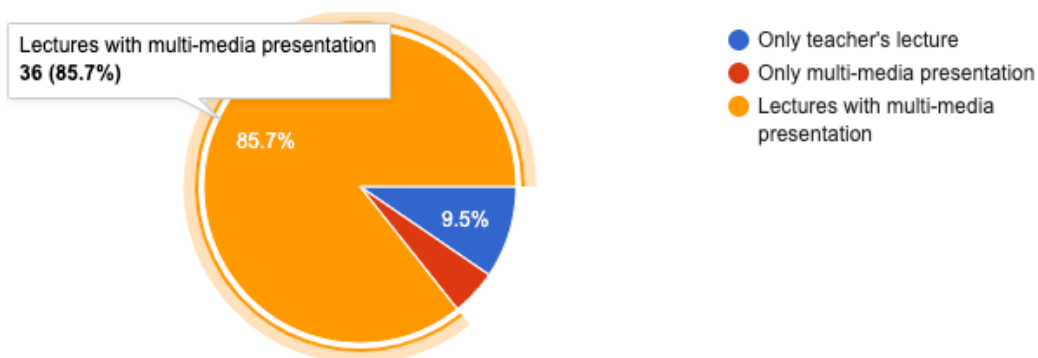
Figure 71: It shows what type of classes are more attractive to students

2.2.11. How students use computer:

With this question we tried to find out how students use their computer in regular maximum activities. To define that we enlisted 27 activities and asked students to select matching activities. The result, we have found from statistics, is that 47.6% students use to access class materials, 7.1% students use to check their grades, 16.7% students use to create

computer program, 9.5% students use to create/edit digital photos/movies, 2.4% students use to create games, 14.3% students use to create graphs or tables, 52.4% students use to create multimedia presentations, 50% respondents use to create slide show presentations (including Prezi), 7.1% students use to create websites, nobody uses to compose music, 11.9% students use to communicate with teachers, 33.3% students use to communicate with fellow students, 40.5% students use to download and play music, 31% respondents use to listen to music through the internet, 71.4% respondents use to find information on the internet, 11.9% pupils use to play games, 14.3% students use to record and analyze data in a spreadsheet, 9.5% students use to record and analyze data in a database, 45.2% students use to solve problems, 54.8% students use for Social Media (Facebook, twitter, Instagram or any other sort of social media), 50% students use to stay connected to what is happening in the world, 16.7% students use to stay organized, 31% students use to take notes, 11.9% students use to take a test or quiz, 45.2% students use to watch movies and shows for entertainment, 21.4% students use work with other students on group project, 31% students use to write drafts and edit papers, 2.4% students use for blogging, 2.4% students use to reduce boring whether they are under pressure, 2.4% students use for excel work, and 2.4% students reported that they cannot use computer normally. The following chart displays details information of the responses.
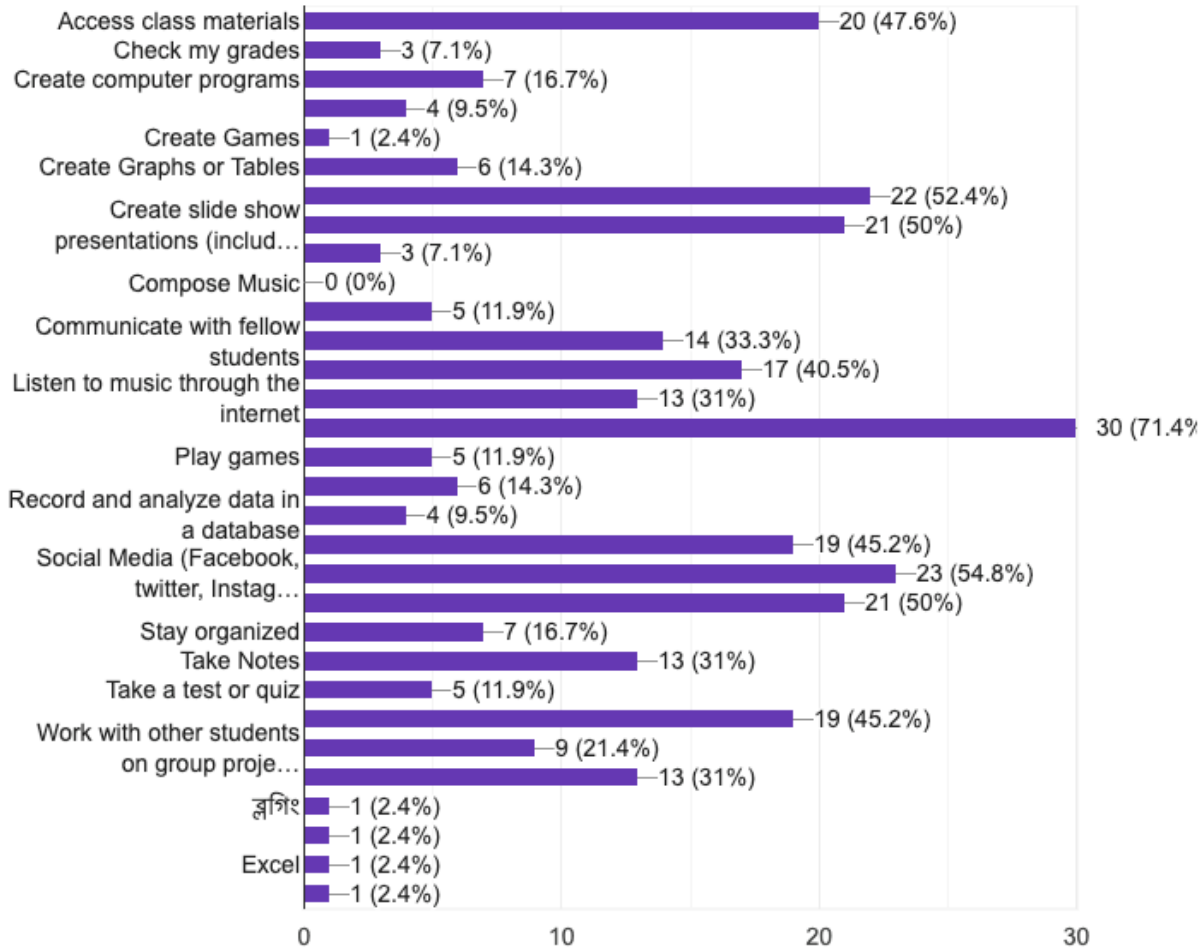
Figure 72: It shows how students use computer

2.2.12. Students' attitudes to computer troubleshooting:

We tried to understand how skills of the students to troubleshoot any simple computer issues. This is to know if students have basic troubleshooting skills, and if they feel comfort to solve problem. We enlisted few issues and asked students if they are comfortable to do the things.

The first point we mentioned "Frozen screen" and we found feedback from students that 7.1% students feel very comfort, 23.8% students feel somewhat comfort, 16.6% students are like to comfort, and 14.2% students were neutral.

The second point was "Printing issues". We asked students if they are able to solve printing problems in this point, and the statistics is that 9.5% students feel very comfort to solve it, 14.2% students are somewhat comfort, 11.9% students are like to comfort, and 9.5% students were neutral.

The third point was "installing, uninstalling, and updating software". We tried to understands if students are able to operate software, setup their computers and can use necessary software. We have found in the responses that 30.5% students are very comfort to do this, 21.4% students are somewhat comfort to it, 9.5% students are like to comfort, and 2.3% students were neutral.

The fourth point was "Downloading & uploading files". The result, we have received, is that 38% students are very comfort to do this, 14.2% students are somewhat preferring it, 4.7% students are likely to comfort, and 2.3% students were neutral.

The fifth point was "File management (save and find documents)" and we found that 35.7% students are very comfort to file management, 19% students are somewhat feeling comfort it, 4.7% students are likely to comfort, and 2.3% student are neutral.

The sixth point was "Managing system preferences" and we have found that 19%

students feel very comfort to manage system preferences, 9.5% students somewhat feel comfort,

11.9% students are likely to comfort, and 4.7% students are neutral to manage system

preferences.

The Seventh point was "Backing up data" and 16.6% students can troubleshoot very

comfortably, 16.6% students somewhat can troubleshoot, 7.1% students are likely to backup

data, and 11.9% students were neutral about backup data.

The eight point was "Sharing document with teachers and fellow students" and the result,

we have found, is that 16.6% students are very comfort to share documents, 21.4% students are

somewhat like to chare, 9.5% students are likely to share documents, and 7.1% students were

neutral to share documents with teacher and fellow students.

The ninth point was "Managing iTunes/iCloud (updating, backup, adding content)" and

the result was that 19% students are very comfort to manage iTunes/iCloud, 14.2% students are

somewhat like, 9.5% students are likely to manage iTunes/iCloud, and 9.5% students are neutral

here.

How comfortable do you feel troubleshooting computer issues as described below? (Mark only one oval per row)

Figure 73: It show how students feel to troubleshoot computer issues

2.2.13. What devices students use:

We tried to identify which educational devices students are using currently. So, we enlisted few devices and asked the students to select which devices they are using. We have found some very valuable statistics. 59.5% students are using laptop computer, 90.5% students are using smartphone, 4.8% students are using desktop computer, 7.1% students are using iPad, none using iPod, 2.4% students are using smartwatch, 16.7% students are using E-book reader.
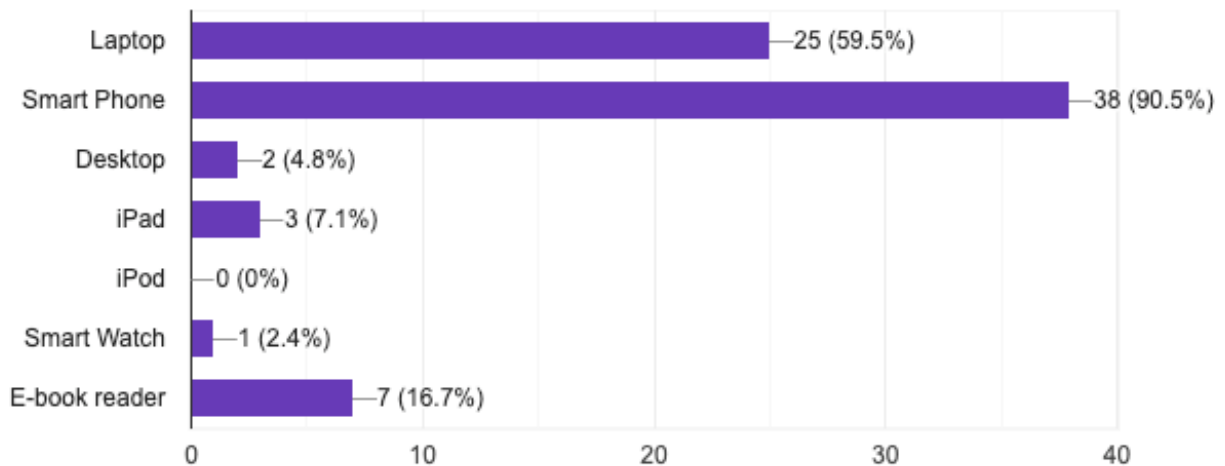
Figure 74: It shows what devices students are using currently

We also asked students if they use class recorder audio or video in the class so that they can have a digital version of the class lecture and prepare their class notes later. This is also helpful if they miss any important discussion in the class and could not understand properly during the class. It can help them to listen or watch repeatedly to be clear on the topic. We found that 23.8 percent students use class recorder and 76.2 percent students do not use it.
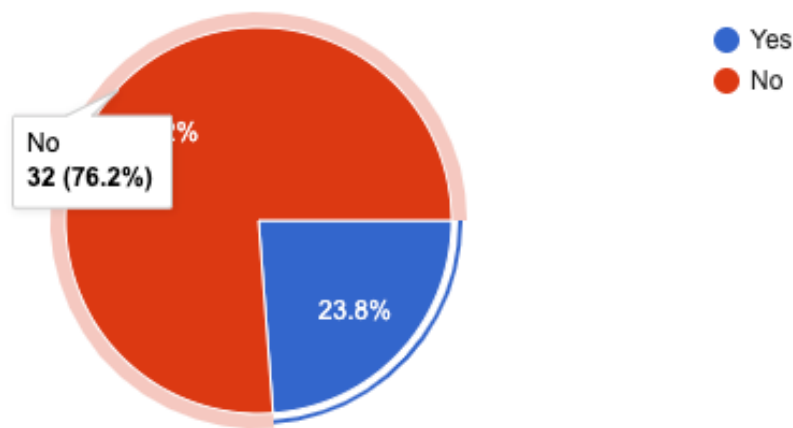
Figure 75: It shows the statistics of students who use class recorders

2.2.14. Students' attitudes towards multi-media class:

We asked the students if they simply like class with multi-media presentation. Then we received great responses that 88.1% students responded they like multi-media class, 9.5% showed they do not like, and 2.4% students were not sure, they might like class with multi-media presentation.
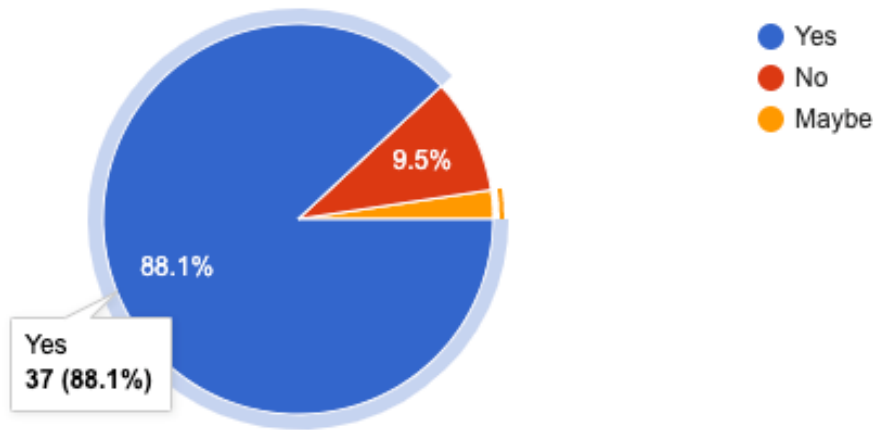
Figure 76: It shows if students like class with multi-media presentation

As majority of the students like multi-media class, we also tried to understand how many students like to attend the class with multi-media presentation. So, we asked the students if they prefer to attend any class where teacher deliver lecture along with multimedia presentation and slides. We received a great response from them and found that 76.2% students like to attend this type of class, 19% students maybe interested to join the class, 4.8% students will not like.
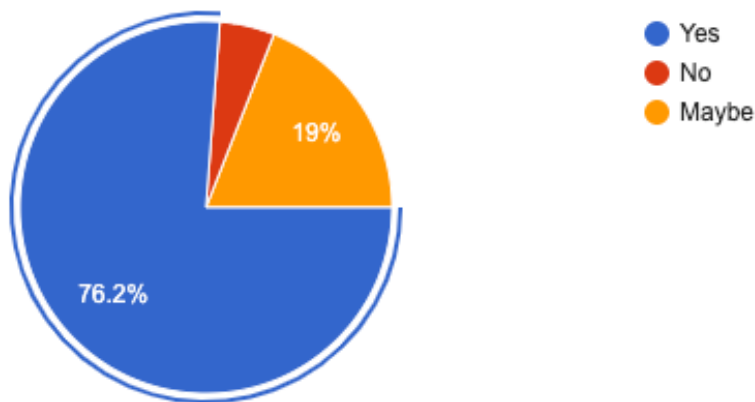
Figure 77: It shows if students like to attend multi-media class

2.2.15. Students' access to internet and learning:

We asked students if they have access to the available Wi-Fi or internet connection in the department or campus. They responded that 54.8% students have access to Wi-Fi randomly and 45.2% students do not get access to internet in the department.
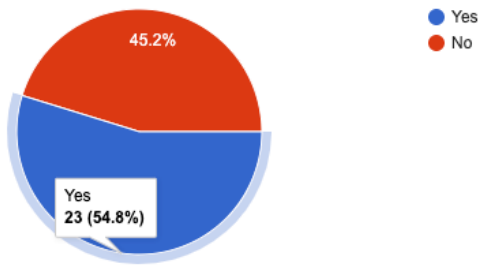
Figure 78: It shows how many students get internet access in the department

As internet is widespread nowadays, we are accessing internet always somehow. We tried to understand how frequently students' access to internet for learning purposes. So, we asked them and received a result that 73.8% students get access to internet daily, 14.3% students access randomly after every few days, and 11.9% students get access to internet weekly for learning purposes.
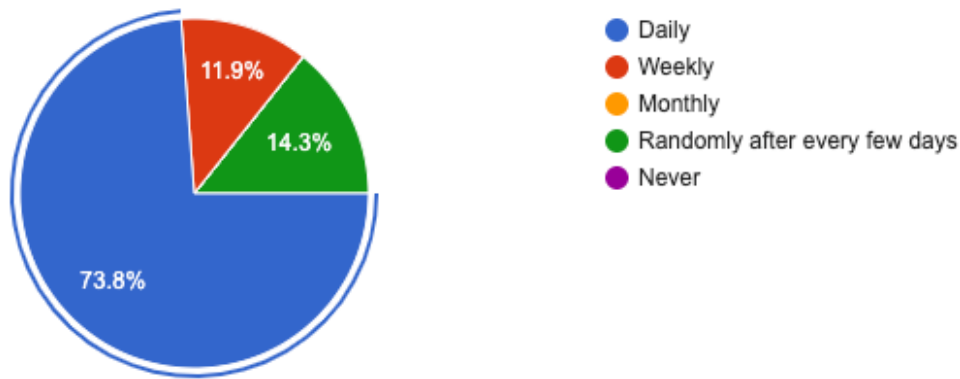
Figure 79: It shows how frequently students get access to internet for learning

2.2.16. Educational software known to Students:

We tried to figure out how many educational technology software are known to students. We enlisted few popular educational technology software/ tools and asked students to mark beside the known one. This is to understand that student maybe using these tools or somehow, they are familiar with the latest educational technology trends. In response, the result we have received is precious for generating statistics. We have found that 11.9% students know about Google classroom, 35.7% students familiar with email services, 42.9% students know about educational websites, 64.3% students know Microsoft Word, excel, PowerPoint. We also found that 26.2% students know popular online libraries, 26.2% students familiar with chat software, nobody knows about WebQuests, 50% students know social networking, 23.8% students are familiar with Google Docs, 40.5% students know Google Earth, Maps, Translator, etc. In addition, 35.7% students know blogging, 23.8% students know Wikis, 21.4% students know audio/video podcasts, 31% students know audio, video, and other multi-media (not podcasts), 23.8% students are familiar with other subject-specific software, and none of the students knows about SPSS software.
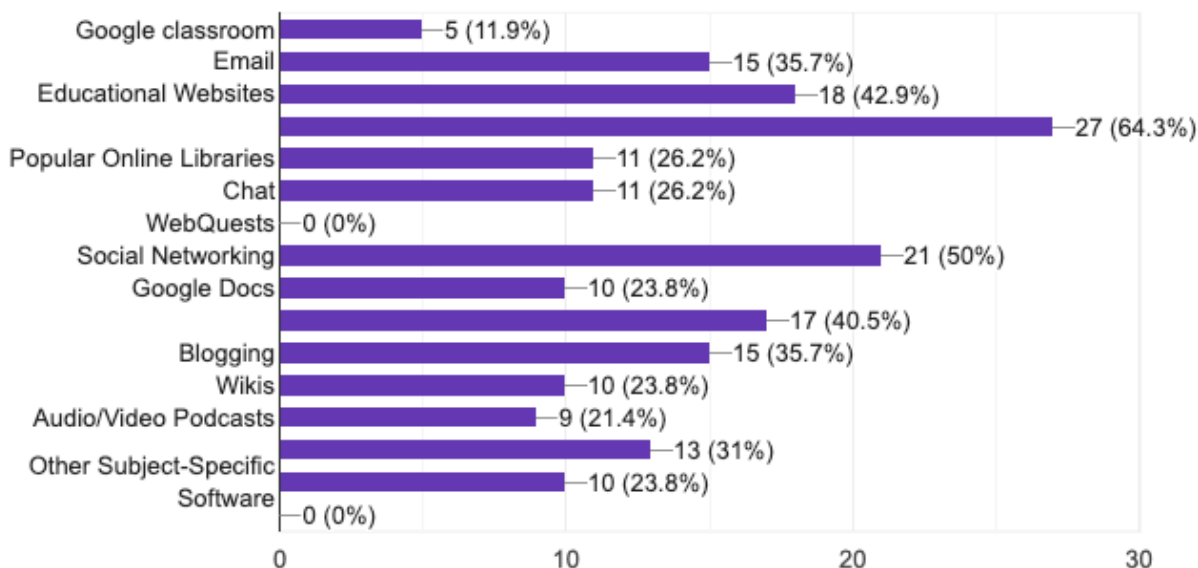
Figure 80: It shows how many students are familiar with educational technology software tools

2.2.17. Educational hardware known to students:

We tried to figure out how many educational technology hardware are known to students. We enlisted few popular educational technology hardware devices and asked students to mark beside the known one. This is to understand that a student maybe using these devices or somehow, they are familiar with the latest educational technology trends. In response, the result we have received is precious for generating statistics. We have found that 19% students are known to teacher-run computer workstation, 11.9% students know student-run computer workstation, 71.4% students know multi-media projector, 38.1% students familiar with VCR/DVD player, 14.3% students know interactive whiteboard (smartboard), 45.2% students know computer lab, 11.9% students know mobile computer lab, 31% students know digital cameras, scanner, video camera. In addition, 11.9% students know OCR (Optical character reader), 54.8% students use calculators, 16.7% students are familiar with PDAs, Cellphones,

iPod or other hand-held devices, 4.8% students know Student Response System (CPS unit,

clickers), 38.1% respondents know digital printer, 9.5% students know 3D printer, and 7.1%

students are familiar with digitizer.
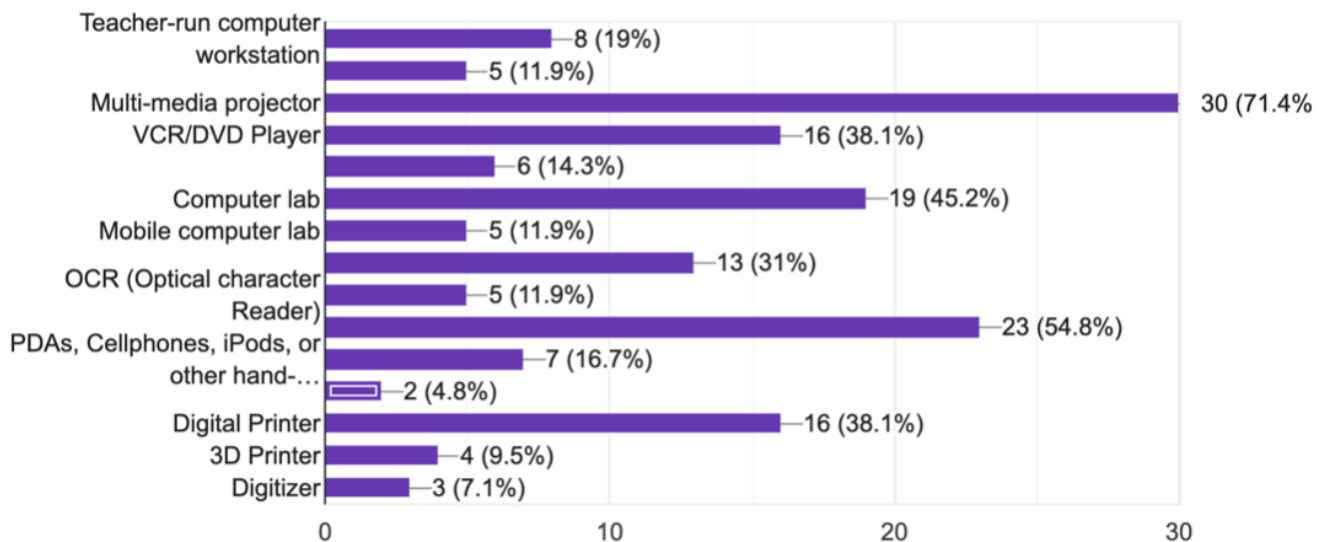
Figure 81: It shows how many students are familiar with educational technology hardware or devices

2.2.18. Students' adaptation with Technology trends:

With this question we tried to find out if the students are up to date with latest technology

trends. So, we enlisted few highlighted popular technologies those are emerging in all areas and

asked the students to respond to how many of them they are familiar with. Most of these

technologies are related with educational technology development and improvement. We have

received great response from students. The statistics is that 14.3% students are familiar with VLE

(Virtual Learning Environment), 9.5% students are familiar with Augmented reality (AR), 38.1%

students know about Virtual Reality (VR), 59.5% students are familiar with E-learning, 4.8%

students are familiar with Moodle, 50% students know about blackboard, 19% students are

familiar with NLP (Natural Language Processing), 2.4% students are familiar with artificial

intelligence, and we have found 2.4% students did not understand these terms or technologies.
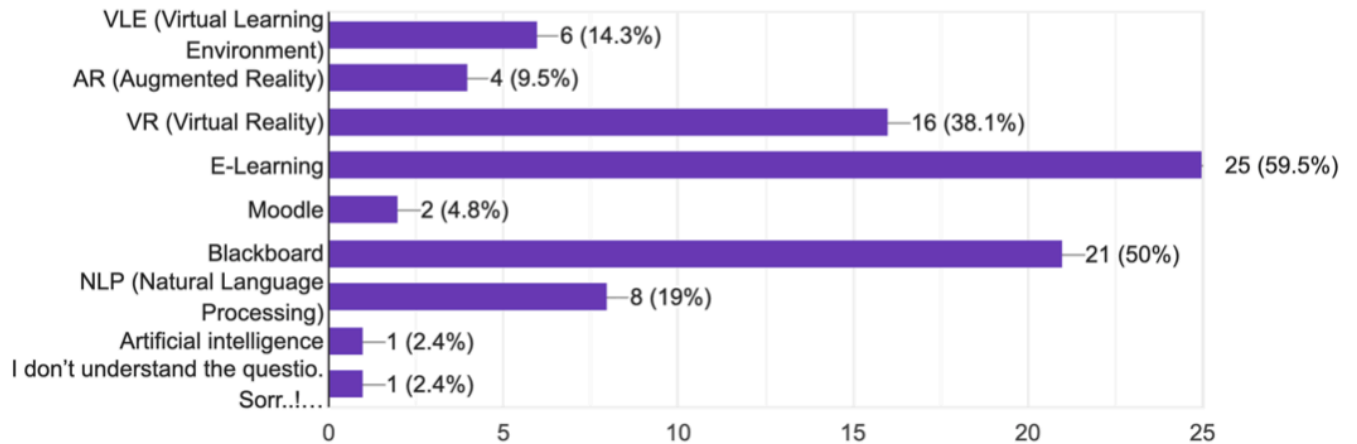
Figure 82: It shows how many students know about latest technologies trends

2.2.19. Students' ICT skills:

2.2.19.1. Level of Expertise:

Through this question, we tried to understand students' confidence to claim their level of

expertise in suing computer and internet. So, we asked students to respond rating their

proficiency level using computer and internet. As a result, we received some valuable response to

define them that 7.1% students are advanced user, 59.5% students are intermediate user, 28.6%

students are beginner, and 4.8% students rated them nothing.
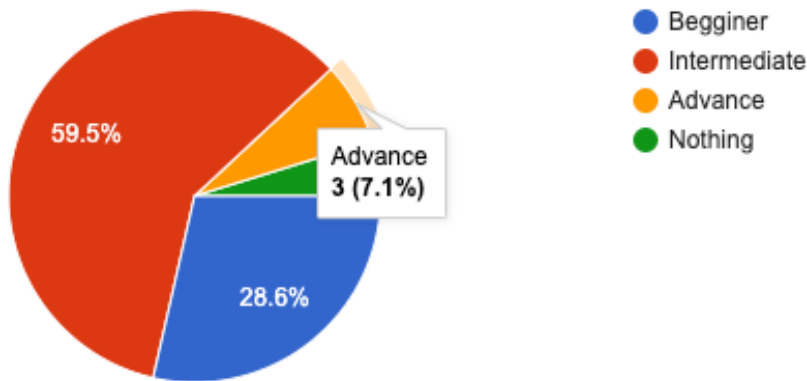
Figure 83: It show the level of students' skills in ICT

2.2.19.2. Use of Educational technology for Arabic:

We tried to understand if students use educational technology tools to learn Arabic. So, we asked them if they take any support of educational technology tools to learn Arabic. In response, we have found that 64.3% students take support of technology and 35.7% students do not take support of educational technology.
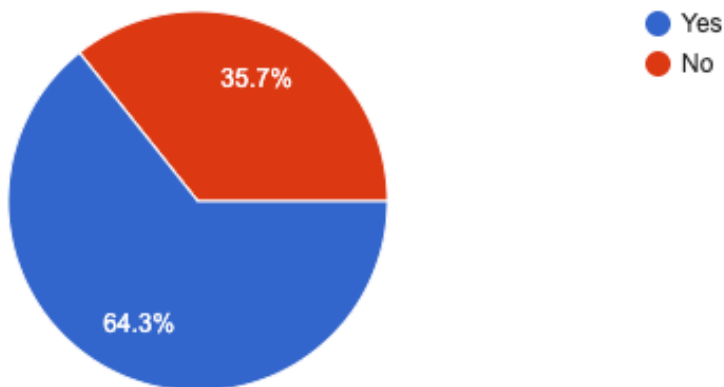
Figure 84: It shows how many students use educational technology to learn Arabic

2.2.19.3. Arabic software used by the students:

We tried to understand the students that how many types of Arabic software they are currently using. We enlisted few categories of most important educational software those are being used frequently by various students and asked the students to respond to the query based on their current usage. We found that 100% students are using Dictionary software, 14.3% students are using Wikipediaes, 4.8% students are using blogs, and 11.9% students are using Arabic library software.
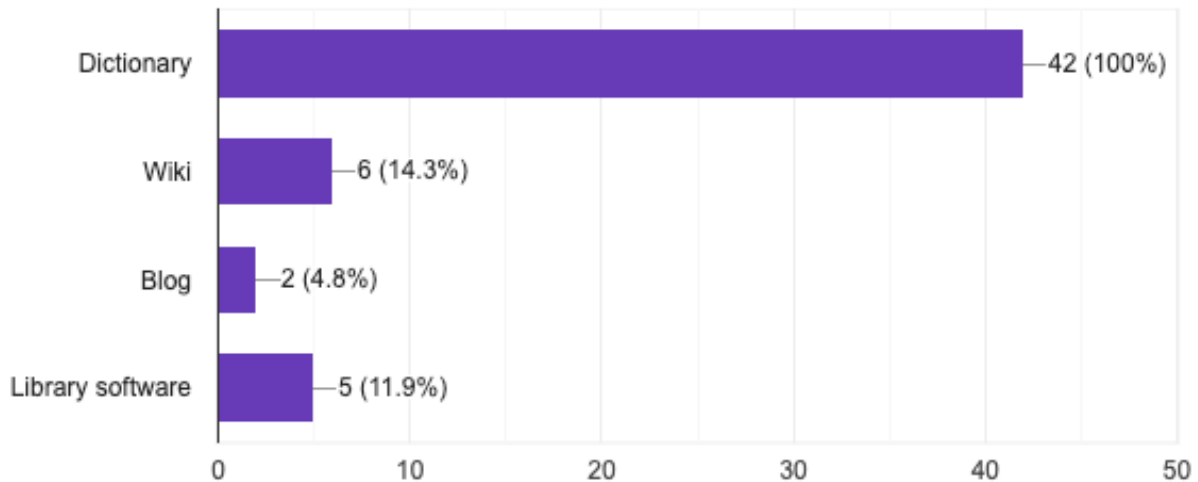
Figure 85: It shows which Arabic software tools are being most used by students.

2.2.19.4. Using Arabic software on Mobile:

As mobile is a most affordable device that is always carried with people, we tried to understand if the students do the best use of this device to learn Arabic. So, we asked the students if they use Arabic dictionaries or any other Arabic software in their mobile phone to improve

their language skills. We have found that 95.2% students use Arabic dictionaries and software in their mobile phone, and 4.8% students do not use this.
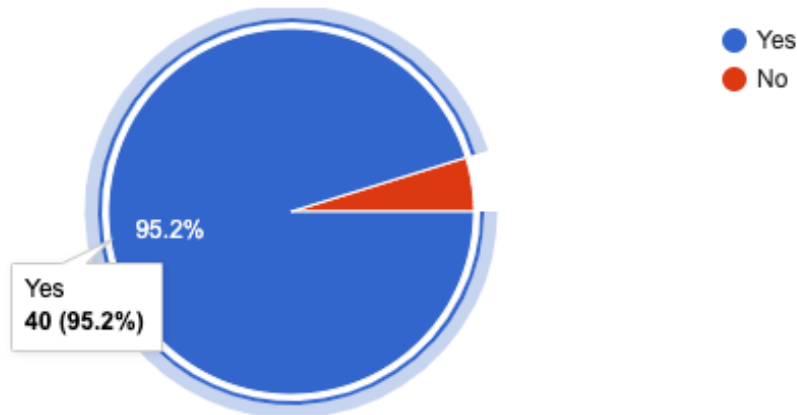
Figure 86: It shows how many students use Arabic software in mobile phone

2.2.20. Students' attitudes to learn Educational technologies:

As educational technology is a new field of study and an emerging trend to change educational system, we tried to understand if the students of Arabic are ready to adapt these new things and willing to upgrade them with the latest technology and innovation. So, we asked them if the students how they are interested to learn and upgrade them with the technologies mentioned above up to the discussion. In response, we found that 50% students are very interested to do this, and 50% students are likely interested; but nobody showed they are not interested.
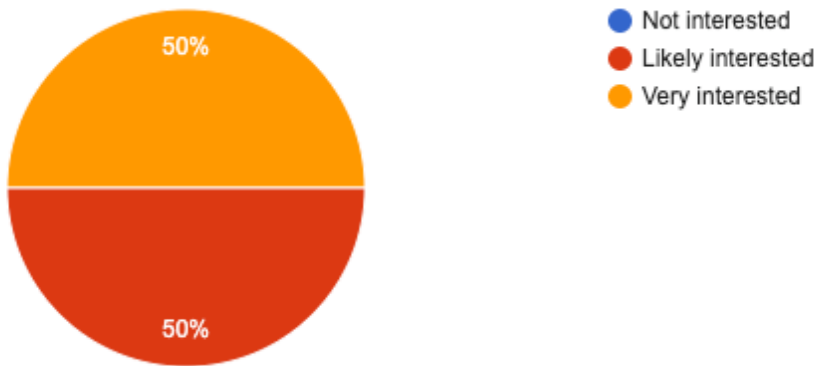
Figure 87: It shows how many students are interested to learn educational technologies.

Chapter -8: Recommendations

This chapter includes the recommendations of the research based on the analysis of collected data and description discussion.

We have come to know many key issues from the aforementioned investigation based on the sample selection and research design. We have known about the ICT skills of teachers, and students, including their interests on educational technology, current trends, barriers to adapt technology in the class room, their attitudes to integrate it in the classroom, etc. Based on the investigation and findings, we have come to provide some recommendations for the university of Dhaka, especially for the department of Arabic, DU to have an effective use of educational technologies in Arabic language teaching and learning.

1. **Decorating smart classroom:**

We have already come to know about many smart technology devices, and software tools those can be used to decorate a modern smart classroom. So, classrooms should be equipped with an interactive smartboard, multimedia projector, good quality speaker and microphone, high speed internet connection, WI-FI facility, use of educational software tools, such as presentation software, media software, collaborating software, google classroom, etc.

The department of Arabic is already using some devices, like, computer, speaker, multi-media projector. But they need to upgrade much to use new more tools and devices those are not present there. Such as smartboard, using collaborating software program, students' engagement platform, VLE, LMS, etc.

Figure 88: Example of a smart classroom. Source: https://www.thehansindia.com/posts/index/National/2019-03-09/Smart-classrooms-for-NSUT/510047

2. **ICT training:**

We know training has always been considered an important way to adapt anything and spread it to others. As technology is improving constantly, and new technologies are emerging regularly, we need to have training facility for teachers, educators and other staffs engaged in teaching so that they can cope with new trends and adjust them with changes and innovations. Teachers should be trained up properly on how to use smart devices and software tools, design course materials, and explore new way of teaching and learning with the support of technology. Because, we all know that technology won't replace teachers; but teachers who use technology will probably replace teachers who do not.

3. **Modern language lab:**

Currently, there is not any modern language lab or even a computer lab for the students of the department of Arabic at the university of Dhaka in which they can practice Arabic, finish their study notes, assignments, etc. There should have a language computer lab with modern

technology facilities. For example, good quality computer, headphone, VR (Virtual Reality) devices to practice, learning software tools, AR (Augmented Reality) tools, internet access to learning resources, subscription or access to popular online libraries or bookstore, etc.

4. **Resource management and monitoring:**

Institute should use LMS (Learning Management System) or CMS (Content Management System) to organize properly their course materials, documents, knowledge sources etc. so that study content become available for all to study. With this software tools, course teachers can manage all their class plans, notes, share digital copy of the materials with students, distribute assignments and monitor each student's progress. There are many facilities that can benefit teachers and students to build a smartly managed and monitoring platform.

5. **Digital library catalog:**

The department should maintain a digital library catalog for their seminar library to manage their library resources and make it available for both teachers and students. And there should be easy process to get the books and read. On online library catalog, it is also possible to add many E-Books on the platform so that students can read digital copy on their mobile device or kindle reader along with a hard paper.

6. **Inspiring to use Educational technology:**

Teachers as well as students should have good inspiration to use educational technology in the classroom and their academic activities. Teachers have to work much to produce IT-based study materials of contents and resources so that students can learn. All their produced contents

should be maintained and saved properly for reuse. Every content produced by the teachers and the students are great resources for others. So, the teachers are the key source to produce new knowledge materials for the students. We have come to know that students reported only 33.3% cases they get necessary resources available online. So, to generate new resources and make them available is very important. They should have good inspiration to use multi-media in the classroom, and with the lecture. Students also should have inspiration to increase interactions with their teachers and instructors to increase their knowledge and learning scope.

7. **IT support:**

There should have a good IT support person from the department or the university to provide IT assistance during the class and regular maintenance support for the devices in the classrooms or language lab, or any other office rooms. IT support also includes to provide support for data storage, backup, and data security so that data can be protected from lose or damaged.

8. **ET expert committee:**

There should have an educational technology (ET) expert committee in the department to provide expert level support for curriculum design, consultancy, research, implementation, progress monitoring, demand analysis, etc. and they will work closely with other academic committee members. ET expert committee should have sound understanding of the benefits of Educational technology, use of technology, foresight of ET, and expertise to consult in the situation of any new adaptation.

Conclusion

We have found in the investigation that 100% teachers of the department of Arabic, DU view that internet is a great source of knowledge to share and collaborate and Technology is changing the education system. With the introduction of some education technology at department level nowadays they get access to internet. Accordingly, 90% teachers are very interested to know more about educational technology tools and they consider paperless books are a great source of knowledge to carry and read them easily. On the other hand, we have found 90.5% students use smartphone and 85.7% students like to read E-books/ PDFs and 73.8% students like to read them on their smartphones. 100% students use Arabic dictionary software and 95.2% use it on their mobile as well. So, smartphone is a great and affordable device for students to use for learning.

Educational technology has brought a great blessing for teachers and learners. It is very tough to carry 10+ books always with a reader; but it is super easy to carry thousands of e-books without any hassle with the help of technology. If one has a kindle reader or just a smartphone, one can carry many e-Books or PDF books. Technology opened the door of endless source of knowledge for everyone available with reading materials (E-books), listening materials (Audio podcasts), watching materials (Video podcasts), playing materials (Gamification or educational games), and feeling materials (Virtual Reality).

Educators need to contribute to produce quality contents and make them available for all to build a community of knowledge sharing worldwide. With the help of technology, now anyone can learn anything or new knowledge though this new knowledge is produced or invented in a far

distance area of the world when it is made available on the internet for all. So, students are global learner, teachers are global teacher, and the knowledge is borderless.

Finally, we have learnt how educational technology is emerging as a field of study with its theories, practices, components, particular goals, learning scopes, web evolutions, and numerous hardware and software tools. We have also learnt how educational technology is evolving in the education sector of Bangladesh with its massive IT infrastructure. Then, we have studied mainly about the status of educational technology in the department of Arabic at the University of Dhaka with broad discussion about teachers and students in the previous chapters. Based on the study of educational technology and the study of analytical information of the survey data, we have come to propose few recommendations which have been stated in the recommendation chapter in detail for the University of Dhaka, especially for the department of Arabic to integrate Educational Technology in the department and simplify the process of Arabic language teaching and learning efficiently.

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Appendices

1. Questionnaire, Survey Modeling and Data collection

There were two forms of questionnaire for collecting data for field work. It includes a questionnaire form for teachers and a questionnaire form for students. The following questions were introduced for the respective data accumulation.

1.1.   Teachers Survey Questionnaire

Teacher's Survey Questionnaire

Survey for getting feedback from teachers about educational technology and its usage at the University of Dhaka. This survey model is designed to collect required information related to Educational Technology and its usage in Arabic language teaching at the University of Dhaka. Your collaborative response will help the researcher to have valuable information and data analytics.

Research Topic: "Use of Technology in Arabic Language Teaching at the University of Dhaka: Observation and Recommendations"

Supervisor: Dr. Zubair Mohammad Ehsanul Hoque
Researcher: Mohammed Zahirul Haque
M.Phil. Reg: 89/2013-2014
Department of Arabic,
University of Dhaka

* Required

1. **About yourself (Name, Designation, batch No/University session, Department) (আপনার সম্পর্কে (নাম, পদবি, ব্যাচ নং / বিশ্ববিদ্যালয় সেশন, বিভাগ)) ***

   _____

2. **Approximately how long have you been teaching?(প্রায় কত দীর্ঘ সময় ধরে আপনি শিক্ষকতা করছেন) ***
   Mark only one oval.

   ◯ 1 - 3 Years

   ◯ 4 - 6 Years

   ◯ 7 - 10 Years

   ◯ 10 - 20 Years

   ◯ More than 20 years

3. **Average number of students per class: (প্রতি ক্লাসে শিক্ষার্থীদের গড় সংখ্যা) ***
   Mark only one oval.

   ◯ fewer than 10

   ◯ 10-15

   ◯ 16-20

   ◯ 21-25

   ◯ 50- 100

   ◯ more than 100

4. **To what extent do you agree with the following statements?(নিম্নলিখিত বিবৃতির সাথে আপনি কতটা একমত?)** *

Mark only one oval per row.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Most of my students have the skills to use institutionally specific technology (e.g., the module registration system, the VLE, the library search system)	◯	◯	◯	◯
Most of my students have the skills to use basic software programs and applications (e.g., MS Office, Google Apps, etc.)	◯	◯	◯	◯
Most of my students have adequate technology skills for discipline specific (Arabic field) software	◯	◯	◯	◯
My students look to me for technology support	◯	◯	◯	◯
My students are more confident using technology than I am	◯	◯	◯	◯
My students ask me to use technology to enhance their learning	◯	◯	◯	◯

5. **How is ICT taught to classes in your department? (কিভাবে আপনার বিভাগে আইসিটি শেখানো হয়?)** *

Mark only one oval.

◯ ICT is taught as a separate subject/ course

◯ ICT is integrated in several subjects/ courses

◯ Department does not concentrate in ICT

6. **Who provides the ICT support at your department? (কে আপনার বিভাগে আইসিটি সহায়তা প্রদান করে?)** *

Check all that apply.

☐ A more experienced / knowledgeable teacher

☐ Department's ICT / technology coordinator

☐ Other department staff

☐ Experts from outside the department

☐ We don't have ICT support

7. **Please identify which of the following educational technologies (software) you currently use in teaching. Mark all that apply. (আপনি বর্তমানে শিক্ষার জন্য নিম্নলিখিত কোন কোন শিক্ষাগত প্রযুক্তি (সফটওয়্যার) ব্যবহার করেন তা সনাক্ত করুন। প্রযোজ্য সবগুলো চিহ্নিত করুন।)** *

Check all that apply.

- [ ] Google classroom
- [ ] Email
- [ ] Educational Websites
- [ ] Microsoft Word, Excel, PowerPoint
- [ ] Popular Online Libraries
- [ ] Chat
- [ ] Moodle
- [ ] Social Networking
- [ ] Google Docs
- [ ] Google Earth, Maps, Translator, etc.
- [ ] Blogging
- [ ] Wikis
- [ ] Audio/Video Podcasts
- [ ] Audio, Video, and Other Multimedia (Not Podcasts)
- [ ] Other Subject-Specific Software
- [ ] SPSS

8. **Please identify which of the following educational technologies (hardware) you currently use in teaching. Mark all that apply.(আপনি বর্তমানে শিক্ষার জন্য নিম্নলিখিত কোন কোন শিক্ষাগত প্রযুক্তি (হার্ডওয়্যার) ব্যবহার করেন তা সনাক্ত করুন। প্রযোজ্য সবগুলো চিহ্নিত করুন।)** *

Check all that apply.

- [ ] Teacher-run computer workstation
- [ ] Student-run computer workstation
- [ ] Multi-media projector
- [ ] VCR/DVD Player
- [ ] Interactive whiteboard (Smartboard or other)
- [ ] Computer lab
- [ ] Mobile computer lab
- [ ] Digital cameras, scanners, videocameras
- [ ] OCR (Optical character Reader)
- [ ] Calculators
- [ ] PDAs, Cellphones, iPods, or other hand-held units
- [ ] Student Response Systems (CPS units, Clickers, Survey modeling)
- [ ] Digital Printer
- [ ] 3D Printer
- [ ] Digitizer

9. **Which of the following educational technologies would you be MOST interested in learning more about? (নিম্নলিখিত শিক্ষামূলক প্রযুক্তিগুলির মধ্যে আপনি কোন বিষয়ে আরো বেশি জানতে আগ্রহী হতে চান?)** *

Check all that apply.

- [ ] Google classroom
- [ ] Google docs, slides, forms
- [ ] WebQuests
- [ ] Microsoft Office (Word, Excel, PowerPoint)
- [ ] Digital photography, audio, and video making
- [ ] Interactive educational game
- [ ] All Social Software
- [ ] Blogs
- [ ] Wikis
- [ ] Podcasting
- [ ] Social Networking
- [ ] Interactive lesson/ class material design

10. **Preferred teaching methodology (choose only one) (পছন্দের শিক্ষণ পদ্ধতি)** *

Mark only one oval.

- ( ) Largely teacher-directed (e.g., teacher-led discussion, lecture)
- ( ) More teacher-directed than student-centred
- ( ) Even balance between teacher-directed and student-centred activities
- ( ) More student-centred than teacher-directed
- ( ) Largely student-centred (e.g., cooperative learning, discovery learning)

11. **Please rate your interest in learning more about Google Apps related to learning and teaching. (শেখার এবং শিক্ষার সাথে সম্পর্কিত Google অ্যাপ্লিকেশান সম্পর্কে আরো শেখার জন্য আপনার আগ্রহ কেমন।)** *

Mark only one oval.

- ( ) I'm not interested.
- ( ) I'm moderately interested.
- ( ) I'm very interested.

12. **Please read the following descriptions of the proficiency levels a user has in relation to computer technologies. Determine the level that best describes you.** (কম্পিউটার প্রযুক্তির সাথে সম্পর্কিত একজন ব্যবহারকারীর দক্ষতা স্তরের নিম্নোক্ত বর্ণনাগুলি অনুগ্রহ করে পড়ুন। যে স্তরটি আপনার সাথে সর্বোচ্চভাবে মিলে এমন স্তর নির্ধারণ করুন।) *

Mark only one oval.

- ◯ Unfamiliar - I have no experience with computer technologies.
- ◯ Newbie - I have attempted to use computer technologies, but I still require help on a regular basis
- ◯ Beginner - I am able to perform basic functions in a limited number of computer applications
- ◯ Average - I demonstrate a general competency in a number of computer applications.
- ◯ Advanced - I have acquired the ability to competently use a broad spectrum of computer technologies
- ◯ Expert - I am extremely proficient in using a wide variety of computer technologies.

13. **Please indicate whether you agree or disagree with the following statements:** (নিম্নলিখিত বক্তব্যের সাথে আপনি একমত বা অসম্মতি কিনা তা নির্দেশ করুন:) *

Mark only one oval per row.

	Agree	Disagree
I am confident using technology in my teaching	◯	◯
I am a late adopter of using technology in my teaching	◯	◯
I experiment with technology in my teaching	◯	◯
I'm not sure yet about the benefits of using technology in my teaching	◯	◯
My institution encourages me to use technology in my teaching	◯	◯
I think technology will be an essential part of teaching in the future	◯	◯
I am an enthusiastic user of using technology to enhance my teaching	◯	◯
I think using technology in the classroom is a waste of time	◯	◯

14. **How often do you typically use the Virtual Learning Environment (VLE) during an academic year (e.g. Moodle, Blackboard, Sakai etc)?** (আপনি একাডেমিক বছরের প্রায় কেমন সময় ভার্চুয়াল লার্নিং এনভায়রনমেন্ট (VLE) ব্যবহার করেন?) *

Mark only one oval.

- ◯ Daily
- ◯ Weekly
- ◯ Monthly
- ◯ Yearly
- ◯ Do not use a VLE
- ◯ Not familiar with VLE

15. **What barriers prohibit you from incorporating technology use into your classroom? (tick all that apply)? (শ্রেণীকক্ষে প্রযুক্তি ব্যবহারে কি কি বাধা রয়েছে বলে আপনি মনেকরেন? প্রযোজ্য সবগুলো চিহ্নিত করুন।)** *

Check all that apply.

- [ ] Not relevant to my teaching / subject area
- [ ] Not sure of the possibilities
- [ ] Lack of confidence
- [ ] Lack of time to attend training
- [ ] Do not have access to the technology
- [ ] Lack of time to engage in technology-enhanced learning
- [ ] Lack of training
- [ ] Do not like the technology
- [ ] Lack of technical support
- [ ] Need more technology support
- [ ] Need more time to develop technology-based lessons after support
- [ ] Need support with connections/devices/technology issues
- [ ] Not enough devices available
- [ ] Using ICT in teaching and learning not being a goal of our department
- [ ] I use technology comfortably

16. **Does your department/university provide an email address? (আপনার বিভাগ / বিশ্ববিদ্যালয় কি ইমেইল ঠিকানা প্রদান করেন)** *

Mark only one oval per row.

	Yes	No
To Teachers	◯	◯
To Students	◯	◯
To other staff	◯	◯

17. **Are the technological devices managed properly in your department? (প্রযুক্তিগত যন্ত্র-পাতি আপনার বিভাগে সঠিকভাবে পরিচালিত হয়?)**

Check all that apply.

- [ ] Yes
- [ ] No
- [ ] Need more concentration of device management

18. **Does your department use Learning Management System (LMS) software? (আপনার ডিপার্টমেন্ট কি লার্নিং ম্যানেজমেন্ট সিস্টেম (এলএমএস) সফটওয়্যার ব্যবহার করে?)** *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ I don't know

19. **Do your department have computer lab? (আপনার বিভাগ কম্পিউটার ল্যাব আছে?)** *

Mark only one oval.

◯ Yes

◯ No

20. **Do your department have language lab with Virtual Reality (VR), Augmented Reality (AR) technology (আপনার বিভাগে ভার্চুয়াল রিয়ালিটি (ভিআর), অগমেন্টেড রিয়ালিটি (এআর) প্রযুক্তির সাথে সংযুক্ত ভাষা ল্যাব আছে)** *

Mark only one oval.

◯ Yes

◯ No

21. **Does your department have digital library or catalog? (আপনার বিভাগে ডিজিটাল লাইব্রেরি বা ক্যাটালগ আছে?)** *

Mark only one oval.

◯ Yes

◯ No

22. **Does your department use any content management system (CMS) (আপনার বিভাগ কোন কন্টেন্ট ম্যানেজমেন্ট সিস্টেম (সিএমএস) ব্যবহার করে)** *

Mark only one oval.

◯ Yes

◯ No

◯ Maybe

◯ I don't know

23. **Do you think data security is a concerning point about technology usage in the classroom? (আপনি কি মনে করেন ডাটা নিরাপত্তা শ্রেণীকক্ষে প্রযুক্তি ব্যবহারের ক্ষেত্রে একটি সম্পৃক্ত বিষয়?)** *

Mark only one oval.

◯ Yes

◯ No

◯ Neutral

24. **Do you think internet/web is a great source of knowledge worldwide to share and collaborate across the globe? (আপনি কি মনেকরেন ইন্টারনেট/অয়েব বিশ্বব্যাপী জ্ঞান বিতরন ও সহযোগিতার জন্য একটি বিশাল উৎস)** *

Mark only one oval.

◯ Yes

◯ No

25. **Do you think technology is changing our education system? (আপনি কি মনে করেন প্রযুক্তি আমাদের শিক্ষা ব্যবস্থা পরিবর্তন করছে)** *

Mark only one oval.

◯ Yes

◯ No

◯ Maybe

26. **Do you consider paperless book/eBook is a good source of knowledge sharing? (আপনি কি মনেকরেন কাগজবিহীন বই জ্ঞান বিনিময়ে একটি ভালো উৎস)** *

Mark only one oval.

◯ Yes

◯ No

◯ Maybe

27. **Do you consider technology engagement in education has made the learning capability and information access faster for both teachers and students? (আপনি কি মনে করেন শিক্ষার সাথে প্রযুক্তির সম্পৃক্ততা শিক্ষক এবং ছাত্র উভয়ের জন্য শিক্ষার দক্ষতা এবং তথ্য পাওয়ার ব্যাপারটি দ্রুত করেছে)** *

Mark only one oval.

◯ Yes

◯ No

◯ Maybe

28. **Would you incorporate the use of technology in the classroom more often if your students had individual access to a laptop every day (one to one ratio?) (আপনার শিক্ষার্থীদের প্রতিদিন ল্যাপটপে ব্যক্তিগত অ্যাক্সেস (১ঃ১ অনুপাতে) থাকলে শ্রেণীকক্ষে প্রযুক্তি ব্যবহার আপনি কি সচেষ্ট হবেন)** *

Mark only one oval.

◯ Not at all

◯ Not sure

◯ Most likely

◯ Definitely

29. **Would you like to add anything (suggestion/comments)? (আপনি কি কিছু যোগ করতে চান (পরামর্শ / মন্তব্য))**

_____

_____

_____

_____

_____

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1.2. **Students Survey Questionnaire**

Student's Survey Questionnaire

Survey for getting feedback from students about educational technology. This survey model is designed to collect required information related to Educational Technology and its usage in Arabic language learning at the University of Dhaka. Your collaborative response will help the researcher to have valuable information and data analytics.

Research Topic: "Use of Technology in Arabic Language Teaching at the University of Dhaka: Observation and Recommendations"

Supervisor: Dr. Zubair Mohammad Ehsanul Hoque
Researcher: Mohammed Zahirul Haque
M.Phil. Reg: 89/2013-2014
Department of Arabic,
University of Dhaka

* Required

1. **About yourself (Name, Roll No, Department)** *

   _____

2. **What's your Batch no/ academic session at the university?** *

   _____

3. **Do you use class recorder? Audio or video:** *
   Mark only one oval.

   ◯ Yes

   ◯ No

4. **How do you prepare your class presentation?** *
   Check all that apply.

   ☐ Microsoft powerPoint

   ☐ Microsoft Word

   ☐ Google Docs

   ☐ Google Slides

   ☐ Other: _____

5. **Do you take support of available websites, blogs, articles, or online library books to prepare your study or class notes?** *
   Mark only one oval.

   ◯ Yes

   ◯ No

6. **Do you get available resources in Arabic language when you search on the web related to your study topic?** *

Mark only one oval.

⬭ Yes

⬭ No

⬭ Not always

7. **Do you like reading PDFs/E-Books** *

Mark only one oval.

⬭ Yes

⬭ No

8. **Where do you like reading PDFs/E-Books?** *

Check all that apply.

☐ Desktop computer

☐ Laptop computer

☐ Mobile

☐ iPad

☐ E-book reader/ kindle book

9. **Are you a member of any language club/lab?** *

Mark only one oval per row.

	Yes	No
Arabic	⬭	⬭
English	⬭	⬭
Other language	⬭	⬭

10. **Do you take support of any Educational technology tools to learn Arabic?** *

Mark only one oval.

⬭ Yes

⬭ No

11. **Would it be helpful for you if you get a soft copy of your teacher's lecture or presentation in the class?** *

Mark only one oval.

⬭ Yes

⬭ No

⬭ Maybe

12. **Do you know about plagiarism?**

Mark only one oval.

⬭ Yes

⬭ No

13. **Do you go to your teacher for getting educational technology support to improve your learning approach?** *

Mark only one oval.

◯ Yes

◯ No

14. **What type of classes help you to pay more concentration in the class and memorize the lessons?** *

Mark only one oval.

◯ Only teacher's lecture

◯ Only multi-media presentation

◯ Lectures with multi-media presentation

15. **I use a computer to (select all that apply):** *

Check all that apply.

☐ Access class materials

☐ Check my grades

☐ Create computer programs

☐ Create/edit digital photos/movies

☐ Create Games

☐ Create Graphs or Tables

☐ Create multimedia presentations

☐ Create slide show presentations (including Prezi)

☐ Create Websites

☐ Compose Music

☐ Communicate with teachers

☐ Communicate with fellow students

☐ Download and play music

☐ Listen to music through the internet

☐ Find information on the Internet

☐ Play games

☐ Record and analyze data in a spreadsheet

☐ Record and analyze data in a database

☐ Solve problems

☐ Social Media (Facebook, twitter, Instagram or any other sort of social media)

☐ Stay connected to what is happening in my world

☐ Stay organized

☐ Take Notes

☐ Take a test or quiz

☐ Watch movies and shows for entertainment

☐ Work with other students on group projects

☐ Write drafts and edit papers

☐ Other: _____

16. **How comfortable do you feel troubleshooting computer issues as described below?**
Mark only one oval per row.

	Very	SomeWhat	Likely	N/A
Frozen screen	⬭	⬭	⬭	⬭
Printing issues	⬭	⬭	⬭	⬭
Installing, uninstalling, and updating software	⬭	⬭	⬭	⬭
Downloading & uploading files	⬭	⬭	⬭	⬭
File management (Save and Find Documents)	⬭	⬭	⬭	⬭
Managing system preferences	⬭	⬭	⬭	⬭
Backing up data	⬭	⬭	⬭	⬭
Sharing documents with teachers and fellow students	⬭	⬭	⬭	⬭
Managing iTunes/iCloud (updating, backup, adding content)	⬭	⬭	⬭	⬭

17. **What type of devices do you currently use?** *
Check all that apply.

☐ Laptop

☐ Smart Phone

☐ Desktop

☐ iPad

☐ iPod

☐ Smart Watch

☐ E-book reader

18. **Do you like class with multi-media presentation?** *
Mark only one oval.

⬭ Yes

⬭ No

⬭ Maybe

19. **Do you have access to available Wifi/ Internet connection in your department?** *
Mark only one oval.

⬭ Yes

⬭ No

20. **How frequently do you browse internet for learning purposes?** *
Mark only one oval.

⬭ Daily

⬭ Weekly

⬭ Monthly

⬭ Randomly after every few days

⬭ Never

21. **What educational software are you familiar with?** *

Check all that apply.

- [ ] Google classroom
- [ ] Email
- [ ] Educational Websites
- [ ] Microsoft Word, Excel, PowerPoint
- [ ] Popular Online Libraries
- [ ] Chat
- [ ] WebQuests
- [ ] Social Networking
- [ ] Google Docs
- [ ] Google Earth, Maps, Translator, etc.
- [ ] Blogging
- [ ] Wikis
- [ ] Audio/Video Podcasts
- [ ] Audio, Video, and Other Multimedia (Not Podcasts)
- [ ] Other Subject-Specific Software
- [ ] SPSS

22. **What educational hardware are you familiar with?** *

Check all that apply.

- [ ] Teacher-run computer workstation
- [ ] Student-run computer workstation
- [ ] Multi-media projector
- [ ] VCR/DVD Player
- [ ] Interactive whiteboard (Smartboard or other)
- [ ] Computer lab
- [ ] Mobile computer lab
- [ ] Digital cameras, scanners, videocameras
- [ ] OCR (Optical character Reader)
- [ ] Calculators
- [ ] PDAs, Cellphones, iPods, or other hand-held units
- [ ] Student Response Systems (CPS units, Clickers, Survey modeling)
- [ ] Digital Printer
- [ ] 3D Printer
- [ ] Digitizer

23. **Which of the following platforms/ technologies are you familiar with?** *
    Check all that apply.

    ☐ VLE (Virtual Learning Environment)

    ☐ AR (Augmented Reality)

    ☐ VR (Virtual Reality)

    ☐ E-Learning

    ☐ Moodle

    ☐ Blackboard

    ☐ NLP (Natural Language Processing)

    ☐ Other: _____

24. **Do your teachers provide digital materials as learning resources along with their class lectures?** *
    Mark only one oval.

    ⬭ Yes every one

    ⬭ Few teachers provide

    ⬭ None

25. **Do you prefer attending any class where your teacher deliver lecture along with multimedia presentation and slides?** *
    Mark only one oval.

    ⬭ Yes

    ⬭ No

    ⬭ Maybe

26. **How will you rate your level of proficiency using computer and internet?** *
    Mark only one oval.

    ⬭ Begginer

    ⬭ Intermediate

    ⬭ Advance

    ⬭ Nothing

27. **Do you keep any Arabic dictionaries/ softwares in your mobile phone?** *
    Mark only one oval.

    ⬭ Yes

    ⬭ No

28. **What type of Arabic software/ tools you are using currently?** *
    Check all that apply.

    ☐ Dictionary

    ☐ Wiki

    ☐ Blog

    ☐ Library software

29. **How would you grade your interest to learn more and use the above mentioned educational technologies?** *

Mark only one oval.

- ( ) Not interested
- ( ) Likely interested
- ( ) Very interested

30. **Do you have any comments/suggestions?** *

_____

_____

_____

_____

_____

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