MASTER OF SCIENCE IN TECHNICAL EDUCATION

Assessment of Competence of TVET Trainee Teachers in the Field of ICT

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Thesis Submitted in Partial Fulfillment of the Requirements of the Degree of
Master of Science in Technical Education
Specializing in **Computer Science and Engineering**

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DEDICATION

This work is dedicated to my family
whose love
and
support
I truly value.

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LIST OF ACRONYMS

B.ScTE	Bachelor of Science in Technical Education
ICT	Information and Communication Technology
IT	Information Technology
NAEP	National Assessment of Educational Progress
OTA	Office of Technology Assessment
TVET	Technical and Vocational Education Training

ABSTRACT

The importance of ICT in empowering teachers and learners, and enhancing teaching and students' achievement has been highlighted in several studies. ICT integration in the developing nations needs to be addressed so as to ensure total integration of ICT in the school curriculum. This study examines the level of basic ICT competence of TVET trainee-teachers' from different OIC countries. The differences in basic ICT competence of the trainee teachers having different educational background were also examined. The data collected through a test were analysed using percentages, means, and t-test statistics. It has been found that the majority of the TVET trainee teachers there were competent in the field of ICT. However, significant difference in performing their ICT competence among the TVET trainee teachers having educational background in Computer Science, Electrical and Mechanical Engineering was found.

CHAPTER I

INTRODUCTION

1.1 Background of the study

Information and communications technologies (ICT) are a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information. Communication and information are at the very heart of the educational process, consequently ICT-use in education has a long history. ICT has played an educational role in formal and non-formal settings, in programs provided by governmental agencies, public and private educational institutions, for-profit corporations and non-profit groups, and secular and religious communities.

The use of information and communication technology (ICT) is becoming an integral part of education in many parts of the globe (Sala, 2004; Kuntoro & Al-Hawamdeh, 2003; Leidner & Jarvenpaa, 1993). Bangladesh is not left behind as ICT gradually finds its way into the educational systems (Ajayi, n.d.; Darkwa & Mazibuko, 2000; Brown, 2002; Darkwa & Eskow, 2000) despite chronic limitations brought about by economic disadvantages (Adesola, 1991).
The potentials of information and communication technology (ICT) to facilitate students' learning, improve teaching and enhance institutional administration had been established in literature (Kazu & Yavulzalp, 2008; Kirschner & Woperies, 2003). The use of information and communication technology as a tool for enhancing students' learning, teachers' instruction, and as catalyst for improving access to quality education in formal and non-formal settings has become a necessity.

The fundamental strategies of higher education institutions outline the need to form citizens able to participate responsibly in all the fields of social life, and act productively and creatively in the development of their functions. In addition, they encourage the curricular design centred in

learning and based on competencies; including proficiency in ICTs, as one of the alternatives that allows achieving the objective of education and pertinence in relation to the transformations occurring in the world.

Huerta, Perez and Castellanos (2000), consider that the globalised world requires an increase in the productivity of social actors. They have also highlighted the need for mechanisms that allow changing the educational process with respect to the organization, contents and teaching methods in order to connect education more effectively with the real work, to acquire qualified staff capable of responding to the needs of production, technological innovation, the management of ICTs and competition in global markets.

The development of competencies is proposed as an approach that is closer to the needs of the labour market (Ben Youssef and Dahmani, 2008). It can be said that competent persons, in any given profession, are those who perform well the role that is expected from them. This definition corresponds with Ibarra's (Estévez et al., 2003: 5), who defines competencies as a "set of abilities, skills, knowledge, and attitudes needed for optimal performance in a given occupation or productive role". Linking this concept to ICT competencies, it can be said that the latter are a group of skills, knowledge and attitudes that are applied to the use of information and communication systems, including the equipment involved, and specifically, according to Godoy (2006), the ability to make Web designs, manage presentations, databases, graphics software, spreadsheets, online bibliographic databases, web browsers, e-mail and chat applications, and word processors, among others.

1.2 Statement of the problem

This research work aimed at assessing the level of competence of the TVET trainee teachers in the use of Information and Communication Technology though assessments test.

1.3 Objectives of the study

The objectives of the study were:

- To determine the level of ICT competence of TVET trainee teachers from different OIC states who are pursuing teacher training at the Department of Technical and vocational Education of Islamic University of Technology.
- To investigate if there are competence difference among TVET trainee teachers' due to their educational background.

1.4 Significance of the study

This study will help:

- To find the TVET trainee teachers' competency towards the use of Information Communication and Technology and thereby reviewing the training curriculum.

1.5 Research questions and Hypotheses

1.5.1 Research question I

Are TVET trainee teachers competent enough towards the use of ICT? Therefore, the hypothesis was formulated as: *TVET trainee teachers are competent enough towards the use of ICT.*

1.5.2 Research question II

Is there any difference with the TVET trainee teachers having background of computer science and that of electrical and mechanical engineering in the level of ICT competency? Therefore, the hypothesis was formulated as: *There is no significant difference in the level of ICT competence*

among the TVET trainee teachers having background of computer science and that of electrical and mechanical engineering..

1.6 Scope of study

The study is delimited to TVET trainee-teachers of the Department of Technical and Vocational Education only. The results may not be applicable to other Departments in Islamic University of Technology.

1.7 Assumption

The researcher assumes that the data collected from the trainee-teachers is reliable.

1.8 Definitions of terms

ICT Competency – the ability to perform simple tasks with a computer. Email, research, interaction with others via the internet.

Skills – an ability to do an activity or job well, especially because you have practiced it.

TVET Trainee-Teacher – a person training to teach in Technical schools.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 Definition of ICT

Pelgrum and Law (2003) state that near the end of the 1980s, the term 'computers' was replaced by 'IT' (information technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term 'ICT' (information and communication technology) around 1992, when e-mail started to become available to the general public (Pelgrum, W.J., Law, N., 2003).

According to a United Nations report (1999) ICTs cover Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities.

According to another definition, ICTs are embedded in networks and services that affect the local and global accumulation and flows of public and private knowledge (Adeya, N.C., 2002).

Moreover, Adeya (2002) mentions about a more simplified definition describing ICTs as an 'electronic means of capturing, processing, storing and disseminating information'.

In this review, the term ICTs designates multimedia, the Internet or the Web, as a medium to enhance instruction or as a replacement for other media (Pelgrum, W.J.Law, N., 2003).

2.2 Computers in Education

Information technology has always played an important role in education in the United States. “Because many reformers viewed technology as the vital link from the classroom to the workplace, technology served as a cornerstone of virtually every reform package in America” (Baines, 1997, p. 494). The first impact of technology on education was the printing press and newspapers (Beekman, 2005). Printed books became widely available in the 18th century and made the content of instruction inexpensive (IITF/CAT, 1994). In the early 20th century, motion pictures or television became an essential element in American’s everyday living. Television had become a focal point for research and the study of its effectiveness on student learning and development (Paisley, 1985). The advent of microcomputers reformed education, industry, and society. Computers and the related technologies were recognized tools that facilitate completing activities both in educational and work-related activities (U.S. Department of Education, 1993). “With the expansion of the power of the microcomputers and the new technologies that use microcomputer platforms, technology has become a focal point in education” (Smith, 1995, p. 16). Technological tools were flexible, lending themselves to a wide variety of activities across grade levels and through the curriculum (U.S. Department of Education, 1993). The use of multimedia technology and the Internet has begun a new chapter by reinventing the way children learn. Computers, Internet, and CD-ROM were examples of new technology that has invaded every aspect of students’ education (Smith, 1995).

In 1969, the Department of Defense created ARPAnet, which later became known as the Internet (Sharp, 2005). The invention of the Internet has become a new technology that transformed our society worldwide. Connecting to a network enhanced the value and power of a computer—it could share resources with other computers and facilitate electronic communication with other computer users. The Internet not only allowed us to connect to a particular building or business but also to remote geographic locations. As Beekman (2005) stated, “Computers and information technology have changed the world rapidly and irreversibly. Our civilization is in a transition from an industrial economy to what we might call the information age, and this paradigm shift is having an impact on the way we live and work” (Beekman, 2005, p. 56).

The purpose of the Internet was to facilitate research among the major universities and the Department of Defense as a way of strengthening the military (Reddick & King, 1996). The National Science Foundation later decided on major expansion of the Internet by establishing five supercomputing centers to connect research institutions across the country. These supercomputing centers provided the internet service through web interconnected networks. The most efficient and effective use of networking computers have included all faculty, students, and administrators networked to a campus wide computer and information system.

As research universities began the educational link, K-12 schools have been the last link of public institutions. The U.S. government has made technology and the access to the Internet a priority for public educational institutions. According to Vedantham and Breeden (1995), "the Clinton-Gore Administration has made the effective integration of technology into education at all levels… it has created several new programs and has expanded existing programs to contribute to the policy debate on educational technology and stimulate investment in projects" (p. 29).

The future of education was now defined by how well an individual could operate and function with upcoming new technology (Capron & Johnson, 2004). The rapid advancement of technology has changed the way people learn and communicate. Students developed skills that they could use to advance their education and to enhance their employability skills (Bafile, 2000). The growth and pervasiveness of computers had reached the point where most students and faculty had equal access to information and databases through networked computers and enhanced instruction and improved curriculum. Increasing use of computers and the Internet by students and educators had fostered an increasing use of computer-related courses, online courses, and campus computer software libraries.

The history of technology in education and the role that federal and state governments have played in implementing technology in education have been evident since the 1960s (Smith, 1995). Technology has impacted education and; therefore, been incorporated into national standards. The information age is upon us, and the curricular implications of this age were that students needed to learn new skills such as how and when to use computers and how and when to

use information stored on computers to solve problems. University campuses had acquired computer technology and encouraged computer literacy, though this was not enough. It was clear that economies around the world would be engaging in a competitive struggle for markets, jobs, and business. Society continued to require computer and information technology skills that responded to the needs of business, society, and industry. Most people were information illiterate, and this had a negative effect on business and society. To overcome this hurdle, universities and colleges had to change the way computer technologies were used in their system. The American Library Association stated that knowledge was the country's most precious commodity and that information literate citizens were our most valuable resource (Breivik, 1992). However, collaborative teams were also essential as the part that allowed students to seek more effective ways of working together, educators should encourage students to seek ways to identify the problems important to their units and acquire appropriate solutions. Increasingly, problem-solving skills would be critical to successful performance (Eisenberg & Johnson, 2002).

Successful candidates for jobs would be those individuals who could compete effectively in the workplace because their educational system prepared them for those economic realities. Students who could access information the fastest and use it effectively and productively to solve important problems would be the ones who were competitive and successful in the challenging times that awaited them (Dougherty, 1999).

This made information literacy a crucial indicator of success (Leu & Leu, 1999). Long and Long (2004) suggested, "Anyone who has achieved information technology competency is quick to tell you what a difference this Information Technology knowledge has made in his or her life" (p. 27). Since information technology was transferable, individuals might be able to adapt their learned skills and pursue any career of their choice (Breivik, 1998). "With only 15% of the workforce considered to be Information technology-competent, management is looking for ways to increase the competency of workers and therefore the overall productivity of the companies" (Long & Long, 2004, p. 27). Such emerging requirements of the workplace reflect the new information technologies that gradually became available as we entered an information society.

It was undeniable how greatly technology influenced U.S. classrooms. Many technology inventions have been introduced and used by educators with the belief that they would positively impact students' achievement and teacher's performance. It started with television, then computers, and now the Internet. Computers and the Internet seem to have the most impact on the education system. With advancement in today's computer technology, there was a need for schools to change their curriculum to ensure that students would possess adequate computer skills needed to become an active participant in a more computer technology oriented society. Technology was an integral part of student's learning and working lives (Clark, 2000). Teachers must possess the readiness and ability to use computer technology effectively and be able to model effective use of computer technology to students (Frey, 1990).

2.3 ICT Literacy

Any discussion of ICT literacy must begin with the concept of information literacy. As defined by the American Library Association, "To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information ..." (ALA, 1989). Information literacy includes many of the skills associated with conducting research and communicating information. In the past these might have been termed "library skills," but with the Internet the skills are probably more often applied outside of the actual library building (although still using resources available from library staff). In addition, the information, as well as the tools used to manipulate and communicate it, takes broader forms. Information now comes in many guises — traditional print (e.g., books), online text, presentation slides, spreadsheets and other print and electronic materials.

ICT literacy is a specialization of information literacy, focusing on information competence as demonstrated through technology. Although demonstrated in this way, ICT literacy is not the same as technical competence — just being technologically savvy does not automatically lead to skillful use of information. For example, modern search engines make it easy to find information. You can access information via a few search terms entered into a library database or Web search engine. ICT literacy focuses on the skills needed to use technology effectively when dealing with — and communicating — information.

Because many University students are familiar with technology, yet lack information-handling skills, the most pedagogically effective definition of ICT literacy combines both information literacy and technical competence.

ICT literacy is the ability to appropriately use digital technology, communication tools, and/or networks to solve information problems in order to function in an information society. This includes having the ability to use technology as a tool to research, organize, and communicate information and having a fundamental understanding of the ethical / legal issues surrounding accessing and using information (The National Higher Education Information and Communication Technology Initiative, 2004).

2.4 Computer Technology in the Workplace

Long and Long (2004) stated that, "Strategic use of information technology has emerged as a competitive weapon for those companies whose employees recognize and use the potential of Information Technology" (p. 27). Both education and industry have been heavily under pressure by the invasion of computer technology. It was becoming increasingly evident that computers and the ability to use them effectively would be of critical importance to success in many fields (Loyd & Gressard, 1984). More employers looked for perspective employees who knew how to use computer technology proficiently. Educators in business have changed their curricula in response to the speedy growth and the need for computer technology. Computers have been used more intensively by workers in all fields as a result of the transformation from an industrial society to on information and service society (Brumley, Pollard, & Yopp, 1993).

Information technology skills were being viewed as one of necessity and required skills for all employees of the new era (Roblyer, 2000; Long & Long, 2004). Personal computer applications, such as word processing, and spreadsheets were gaining popularity in education and businesses (Beekman, 2005).

In the United States, an estimated 120 million people are considered knowledge workers because they routinely work with computers. However, the vast majority of these people, over 100

million, would not be considered information technology competent! The fact that these people routinely use computers but are not IT-competent is referred to as the "computer proficiency digital divide." Most people use their PCs for only one or two applications, such as word processing or e-mail, or they are trained to work with a specific system, such as accounting, airline reservations, or inventory management (Long & Long, 2004, p. 28).

The new literacy for the 21st century and beyond was clearly the ability to utilize appropriate technological tools in an information society. The personal computer and its associated technological innovations – the Internet, electronic mail, and word processing software – have become a common ground. Current industry standards demanded skilled workers who were fluent in the use of these technological skills. In addition to basic computer skills, communication skills have become a significant component adding to the existing computer skills (Granitz & Hugstad, 2004). The world has become more globally connected, mainly due to the innovations of the Internet that allowed the connection of computers throughout the world and to share the information and resources in the same mainstream (Beekman, 2005). The Internet has introduced a whole new way of communication and the new workplace communications within and outside of the offices via electronic mail. Zhao (1996) suggested that one of the three factors that contributed to faster career advancement among workers was the fact that those workers had the skills to use computers more efficiently. Labich (1993) and Wiener (1992) found the lack of computer skills often lead to unemployment and/or less job advancement.

Advanced computer technology impacted how people live, work, and learn. Computers have become a basic household appliance for many people and were used on a regular basis. Electronic mail has become a basic mode of communication for many people, young and older adults alike. Students learned to type by using computers instead of typewriters. Farmers used computers to calculate cost per acre and market price (Capron & Johnson, 2004). Parents used computers as educational tools for their children. It could be concluded that computer skills have become one of many skills required for daily living. Computer technology skills made prospective employees more marketable and played a significant role in job replacement and

advancement for current and new employees. The beginnings of computer literacy were already obvious (Capron & Johnson, 2004).

2.5 Technology and Teacher Training

2.5.1 Historical Evolution of Technology in Teacher Training

Because of changing society and its huge amount of new demands, teacher education institutions have to support their curriculum with introductory technology courses. Technological innovations had been crucial impact on definition of content of the courses. Historical evolution of instructional technologies in teacher education could be divided into three eras (Betrus & Molenda, 2002):

1. Early visual instruction courses: 1920s and 1930s: The dominant technology of this era was visual elements. Therefore, Starnes recommended a course outline having 'history of visual instruction', 'psychological background of visual aids', 'discussion of result of experimentation visual aids, and use of various media, including flat pictures, globes, object-specimen-model materials, motion picture, and others' (Starnes, 1937, p.13, as citied in Betrus & Molenda, 2002)
2. A gradual evolution of content: 1940s, 1950s, and 1960s: Due to the new emerged technology audio recording and playback, the content of introductory technology courses were improved. They were consisted of audio materials as well. The new topic "theory of communication" and "instructional systems" also added to introductory technology courses as a result of progress of communications technologies and more support for the systems approach in the professional field (Betrus & Molenda, 2002, p.19).
3. The information age: 1980s and 1990s: The rapid development of computers in both society and education influenced the evolution of introductory technology courses' content. Computers were more important aspects of technology courses than other materials.

Betrus and Molenda (2002) divided courses into two categories. In the first and second era, *the classic course* was developed. Its content was sorts of media used in educational settings such as audio-visuals equipments (video, pictures, projectors, tape and i.e.) and computers. This course took into account balance between other media and computer technologies. In the third era, *the new course* was developed. It was focusing on computer technologies rather than previous technologies.

Betrus and Molenda (2002) summarized that technology courses play especially serious role in teacher education but there is a gap between what the things taught and what the real things utilized in schools.

From the historical development, it can be concluded that the introductory technology courses always are in charge of changes due to rapid development of technologies. Today, the most powerful technology is computer so the technology courses give more attention on computer technologies and their usage in educational environments. In future, another technological tool definitely will enforce technology courses to change. Also, rapid developments resulted with many tried technology integration models in teacher education.

2.5.2. Technology Integration into Teacher Education Programs

Teacher training institutions are in adaptation process to meet current standards of information and communication society. They reorganize their curriculum and as well as their goals with respect to different aspects, which is the way of technology infusion into schools, the characteristic of curriculum, the teacher training system, and socio-political philosophy of the role of schools and teachers (Aufenanger & Yildirim, 2003). At this point, goals of teacher training institutions have critical roles.

In the literature, there are a number of goals recommended for teacher training institutions for information and communication society. For example, Niederhauser (2001) declared that “the ultimate goal of technology in teacher education is to enable K-12 teachers with necessary skills and understandings so they can provide a technology-rich learning experience for their students.” (p. 3).

The other example which was proposed by Kennedy in 1987 (as citied in Willis & Mehlinger, 1996, p.1002), focused on necessary computer skills trainee teachers should know. He stated that:

"The following computer skills necessary for teacher training students:

- familiarity with machine teachings and assembly language as well as knowledge of a high level language;
- knowledge of computer-assisted instruction languages and list process languages;
- programming competencies to write, debug, and test programmes;
- knowledge of the system facilities;
- recognition of computer applications for a variety of group and individual activities;
- ability to recognize and use available software support services;
- ability to evaluate hardware and software;
- ability to adapt available software to a variety of subject areas." (Kennedy, 1987, as citied in Willis & Mehlinger, 1996, p.1002).

Kennedy's proposal was more concentrated on computer programming. However, it neglected pedagogical part of technology use skills. Makrakis (1997) reported that the most of information and technology instructors in universities are from the field of computer sciences without any pedagogical and educational computing background. Hence, the content of the technology course(s) were based on more technical aspects of technological tools. This condition caused dissatisfaction of students towards the technology training programs in teacher education. Therefore, Kennedy's skills could be resulted in some problems in teacher training.

In contrast, Davis (1992) mentioned necessary skills based on effective use of technology in educational environments rather than computer programming. Furthermore, he affirmed that trainee teachers should be able to:

- "make confident use of a range of software packages and information technology devices appropriate to their subject specialism and age range;

- review critically the relevance of software packages and information technology devices appropriate to their specialism and age range and judge the potential value of these in the classroom;
- make constructive use of information technology in their teaching and in particular prepare and put into effect schemes of work incorporating appropriate uses of information technology;
- evaluate the ways in which the use of information technology changes the nature of teaching and learning." (as cited in Aufenanger & Yildirim, 2003, p. 274).

The last sample, Kynigos (2003) mentioned the technologies the teachers need to know. The development of trainee teachers' skills about these technologies also can be defined as goals of teacher training institutions. He divided these technologies into following groups:

- mind tools;
- communication and collaboration media;
- information resources;
- presentation and dissemination tools (Powerpoint presentations, web pages);
- administrative tools;
- authoring systems. (p. 253).

Kynigos (2003) also proposes that teachers initially learn how to use these technologies developed for educational use. Later, it is possible to utilize them in school settings. But mind tools have more important role from other tools because of its deeper requirements for both technical and instructional dimensions. Mind tools are a part of software used for educational purposes to "support exploration and expression of ideas by means of constructing models, handling data, representing ideas in different ways and carrying out experiments." (p. 254).

As mentioned before the teacher training systems is a factor affecting the goals of teacher education. Therefore, also it is crucial to investigate literature for the types of technology training. Dell and Disdier (1994) defined four general circumstances of effective technology training. The first one is integration of educational technologies into overall curriculum. Second one is that training should make connection between technology and curriculum. Third one is

that training should support practical experiences so that trainee teachers feel contented to use technology. The last one is that training should support detailed instruction of technology (as cited in Aufenanger & Yildirim, 2003).

The 1995 report of Office of Technology Assessment (OTA) proposes three types of technology training in teacher education: (a) discussion/demonstration, (b) technology practice, and (c) professional practice. Discussion/demonstration means that discussing how the technological tools can be used in educational environments and demonstrating a few samples of technological implications. Second one is technology practice meaning that preparing and utilizing technological tools with aid of instructors. The last one; professional practice, is observation of usage of technological tools in real job conditions such as classroom during instruction. Trainee teachers not only observe but also examine utilization of technology in the classroom. Also, at professional practice, trainee teachers should gain experiences on teaching with technology. In method courses, they learn how to write lesson plans include technology and its practice in classroom and later they observe teacher using technology and finally they teach with technology themselves. This model can be accepted as core curriculum of technology training in teacher education. Today, most of the teacher education institutions have tried to realize this kind of technology training.

Kynigos (2003) mentions some elements, which can be explained in addition to OTA's report, should be integrated into teacher training. These are: (a) supporting life-long learning as a part of teacher professional development, (b) concentrating on educational issues rather than technical aspects of technology, (c) considering current schools conditions, (d) investigating, preparing, utilization of alternative materials, resources and tools to work with curriculum-based knowledge and content, and (e) developing understanding of diverse roles of technology such as learning tool, personal tool, educational software and material development tool, personal administrative tasks tool, medium tool for communication and using information, medium for participating forum either colleagues or with students. Kynigos also gives example activities to support this kind of integration:

- authentic debates;
- small group discussion and preparation of materials;

- reflection and enhancing techniques;
- classroom practice;
- construction of software and materials for students;
- use of observational data from their own teaching;
- participation in communities of practice with use of communication technology (p. 251 – 252).

Wilkerson (2000) proposed a technology integration approach. It has three areas of technology infusion, that is, communication, productivity, and research/instruction. Wilkerson explained communication area as appropriate technology utilization to facilitate communication between and among various groups involved in teacher training program. E-mail and video conferencing could be used as tools to interact pre-service teachers, instructors, and curriculum experts. He also continued to describe productivity area as personal productivity and support of instruction. The last area is research/instruction component addressing use of technology for research and instruction. Wilkerson concluded that a program including these three areas could fulfill the challenge of preparation of trainee teachers for effective utilization of technology for instruction.

In European countries, two forms of technology training can be observed. These are ICT as a compulsory and ICT as a voluntary subject. The most of the countries use courses and workshops to deliver ICT skills (Aufenanger & Yildirim, 2003). Authors also mentioned other innovative forms of teaching ICT skills. These are: (a) on-line courses; (b) learning networks; (c) learning labs; (d) collaborative workplaces for student-teachers; (e) blended learning or hybrid model of offline and on-line learning opportunities; and (f) virtual universities.

Moreover, Willis and Mehlinger (1996) explained two types of technology integration in their review about information technology in teacher education: (a) the stand-alone educational computing course, and (b) technology and the method courses. In the stand-alone courses, most of the strategies were explained based on behavioral models such as programmed instruction. In contrast to stand-alone courses, the underlying theory of integrating technology into method courses was constructivist theory. They also mentioned the importance of utilization of technology knowledge and skills by student-teachers during their practice teaching.

Except for these two integration models, there is an innovate model to improve effectiveness of technology training. It can be named as field-base technology training model or job-embedded learning (Loucks-Horsley, Hewson, Love, & Stiles, 1997, as citied in Brush et al, 2001). This model might differ from one institution to another institution with respect to implications but it has common goals providing trainee teachers with technology training in real teaching situations. Brush et al. (2001) mentions that "the model moves beyond the idea of integrating technology training into teaching method courses; in contrast, trainee teachers learn to integrate technology into their teaching as part of field-based experiences in real classrooms" (p. 16).

There are vast amount of studies related to these integration models in the literature. It is important to review some of these studies.

2.6. Factors Involved in Developing Competence

The use of technology is so widespread, that unless it is vital to career or personal life, some people may lack the motivation to adopt. For some people, the adoption of new technology is dictated by their vocation. Many jobs require that employees not only adopt, but become highly proficient with a particular technology. Such people may experience a higher level of motivation, knowledge and skill than those who have no need for the technology in their employment. Any number of factors can contribute to motivation or desire to learn and use new technology.

Competence can be achieved through the process of learning, acquisition of knowledge, and development of skills. The model of computer-mediated competence developed by Spitzberg (2003) and Morreale et al. (2001) involves the individual factors of motivation, knowledge and skills. These factors when combined together can contribute to an increased level of competence, and can be measured in regard to a person's use of a particular technology. According to Spitzberg (2003), motivation can have either positive or negative facets. The negative facets reflect the fear and apprehension aspects that characterize technophobia. The positive facets generally reflect "a feeling or belief that a given medium can enhance preferred outcomes" (Morreale et al., 2001, p. 183), and therefore can lead to an increased competence. Morreale et

al. (2001) suggest that knowledge can be gained either via formal methods such as workshops and computerized tutorials, or by more informal ways such as tinkering with a device, or having someone show them how to perform a simple task. Spitzberg (2003) describes skills as being "the repeatable, goal-oriented behavioral tactics and routines that people employ in the service of their motivation and knowledge" (p. 12). Because they represent behaviors, skills can be measured in order to assess the degree to which a user has achieved competence with a particular technology.

The process of learning may vary per individual; therefore, a number of resources are available to assist a person in increasing his or her competence. Some studies (Abu-Jaber & Qutami, 1998; Bunz, 2003; Eastin & LaRose, 2000; Hacker & Wignall, 1997; Korukonda & Finn, 2003; Scull, 1999) involve the development of technological competence in an educational setting. Scull (1999) observed a group of graduate students at a computing center and collected data to measure their anxiety. Anxiety was most associated with situational factors. Some of these factors, such as equipment failure and unreliability, did not aid in the creation of a comfortable environment, and caused some of the students to shy away from the technology. However, taking classes and spending time in the environment are typically positive methods of exposure, and can contribute to gradual learning and adaptation over time. This can lead to an increased comfort level thereby decreasing technophobia.

2.7. Measuring ICT Competence

There have been many approaches to assessing ICT competence. For example, Flowers and Algozzine (2000) developed an inventory to measure the basic technology competence (BTCEI) of school administrators or students. Testerman et al. (2001) used the BTCEI to find that the ICT competence of educational administrators was low. Schiller (2003) also created an inventory of ICT competencies with applications such as word processing, spreadsheets, PowerPoint and email. A key characteristic of these inventories is the focus on explicit knowledge that is, knowledge that can be taught, read or explained. They also emphasize specific know-how (e.g., knowledge of how to send email or create a PowerPoint presentation) and can therefore be long and tedious to complete.

In contrast to inventories such as the BTCEI, Bassellier, Reich, and Benbasat (2001) took a broader view of knowledge examining explicit knowledge and tacit knowledge. While explicit knowledge emphasizes what can be taught, read or explained, tacit knowledge is gained through personal experience and is not easily transferred. Based on these two dimensions of knowledge, Bassellier et al. (2003) developed an instrument to capture what people do as well as what they know. Hence, two aspects of ICT competence were assessed – ICT knowledge (what people know) and ICT experience (what people do). This approach recognizes that competence should involve a knowledge and skills component so that university students are able to transfer their competence to a variety of different tasks and situations in their daily work. Using survey data from 404 business managers in two large insurance companies, the instrument was evaluated in the context of ICT championing and found to be reliable. The research findings showed that manager's ICT knowledge and experience influences their intention to champion ICT (Bassellier et al., 2003).

2.8. Rationale for Assessment and Measurement

Integration of digital technology devices and network applications into the learning environment has been supported by numerous government, education and advocacy organizations for practical and pedagogical reasons, such as fostering global competitiveness, functioning in the labor market and in succeeding in post-secondary education. Thus, assessment follows out of necessity.

In K-12 education, an effort has been made by the Obama administration to place "Technological Literacy" at the forefront of national education priorities. Defined broadly as "the capability to use, understand, and evaluate technology as well as to apply technological concepts and processes to solve problems and reach one's goals," Technological Literacy has been mandated to become a part of the assessment of educational progress of pre-college level students, and will become a formal part of the National Assessment of Educational Progress (NAEP), also known as the 'Nation's Report Card,' which gauges the educational progress of elementary and secondary students. The assessment will be instituted nationwide in 2012 (Perez and Murray, 2010). The California Emerging Technology Fund, in their 21st Century Learning

and Workforce matrix of best practice, supports the use of ICT assessment as a high school exit requirement (CETF, 2008).

2.9. Multiple-choice Questions

Multiple choice items consist of a stem and a set of options. The *stem* is the beginning part of the item that presents the item as a problem to be solved, a question asked of the respondent, or an incomplete statement to be completed, as well as any other relevant information. The options are the possible answers that the examiner can choose from, with the correct answer called the *key* and the incorrect answers called distracters. Only one answer can be keyed as correct. This contrasts with multiple response items in which more than one answer may be keyed as correct.

Usually, a correct answer earns a set number of points toward the total mark, and an incorrect answer earns nothing. However, tests may also award partial credit for unanswered questions or penalize students for incorrect answers, to discourage guessing. For example, the SAT removes a quarter points from the test taker's score for an incorrect answer.

2.9.1 General Guidelines for Developing Multiple-Choice Items

Multiple-choice items are less ambiguous than short answer items, thereby providing a more focused assessment of student knowledge. Multiple-choice items are superior to true-false items in several ways: on true-false items, students can receive credit for knowing that a statement is incorrect, without knowing what is correct. Multiple-choice items offer greater reliability than true-false items as the opportunity for guessing is reduced with the larger number of options. Finally, an instructor can diagnose misunderstanding by analyzing the incorrect options chosen by students.

There are nine primary guidelines for developing multiple-choice items (Gronlund & Linn, 1990; McMillan, 2001). Following these guidelines increases the validity and reliability of multiple-choice items that one might use for quizzes, homework assignments, and/or examinations.

The first four guidelines concern the item "stem," which poses the problem or question to which the choices refer.

1. Write the stem as a clearly described question, problem, or task.
2. Provide the information in the stem and keep the options as short as possible.
3. Include in the stem only the information needed to make the problem clear and specific. The stem of the question should communicate the nature of the task to the students and present a clear problem or concept. The stem of the question should provide only information that is relevant to the problem or concept, and the options (distractors) should be succinct.
4. Avoid the use of negatives in the stem (use only when you are measuring whether the respondent knows the exception to a rule or can detect errors). You can word most concepts in positive terms and thus, avoid the possibility that students will overlook terms of “no, not, or least” and choose an incorrect option not because they lack the knowledge of the concept but because they have misread the stated question. Italicizing, capitalizing, using bold-face, or underlying the negative term makes it less likely to be overlooked. The remaining five guidelines concern the choices from which students select their answer.
5. Have ONLY one correct answer. Make certain that the item has one correct answer. Multiple-choice items usually have at least three incorrect options (distractors).
6. Write the correct response with no irrelevant clues. A common mistake when designing multiple-choice questions is to write the correct option with more elaboration or detail, using more words, or using general terminology rather than technical terminology.
7. Write the distractors to be plausible yet clearly wrong. An important, and sometimes difficult to achieve, aspect of multiple-choice items is ensuring that the incorrect choices (distractors) appear to be possibly correct. Distractors are best created using common errors or misunderstandings about the concept being assessed, and making them homogeneous in content and parallel in form and grammar.
8. Avoid using "all of the above," "none of the above," or other special distractors (use only when an answer can be classified as unequivocally correct or incorrect). *All of the above and none of the above* are often added as answer options to multiple-choice items. This technique requires the student to read all of the options and might increase the difficulty

of the items, but too often the use of these phrases is inappropriate. *None of the above* should be restricted to items of factual knowledge with absolute standards of correctness. It is inappropriate for questions where students are asked to select "the best" answer. *All of the above* is awkward in that many students will choose it if they can identify at least one of the other options as correct and therefore assume all of the choices are correct – thereby obtaining a correct answer based on partial knowledge of the concept/content (Gronlund & Linn, 1990).

9. Use each alternative as the correct answer about the same number of times. Check to see whether option "a" is correct about the same number of times as option "b" or "c" or "d" across the instrument. It can be surprising to find that one has created an exam in which the choice "a" is correct 90% of the time. Students quickly find such patterns and increase their chances of "correct guessing" by selecting that answer option by default.

2.10. Summary

Studies discussed above show that ICT have critical roles in education. Some of them are as a tool to help create equal opportunities, as a catalyst for change, and as a means to improve the quality of learning. ICT competencies play key roles in integration/use of ICT.

CHAPTER 3

METHOD AND PROCEDURE

3.1 Introduction

This chapter presents the methods and procedures used in conducting the research. The methodology employed to test the hypothesis is presented in this chapter. It describes the population, sample, tools of research, data collection procedure, data analysis technique and a summary of the chapter.

3.2 Population

The target population of this research consisted of all TVET trainee teachers from Department of Technical and Vocational Education (TVE) of Islamic University of Technology at Bachelors level.

3.3 Sampling

This study measured ICT competence of TVET trainee-teachers from different OIC countries including Comoros, Uganda, Nigeria, Afghanistan, Yemen, Senegal, Gambia, Somalia, Pakistan and Bangladesh. The Trainee-Teachers are pursuing Bachelor of Science in Technical Education (B.Sc.TE) at the Department of Technical and Vocational Education of Islamic University of Technology. The number of teachers (participants) was 36. Among these participants: 10 have electrical engineering background, 10 mechanical engineering and 16 computer science and engineering background. There were no female trainee teachers. The data was analyzed quantitatively.

3.4 Tools of research

The research tool consisted of a test for gathering information regarding ICT competencies of Bachelors' level. The test was developed by the researcher based on related literature. The test or question paper was designed to find out the level of ICT competence of TVET trainee teachers of OIC states. The question paper included Multiple-Choice Items. The questions on the instruments were developed with the following guidelines (Fink & Kosecoff, 1998):

1. each question was relevant to the subjects' role,
2. each question was concrete,
3. each question attempted to avoid biased words or phrases,
4. each question represented just one thought.

3.4.1 Test or Question paper

The question paper was developed to gather information from trainee teachers and consisted of 30 items of multiple choices. It was developed by the researcher based on a review of related literature (Gronlund & Linn, 1990; McMillan, 2001) investigated in this study. The items were grouped around five major topics:

1) Basic computer operation and issues
2) Use of office application software
3) Use of Internet Resources
4) Use of Peripheral ICT Equipment.
5) Graphical tools and software

After question paper was developed, it was reviewed by four experts, examined the question paper and based on their suggestions, it was revised again. Before the final version, Question paper was checked by a Supervisor for clarity of the language.

We designed the bench mark for student grading using the guide of (IUT CALENDAR 2011).

- Very competent = 100 < 85%,
- Competent= 84 – 70%,
- Average= 69 – 55% and
- Not competent= 54 - 40%.

3.4.2 Instruments Validity and Reliability

Consideration of the validity and reliability of the instruments used is important in establishing the efficacy of a study (Millington, Leierer, & Abadie, 2000). The term validity, as it applies to survey research, can be described as the degree to which the instrument *"measures what is purported to be measured"* (p.122) whereas reliability can best be described as *"the extent to which an instrument provides consistent results"* (Schloss & Smith, 1999, p.113). In order to assure that these aspects of research are adequately addressed it is imperative the researcher provides a clear description of the relationship of validity and reliability to the study and a rationale for the statistical tests used in the analysis of each of these factors.

According to Jacobs and Chase (1992), an *"instrument's validity deals with appropriateness of information for making decisions"* (p. 32). There are several types of validity data; the one researchers are mainly interested in is content validity. Content validation deals with the content and format of the instruments (Fraenkel & Warren, 2000). There are several factors that affect content validity positively. Most notable among these are adequate and appropriate content sampling in the test and avoidance of nonfocal skills, clear directions, well written test items, and less complex and subjective scoring (Jacobs & Chase, 1992).

Expert review of the initial instrument is a frequently used method to establish instrument validity in the social sciences and educational researches (Gay, 1987). In this study, the initial consideration is the content validity which was provided by asking expert opinions. To determine the content validity of the question paper expert juries were used.

3.5. Validity of the Test Questions

The *validity* of a measure is how well it fulfills the function for which it is being measured. The validity of a test can be viewed as the accuracy of specified inferences made from its score. During the process of test validation, one examines the relationships among test scores, other

empirical data, and logical considerations (Hopkins et al. (1990)). A test possesses many validities; it may be highly valid for one purpose but not for others.

To validate the competency test, the test questions were presented to the experts/ teachers. These teachers/ experts have a long teaching and/or industry experience in the field of Information technology. They have assessed the test questions on the basis of a five-point answer scale (Figure 3.1). They were asked if the content of these questions were relevant to basic ICT Skills. Furthermore, this questionnaire asks: the degree of complexity and comprehensibility.

Figure 3.1 shows the questionnaire which was used to assess the validity of the test by experts/teachers. Four (4) experts/teachers from Islamic University of Technology in the Department of Computer Science and Engineering.

Assessment of the tasks of the ICT competency test
By teacher/ expert

Please assess using the box below each question.

Part A: Basic computer operation and issues - Questions 1 to 6

1. Important data on a pen drive or USB stick can be protected from being deleted by
   A. None of them **B.** Labeling the disk clearly **C.** using suitable filenames
   D. write protecting the disk

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	Low	Average	High	Very high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

Figure 3.1.: The questionnaire for assessing the tasks used for the competency test

Thus the **content validity** was estimated from the data given by teachers/ experts (Figure 3.2). The content related to Tasks 1 to 6 under category of "*Basic computer operation and issues*". Tasks 7 to 12 are related to "*Use of office application software*", Tasks 13 to 19 are related to "Use of Internet Resources" and Tasks 20 to 30 are related to "*Use of Peripheral ICT Equipment & Graphical tools and software*". These tasks can be seen in Appendix A.

The **criterion related validity** was estimated from the data given by the same experts/ teachers, as presented in Figure 3.3 and 3.4.

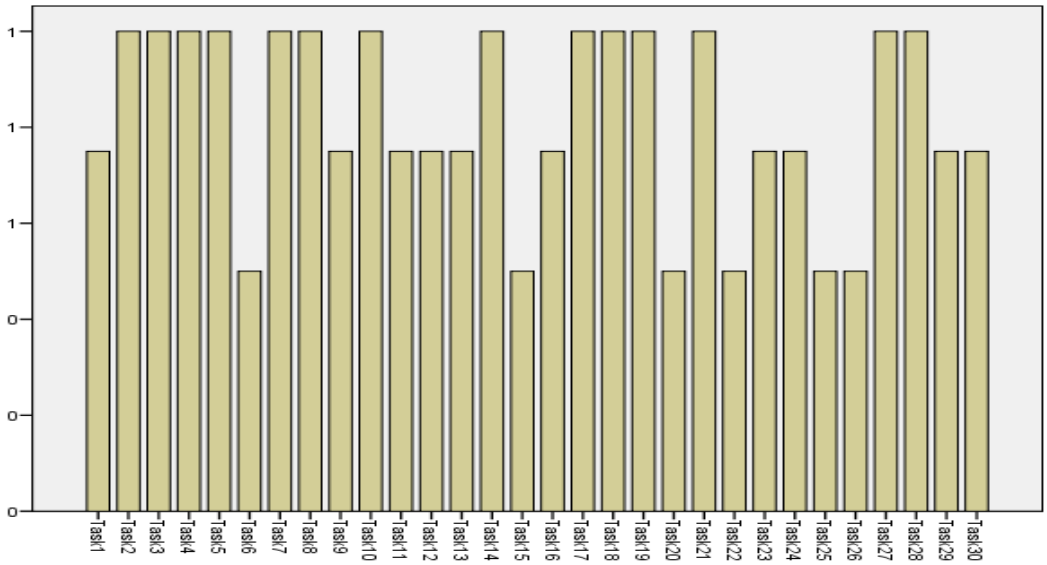

Figure 3.2.: The content of the tasks relevant to basic ICT skills

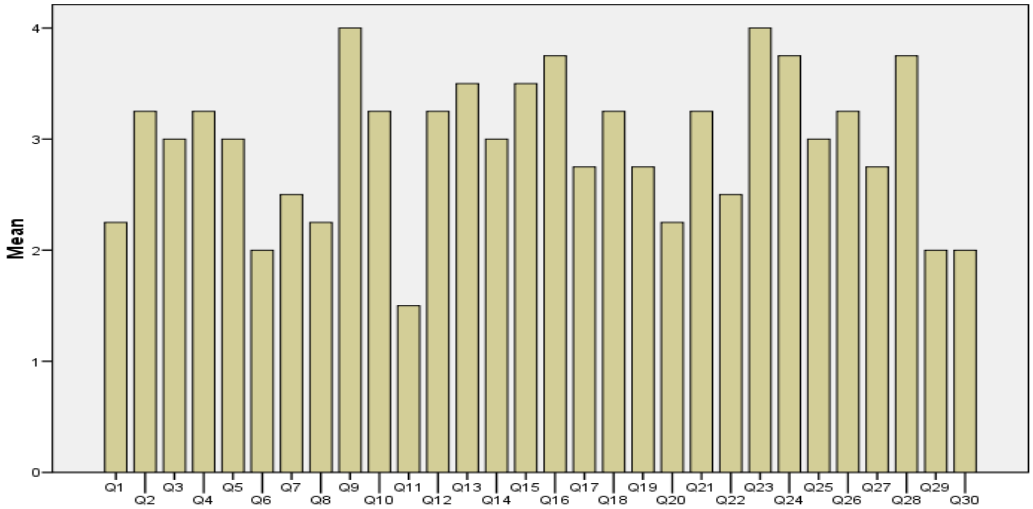

Figure 3.3.: The degree of complexity of the tasks assessed by experts/ teachers.

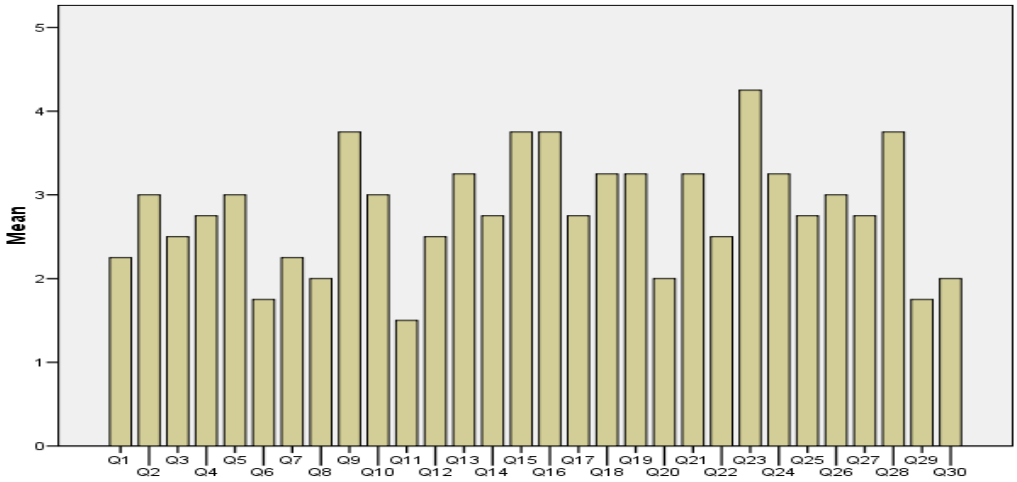

Figure 3.4.: The degree of comprehension of the tasks assessed by experts/ teachers.

3.5. Reliability and Test Items Analysis

Each measurement (response to an item) reflects to some extent the true score for the intended concept, and to some extent unusual, random error. A measurement is reliable if it reflects mostly true score, relative to the error. Below there are some methods of estimating the reliability.

3.5.1. Split-Half Reliability

Alternatively, the reliability has been checked using the Spearman-Brown *split-half reliability* formula, $rsb = 2rxy/ (1 + rxy)$, in which the sum scale (total scores) is divided in some random manner into two halves. In the above formula, *rsb* is the split-half reliability coefficient, and *rxy* represents the correlation between the two halves of the scale (Lienert & Raatz, 1994).

3.5.2. Results of the Reliability Test

The Cronbach coefficients (α) were found 0.921, 0.809 and 0.684, respectively. The calculations were made considering all 30 tasks in a group.

Considering the test items in four separate categories: the reliability coefficients were as shown in Table 3.1.

Table 3.1.: The Results of the Reliability Test

	Question relevant to basic ICT skills	Degree of complexity	Degree of comprehensibility
Cronbach's Alpha	.921	.809	.684

3.6. DATA COLLECTION PROCEDURE

Data collection included the administration of a test of 30 multiple choice items to the 36 TVET trainee teachers from different OIC states in the Department of Technical and Vocational Education (TVE). The test was administered to the trainee-teacher at their respective classrooms. Sitting arrangements were made allowing enough space between students so that one cannot see the answers of others. A class teacher/lecture and the author himself were present while the test was running.

Before beginning the test, trainee teachers received a briefing, for example, why they are going to take the test, in order to motivate the trainee teachers. Also, the guidelines for taking the test were read out to the trainee-teachers as given on the first page of the question paper (Appendix B).

The TVET trainee teachers were given limited amount time to answer the questions. Moreover, researcher stated that participation was voluntarily and unless students want to contribute the study, it would not result negatively. At the end, researcher also informed that all information about participants were kept confidential and only used for this study. However, the author received all kinds of support from the administrations and from the teachers that allowed him to conduct the test successfully.

3.6. DATA ANALYSIS

Data analysis technique was quantitative method. The quantitative data was analyzed statistically using mean, standard deviation, bench mark and ANOVA.

3.7. SUMMARY

This chapter restated the purpose of this research. A summary of data collection, indicating how data source (question paper or test) investigate the research questions. The procedures for how, when, and where the data were collected and how the data were recorded. A description of how data were gathered from source and analyzed. The results of the data analysis are presented in the following chapter 4.

CHAPTER 4

ANALYSIS AND INTERPRETATION OF DATA

4.1 Belief description of the Statistical Tests used for Test Scores Analysis

The results of statistical analyses are explained in this chapter. The chapter is organized based on research questions. The quantitative analyses the data of a competency test assessment of the test items were used. The competency test consisted of 30 tasks. The measurement was made on a total of 100 points. The test design, test item construction, its validity, et cetera, have been discussed in Chapter 3. This test was conducted with the TVET trainee-teachers in the Department of Technical and Vocational Education (TVE) from different OIC states in Islamic University of Technology, Bangladesh.

4.2 Analysis and interpretation of data

4.2.1 Competency levels of TVET trainee-teachers

Research question I states that:

Are TVET trainee teachers competent enough towards the use of ICT? Therefore, the hypothesis was formulated as: *TVET trainee teachers are competent enough towards the use of ICT.*

In order to examine this research question, mainly the ICT competency, was measured through a competency test. As mentioned earlier in chapter 3, the test included mainly practical relevant questions. A total of 36 trainee teachers in TVET trainee teachers of Technical and Vocational Education (TVE) department in IUT participated in the test.

The average points achieved by TVET trainee-teachers of both groups were found above 50%. According to the results from the figure 4.3 shows that the mean percentage of all trainee-teachers was 67.228 and standard deviation was 12.436, which indicates that TVET trainee teachers have average level of competency due to the bench mark (Very competent = 100<85, competent=84-70, average=69-55 and not competent= 54-40%) (IUT CALENDAR, 2011), pp 43).

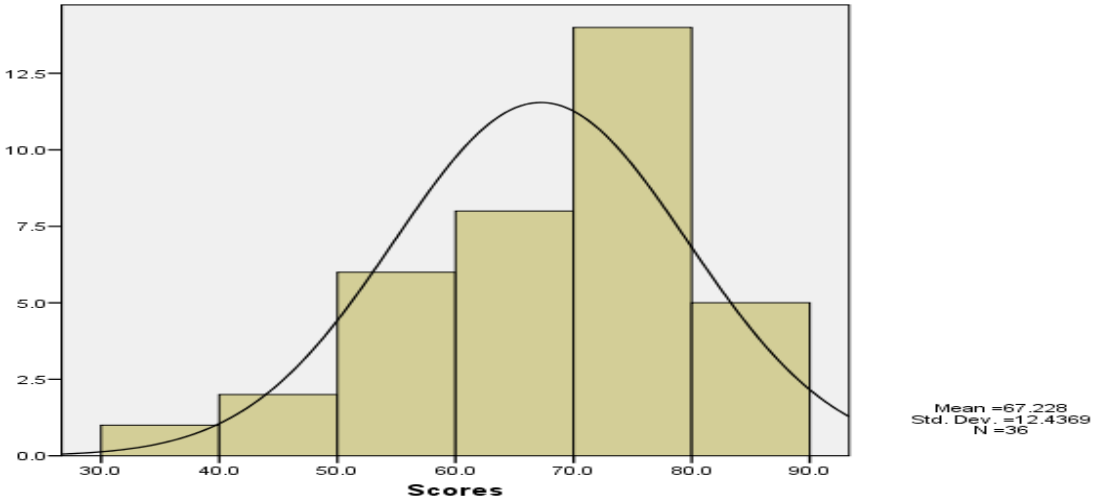

Figure 4.1: Histogram of points obtained by TVET trainee teachers.

Table 4.1**:** Statistics of TVET trainee teacher achievement in competency test

Mean	N	SD	Min	Max
67.228	36	12.43	33.3	90

The competence test results show that TVET trainee teachers have an average level of competency compared to the bench mark. The average points achieved by trainee teachers were found above 55%. So the hypothesis is proved right.

4.2.2 The difference between the trainee-teachers from different background

Research question II states that:

Is there any difference with the TVET trainee teachers having background of computer science and that of electrical and mechanical engineering in the level of ICT competency? Therefore, the hypothesis was formulated as: *There is no significant difference in the level of ICT competence among the TVET trainee teachers having background of computer science and that of electrical and mechanical engineering*.

In this study we also investigated that if any difference in ICT competence of the trainee teachers having different educational background, i.e EEE, MCE and CSE. The results of the ANOVA test are presented in Table 4.2.

It is seen, as in Table 4.2, that the three groups (CSE, EEE and MCE) differ with F value = 4.115 and the significance level *p* is 0.025. The findings shows that trainee-teachers' competence in ICT differs significantly. However, it may happen that not all three groups differ from each other. There may be trainee groups whose performances are more or less similar.

The *Student Newman-Keuls* test, also labeled as 'post-hoc' analysis, was applied in order to make a posteriori pair-wise comparison. This test reveals the differences between backgrounds. The results of this test are given in Table 4.3. In Table 4.3 all backgrounds belong to subset 1 do not differ among themselves.

Table 4.2: The student performance differences between backgrounds

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig. p**
Between Groups	1080.228	2	540.114	4.115	0.025
Within Groups	4331.579	33	131.260		
Total	5411.807	35			

Table 4.3: Homogeneous subsets of different backgrounds in TVE

Student-Newman-Keuis		
		Subset of backgrounds
Background	N	1
MCE	10	61.690
EEE	10	63.000
CSE	16	73.325
Sig. p		0.05

In Table 4.3 all the three groups of trainees with different backgrounds belong to subset 1. It shows that these three groups do not differ among themselves so significantly, because it lies only on the p-value = 0.05.

Therefore, the results of the two tests (the ANOVA and the *Student Newman-Keuls* test) conducted above contradict each other. But, based on our own observation, particularly the statistics, we can say that the performance of MCE-Group and EEE-Group are similar, and the performance of CSE-Group is relatively better compared to other two groups.

4.2.3 TVET trainee-teachers' ICT competency in different task categories

To examine the above statement the assessment items were classified in five categories:
Part A – *Basic computer operation and issues*

Part B - *Use of office application software*

Part C - *Use of Internet Resources*

Part D - *Use of Peripheral ICT Equipment*

Part D- Graphical design and software tools

Some of the questions used to assess basic computer operation and issues in Figure 4.5, use of office applications in Figure 4.6, use of internet resources in Figure 4.7 and use of peripheral ICT equipments and graphical software in Figure 4.8 are shown below.

Part A: Basic computer operation and issues - Questions 1 to 6

1. Important data on a pen drive or USB stick can be protected from being deleted by
   - **A.** None of them
   - **B.** labelling the disk clearly
   - **C.** using suitable filenames
   - **D.** write protecting the disk

Figure 4.5: A task used for basic computer operation and issues

Part B: Use of office application software (Questions 7 to 12)

7. In a lengthy document the word 'weather' has been incorrectly spelled as 'whether'. What feature could best be used to correct the error?
   - **A.** find and replace
   - **B.** spell check
   - **C.** select all
   - **D.** find

The Jasmine Health Club wants to store the personal details of its members shown in the table below.

SURNAME	FORENAME	TEL NUMBER	JOIN DATE	MEMBERSHIP TYPE
Elfeky	Mohammed	01935 423411	10.01.94	F
Lunn	Sally	01747 234129	11.03.95	E
Aiken	James	01934 231122	23.09.94	W
Gostford	Kevin	01935 421144	27.05.90	F

Figure 4.6: A task used for use of office applications

15. To avoid visual fatigue when using IT systems for long periods, a user should
   - **A.** avoid computer viruses
   - **B.** make backup copies
   - **C.** take regular breaks
   - **D.** check the power supply

Figure 4.7: A task used for use of internet resources

Part D: Use of Peripheral ICT Equipment & Graphical software (20-30)

20. The image **fig 1** was created from the original clip art by

Original clip

Fig 1

   - **A.** aligning
   - **B.** resizing
   - **C.** cropping
   - **D.** repositioning

Figure 4.8: A task used for use of peripheral ICT equipments

There were 30 assessment items in the test. The *Basic computer operation and issues* category included 6 items, the category *Use of office application software* included 6 items, the category *Use of Internet Resources* included 7 items, use *of Peripheral ICT Equipment 5 items and Graphical design and software tools* included 6 items. The allocated points in each category were normalized to a scale of 100. The points obtained by trainee teachers in a particular level of ICT competency is the measure of the trainee's performance on that level.

In the competency test TVET trainee teachers performed almost the same in the categories of *Basic computer operation and issues* (Mean value = 71.72 and standard deviation, SD = 20.26), *Use of office application software* (Mean value = 73.58 and SD = 21.23), *Use of Internet Resources* (Mean value = 73.78 and standard deviation, SD = 16.91), *Use of Peripheral ICT Equipment* (Mean value = 65.55 and SD = 16.97), but in *Graphical design and software tools* (Mean value = 51.37 and SD = 21.57) had the lowest average from Table 4.4 below.

According to the finding from Table 4.5 results of ANOVA shows that F_{cal} = 1.737 and F_{cri} = 2.68 as F_{cal} was less than F_{cri}, which means that were in the accepted region of the normal curve, the null hypothesis is rejected. The Sig. = 0.162 greater than 0.05, which means that among categories no significant effect on the trainee teachers' ICT competency.

Table 4.4 Statistics of TVET trainee-teachers' competency on different task categories

Tasks	Mean	N	Std. Deviation
Basic computer operation and issues	71.719	36	20.2665
Use of office application software	73.581	36	21.2306
Use of Internet Resources	73.786	36	16.9123
Peripheral ICT Equipment	65.556	36	16.9780
Graphical software	51.369	36	21.5784
Total	67.202	180	21.0652

Table 4.5: Comparison of TVET trainee teachers' competency on different task categories: results of ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1833.747	3	611.249	1.737	0.162
Within Groups	49262.336	140	351.874		
Total	51096.083	143			

The *Student Newman-Keuls* test, also labeled as 'post-hoc' analysis, was applied in order to make a posteriori pair-wise comparison. This test reveals the differences between categories. The results of this test are given in Table 4.6.

In Table 4.6 Category *Graphical design and software tools* within Subset 1 attained a category average of only 51.369 points (the lowest category average), whereas, other Categories which belong to subset 2 do not differ among themselves so much (p-value 0.281).

Table 4.6: Homogeneous subsets of different categories.

Student-Newman-Keuls

Categories	N	Subset for alpha = 0.05	
	1	2	1
Graphical software	36	51.369	
Peripheral ICT Equipment	36		65.556
Basic computer operation and issues	36		71.719
Use of office application software	36		73.581
Use of Internet Resources	36		73.786
Sig.		1.000	.281

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 36.000.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Study

This chapter provides a summary of the study, major findings from the study, discussions, implications and recommendations. Major findings and discussions will be organized that each research question is associated with a finding and a later discussion.

The purpose of this study was undertaken to assess the level of information and communication technology competency of TVET trainee teachers who are undergoing training at the Department of Technical and Vocational Education in Islamic University of Technology, Bangladesh. The second purpose was to find out the difference of ICT competency levels of trainee teachers having background of computer science and that of electrical and mechanical engineering.

The study included 36 participants' trainee teachers. The questionnaire (competency test) consisted of 30 items with four different categories which include basic computer operation and issues, use of office application software, use of Internet Resources and use of Peripheral ICT Equipment.

This study included two research questions:

1. Are TVET trainee teachers competent enough towards the use of ICT?
2. Is there any difference with the trainee teachers from background of computer science and that of electrical and mechanical in the level of ICT competency?

5.2 Findings

Research question one

Are TVET trainee teachers competent enough towards the use of Information and Communication Technology (ICT)?

The findings show that trainee teachers have average level of competency. The mean percentage of all trainee teachers was 67.228 and standard deviation was 12.436 with irrespective their specifications. It could be stated that trainee teachers of TVE are competent in ICT using.

Research question two

Is there any difference with the trainee teachers from background of computer science and that of electrical and mechanical engineering in the level of ICT competency?

As the findings for the research question two revealed significantly positive effect of the trainee teachers' background on ICT competency level, F value = 4.115 and the significance level p = 0.025 from the results of the ANOVA test.

5.3 Implications

Ultimately, we hoped to provide both teacher educators and professional developers with specific suggestions for preparing and supporting trainee teachers in their efforts to become effective ICT integration. These suggestions may help policy makers in other OIC member countries to create a roadmap which will lead teachers to become sufficient users of ICT in their classes.

This study highlighted that trainee teachers need to be aware of more advanced ICT applications than the basic ones (like MS Office), and they need to be further educated regarding use of Peripheral ICT Equipment.

5.4 Conclusions

In this study, it was found that TVET trainee teachers have average competency towards the use of ICT. The results revealed that among the basic ICT competency different categories came well, trainee teachers in area of Basic computer operation and issues, Use of office application software and Use of Internet Resources. However the same trainee teacher lacked required competence in use of Peripheral ICT Equipment and Graphical software tools. The findings underscore the need to introduce trainee teachers to more courses on ICT with needed hands-on experiences.

5.5 Recommendations for Further Research

The goal of this study was to investigate the level of ICT competency of trainee teachers. Data was collected to test the two hypotheses relating to this goal. The information was studied and many significant findings resulted from the examination of the data. The findings, although significant, have some limitations. One limitation is the design of the study. The overall approach would have been strengthened by the use of classroom observation, interviews, and focus-groups. Observation would have been relevant in gathering data on trainee teachers ICT competence and actual use of ICT. Focus group would have been good for identifying and exploring trainee teachers' practical point of view about ICT.

It may be necessary for further research to be conducted on the impact of the computer-based test, the Microsoft digital literacy programme etc. on trainee teachers' ICT competency, and other innovative application of ICT in TVE.

Furthermore, this competences test measured only the basic ICT competences of the trainee-teachers therefore, the researcher recommend that the in-depth ICT competences should be measured according to UNESCO ICT competency standard for teachers.

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APPENDIX A

ASSESSMENT QUESTIONNAIRE OF THE TASKS

Assessment of the tasks of the ICT competency test

By teacher/ expert

Please assess using the box below each question.

Part A: Basic computer operation and issues - Questions 1 to 6

1. Important data on a pen drive or USB stick can be protected from being deleted by

   A. None of them **B.** Labeling the disk clearly **C.** using suitable filenames

   D. write protecting the disk

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

2. Which peripheral device is used while typing or inputting data in the computer?

A. mouse **B.** speaker **C.** keyboard **D.** cursor

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

3. Information or data on the CD can be?

   A. Deleted **B.** Formatted **C.** Copied **D.** scanned

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

4. How do you properly shut down a computer?

   A. Press the power button on the front of the monitor.

B. Go to the "Start" button and select "Shut Down."

C. Go to the "Start" button and select "Log Off."

D. Press the "Shut Down" key on the keyboard.

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

5. How do you rename a file saved on your computer?

A. Right click on the file name and choose "Rename File." Type the new file name.

B. Left click on the file name and choose "Rename File." Type the new file name.

C. Open the file. Click "Edit" at the top left of the screen and select "Rename."

D. Open the file. Click "File" at the top left of the screen and select "Save."

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

6. Which of the following commands is given to reboot the computer?

A. Ctrl + Shift + Del **B.** Ctrl + Alt + Tab **C.** Ctrl + Alt + Del **D.** Ctrl + Alt + Shift

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

Part B: Use of office application software (Questions 7 to 12)

7. In a lengthy document the word 'weather' has been incorrectly spelled as 'whether'. What feature could best be used to correct the error?

A. find and replace **B.** spell check **C.** select all **D**. find

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

The Jasmine Health Club wants to store the personal details of its members shown in the table below.

SURNAME	FORENAME	TEL NUMBER	JOIN DATE	MEMBERSHIP TYPE
Elfeky	Mohammed	01935 423411	10.01.94	F
Lunn	Sally	01747 234129	11.03.95	E
Aiken	James	01934 231122	23.09.94	W
Gostford	Kevin	01935 421144	27.05.90	F

8. The best way to store these above information would be to use

A. wordprocessor **B.** spreadsheet **C.** database **D.** desk top publisher

- Is the content of this question relevant to basic ICT Skills Yes / No

	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

9. The words in first row of the previous table are in

A. italic **B.** bold **C.** underline **D.** subscript

- Is the content of this question relevant to basic ICT Skills Yes / No

	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

10. You want to insert a paragraph of text from one document into another document while still keeping it in the first document. You would select/highlight the text, then

A. cut and paste. **B.** copy and paste. **C.** delete and paste. **D.** insert and paste.

- Is the content of this question relevant to basic ICT Skills Yes / No

	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

11. You type the following information into a word processor document.

The Olympic flag shows five coloured rings on a white background.
The rings symbolize the uniting of the five continents of the world.

You wanted the text to look like this:

- The Olympic flag shows five coloured rings on a white background.
- The rings symbolize the uniting of the five continents of the world.

You select/highlight the text on your screen. Which tool should you use now?

(A) (B) (C) (D)

12. To avoid losing all the information if the file is damaged, the user should

A. Copyright the content **B.** Use a password **C.** Keep a backup copy

D. Delete the file

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

Part C: Use of Internet Resources (Questions 13 to 19)

13. A large company has offices in several towns across the country, and needs to send an urgent message to the senior managers in each office. The easiest way to get the message to them would be to

A. Send an e-mail **B.** telephone them **C.** put it in the post **D.** send it by messenger

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

14. To find the websites that have information about holidays, the user should use

A. a telephone directory **B.** find and replace **C.** a sort on "holidays"

D. a search engine

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

15. To avoid visual fatigue when using IT systems for long periods, a user should

A. avoid computer viruses **B.** make backup copies **C.** take regular breaks

D. check the power supply

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

16. Select the email address from the following options.

A. Bob Smith@yahoo.com **B.** bobsmith461@yahoo.com **C.** www.bobsmith.com

D. bobsmith461*yahoo.com

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

17. You have received an email with two attached files having extension of ***.pdf*** and ***.doc***. To open those attachments, you must have two applications which are

A. Ms Word and Text editor **B.** Ms Excel and Adobe acrobat

C. Adobe Acrobat and Ms Word **D.** Adobe Acrobat and Windows Explorer

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

18. When we open an internet site we see www. What is the full form of www?

A. World wide word

B. World wide web

C. Word widing works

D. Word wide Spiderman web

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

19. If you have a PowerPoint show you created and want to send using email to another teacher you can add the show to your email message as a (an)

A. Inclusion **B.** Attachment **C.** Reply

B. forward

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

Part D: Use of Peripheral ICT Equipment & Graphical software (20-30)

20. The image **fig 1** was created from the original clip art by

Original clip

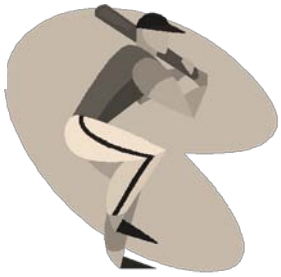


Fig 1

A. aligning

B. resizing

C. cropping

D. repositioning

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

21. A scanner should be connected with which part of the computer

A. keyboard **B.** monitor or screen **C.** CPU **D.** none of the above

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

22. When saving a photograph for use on a website, which format shouldn't choose?

A. BMP **B.** GIF **C.** JPEG **D.** TIFF

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

23. On a standard mouse, which is the most frequently used button?

A. Both Buttons **B.** Right Button **C.** Left Button **D.** Not Sure.

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

24. You have downloaded a screensaver, a 10sec audio file and a 10sec video clip.

Which of the media has the biggest file size?

A. Screensaver **B.** Sound **C.** Video **D.** All of the above

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

25. An Input/output device which provides photographic outputs for printing galleys, is the

A. Camera printer

B. Automatic typesetter

C. Laser printer

D. All of these

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

26. Which one of the following is a file?

A. Pen drive

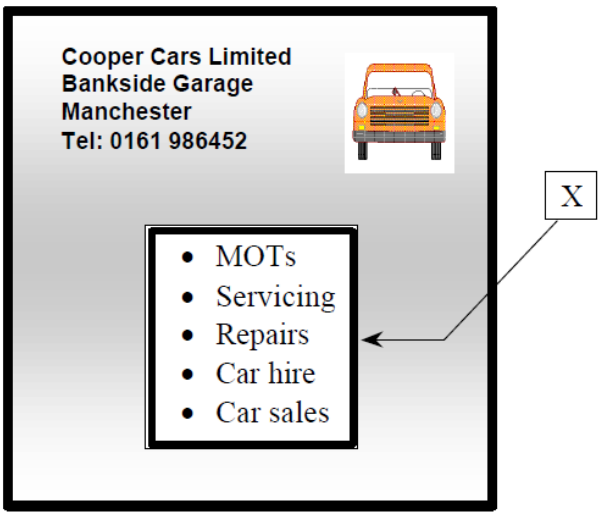
B. Magnetic disk

C. Magnetic tape

D. None of these

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

The garage has designed the following leaflet to send to its customers.



Questions 27 to 30 are based on this leaflet

27. Which one of the following software packages might be used to produce this leaflet?

A. Database

B. Accounts

C. internet browser

D. word processing

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

28. What has been used in the text box (indicated with arrow **X**) to make the list clearer?

A. upper case

B. bullets

C. italics

D. tabs

- Is the content of this question relevant to basic ICT Skills			Yes	/	No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

29. When producing a leaflet like this, the text box can often get lost behind the graphic images. This can be rectified by using the facility called

A. Group

B. Order

C. Wrap

D. Insert

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
- The degree of complexity of the task	☐	☐	☐	☐	☐
- The degree of comprehensibility of the task	☐	☐	☐	☐	☐

30. Graphic images of cars suitable for use on this leaflet are available in the form of

A. CD-ROM clip art

B. CD-ROM programs

C. Watercolors

D. oil paintings

- Is the content of this question relevant to basic ICT Skills			Yes /		No
	Very low	**L**ow	**A**verage	**H**igh	**V**ery high
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THANKS A LOT FOR YOUR TIME MAY GOD BLESS YOU!

APPENDIX B

TEST INSTRUMENT FOR TRAINEE TEACHERS/STUDENTS

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
THE ORGANIZATION OF ISLAMIC COOPERATION (OIC)
DHAKA-BANGLADESH

Question Paper

Do NOT open this Question Paper until you are told to by the supervisor

THERE ARE **30** QUESTIONS IN THIS TEST

Total marks available: 30

Try to answer ALL the questions

TIME ALLOWED: **15** MINUTES

INSTRUCTIONS

- Read each question carefully
- Follow the instructions on how to complete the survey questions.
- At the end of the test, handover the Question Paper with the Answers and all notes to the supervisor

---

REMEMBER: YOU HAVE 15 MINUTES TO COMPLETE THE TEST

Please indicate your previous background

Electrical engineering ☐

Mechanical engineering ☐

Computer Science and IT ☐

Please apply a tick to the correct answer for all the 30 questions.

Part A: Basic computer operation and issues - Questions 1 to 6

1. Important data on a pen drive or USB stick can be protected from being deleted by
   - **A.** None of them
   - **B.** labelling the disk clearly
   - **C.** using suitable filenames
   - **D.** write protecting the disk

2. Which peripheral device is used while typing or inputting data in the computer?
   - **A.** mouse
   - **B.** speaker
   - **C.** keyboard
   - **D.** cursor

3. Information or data on the CD can be?
   - **A.** Deleted
   - **B.** Formatted
   - **C.** Copied
   - **D.** scanned

4. How do you properly shut down a computer?
   - **A.** Press the power button on the front of the monitor.
   - **B.** Go to the "Start" button and select "Shut Down."
   - **C.** Go to the "Start" button and select "Log Off."
   - **D.** Press the "Shut Down" key on the keyboard.

5. How do you rename a file saved on your computer?
   - **A.** Right click on the file name and choose "Rename File." Type the new file name.
   - **B.** Left click on the file name and choose "Rename File." Type the new file name.
   - **C.** Open the file. Click "Edit" at the top left of the screen and select "Rename."
   - **D.** Open the file. Click "File" at the top left of the screen and select "Save."

6. Which of the following commands is given to reboot the computer?
   - **A.** Ctrl + Shift + Del
   - **B.** Ctrl + Alt + Tab
   - **C.** Ctrl + Alt + Del
   - **D.** Ctrl + Alt + Shift

Part B: Use of office application software (Questions 7 to 12)

7. In a lengthy document the word 'weather' has been incorrectly spelled as 'whether'. What feature could best be used to correct the error?

   A. find and replace

   B. spell check

   C. select all

   D. find

The Jasmine Health Club wants to store the personal details of its members shown in the table below.

SURNAME	FORENAME	TEL NUMBER	JOIN DATE	MEMBERSHIP TYPE
Elfeky	Mohammed	01935 423411	10.01.94	F
Lunn	Sally	01747 234129	11.03.95	E
Aiken	James	01934 231122	23.09.94	W
Gostford	Kevin	01935 421144	27.05.90	F

8. The best way to store these above information would be to use

   A. wordprocessor

   B. spreadsheet

   C. database

   D. desk top publisher

9. The words in first row of the previous table are in

   A. italic

   B. bold

   C. underline

   D. subscript

10. You want to insert a paragraph of text from one document into another document while still keeping it in the first document.
    You would select/highlight the text, then

    A. cut and paste.

    B. copy and paste.

    C. delete and paste.

    D. insert and paste.

11. You type the following information into a word processor document.

The Olympic flag shows five coloured rings on a white background. The rings symbolize the uniting of the five continents of the world.

You wanted the text to look like this:

• The Olympic flag shows five coloured rings on a white background. • The rings symbolize the uniting of the five continents of the world.

You select/highlight the text on your screen. Which tool should you use now?

(A) (B) (C) (D)

12. To avoid losing all the information if the file is damaged, the user should

A. Copyright the content

B. Use a password

C. Keep a backup copy

D. Delete the file

Part C: Use of Internet Resources (Questions 13 to 19)

13. A large company has offices in several towns across the country, and needs to send an urgent message to the senior managers in each office. The easiest way to get the message to them would be to

A. Send an e-mail

B. telephone them

C. put it in the post

D. send it by messenger

14. To find the websites that have information about holidays, the user should use

A. a telephone directory

B. find and replace

C. a sort on "holidays"

D. a search engine

15. To avoid visual fatigue when using IT systems for long periods, a user should

A. avoid computer viruses

B. make backup copies

C. take regular breaks

D. check the power supply

16. Select the email address from the following options.

A. Bob Smith@yahoo.com

B. bobsmith461@yahoo.com

C. www.bobsmith.com

D. bobsmith461*yahoo.com

17. You have received an email with two attached files having extension of ***.pdf*** and ***.doc***. To open those attachments, you must have two applications which are

A. Ms Word and Text editor

B. Ms Excel and Adobe acrobat

C. Adobe Acrobat and Ms Word

D. Adobe Acrobat and Windows Explorer

18. When we open an internet site we see www. What is the full form of www?

A. World wide word

B. World wide web

C. Word widing works

D. Word wide Spiderman web

19. If you have a PowerPoint show you created and want to send using email to another teacher you can add the show to your email message as a (an)

A. Inclusion

B. Attachment

C. Reply

D. forward

Part D: Use of Peripheral ICT Equipment & Graphical software (20-30)

20. The image **fig 1** was created from the original clip art by

Original clip

Fig 1

A. aligning

B. resizing

C. cropping

D. repositioning

21. A scanner should be connected with which part of the computer

A. keyboard

B. monitor or screen

C. CPU

D. none of the above

22. When saving a photograph for use on a website, which format shouldn't choose?

A. BMP

B. GIF

C. JPEG

D. TIFF

23. On a standard mouse, which is the most frequently used button?

A. Both Buttons

B. Right Button

C. Left Button

D. Not Sure.

24. You have downloaded a screensaver, a 10sec audio file and a 10sec video clip.

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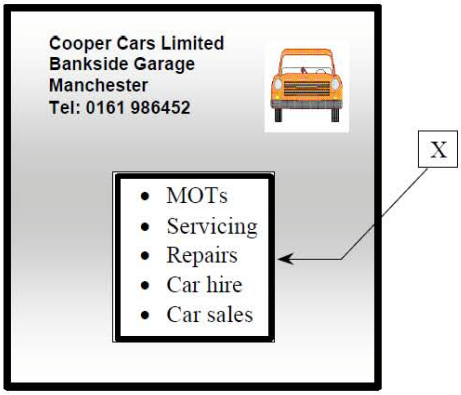

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