Students' Attitude towards Technology in the Learning Process: A Case of Higher Institutions of Learning in Bangladesh.

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A thesis submitted for fulfillment of the degree of Masters of Science in Technical Education with specialization in Computer Science and Engineering

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The thesis titled **Students' Attitude towards Technology in the Learning Process: A Case of Higher Institutions of Learning in Bangladesh** submitted by **Lwembawo Ibrahim** with student No. **181031401** has been found satisfactory and accepted as fulfillment of the requirement for the degree of **Master of Science in Technical Education** (M.Sc.T.E.) with specialization in **Computer Science Engineering.**
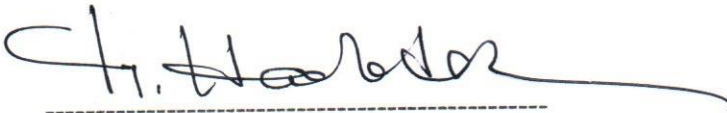
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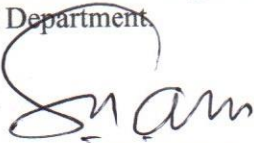
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This is to certify that the work presented in this thesis is an outcome of the investigation carried out by Lwembawo Ibrahim under the supervision of Professor. Dr. Md. Shahadat Hossain Khan in the department of Technical and Vocation Education (TVE), Islamic University of Technology. Gazipur, Bangladesh. It is hereby declared that this thesis report or part of it has not been submitted anywhere for the award of any Degree or Diploma.
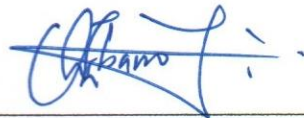
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DEDICATION

I dedicate this thesis work to my parents, brothers, sisters, and friends who have been by my side in the process of building up this work. May the Almighty Allah reward them abundantly.

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ACRONYMS

ABBREVIATIONS	ACRONYMS
ICT	Information and Communication Technology
TCA	Technology Career Aspirations
COT	Consequences of Technology
TFBG	Technology for both Gender
TTT	Tediousness of Technology
TID	Technology perceived as difficult
TVE	Technical and Vocational Education
CSE	Computer Science Engineering
EEE	Electrical and Electronic Engineering
MPE	Mechanical and Production Engineering
BTM	Business and Technology Management
SPSS	Statistical package for Social Sciences
PATT	Pupils Attitude towards Technology

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Abstract.

As the Education system gets digitalized through technology innovations, learners tend to have deviating attitudes towards technology in their learning cycle. A clear understanding of students' attitudes towards technology is paramount regarding technology utilization for learning. This thesis work is aimed at investigating students' attitudes towards technology use in their learning process, a case of Bangladesh higher education institutions. A convenience sampling technique was used to gather data from students of higher educational institutions in Bangladesh. In the study, 400 participants were involved and only 258 of them fully participated in the study. Results from the study confirm that students had a positive attitude towards technology utilization in learning. Furthermore, there was a significant difference between male and female students in regards to technology usage based on the gender factor and no significant difference was witnessed across the departments except for the TCA factor. The findings are expected to be useful in aiding curriculum designers in developing curricula that are technologically orientated. Moreover, academic institutions should also base on these findings to implement and provide necessary educational technologies for teaching and learning.

Key Words: students' attitude towards technology; learning; higher educational institutions in Bangladesh.

Chapter 1   Introduction

1.1   Background.

Today's societies are observing continuous exponential growth in the technological development permeated by the facets of new technologies such as smart things, cloud computing, Internet of things, mobile computing, big data, social media, etc. that has transformed the way we learn, think and do things (Kumar, Tiwari, & Zymbler, 2019). This has been witnessed in various sectors like banking, transport, health, agriculture, mining, etc. in different societies that have been affected by technology advancements and education has not been left out. Due to the rapid advancements in technological innovations, learning approaches are experiencing a shift from traditional learning to new modern learning styles. The learning elegances that are technologically orientated, for example, e-learning, blended classroom, mobile learning, etc have impacted students learning behaviors positively (Sun, Liu, Luo, Wu, & Shi, 2017). Cai, Fan, & Du, (2019) mentioned that learning and developing a virtuous order and technological skills have turned out to be an essential part of ones' aptitude for effective education and career. Moreover, technology competency has become very vital for an extensive array of professionals. Furthermore, current society heavily depends on technology to function, therefore, technology has turned out to be an indispensable part of daily lives.

Hasni & Potvin, (2015) noted that technology leads to the advancement of scientific and technological principles for all citizens, whether they pursue professions in science and technology or not. Shortage of experienced manpower that has gained substantial training in science and technology arenas was still lacking (Hasni & Potvin, 2015). This creates sluggish developments in science and technological fields in various communities hence not fulfilling all the required demands of the society. Based on that, many governments and non-government bodies have extended technology facilities and formulated policies that are in-line with the problem at hand, for example, the Government of the People's Republic of Bangladesh made a vision of incorporating ICT into the education system so that such situations are combated (Sultana & Haque, 2018a). Besides, Sultana & Haque, (2018b) continued and asserted that the secretary to the Ministry of Education in Bangladesh reported that "ICT education is already made compulsory in education" (pg.68). Furthermore, the Ministry of education of the People's Republic of Bangladesh published its master plan for ICT in education, according to the 2012 to

2021 report. The report had the main vision of building a fair and just society through digitalizing education to ensure the use of ICT for development and create opportunities in high education (Ministry of Education-Government of People's Republic of Bangladesh, 2019). Additionally, with the help of the World Bank, Bangladesh embarked on the excursion of digitalizing advanced education through the Higher Education Quality Enhancement Project (HEQEP) in 2009. This venture offered to ascend of the Bangladesh Research and Education Network (BdREN) which set out the establishment of the computerized framework by setting up a high bandwidth capacity and secure organization availability at institutions (Mustahsin-ul-Aziz & Ahmed, 2020).

However, differences in attitude towards technology usage in learning and teaching may diverge depending on either student's attitude towards learning using technology, or teacher's attitude towards teaching using technology. For example, Incantalupo, Treagust, & Koul, (2014) reported that teachers' beliefs and attitudes about technology efficacy compared to traditional methods of teaching can influence the application of technology in their classroom. This can generate a positive attitude in students towards the use of technology in learning hence leading to the acquisition of technical skills which are crucial in this 21st century. Whileas, Colaste, (2018) studied the impact of students' attitude towards the English language on academic achievement and articulated that an optimistic attitude extended fruitful success to students. This has demonstrated positive outputs in students' academic performance e.g. Incantalupo, Treagust, & Koul, (2014b) noted that technology improves students' academic performance and expertise in technology utilization. Also, Rahman, Paul, & Hasan, (2012) pointed out that technology provides powerful tools for extending educational access, improving the skills and knowledge of students. Furthermore, Raja & Nagasubramani, (2018) elaborated on the positivity of technology in a learning situation and expressed that modern technological equipment intensifies students' interactivity and learning. This gives learners' total freedom to access the learning materials within their comfort zones through the use of smart technological gadgets.

However, there should be a clear understanding of students' attitudes towards the use of technology in their learning process. Therefore, this present study aims at addressing the attitude of students towards technology in their learning process, with the context of higher academic institutions of learning in Bangladesh. This has come with the fact that much has not been investigated in this area since much of the empirical evidence is seen to be wanting which is very

crucial for the study. Furthermore, the rapid technological innovations in the educational sector which has reshuffled the learning paradigm from traditional to modern learning styles call for this type of study.

To address such a concern in this current study, the following research questions were formulated: -

1. Does attitude towards technology affect students' learning process?

2. Is there any difference in using technology in relation to the gender factor?

3. Is there any difference in students' attitudes towards technology utilization at the department level?

Chapter 2   Literature Review

2.1   Theoretical Background.

2.1.1   Factors of attitudes towards technology.

Attitude towards technology has been interrogated by different researcher e.g. (Andrew, Taylorson, Langille, Grange, & Williams, 2018a; Ardies, De Maeyer, Gijbels, & van Keulen, 2014; Ardies, Maeyer, & Gijbels, 2013; Autio, Jamsek, Soobik, & Olafsson, 2017; Hussain & Akhter, 2016; Szekeres, Takács, Vicsek, & Nagy, 2012) and it's associated with different factors as elaborated by (Ardies et al., 2014, 2013; Bame, Dugger, Jr., & McBee, 1993) in students' attitude towards technology, reconstructing pupils attitudes towards technology survey and pupil's attitude towards the technology-PATT USA respectively. The different factors of attitudes towards technology as elaborated below: -

Figure 1: Shows factors of attitudes towards technology.

2.1.1.1 Interest in Technology.

Interest in technology promotes rapid development of students' confidence and ease of use of different technologies that are applied in executing different tasks in a learning environment. These tasks can range from accessing study materials, collaborating with different students from other parts of the world, taking assignments and submitting them, and many other tasks that come in daily. However, if the technology is repelled, slow development in technological fields will be observed. Mammes, (2004) said that the dearth of interest in technology leads to having incompetent persons in fields where the technological application is very vital. Furthermore, as a consequence, having people who oversee technology development and provide societies with technology professions is hard.

2.1.1.2 Career Aspirations.

Career Aspirations are the goals one sets to gain in life concerning the kind of profession he/she desires in the future. Ardies et al., (2014) investigated students' attitudes towards technology and the findings revealed that learners who took technological curriculum options were more optimistic of achieving a technological career in their future than their counterparts who did not take up programs that involved technology. This means that students with technological skills and experience stand higher chances of attaining careers from different institutions that have integrated technology in operationalizing their day-to-day work.

2.1.1.3 Consequences of Technology.

The consequences of technology in the educational life of a student have contributed in two dimensions either negatively or positively. Raja & Nagasubramani, (2018) pointed out some of the negative impacts of merging ICT in education are i) declining writing skills, ii) increasing incidents of Cheating, iii) lack of Focus. However, Raja & Nagasubramani, (2018) also acknowledged the positive aspects of incorporating ICT in education and these are: i)enhance teaching and learning, ii)globalization and iii) no geographical limitations between the student and learning. Additionally, Chowdhury, Arefin, & Rahaman, (2018) asserted that the assimilation of technology in education enhances student knowledge development and create a conducive environment for independent learning of students.

2.1.1.4 Perception of difficulty of technology.

A study by Ardies et al., (2014) on Students' attitudes towards technology demonstrated that perception of technology as a difficult component in learning was equally distributed across all

gender i.e. male and female students. Although, we have witnessed some benefits of technology from the previous factor in an academic environment, much has to be done to eradicate that perception of saying that technology is difficult to deal with. This calls for the implementation of a comprehensive strategy that involves all the stakeholders of the educational institutions to combat the problem at hand. For example, a study by Sabti & Chaichan, (2014) revealed that educators and organizers should adopt a complete method of teaching using the computer to enable students to learn using the technology, and by doing so, their perception about technology as a complex mechanism to use in learning is altered. This gives students' opportunity to transfer the acquired knowledge during the class sessions to personal or group class projects hence improving their computer application in the learning situation.

2.1.1.5 Technology in the curriculum.
In this 21st century, technology has affected the way we live, think, and learn. This has become an obligation for academic institutions, curriculum designers, and instructors to incorporate technological tools in the process of instructing and learning for the betterment of students, institutions, and the country at large.

2.1.1.6 Gender differences towards technology.
Gender plays a very substantial role in determining students' attitude toward technology. Different studies were carried out and the results revealed vary from one scholar to another when gender attitude towards technology comes into play. For example, a study by Kubiatko, (2010) divulged that students observed an optimistic attitude towards ICT. Furthermore, the inclination towards the transformation of the traditional way of instructing to the modernized way of teaching using ICT resources was more observed on the side of male students. In another study by Cai et al., (2017a) shows that male students exhibited favorable attitudes towards technology application than their female colleagues. However, the conclusion drawn from a study by Cai et al., (2017a) was that females students portrayed a positive attitude towards the use of technology although they demonstrated slightly lower levels of attitude compared to the males. On the other hand, a study by Sabti & Chaichan, (2014) shows that female students exhibited a higher positive attitude towards the utilization of technology than the male students.

Nevertheless, not only the elaborated factors of attitudes towards technology as illustrated by (Ardies et al., 2014, 2013; Bame et al., 1993) contribute to the variations in students attitude towards technology but also the absence of information technology amenities have contributed

largely to having students with low-level skills of utilizing IT tools and hence leading to a low behavior attitude towards using computers (Ali & Bhat, 2018). Khan, Hasan, & Clement, (2012) also echoed that lack of resources and suitable structure for applying ICT in the education sector was detected as a key barrier in Bangladesh. Moreover, due to poor vision and plan, few higher institutions in big metropolises have ICT facilities but cannot incorporate them effectively.

Based on the factors of attitudes towards technology presented above, a survey questionnaire was designed. The factors that were extracted were interest in technology, career aspirations, consequences of technology, perception of the difficulty of technology, gender point of view towards technology. Different items that perfectly explain the factors explained above were developed.

2.2 Attitude.

Petty & Wegener, (1996) defined attitude as " a person's overall evaluation of persons (including oneself), objects, and issues". Furthermore, assessed attitude as to how favorable or unfavorable one's judgment based on given statements, objects, or actions. Jain, (2014) elaborated on the different components of attitudes. The cognitive, affective, and behavior determine the three components of attitude. A more elaborative explanation is given below.

1. Cognitive component:

   This component of attitude deals with the cognitive or knowledge related attitudes towards an object, statement, or opinion. This can be in terms of beliefs or attributes that would associate with the object, for example, smoking is detrimental to your health.

2. Affective component.

   The component of affection about attitude can be thought of as the emotional feelings of attitude towards an object, statements, for example, hate, fear, love, like, etc.

3. Behavior component.

   This component of attitude involves the way a person acts/ behaves or responds to different objects and opinions. This contributes to favorable or unfavorable responses to different views and objects by different persons.

The three components of attitude elaborated above define how students of different academic institutions view the different tools that propagate the smooth learning process in an educational environment. In this study, attitude is defined as any form of judgment that is based on the

individual's awareness of any educational technology that is presented to him or her for learning purposes.

2.3 Technology.

In this study, technology is any software or hardware that can be used to propagate and receive different learning materials for students in an academic environment. Different technologies that can be used in the learning process, for example, laptops, kindles, learning management systems, google classroom, etc. that may have a significant impact on students' performance. However, different scholars variously defined technology in many ways, for example, Zuppo, (2012) defined it as the infrastructures and devices that propagate the transmission of information through the digital medium. Moreover, Islam, (2016) defined technology as a collection of gears that facilitate the use, creation, management, and exchange of information more easily and efficiently. The use of different technologies in an educational system will depend on the attitude that one has towards utilizing them in the learning process. A favorable attitude towards technology leads to improving someone's technical skills compared to one who has unfavorable attitudes towards technology since he/she feels insecure with technology being around him/her.

2.4 Attitude towards Technology.

This is the evaluation of different technologies used in educational systems for learning purposes by students and instructors based on their attitudes towards technology. The evaluation is based on the three components of attitude as elaborated earlier. Different people may adopt different forms of attitudes either positive or negative towards various forms of things and technology is one of them (Otaibi, 2012). This comes into action with globalization and the vast utilization of technology that has rehabilitated the way we learn and use our cognitive capabilities in different dimensions of day-to-day life (Vaino, Vaino, & Rannikmäe, 2015). Many academic institutions have embraced the new teaching and learning styles that have come with advanced technology, for example, e-learning, online collaborative learning, mobile learning, etc. In this study, an extra mile is taken into account in analyzing different kinds of literature that are connected to the current study given the knowledge gap that is existing in the context of higher educational institutions in Bangladesh.

Incantalupo et al., (2014) explored students' attitude and knowledge in technology in a biology classroom. The sample of the study was composed of 700 high school students of 9-12 grade and

the results proved that learners perceived that technology was vital in their life. This simplifies the creation of technology integration in education. Furthermore, Ali & Bhat, (2018) surveyed 400 students in different higher educational institutions in J&K State in Kashmir valley on their attitude towards information technology and science education. Results from their study revealed higher confidence was attained by science students in using computers and participating in activities that involve information technology. With that being gotten from the study, they concluded that both the arts and science students registered positive attitudes towards technology. Additionally, they recommended that the government should give in extra support in organizing workshops and conferences for teachers to acquire new skills in computer. This was also supported by Kubiatko, (2010) where he stressed the point of teachers participating in computer-related workshops and echoed that such kind of workshops improve the quality of instructing and learning since they promote teachers' realization of ICT potentials. Additionally, Andrew, Taylorson, Langille, Grange, & Williams, (2018b) addressed student attitudes towards technology and their preferences for learning devices at two universities in the United Arab Emirates(UAE). A mixed-method was employed in their studies with data collected from 1102 Arabic-speaking students in two English-medium universities in the UAE in both English-language foundation studies programs, general Studies programs of first and second-years. The findings obtained showed that foundation studies participants believed that learning how to use technology was more beneficial compared to general studies participants. This builds curiosity among students in regards to using technology hence improving their learning. Besides, Abdullah, Ziden, Aman, & Mustafa, (2020) explored students' attitudes towards information technology and their relationship with their academic performance at Koya University in Iraq. Their study focused on the undergraduate students of the second and fourth year in arts and science disciplines. The findings from their study revealed that students expressed positive attitudes towards information technology. This creates an environment populated with high opportunities for students to collaborate, share ideas, and improve their academic performances.

Gokhale, Rabe-Hemp, Woeste, & Machina, (2015) conducted a study on gender differences in attitudes toward science and technology among majors. Their research comprised of college students in applied science and technology and findings divulged that male students expressed more interest in science and technology compared to their female colleagues. However, the continued taking of science and technology courses by female students sparked a more positive

attitude towards science and technology in the long run since they became more involved with technology interaction. Moreover, Cai, Fan, & Du, (2017b) analyzed gender and attitude towards technology use with a meta-analysis and the study focused on college and secondary students. Results from their study also confirmed that male students demonstrated a higher attitude towards the use of technology than female students. Furthermore, the major gender differences were highly observed in secondary school students than in college students in regards to technology use. The differences could be as a result of low technology implementation rates in secondary schools than in colleges. Cai et al., (2017b) concluded that although female students displayed low favorable attitudes towards technology utilization in their learning, their attitude was still positive. Also, Sabti & Chaichan, (2014) examined Saudi high school students' attitudes and barriers toward the use of computer technologies in learning English. Results from analyzing 30 Saudi, English as a Foreign Language students from a Saudi Arabia public school in Kuala Lumpur aged 16-18 years' demonstrated a higher tendency to use technology for both male and female students. However, female students had a high positive attitude towards the use of technology compared to male students. Further, Al-Emran, Elsherif, & Shaalan, (2016) investigated attitudes towards the use of mobile learning in higher education in Oman and the United Arab Emirates (UAE). Their data was mainly from five prominent academic institutions in the Arab Gulf region. The findings of the study demonstrated that there was no significant difference between male and female students in using mobile devices for learning. Hilao & Wichadee, (2017) supported the findings of Al-Emran et al., (2016) and echoed that having no significant difference in mobile usage in regards to gender could be attributed to the experience students gained since they use mobile devices in communicating with their peers and instructors in chat groups, checking for study materials and sharing study materials.

Uzunboylu, Hürsen, Özütürk, & Demirok, (2015) carried a study to determine Turkish students' attitudes towards mobile integration in English as a Foreign Language in North Cyprus. Their study comprised of 275 elementary English learners where 95 were male and 180 were female from different departments of the University. The results recorded showed that affirmative attitude was attained by students from different departments. Further, Alkan & Erdem, (2010) studied the attitudes of students teachers towards educational technologies according to their status of receiving teaching application lessons. The study focused on 244 students in 1st grade and 5th-grade students in different departments in the faculty of education, Hacettepe University. Results

from the study showed that students had positive attitudes toward educational technology. However, 5th-grade student teachers had a more positive attitude towards technology than the 1st-grade students. This implies that the implementation of different technologies that propagate learning are easily assimilated by the students. Unfortunately, department members can ruin the system as elaborated by Marzilli, Delello, & Marmion, (2014) where they investigated faculty attitudes towards integrating technology and innovation. The results revealed based on the theme of fear and anxiety about losing their employments, faculty members elaborated that since everything will be online and based on that, they found it extremely scary that they lose their jobs hence they resist the changes that come with technology.

The empirical work collected through cross-examination of different pieces of literature that focused on both pre-university and university education for example (Al-Doub, Goodwin, & Al-Hunaiyyan, 2008; Ali & Bhat, 2018; Andrew et al., 2018a; Ardies et al., 2014; Hussain & Akhter, 2016; Incantalupo et al., 2014b; Kubiatko, 2010; Potvin & Hasni, 2015) explicitly shows that there is need to know the position of students in higher education institutions in regards to their attitudes towards technology in the context of Bangladesh. Therefore, this present study will be in position to address the attitude of students towards technology in the context of higher educational institutions in Bangladesh.

Chapter 3   Methodology

3.1   Research design

The study was quantitative and a descriptive survey method used to investigate students' attitude towards technology in their learning process in higher institutions of learning in Bangladesh. According to Nigel, Nick, & Amanda, (2007), a survey questionnaire was considered appropriate for this study because it is to gather data on behavioral and attitudes research studies. Additionally, survey questionnaires also cover a wide geographical area. Moreover, it gives its respondents chances to freely express their views on given statements.

3.2   Research Sample.

The population of this present research was connected to the students of higher academic institutions in Bangladesh.

After calculating the sample size using Cochran's formula, with a confidence interval of 95%, margin error of 5%, and a z-score value of 1.96, 400 turned out to be the ideal sample size. With the permission granted to collect data from the two institutions. Four hundred (400) participants were selected from different departments of those institutions.

$$n_0 = \frac{Z^2 pq}{e^2}$$

Equation 1:Cochram's formula of calculating sample size

The two institutions i.e. Islamic University of technology and BRAC university were selected based on the experience of different participants in using various technologies for learning. Moreover, they also offer both engineering and non-engineering programs. After the permission to collect data was attained from different departments of the two institutions. The sample was conveniently selected based on both willingness and accessibility to participate in the study. The same sampling technique was utilized by different scholars and their results from their study were good (Adalier, 2012; Andrew et al., 2018a)

Institution	Sample size
Islamic University of Technology	200
BRAC University	200
Total	400

3.3 Research tool.

A reconstructed and revalidated tool of Pupils' attitude towards technology (PATT) questionnaire was adopted and modified from (Ardies et al., 2013). It was noted that various researchers also adopted the same tool in the processing of exploring their studies that were in line with the attitude towards technology (Ardies, De Maeyer, & Gijbels, 2015; Ardies et al., 2014).

The questionnaire was partitioned into two divisions that were filled based on the closed-ended question structure. The first section of the questionnaire was based on demographic data like gender, department, academic level, and year of study while the second section based on the factors that affect students' attitudes towards technology as described by Ardies et al., (2013) i.e. technology career aspiration (TCA) [2 items], interest in technology (IIT) [3 items], tedious about technology (TTT) [3 items], technology for both genders (TFBG) [2 items], consequences of technology(COT) [4 items], the difficulty of technology (TID) [2 items].

The questionnaire is available presented in appendix A.

The reliability of the questionnaire was carried out and the Cronbach alpha was in the range of 0.61 to 0.76. Basing on the different scholars, the Cronbach alpha of 0.6 to 0.7 is considered acceptable (Jeanne Ross, Weill Peter & David, 2014; Ursachi, Horodnic, & Zait, 2015). In another study where researchers used the reliability of 0.6 and 0.7 of some constructors and attained good results are (Ardies et al., 2014, 2013).

3.4 Data Collection.

Data was collected using a survey questionnaire. This is because it covers geographically spread samples and is also recommended by Nigel et al., (2007) in studies that are related to attitude. This data collection tool was also used in different studies that are in line with the current study for example, (Ardies, De Maeyer, & Gijbels, 2015; Ardies et al., 2013; Autio et al., 2017; Hussain & Akhter, 2016; Incantalupo & Treagust, 2014; Ardies et al., 2014)

The questionnaire was designed in two forms namely: i) Google form: The google form was designed and made fit to be used in data collection exercise through a shared link between participants and the researcher of the present study. Based on the nature of the google form link, responses were received in real-time upon completion of the form. ii) printed questionnaire: the designed printed questionnaires were availed to different respondents from the two higher institutions of learning. A total of 300 paper questionnaires when disseminated among the respondents. The other 100 were shared using google form. With the help of the form limiter, the form would automatically stop accepting responses when the responses reach 100. However, a total of 258 (64.5%) questionnaires were filled and returned, of which 170 (68.9%) were filled using the offline form (printed questionnaire) and 88 (34%) were filled using the online web instrument (Google form) as demonstrated below.

Table 1: *Questionnaires return rate.*

Number of distributed questionnaires	Number of returned	Percentage
400	258	64.5%

According to Fincham, (2008), a percentage of sixty and above of filled and returned questionnaires are considered acceptable. In that case, the percentage of returned questionnaires in this study was 64.5% which made it acceptable.

3.5   Ethical considerations.

The ethical considerations stipulate the confidentiality of the participants, voluntary participation in the research. This gives participants in the research study assurance that their privacy will not be compromised. This was also elaborated by (Cacciattolo, 2015).

Before the data collection, a permission form was sent to different departments requesting the participation of their students in the study. Fortunately, all the contacted departments responded positively and an arrangement was established such that printed questionnaires would be distributed among the participants. Moreover, an online google form link was also shared with the participants such that real-time responses are attained. The data collected was treated with a high level of privacy hence the anonymity of the participants was achieved.

3.6 Data Analysis.

After the data collection exercise, it was analyzed using IBM Statistical Package for Social Sciences(SPSS) statistical software version 23 for windows. Different analysis methods were utilized in examing students' attitudes toward technology use. Descriptive analysis was performed to determine the means and standard deviation of different domains of independent and dependent variables. Mann-Whitney U test was performed to examine whether there was any difference in technology utilization in regards to gender factor. The other analysis that was performed was the Kruskal Wallis H test which was used to examine whether there was any difference in students' attitude technology utilization at the departmental level.

Chapter 4   Results

4.1   Introduction.

After performing different statistical analyses on the data. Tables and charts were prepared with corresponding interpretations basing on the different sections of the questionnaire that was deployed to the two universities.

Non-parametric inferential statistical approaches were applied in the process of analyzing the collected data from the structured questionnaire.   Based on the research questions that were specified in chapter 1, a descriptive analysis, Mann-Whitney, and Kruskal Wallis tests were used utilized in getting meaningful information from that data collected.

4.2   Demographic Responses.
Gender
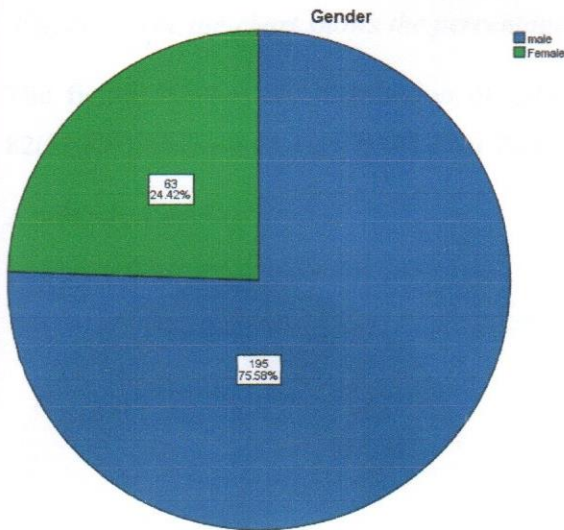
Gender	Response rate	(%)
Male	195	76
Female	63	24
Total	**258**	**100**

Figure 2: The pie-chart shows the percentage distribution of the male and female gender

The figure above represents the Gender Demographic data distribution of university students. Out of the 258 respondents, 195(76%) were males and 63(24%) were females.

Departments

Figure 3: The pie-chart shows the percentage distribution of data at the departmental level.
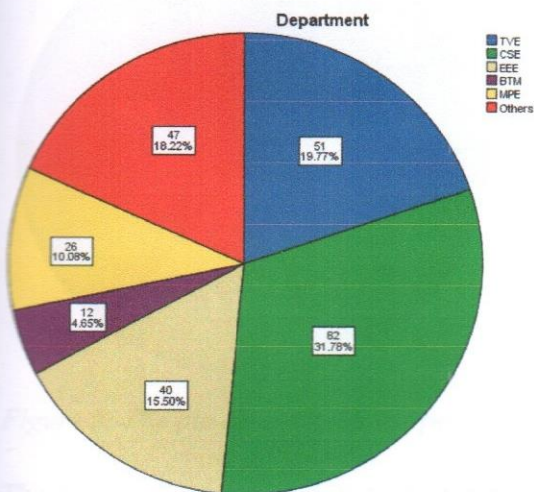
Departments	Response rate	(%)
TVE	51	20
CSE	82	32
EEE	40	15
BTM	12	5
MPE	26	10
Others	47	18
Total	**258**	**100**

The figure displays the distribution of data at the Department levels, TVE 51(19.8%), CSE 82(31.8%), EEE 40(15.5%), BTM 12(4.7%), MPE 26 (10.1%), Others 47(18.2%).

Academic Level

Figure 4: The pie-chart shows the percentage distribution of data based on the level of education.
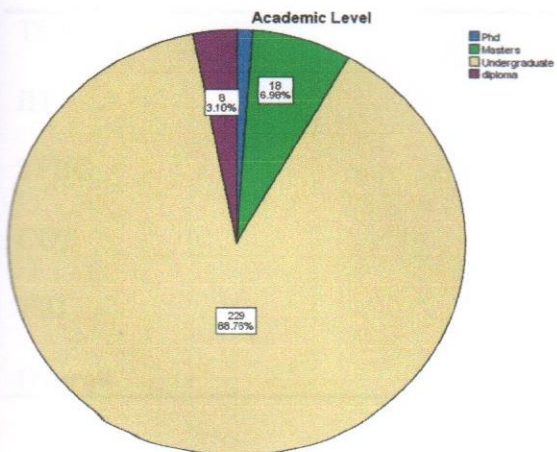
Academic Level	Response rate	(%)
Post-graduate	21	8
Under-graduate	229	89
Diploma	8	3
Total	**258**	**100**

The figure shows the distribution of data based on the academic levels of students. Post-graduate 21(8%) Undergraduate 229(89%), Diploma 8(3%)

Year of Study
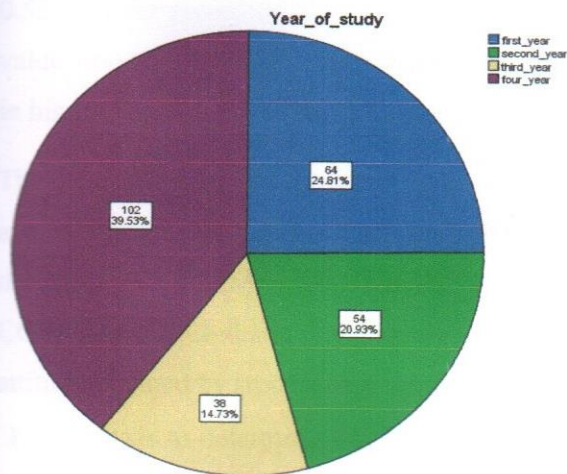
Year of study	Response rate	(%)
First	64	25
Second	54	21
Third	38	15
Fourth	102	39
Total	**258**	**100**

Figure 5: The pie-chart shows the percentage distribution of data based on the year of study.

The figure shows the distribution of data at different years of study i.e. First Year 64(24.8%), second Year 54(20.9%), Third year 38(14.7%), and Fourth-year 102(39.5%)

Analysis of whether students' attitudes towards technology affect their learning.

Table 2. *Summary statistics of different domains that affect students' attitudes towards technology.*

Domain	Number of Items	Mean	SD	Cronbach Alpha
TCA	2	4.35	0.67	.73
IIT	3	4.19	0.63	.61
TFBG	2	3.63	0.81	.64
COT	4	4.17	0.60	.76
TID	2	2.22	0.89	.64
Overall	**13**	**3.71**	**0.72**	**0.68**

After performing reliability tests on the questionnaire, it was found that it was reliable and acceptable based on the elaborations presented by (Jeanne Ross, Weill Peter & David, 2014; Ursachi et al., 2015). The different Cronbach alpha values of the different factors were presented as 0.73,0.61,0.64,0.76,0.64 corresponding to factor TCA, IIT, TFBG, COT, and TID respectively.

Factor TTT was removed due to its Cronbach alpha value obtained being lower with the value of 0.53 than the presented alpha value presented in table 2 above. This impacted the overall alpha value from 0.65 to 0.68. The overall reliability of the study was quite close to Kubiatko, (2010) in his study where he attained an overall Cronbach alpha of 0.72.

The mean and standard deviation scores of the different factors were analyzed and recorded. The average mean score greater than three (>3) indicated a positive attitudes attained by students for the factor TCA($M=4.35$, $SD=0.67$), IIT($M=4.19$,$SD=0.63$),TFBG($M=3.63$,$SD=0.81$) and COT($M=4.17$,$SD=0.60$). The average mean score of less than three (<3) indicated a negative attitude attained by students for the factor TID($M=2.22$, $SD=0.89$).

1. Analysis to determine whether any significant difference in students' attitudes in relation to the gender factor.

Table 3. *Summary of descriptive statistics of the Mann-Whitney test.*

Factor	Gender	Mean Rank	Sum of Ranks
TCA	Male	131.87	25714.00
	Female	122.17	7697.00
IIT	Male	127.65	24891.50
	Female	135.23	8519.50
TFBG	Male	136.83	26681.50
	Female	106.82	6729.50
COT	Male	132.49	25836.50
	Female	120.23	7574.50
TID	Male	133.25	25984.00
	Female	117.89	7427.00

Table 4. *Summary statistics for the Mann-Whitney test.*

Factor	Man-Whitney U	Wilcoxon W	Z	p
TCA	5681.00	7697.00	0-.936	0.35
IIT	5781.50	24891.50	0-.714	0.47
TFBG	4713.50	6729.500	-2.839	0.005*
COT	5558.500	7574.500	-1.145	0.252
TID	5411.00	7427.00	-1.445	0.149

* Significant at p< .05

Mann-Whitney U test was used to examine whether there was any difference in students' attitude towards technology with respect to gender as a single factor. After the analysis, results prove that there was a significant gender difference based on the TFBG factor with a probability value of $p < .05$. The results from the analysis for the TFBG factor were $4713.50(z = -2.839, p = 0.005)$ as shown in table 4 above. This is due to the fact that factor TFBG specifies the pragmatic nature and experience of gender in using technology for learning and solving different educational related tasks. However, it was noticed that male students demonstrated a higher positive attitude towards technology on the TFBG factor compared to their female colleagues. The differences were witnessed in the mean ranks where male students attained a mean rank of 136.83 and female students attained 106.82 as illustrated in table 3. This indicates that gender will have an effect on technology use when specific gender factors are considered.

On the other hand, results reported from the other factors show that there was no significant difference between male and female students in technology utilization in their learning process based on the evidence presented in table 4 above. The results obtained for those factors are TCA: 5681.00 ($z = -.936$, p=.349), IIT: 5781.50($z = -.714$, p=.475), COT: 5558.50($z = -1.145$, p =.252) and TID: 5411.00 ($z = -1.445$, p=.149). The probability values of the listed factors in the previous statements were $p <.05$. This implies that the factor TCA, IIT, COT, and TID do not affect gender in the course of applying technology in their learning at different higher educational institutions.

3. Statistical analysis to examine whether there is any difference in students' attitudes towards technology utilization at the departmental level.

Table 5. *Summary statistics data for the Kruskal Wallis H test.*

| Factor | Mean Ranks by groups | | | | | | ANOVA | |
	TVE	CSE	EEE	BTM	MPE	Others	H	p
TCA	141.18	146.10	126.13	142.42	106.40	100.21	16.888	.005*
IIT	133.99	135.36	115.66	100.79	142.98	126.05	4.974	.419
TFBG	137.86	137.48	133.84	128.13	129.48	103.17	7.922	.161
COT	150.72	133.68	112.30	111.17	124.33	121.37	8.058	.153
TID	146.39	114.74	128.49	127.08	144.54	130.07	7.133	.211

* Significant at p <.05

Kruskal Wallis test was used to examine whether there was any difference in students' attitudes towards technology application at the departmental level. After the analysis, results proved that there was no significant difference in technology utilization across departments as shown in table 5 above. The results from the analysis for all the factors are IIT: $X^2((5) = 4.974, p=.419)$, TFBG: $X^2((5) = 7.922, p=.161)$, COT: $X^2((5) = 8.058, p=.153)$ and TID: $X^2((5) = 7.133, p=.211)$.

The probability values for all factors elaborated above were greater than 0.05 ($p >.05$). The results showed that departments do not affect students' attitudes towards the use of technology in their journey of securing new knowledge based on the factors illustrated.

However, for the factor, TCA, a significant difference was recorded in students' attitudes towards technology across the department with a statistical test value of $X^2((5) = 16.888, p= .005)$ as shown in table 5. This explains that students from different departments have various opinions about technology career aspirations.

Chapter 5   Findings

5.1   Discussions

The current study focused on students' attitudes towards technology in their learning process at higher institutions of learning in Bangladesh.

RQ1. Does attitude towards technology affect students' learning process?

After performing a descriptive analysis of the data, the results showed that most of the factors of attitudes towards technology contributed optimistically to a high level of students' attitudes towards technology. This demonstrated students' enthusiasm in using technology in executing different tasks as they continued on their journey of learning. Furthermore, this has created a learning paradigm that advocates for a student-centered way of learning hence promoting creativity and improving student's academic performance. Additionally, a study by Al-Zahrani, (2015) showed that flipped classroom technology boosted students' creativity in the learning process. This builds confidence and experience in students' way of interacting with the technical devices used for learning purposes. Similar results were obtained by Andrew et al., (2018a) in the study where authors analyzed students' attitude towards technology and their preferences for learning tools at two universities. The results from their study proved that students had positive attitudes towards technology deployment and also viewed technology as a very vital tool in their learning. This gives a clear manifestation that students' technology utilization for learning is attached to having a clear mind that looks at technology more positively. This may be attributed to rapid developments in technologies and also academic institutions embracing technology in their educational structures.

However, a study by Incantalupo et al., (2014) revealed contradicting findings on the scale of attitude towards technology demonstrating that although students had positive perception and knowledge towards technology towards, they had negative attitudes towards technology. This implies that students did not welcome the notion of using technology for learning purposes though they can use it for other activities like chatting, playing music, etc.

The results from this current study confirm that the more students get exposed to different technology in a learning environment, the higher the chances of developing their attitudes towards

those technologies more positively and hence having an environment of technologically sound and oriented learners.

RQ2. Is there any difference in using technology in relation to the gender factor?

After performing analysis on the data, the results proved that there was a significant gender difference based on the TFBG factor as illustrated in table 4 in the result section. The verdicts provided evidence that male students had a more favorable attitude towards technology use than their fellow female counterparts when a closer inspection was taken. The fact the results showed a significant difference on the factor TFBG, explains how experienced students are based on their gender in using technology to learn and solve academic-related problems in an education setting. This can be attributed to having low self-esteem of female students in regards to technology utilization in learning. Furthermore, the pragmatic nature of male students with technological devices through playing computer games and other computer-related activities creates the differences recorded in an educational environment. Similar results were presented by Cai et al., (2017a) in the study where they examined gender and attitudes towards technology use and a higher optimistic attitude towards technology in favor of male students.

On the other hand, results from other factors like TCA, IIT, COT, and TID show that there was no significant difference between the male and female students in regards to the use of technology in their learning. This can be connected to the significant roles played by the high institutions of learning in promoting gender equality in the angle of technology education programs for students.

Furthermore, having well-structured policies that empower students to make use of the provided technology facilities in different learning environments regardless of their gender. This creates a healthy environment where no gender feels marginalized when technology application is put to test in the process of knowledge acquisition. Al-Emran et al., (2016) reported similar results in a study where they investigated students' attitudes towards the use of mobile learning in higher education. Moreover, Bain & Rice, (2006) also narrated parallel results in their study where they analyzed the influence of gender attitude, perception, and use of technology. However, Ardies, Maeyer, et al., (2015) scrutinized different sub-domains of attitude towards technology and results revealed significant differences in the sub-domain of career aspiration and interest in technology with a positive attitude of students who enrolled in programs that involve technology curriculum and those who enrolled in non-technologized programs.

In regards to the results attained in this study across different factors of attitudes towards technology, it clearly shows that gender had some minimal effects on students' attitudes towards technology application in learning.

RQ3. Is there any difference in students' attitudes towards technology utilization at the department level?

After analyzing the data, results from the present study show that there was no significant difference in students' attitudes towards technology utilization at the department level across all the factors of attitudes towards technology except for factor TCA. This can be linked to having well-equipped technological facilities provided and equally distributed by different institutions of higher learning across different departments. Moreover, having instructors who have vast background knowledge in delivering course content to learners using different forms of technology contributes heavily to a uniform positive attitude with no technological differences in attitude towards technology across different departments. Similar results were confirmed by Georgina & Olson, (2008) in the study that explored the integration of technology in higher education with the review of faculty self-perceptions. In their study, results showed that faculty members with technology skills strongly correlated with pedagogy. With that said, the integration of technology in teaching and learning is simplified hence creating an interactive learning environment that is engineered with technology. Additionally, Uzunboylu et al., (2015) also noted similar results where no meaningful difference was achieved between departments in terms of students' attitudes towards using mobile technologies in learning the English language.

Nevertheless, previous studies, for example, Hussain & Akhter, (2016) reported refuting results where significant differences were witnessed across all the departments with different technologies used in the implementation of teaching and learning i.e. Civil, Electrical and Mechanical technologies on the attitude scale and its sub-domains. Moreover, Adalier, (2012) reported contracting results as significant differences were noted between Turkish and English Language departments. Additionally, Tuncer, Doğan, & Tanaş, (2013) also recorded opposing results among the department of computer technologies, department of child Development, Electricity and Energy, Accounting and Tax practices, Fashion and Design, and Hair Care and Beauty services.

For the factor TCA, some significant differences were recorded in regards to students' attitudes towards technology utilization at the department level. This explains that not all students from the different departments have the prospects of having careers that are technology orientated. This can

be attributed to the fact that students feel that careers that are technologically engineered cause a lot of anxiety and stress due to having different organizations using different technologies in executing day to day work.

Basing on the evidence presented, departments have no significant effect on students' attitudes towards the use of technology in their learning process.

5.2   Implications.

The findings of the current study attested that students demonstrated a positive attitude towards technology utilization in their learning. This creates opportunities for different key players in the education system to restructure and look at different ways of providing the best educations keeping in mind the driving force of cutting-edge technology developed for educational purposes.

The results from the study provide a solid foundation for higher educational institutions to embark on the journey of establishing a learning environment that allows both physical and online classes for their students in different parts of the world. This can be achieved through designing a magnificent curriculum, policies that are favorable for both on-campus and long-distance students hence creating an environment that is multicultural therefore a pool of knowledge and experiences can be shared in the long process.

Students' positive attitudes towards technology facilitate learning with more ease since most of the learning materials, assignments, and other learning activities that fall in the same category can be accessed online at any time and place without any physical hindrances. This builds creativity, confidence, and enjoyment in students thus their academic performances may be impacted positively.

With the favorable attitude attained by students, future careers in the field of technology can be guaranteed since different positions in different organizations will be filled up by skilled graduates thus serving and developing their communities. The force behind it is the adequate knowledge and skill acquired during the academic journey that has reduced their anxiety and shaped their way into the world controlled by the computing power of machines.

5.3 Limitations.

Throughout this study, a few limitations were recorded in the process of building up and having a complete piece of work. With regards to the sample of 258 from two universities participated fully in the study. Based on that, the data collected from the two universities could not give a clear representation of the whole of Bangladesh given the number of universities in the country. Having noted that results could not be generalized. However, in a study by ALDUWAIREJ, (2014) the sample size that was involved in the study was much smaller than the current study.

Furthermore, from this study, the concept of behavior aspects was not considered. These aspects are found in the Technology Acceptance Model (TAM) and Theory of reasoned action(TRA). Including behavior aspects in the instrument may have improved the quality of outcomes.

However, teachers' attitudes also play a significant role in understanding more about students' attitude towards the use of technology in learning. To address such a concern, there is a need for a comparative study of both the students' and teachers' attitude towards the use of technology in teaching and learning in the context of higher educational institutions in Bangladesh with bigger sample size. Additionally, there should also be a study to tackle students' attitude towards technology application in regards to different OIC member state countries.

Although many studies were carried out without doing triangulation, in order to increase the credibility of the research findings of future studies, the implementation of triangulation shall be treated with great priority.

5.4 Conclusion.

This study aimed at examining students' attitudes towards the use of technology in the learning process within the context of higher institutions of learning in Bangladesh. The finding and discussion segment of this study demonstrate the results of this research and from those results, some of the following conclusions were extracted. Firstly, students demonstrated positive attitudes towards the use of technology in their learning. This promotes the integration of technology in the teaching and learning process. Secondly, in regards to the TFBG factor, gender differences were witnessed between the male and female students in utilizing technology for different areas in the learning process. However, for the other factors like TCA, IIT, COT, and TID, there was no significant difference among male and female students. Since the world is going digital, educational institutions need to continually modify their curriculum to be engineered towards

digitalizing education. Lastly, departments contribute positively to students' attitude towards technology in their learning process.

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Appendix A: A Modified PATT From (Ardies et al., 2013).

Survey Questionnaire.

Attitude towards technology Questionnaire.

I am Ibrahim …, a second-year student pursuing Masters in Technical education (M.Sc.T.E. with specialization in Computer Science and Engineering) at the Islamic University of Technology, a subsidiary organ of the Organization of Islamic Cooperation (OIC).

As part of my M.Sc. T.E thesis requirement, I therefore humbly request you to be one of the participants in this study titled: **"Students Attitude towards Technology in the Learning Process: A Case of Higher Institutions of Learning in Bangladesh."**

Any information you give here will be kept **confidential** and please note that your honest response and contribution will highly contribute positively towards the success of this study.

Terminologies

Attitude towards technology: This refers to the individual's positive or negative feelings towards the use of technology.

Technology: This can be either hardware or software like laptops, smartphones, kindles, learning management systems, google classroom, office packages, etc. that are involved in the students learning process.

A: DEMOGRAPHIC DATA

(please check (√) in the space provided)

1. **Gender**

   Male ☐   Female ☐

2. **Academic level**

   PhD ☐   Masters ☐   Undergraduate ☐   Diploma ☐

3. **Department**

   TVE ☐   CSE ☐   EEE ☐   BTM ☐   MCE ☐   CEE ☐

   Others --

4. **Year of Study**

   First Year ☐   Second Year ☐   Third Year ☐   Fourth Year ☐

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B: ATTITUDE TOWARDS TECHNOLOGY SCALE

Please rate the degree to which you agree or disagree with each of the following statements related to attitude towards technology by checking (√) in the spaces provided:

[1] Strongly Disagree (SD) [2] Disagree (d) [3] Neutral (N) [4] Agree (A) [5] Strongly Agree (SA)

No	Section 1: Technology Career Aspiration	SD	D	N	A	SA
1.	I would like a job in the future that utilizes technology.					
2.	Working with technology would be interesting.					

No.	Section 2: Interest in Technology.	SD	D	N	A	SA
1.	Technology is important in my learning process.					
2.	There should be more class lessons related to technology usage.					
3.	Learning technology has helped me in solving and understanding complex problems.					

No.	Section 3: Technology for both genders.	SD	D	N	A	SA
1	I know more about the different technologies that are used in learning process.					
2	Am capable of doing given tasks that involves technology in my learning process.					

No.	Section 4: Consequences of Technology.	SD	D	N	A	SA
1	Technology makes learning easier.					
2	I learn better with technology					
3	Technology has contributed significantly to my performance in class					
4	I am more motivated to learn, thanks to technology					

No.	Section 5. Tediousness towards technology	SD	D	N	A	SA
1	Technology is boring when used in learning process.					
2	Only students who have technological hobbies are more capable of using it in the learning process.					
3	Most technologies that are used in learning are not interactive.					

No	Section 6: Technology is Difficult.	SD	D	N	A	SA
1.	Only talented students use technology in their study.					
2.	I find difficulties in using technology in my classes(learning).					

Appendix B: Items from (Ardies et al., 2013)

Factor	Items – *to be measured on a 5 point Likert-scale*
Technological career aspirations	17. I will probably choose a job in technology 39. I would enjoy a job in technology 45. I would like a career in technology later on 63. Working in technology would be interesting
Interest in technology	27. Technology lessons are important 32. I would rather not have technology lessons at school 34. If there was a school club about technology I would certainly join it 46. I am not interested in technology 50. There should be more education about technology 52. I enjoy repairing things at home
Tediousness towards technology	33. I do not understand why anyone would want a job in technology 57. Most jobs in technology are boring 58. I think machines are boring 64. A technological hobby is boring
Technology is for both, Boys and Girls	30. Boys are able to do practical things better than girls 41. Boys know more about technology than girls do this 47. Boys are more capable of doing technological jobs than girls
Consequences of technology	20. Technology makes everything work better 25. Technology is very important in life 27. Technology lessons are important 31. Everyone needs technology
Technology is Difficult	21. You have to be smart to study technology 26. Technology is only for smart people 43. To study technology you have to be talented 49. You can study technology only when you are good at both mathematics and science