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Assessing the Utilization of Educational Technology Materials in Nigeria and Uganda Educational Systems

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Abstract
Recent educational reforms in developing countries show conscious efforts to completely restructure the education system in response to Covid-19. This research studied the use of modern educational technology tool in the tertiary education sector, Nigerian and Ugandan educational systems. Students from public and private universities were chosen at random to fill out questionnaires and provide data in order to achieve consistent results. SAS Statistics was applied to the collected data, and the results were presented graphically. T-test and ANOVA were employed in the analysis, to check the importance of the differences between hypotheses. The findings revealed that students have the necessary prerequisites for online learning, and institutions should raise parental awareness of the benefits and application of technology to facilitate learning, as well as improve the school's access to technological tools for educational purposes. Educational institutions should increase budgetary allocations for the acquisition of new technological learning aids. Students are eager to move away from traditional face-to-face instruction and toward technology-driven learning, so educational institutions should continue to use online learning tools for technological advancement while also investigating new tools. It was further noted that most students are unfamiliar with e-learning platform such as learning management system and virtual management system, and educational institutions must engage students in these technologically driven learning tools. Teenagers can benefit from modern technology to help them learn and understand their schoolwork and modern teaching methods, when used effectively, increase students' opportunities for exploration and communication.
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1.0 Introduction

Over the past four and a half decades, the Ministry of Education has undergone numerous organizational and operational reforms, including the adoption of new instructional framework goals. Structure, educational modules, reading material evaluation, course preparations, instructive foundation, school association, custom curriculum, training field, continuous assessment and project enhancement, and financial investment in training have all undergone modifications (Clark et al., 2009).

Due to recent technological advancements, the identified alterations in traditional education have proven to be extensive and moderately disruptive (Bar-Yam, et al. 2002). It is crucial to address the methods required to facilitate the process of fostering continuous inventions in the educational system. Despite the fact that the initial role of technology was contingent on how the materials assisted the educator in enhancing the instructional process and advancing the facilitators' experiences, its accomplishment was contingent on the educator's belief in the value of sensible utilization. While teachers have access to a variety of new tools for in-class instruction and inspiration (Eady & Lockyer, 2013; Laurillard, 2002; Tam, 2000), there is a lack of adequate training on how to use the tools and technology effectively.

Tsay et al. (2018) looked into how undergraduate year 2 lecturers used gamification websites to improve student-based assessment and professional development. The gamified course improved learners' participation in online learning as well as after-class performance and the gaming course can test any class

and is appropriate for part-time workers and female learners. Uerz et al. (2018) looked into how teachers get ready for technology classes. Four abilities that were identified are technical outcomes, teaching abilities, teaching in teaching and learning, and professional education credentials". There is a paucity of scholarly investigation on the skills needed by trainers of educators, with the majority of literature focusing on teachers' pedagogical abilities. The results show that student communication complexity has an impact on independent learning and academic success. Waqar (2013) evaluated how teachers affected the dissemination of knowledge in Third-World courses with little access to technology. Technology limitations made research into integrated technology design necessary for knowledge transfer. Teachers were also excited about using apps and mobile learning and they strongly supported its use (57%), and were very likely to advocate for it (40.5%), but they were reluctant to put it into practice due with a variant of 31.9%. According to Dina et al. (2016), technology improves education and the flexible nature of the curriculum can foster intellectual development in students.

According to Karemaker et al. (2017), "word reference" children developed more than "companion" children. The comprehension of the "word reference" group exceeds that of the "electronic companion" group and the development of classroom technology is being driven by social, societal, and pedagogical requirements. According to Nobles and Paganucci (2015), students believe that the use of digital devices, "pen and paper, and an online environment that encourages writing skills" improves their writing. This leads to programs since schools are mandated to provide children with digital devices and expand online opportunities to improve writing skills. Also, Jaycox et al. (2018) evaluated online first-year WPA writing objectives and students believe that by using the internet as their "primary communication medium and having more time to reflect online", their skills will expand beyond the four WPA domains. According to the findings, course evaluation is enhanced by suggested feedback and relevant study materials.

Makki et al. (2018) examined third-order obstacles in urban fourth- and fifth-grade classrooms, such as inadequate or excessive computing resources and investigated computer literacy educators, computer attitudes, and program content (second-order barriers)". The most reliable indicator of computer adaptation is maximum computer convenience and the research indicates that third-order obstructions can assist educators in overcoming obstacles. Irfan and Noor (2012) surveyed high school students in Malaysia regarding their IT usage and obstacles. According to the survey, information technology is concerned with basic situations and online applications for information access and restricted disclosure; sophisticated IT programs have the lowest communication and comprehension skills. Men and women have little impact on IT students, as argued in the study but there exists substantial differences between rural and urban schools in terms of IT. Indeed, Bearss et al. (2015) examined the writing of elementary school students, workplace readiness, and computer technology in order to assess and comment on classroom writing. The proficiency of students in using computerized writing "assessment technology as a teaching aid for writing development" was evaluated. Over ninety-five percent of students found the tool helpful, indicating that computer-based editorial technology can be utilized as a curriculum guide. Pérez-Torregrosa et al. (2017) examined the utilization of software advertisements in the training of educators and the findings indicate that despite adequate training, educators are hesitant to use ICT.

Uerz et al. (2018) examined preschool and elementary school teachers' IT classroom ideas and these have aided in the analysis of educator attitudes and teaching demands in IT to enhance training by modifying curriculum and tailoring instruction to university students. It is possible that the implementation of technology in contemporary educational institutions, particularly foreign language instruction, is highly efficient. Sona (2015) designed a training program to aid rural Armenian schools, as part of the initiative to inform and encourage Yerevan State University's Ijevan branch's foreign language specialists to use technology with educational potential, professional training programs were intended and realized. Education and learning processes in higher education have been altered by the introduction of IT and changing teaching methods are increasing students' capabilities and power, making education technology more important than ever. At Oman University, Al-Senaidi et al. (2009) examined IT challenges and the investigation uncovered five factors including absence of equipment, absence of institutional support, lack of IT, lack of confidence, and lack of time and barriers that prime ministers encountered when integrating technology into their classroom instruction were minimal.

Maat and Rosli (2011) examined the utilization of the institution's website in the Sultanate of Oman and uncovered employment issues. The primary findings revealed that the institutional website is used in school's administration, and that there are no statistically significant deviations between the average sample estimates and the actual axis at the 0.05 level (0.05). The school implemented an e-learning platform due to "gender, managerial experience, and scientific" proficiency. The paper recommended increasing internet speed in schools, providing trained technicians to maintain electronic devices, and equipping each school administration with a computer to access the electronic educational portal. According to Postman (1993), "technology is an ideology"; it is naive and simplistic to believe that technology is neutral or a friend of

culture in this day and age. Students frequently complain about power station violations, malfunctioning projectors or software, and limited access to instructional tools. Non-instructors believe that the use of technical equipment in the classroom excludes training, benefits for completing the training, a lengthy period of time to master "new hardware technology, and poor distribution of hardware technology among educators".

This study examines how schools, students, and parents accept technological innovation and incorporate technology tools into reliable educational processes in order to better understand how schools and students view the use of technological tools in higher education, case study of Nigerian and Ugandan educational systems.

2.0 Methodology

The Student Technology Survey (STS) was used to collect information regarding the perceptions of schools, students, and parents regarding the availability of adequate technological tools for instruction, online teaching tools, online teaching methodologies, and online assessment tools. Google Forms was used to construct and administer the survey. The Technology Questionnaire investigated how schools and students used technology in the classroom. It also asked about the availability of sufficient technological tools for instruction in schools, student familiarity with online teaching tools and methods, and the use of sufficient technological tools for assessment in schools. This study analyzes both public and private tertiary institutions. Respondents were selected from public and private universities in Uganda and Nigeria to complete the Google form-based online questionnaire. The data was utilized to provide information, in order to achieve set objectives.

This study aimed to determine students' acceptance and desire for using modern technological tools in the classroom, as well as their satisfaction with the tools' accessibility. The purpose of this investigation was to determine how well schools and students adopt and interact with modern technological tools in the classroom. The respondent's demographics, level of satisfaction with the current educational assessment tool, and reaction to the available technological tools were estimated.

Google Forms was used to administer the questionnaires, and the responses were recorded. Responses to the queries were submitted via online submission. The queries were developed using a Likert scale questionnaire format, SAS Statistics was applied to the collected data, and the results were presented graphically. T-test and ANOVA were used in the analysis to determine the significance of hypotheses.

2.1. Data analysis

The investigation employed two distinct types of analysis, independent sample t-tests and analysis of variance. Analysis of Variance (ANOVA) is used to investigate differences between groups in a sample by employing a collection of associated estimate procedures. ANOVA was used to evaluate the differences in responses from respondents. The T-test was used to examine the relationship between respondents' responses. Independent sample t-tests were used to evaluate the difference between two independent samples and to compare two independent means to determine whether statistical evidence supports the existence of a significant difference between the hypotheses.

2.2 Hypotheses for the Study

This investigation was guided by three hypotheses,
Hypothesis (i)
Ho (null hypothesis): - The school's availability of adequate technological tools for instruction is insignificant.
Hi (alternatives hypothesis): - The school's availability of adequate technological tools for instruction is significant.
Hypothesis (ii)
Ho (null hypothesis):- The school's familiarity with online teaching tools is insignificant?
Hi (alternatives hypothesis):- The school's familiarity with online teaching tools is significant?
Hypothesis (iii)
Ho (null hypothesis):- The school's familiarity with online teaching methods is insignificant
Hi (alternatives hypothesis):- The familiarity with the online teaching method in the school is significant?
The Analysis of Variance (ANOVA) and t-test are utilized to demonstrate and comprehend how respondents' perceptions varied.

2.3 Overview of t-test

The t-test is applied to hypotheses when the standard deviation of the population is unknown. The t-test compares the means of two groups and determines if a process impacts both samples and whether the groups are distinct. In t-test equations, null and alternative hypotheses are compared to standard values. The comparison either rejects or accepts the null hypothesis. The formula for calculating the t-value is given in equation (1)

$$t = \frac{\bar{x} + \mu}{\frac{\sigma^2}{\sqrt{n}}} \quad (1)$$

where n represents the number of occurrences, .$\bar{x}$ represents the sample mean σ represents the standard deviation, and, μ represents the assumed mean. The formula for calculating the T-test for the difference in means is given in Equation (2) (Kothari, 1990).

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(n_1-1)\sigma_1^2 + (n_2-1)\sigma_2^2}{n_1+n_2-2} \times \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}} \quad (2)$$

where n_1 and n_2 represent the number of occurrences in two samples.σ_1 and $\sigma_2$represent the standard deviations of two samples, and $\bar{x}_1$ and $\bar{x}_2$ represent the means of two samples,

2.4. ANOVA Test Overview

The two subcategories of analysis of variance are one-way analysis of variance (ANOVA) and two-way analysis of variance (ANOVA). The One-Way ANOVA is used to compare the means of three or more groups, when a single independent variable covers three or more categories. The One-Way ANOVA analyzes if the three groups differ on a dependent variable, with just one factor included, and the results are summarized in Table 1.0.

Table 1.0 One–way ANOVA Table:

Source of variation	**Sum of Squares (SS)**	**Degree of freedom (d.f.)**	**Mean Square (MS)**	**F-ratio**
Between Samples	SSC	v_1=(k-1)	$MSE = \frac{SSE}{n-1}$	$\frac{MS\ between}{MS\ within}$
Within Samples	SSE	v_2= (n-1)	$MSC = \frac{SSC}{k-1}$	
Total	SST	(n-1)		

Where: SST represents the total sum of squares of variances; SSC represents the sum of squares between samples (columns).SSE represents the sum of squares within samples (rows); MSC represents the mean sum of squares between samples. MSE represents the mean sum of squares within samples. The two-way ANOVA test is used, when data is classified according to two factors, and Table 2 shows the analysis of variance for a two-way ANOVA.

Table 2.0 Two-Way Analysis of Variance

Source of Variation	**Sum of Squares**	**Degree of freedom**	**Mean sum of Squares**	**Ratio of F**
Between Samples	SSC	(c-1)	$MSC = \frac{SSC}{(c-1)}$	$\frac{MSC}{MSE}$
Between Rows	SSR	(r-1)	$MSR = \frac{SSR}{(r-1)}$	$\frac{MSR}{MSE}$
Residual or Error	SSE	(c-1)(r-1)	$MSE = \frac{SSE}{(r-1)(c-1)}$	
Total	SST	(n-1)		

Where SST denotes the total sum of squares; SSC denotes the sum of squares between columns; SSE denotes the sum of squares due to error and SSR denotes the sum of squares between rows. c represents the number of columns, r represents the number of rows and the number of degrees of freedom among columns is (c-1), number of degrees of freedom between rows is (r-1). The findings are illustrated by different profiles and tables, as shown in section 3.0.

3.0 Results and Discussions

The information collected via questionnaires was analyzed and presented using Tables and Figures. This section is divided into three subsections: personal information, the use of educational technological tools, and instructional strategies and classroom materials. To confirm the significance of the findings' hypotheses,

ANOVA and t-test analyses are performed. The questions were completed by 117 respondents from public and private tertiary institutions in Uganda and Nigeria using Google forms. Students' responses were monitored to ensure that they had answered all of the questions.

3.1. Descriptive statistics of students

A student technology survey is a research-based instrument for determining the technological knowledge and attitudes of students. Figures 1 and 2 depict the demographic characteristics of the participating students, revealing that the majority of them were males (63.55%), while girls made up 36.5% of the total (Fig. 1.0). The majority of participants hold bachelor's degrees (82 percent), followed by master's degree holders (9.5 percent) and non-degree holders (8.5%) as shown in Fig. 2.0

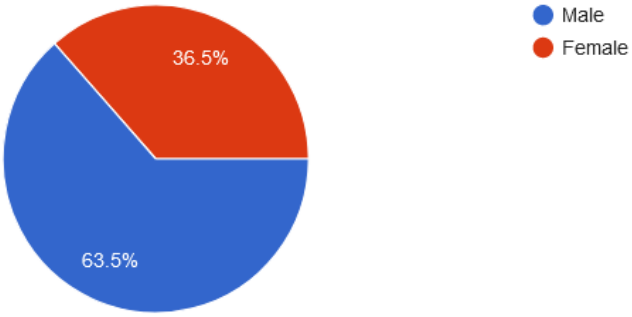

Fig. 1. Sex of the respondents

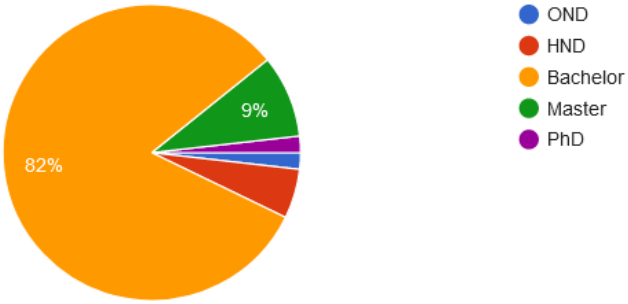

Fig. 2: Highest Qualification of the respondents

Figure 3 illustrates past online learning experience. 69.2% of respondents reported prior experience with online learning, while 30.8% reported no prior experience. Given that 69.2% of respondents have prior experience with online learning, it is reasonable to infer that majority of the respondents possess the necessary prerequisites for online learning, supported by Nobbles and Paganucci (2005)

3.2. Adjusting to learning through online platforms

Figure 4 depicts students who require assistance in making the transition to online learning. 75.2 percent of respondents indicated that help is needed to adjust to online learning, while 24.8 percent indicated that help is unnecessary. 75.2% of respondents need help adjusting to online learning, indicating that institutions must provide adequate technological support for students to succeed with online instruction.

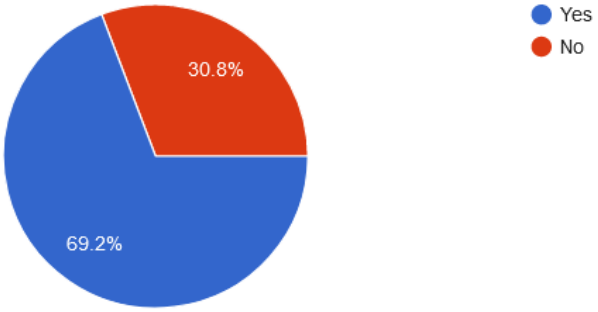

Fig. 3: Previous experience with education obtained online

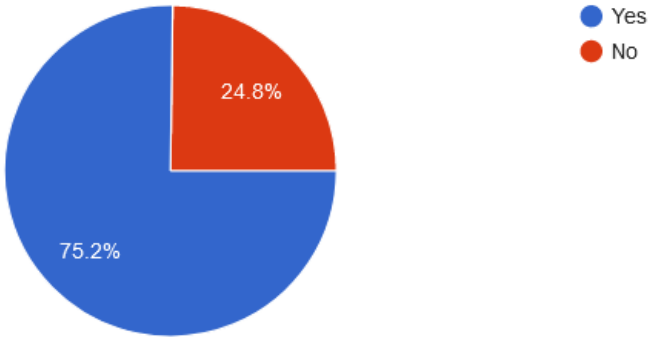

Fig. 4: Aid with the adaptation of online learning

Figure 5 depicts parent's attitude toward encouraging their children to use technology for schoolwork. Figure 5 shows that 9 percent of males and 10% of females strongly agree, and 39 percent of males and 21% of females agree that parents encourage children to use educational technological tool to solve problems at home and enhance the use of technology in the classroom. It indicates that 48% of male parents and 31% of female parents accept the use of technological tools for learning, whereas 11% of male parents and 3% of female parents do not encourage or support their children's use of technology at home or in the classroom. As a result, the vast majority of parents (79%) encourage their children to use technology to solve problems at home and support the use of technological tools in the classroom, and educational institutions should raise parental awareness of the benefits and applications of technology to facilitate learning.

The findings from Figure 5 were further examined using the t-test to test the null hypothesis that the responses of male and female parents who encourage their children to use technology to solve problems at home are not statistically significant and the alternative hypothesis that the responses of male and female parents who encourage their children to use technology to solve problems at home are statistically significant. Table 3 displays the findings of the t-test performed on the two samples under the assumption that there are unequal variances and that parents promote their children to use technology as a tool for problem-solving.

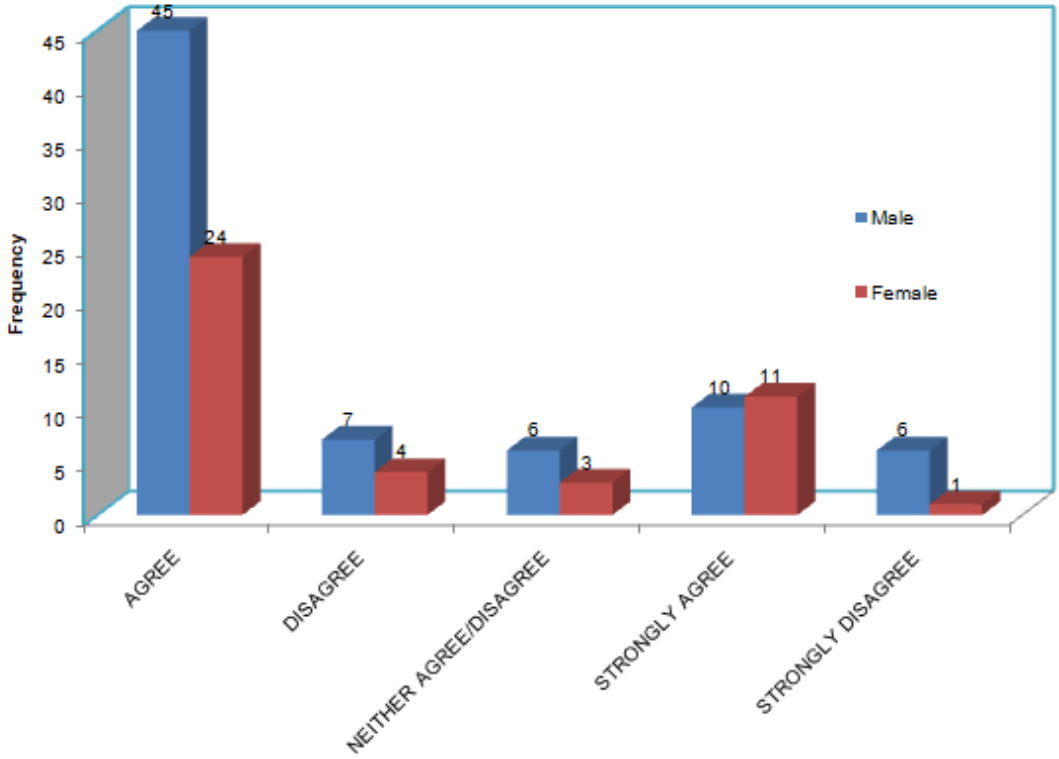

Figure 5: Parent encourages children to use technology for school work

Table 3.0 shows that the predicted value of t Stat is 1.054092553 less than the standard table value, and t-Stat (1.054092553) is less than t Critical one-tail (2.131846782) and two-tail (2.776445105). The probability, p-values for these terms are greater than 0.05 at the 5% significance level, implying that Ho is accepted and H1 is rejected, implying that the difference in respondent means of parent encourages children to use technology to solve problems at home is statistically insignificant. It shows that many respondents strongly agree or agree that their parents encourage their children to use technology to solve problems at home, and that schools should continue to support the use of technology in the classroom.

3.3 The accessibility to technological learning tools

Figure 6 depicts the respondent's opinion that the school gives adequate access to technology learning equipment. Figure 6 shows that 5% (6) of HND students, 86% (100) of Bachelor students, and 9% (10) of master's students participated in the survey, implying that Bachelor students were the primary decision-makers in this study. The figure also indicates that HND, Bachelor's, and Master's students have adequate access to technological tools for educational purposes within the institution. 8 percent of Bachelor respondents strongly agree and 30 percent of Bachelor respondents agree that there is sufficient access to technological tools for educational purposes within the school, while 10 percent of Bachelor respondents strongly disagree and 22 percent of Bachelor respondents disagree. It suggests that the school's access to technological tools for educational purposes should be enhanced. Therefore, institutions should increase budgetary allocations for the acquisition of additional technological learning aids.

Table 3: t-Test: Two-Sample Assuming Unequal Variances for Parent encourages children to use technology to solve problem

	45	*24*
Mean	7.25	4.75
Variance	3.583333333	18.91666667
Observations	4	4
Hypothesized Mean Difference	0	
df	4	
t Stat	1.054092553	
P(T<=t) one-tail	0.175650502	
t Critical one-tail	2.131846782	
P(T<=t) two-tail	0.351301003	
t Critical two-tail	2.776445105	

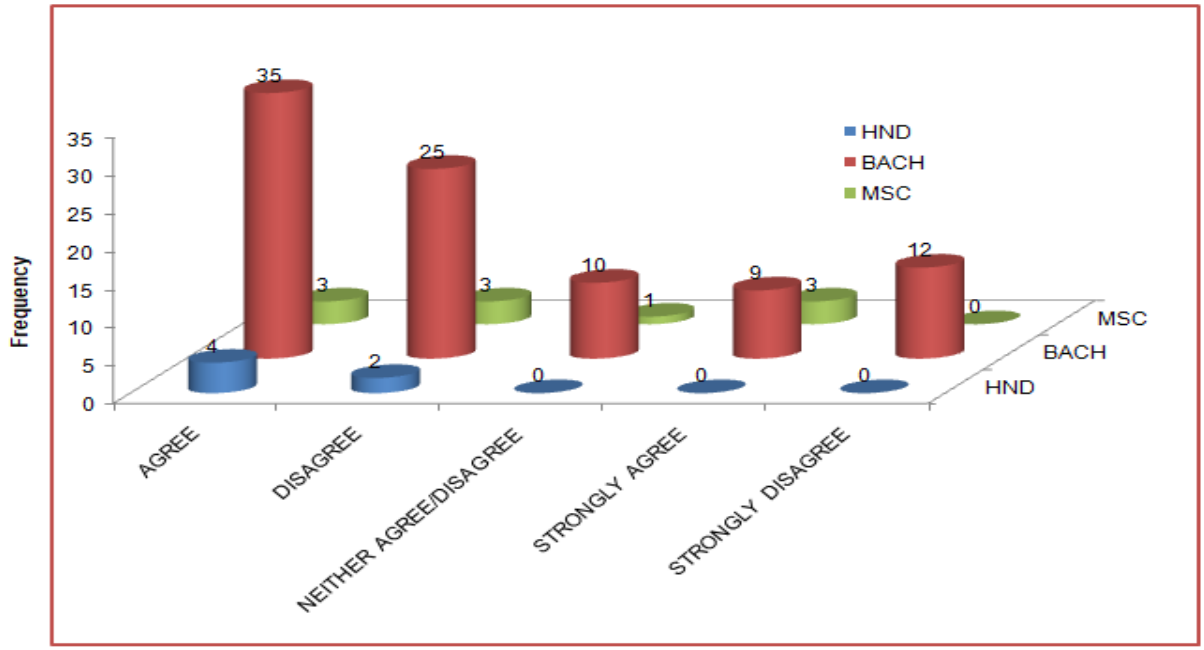

Figure 6: The school provides adequate access to technological tools for learning

Figure 7 is a component bar chart that displays the rate of students' computer skills. According to Figure 7, 42% (49) of male students and 22% (26) of female students who took the survey have average computer skills, with 5% (6) of male students and 3% (4) of female students having excellent computer skills. It implies that the majority of students (72%) have average or higher computer skills. It implies that the students are willing to use technological tools for educational purposes and as a result, educational institutions should continue to make learning more desirable to students by utilizing technological learning aids, supported by Bearss *et al*.(2015)

The results of Figure 7 were further investigated using the t-test in order to test the null hypothesis that there is no statistical significance between the responses of male and female students regarding the rate of students' computer skills and the alternative hypothesis that there is statistical significance between the responses of male and female students regarding the rate of students' computer skills. The results of the t-test conducted on the two samples under the presumption that there are unequal variances in the rate of students' computer proficiency are shown in Table 4.

Table 4.0 demonstrates that the calculated value of t Stat is 0.2 less than the standard table value and that t-Stat (0.2) is less than t Critical one-tail (2.131846782) and two-tail (2.776445105). The probability, p-values for these terms are greater than 0.05 at a significance level of 5%, indicating that Ho is accepted and H1 is rejected, indicating that the difference between the respondent means of male and female students regarding the rate of computer skills is not statistically significant. It demonstrates that the majority of respondents have average or above-average computer skills and it implies that students are eager to use technological tools for educational purposes; consequently, educational institutions should continue to make learning more appealing to students by employing technological learning aids with interactive contents,

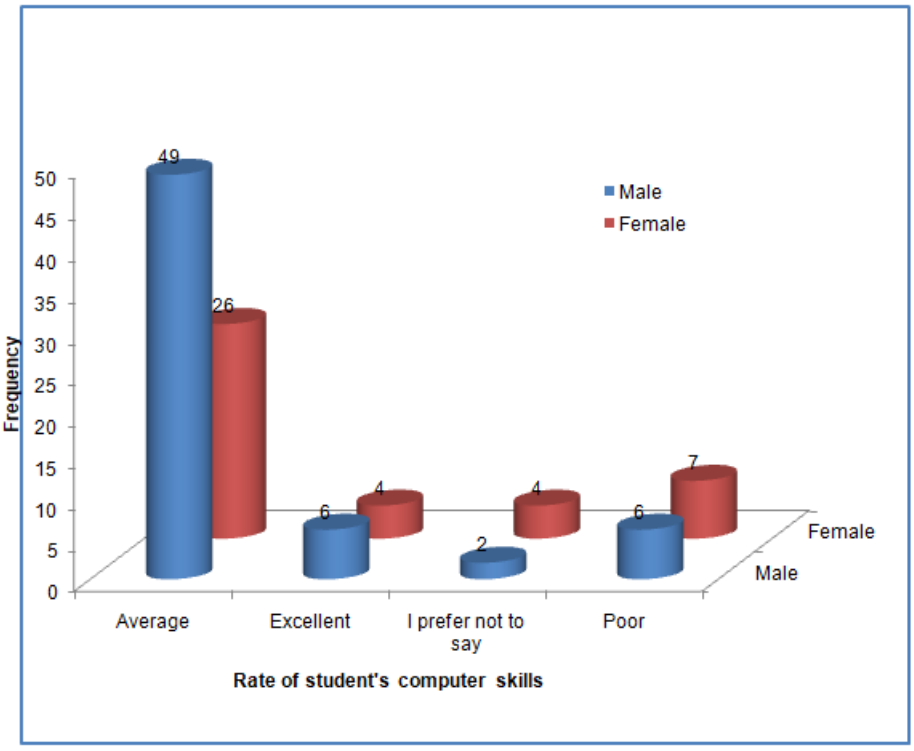

Figure 7: Component bar chart showing rate of student's computer skills

Table 4.0 t-Test: Two-Sample Assuming Unequal Variances for rate of student's computer skills

	49	*26*
Mean	4.666666667	5
Variance	5.333333333	3
Observations	3	3
Hypothesized Mean Difference	0	
df	4	
t Stat	-0.2	
P(T<=t) one-tail	0.425618507	
t Critical one-tail	2.131846782	
P(T<=t) two-tail	0.851237014	
t Critical two-tail	2.776445105	

Figure 8 shows that 7% (8) of HND students, 85% (99) of Bachelor students, and 9% (10) of master's students took the survey, indicating that Bachelor students were the central decision in this study. The graph also shows that HND, Bachelor's, and Master's students are acquainted with online teaching methods. 15 percent (18) of Bachelor respondents are very familiar with online teaching methods, 40 percent (47) are familiar with online teaching methods, and 16 percent are not familiar with online teaching methods and it suggests that the vast majority of students (84%) are acquainted with online teaching methods. It implies that students are willing to transit from traditional face-to-face instruction to technologically driven learning, and as a result, educational institutions should continue to use online learning tools for technological advancement and explore new tools.

Figure 9 depicts a bar graph for schools' utilization online educational resources. Figure 9 demonstrates that 81.4% (92) of students are familiar with Zoom, and 48.7% (55) are familiar with Google Classroom as online educational tools in the schools; this suggests that students are well-integrated with the new technological tools of Zoom and Google Classroom for teaching and learning. Figure 9 shows that 12.4% (14) of students are familiar with Microsoft Teams, 8.8% (10) of students are familiar with Evernote, 5.3% (6) of students are familiar with Loom, 6.2% (7) of students are familiar with Learning Management System, LMS, and 2.7% (3) of students are familiar with Virtual Management System, VMS. It suggests that the vast majority of students (90%) are unfamiliar with the official LMS and VMS online teaching methods. Consequently, it is essential for educational institutions to engage students with online teaching methods of LMS and VMS as technologically driven learning tools in the world, and educational institutions should continue to use LMS and VMS online learning tools for technological advancement and explore new tools, as

supported by Maat and Rosli (2011)

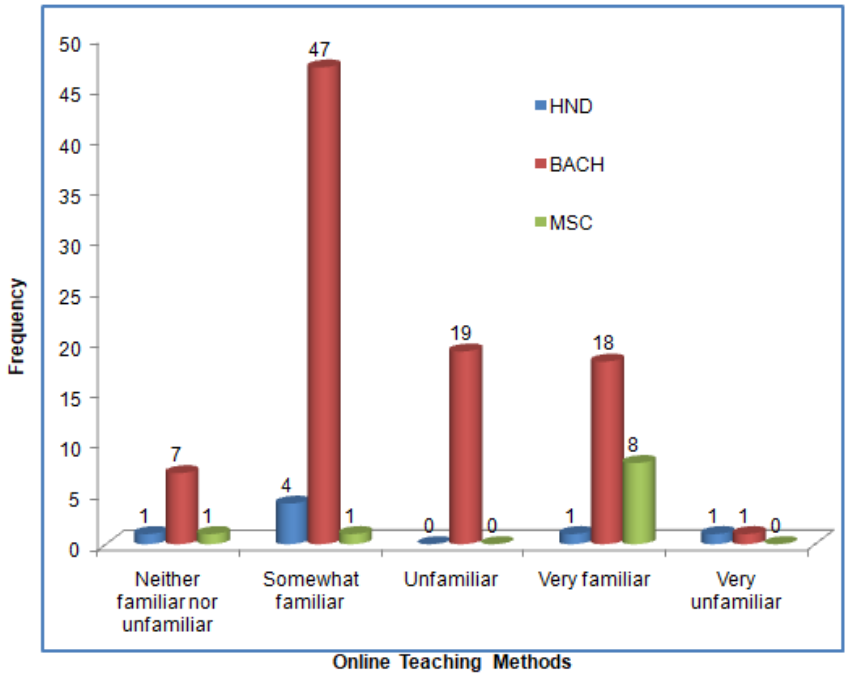

Figure8: Familiarity with online teaching methods

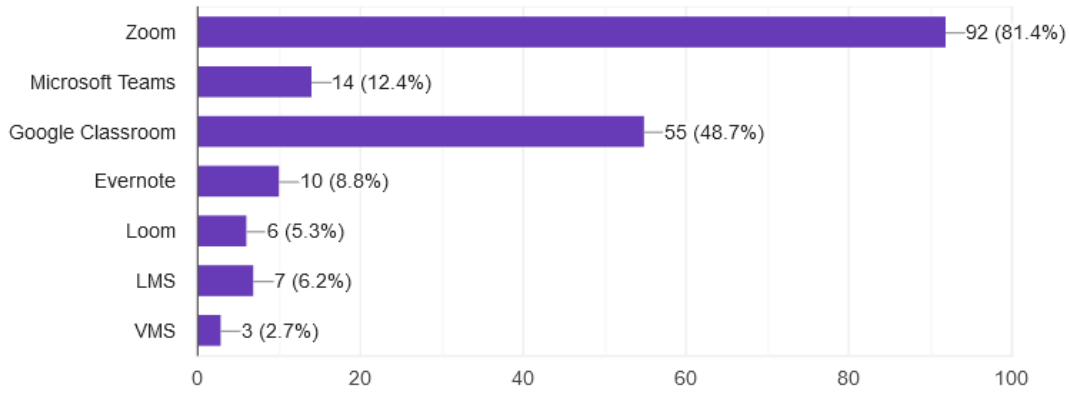

Figure 9:Bar chart for online teaching tools with schools

A bar graph for an online educational assessment tool with schools is shown in Figure 10. Figure 10 demonstrates that 59.5% (66) of students are familiar with using GoogleDoc as an online educational assessment tool in schools, and 64% (71) of students are familiar with using PowerPoint presentations. This suggests that students are well-integrated to new dimensions of technological tools such as PowerPoint and GoogleDoc for educational assessment to measure learning ability. As shown in figure 10, where 7.2% (8) of students are familiar with Formplus and 3.6% (4) of students are familiar with Khan Academy, the students are not well integrated to other educational assessment tools. It suggests that the vast majority of students (90%) are unfamiliar with Formplus and Khan Academy's online educational assessment tools. Because Formplus and Khan Academy's online educational assessment tools are among the most new technologically advanced learning resources available, educational institutions must use them to engage students in learning. They should also keep using these resources to advance technology and discover new resources.

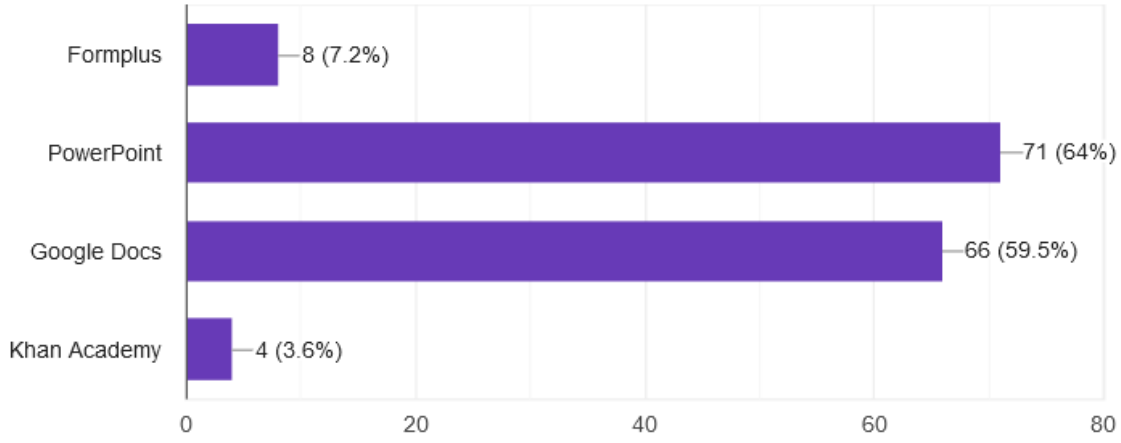

Figure 10: Bar graph for online educational assessment tool

4. Conclusions

This study has examined how schools, students, and parents embrace technological innovation and integrate it into sound instructional practices in higher education. The following conclusions were drawn; the students possess the necessary prerequisites for online learning, but it is required that institutions provide adequate technological support for students to succeed with online instruction since the vast majority of parents encourage their children to use technology to solve problems at home and support its use in the classroom. Therefore, educational institutions need to raise parental awareness of the benefits and applications of technology to facilitate learning.

The majority of respondents have average or above-average computer skills and students are eager to utilize technological tools for educational purposes; therefore, educational institutions should continue to make learning more engaging for students by employing technological learning aids with interactive content. Indeed, the overwhelming majority of students are familiar with online teaching methods and students are willing to migrate from traditional face-to-face instruction to technology-driven learning. As such, educational institutions should continue to use online learning tools for technological advancement and investigate new tools.

The majority of students are unfamiliar with the official LMS and VMS online teaching methods and it is essential for educational institutions to engage students with online teaching methods of LMS and VMS as technologically driven learning tools in the world. The students should continue to utilize these assets to advance technology and discover new assets. In reality, modern technology can provide innovative ways for children to enhance their education and better comprehend their schoolwork. Modern technology approaches should not totally replace traditional teaching methods, but when used effectively by teachers, they broaden students' opportunities for exploration and communication in education.

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