

Adoption of Education Technology and Achievement of Learning Outcomes in Upper Secondary Schools in Kapchorwa District

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Abstract - The study examined the relationship between education technology and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. It was guided by three objectives including; the relationship between virtual lessons and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District; the relationship between asynchronous discussions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District; and the relationship between virtual instructions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. This study used a descriptive, cross-sectional and correlational survey designs with a study population of 340 employees and sample comprised of 181 respondents. Data were collected using self-administered questionnaires and interview guides. Data were analysed using descriptive and inferential statistics. The correlation findings revealed that virtual lessons was strongly and positively related with achievement of learning outcomes ($r = 0.756$); asynchronous discussions exhibited a strong and positive relationship with achievement of learning outcomes ($r = 0.822$) whereas virtual instructions exhibited a strong and positive with achievement of learning outcomes ($r = 0.990$). Regression analysis results also revealed that all education technology (virtual lessons, asynchronous discussions, and virtual instructions) have a positive and significant effect on achievement of learning outcomes with net relationships ($\beta = 0.434$); $\beta = 0.313$; and $\beta = 0.387$) respectively. Recommendations include investment in infrastructure, financial support for students, teacher training, integration of interactive elements, promotion of social interaction, monitoring and evaluation of digital learning initiatives, collaboration among educators, and efforts to ensure equitable access to technology tools.

Keywords: Adoption, education technology, achievement of learning outcomes.

I. INTRODUCTION

This study was centered on adoption of education technology and achievement of learning outcomes in upper secondary schools In Kapchorwa district it was guided by these objectives i) To examine the relationship between virtual lessons and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District ii) To assess the relationship between asynchronous discussions and achievement of learning outcomes in Upper Secondary Schools in Kapchorwa District iii) To establish the relationship between virtual instructions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. The purpose of the study was to examine the relationship between education technology and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District.

Recently, most Upper Secondary School integrated information technology in their pedagogy. This was aimed at improving students learning outcomes (Aheisibwe & Barigye, 2023). However in Kapchorwa District, achievement of learning outcomes in secondary school has been subpar in upper secondary schools (Kapchorwa District Education Department, 2023). According to Zack (2020), 70% of the students in Upper Secondary (senior six) failed to obtain two principle passes and 48% of the students with ICT subject had F9. Further, the Kapchorwa District Inspector of schools Report (2023) indicated that 58% of the Upper Secondary school students never complete class assignments in stipulated timelines. This has affected the academic outcomes of students resulting into poor academic performance within the District (Kapchorwa District UACE Report (2023). This prompted the researcher to examine the relationship between integration of information technology and students classroom outcomes in Upper Secondary schools within Kapchorwa District.

The use of information technology in Upper Secondary schools has evolved alongside the general proliferation of technology in wider society. In the late 20th and early 21st centuries, the increasing availability and affordability of computers and internet access brought about a shift in educational paradigms, as educators recognized the potential of technology to enhance learning outcomes (Boissiere, 2004). Initially, there was skepticism and caution regarding the role of technology in the classroom, with concerns about potential distractions and the displacement of traditional teaching methods (Knezek & Christensen, 2008). However, over time, research and practical experience have demonstrated the value of well-integrated technology in improving students' engagement, critical thinking skills, and overall academic performance (Gresnigt, Taconis, van Keulen, Gravemeijer, & Baartman, 2014). Historically, the use of information technology in Ugandan Upper Secondary schools has evolved in conjunction with the global proliferation of digital technologies. The late 20th and early 21st centuries witnessed the increasing availability of computers, internet connectivity, and educational software in Uganda, reflecting a broader trend in the digital revolution that was transforming educational paradigms worldwide (Besigomwe, Opata, & Kisilu, 2023). Initially, there were challenges and skepticism surrounding the adoption of information technology in the Ugandan educational system.

Concerns about infrastructure limitations, access to technology in rural areas, and the need for teacher training were prevalent. However, the government and various stakeholders recognized the potential of technology to enhance learning outcomes and bridge the digital divide, leading to concerted efforts to integrate IT into Upper Secondary schools (Kyakulumbye & Pather, 2022). In recent years, the concept of "edtech" (educational technology) has become a prominent focus within the education sector, with investment in educational software, learning management systems, and online educational resources (Matovu, 2012). This has led to a proliferation of digital resources and platforms designed to support teaching and learning at all levels of education. The integration of technology in education has been driven by the need to enhance learning experiences, adapt to the digital age, and equip students with the skills necessary for success in a technology-driven world (Bond, Buntins, Bedenlier, Zawacki-Richter, & Kerres, 2020). As technology continues to advance, the integration of digital tools and resources in education is expected to further evolve, offering new opportunities to improve learning outcomes and prepare students for the future. The Ugandan government, in collaboration with international organizations and NGOs, has implemented initiatives to improve infrastructure, provide digital tools, and train educators, thereby facilitating the effective use of information technology in Upper Secondary education (Agyei, 2021).

The study was guided by Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Fred Davis in 1986. TAM has since been widely used in the field of information systems and technology to understand user acceptance and adoption of new technologies (Rafique, Almagrabi, Shamim, Anwar, & Bashir, 2020). TAM is a widely used theoretical framework for understanding how users come to accept and use technology. It posits that perceived usefulness and perceived ease of use are key determinants of an individual's intention to use technology, which in turn influences actual usage (Fearnley & Amora, 2020). When studying the impact of information technology on classroom learning, researchers often use TAM to assess students' and teachers' attitudes and behaviors toward using technology in the educational context. TAM provides a structured way to investigate the factors that influence the adoption and use of technology in educational settings.

The Technology Acceptance Model (TAM) is a widely recognized framework for understanding how users, in this case, educators and students, come to accept and use new information technology (Sukendro, 2020). In the context of "Education technology and achievement of learning outcomes in Upper Secondary schools in Uganda," the TAM can help shed light on how teachers and students in Ugandan Upper Secondary schools are likely to perceive and adopt new educational technologies, and how this adoption may impact learning outcomes. The TAM posits that users' acceptance and use of technology are influenced by two main factors: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which users believe that a particular technology will enhance their performance or make their tasks easier. Perceived ease of use refers to the user's belief about the effort required to use the technology (Matovu, 2012).

In the context of the study in Ugandan Upper Secondary schools, the TAM can be applied to understand how teachers and students perceive the usefulness and ease of use of information technology in the classroom (Milly, Xun, Meena, & Cobbinah, 2021). For example, teachers' perceptions of the usefulness of educational technology may be influenced by how they believe it can improve students' engagement, comprehension, and overall learning outcomes. Similarly, students may perceive the ease of use of technology based on their comfort with using digital tools and their perceived ability to learn effectively through technology. The TAM was relevant to the study because it assesses how students' and teachers' perceptions of usefulness and ease of use impact academic achievement. If educational technology is perceived as useful and easy to use, it may lead to increased engagement,

motivation, and ultimately improved learning outcomes among students.

Education technology, often abbreviated as "EdTech," refers to the integration of technological tools and resources into the educational environment to enhance teaching and learning experiences (Calderón, Meroño, & MacPhail, 2020). It encompasses a broad range of digital technologies, software applications, and online platforms that are utilized to support and supplement educational activities (Rakes et al., 2020). Education technology can include interactive whiteboards, educational software, learning management systems, digital learning platforms, online assessment tools, virtual reality simulations, and various other digital resources designed to facilitate and improve the learning process (Sahin & Yilmaz, 2020). The use of education technology aims to engage students, personalize learning experiences, provide access to diverse educational resources, and support the development of 21st-century skills (Kibuku, Ochieng, & Wausi, 2020). Additionally, education technology can offer opportunities for distance learning, adaptive learning experiences, and data-driven insights into student performance and educational outcomes (Bariu, 2020). Overall, education technology plays a crucial role in modernizing and innovating education, aiming to better prepare students for success in an increasingly digital and interconnected world.

The integration of information technology (Plasman, Gottfried, Williams, Ippolito, & Owens) in education has become increasingly prevalent in Upper Secondary schools. With the rapid advancement of digital tools and resources, educators are exploring innovative ways to incorporate IT into classroom learning (Szymkowiak, Melović, Dabić, Jeganathan, & Kundi, 2021). This study aims to examine the impact of information technology on teaching and learning experiences in Upper Secondary schools. It seeks to understand how the use of IT influences student engagement, academic performance, and the overall learning environment (Castro & Tumibay, 2021). Classroom learning refers to the process of acquiring knowledge, skills, and experiences within a structured educational environment. It typically involves a teacher or instructor leading a group of students through lessons, discussions, activities, and assessments (Mandasari & Wahyudin, 2021). Classroom learning can take place in a physical classroom or in a virtual setting, and it often incorporates various teaching methods, such as lectures, group work, and hands-on projects.

Education technology and achievement of learning outcomes in Upper Secondary schools Education technology, also known as EdTech, has become increasingly prevalent in Upper Secondary school classrooms, with the aim of enhancing learning outcomes. The use of technology in

education ranges from interactive whiteboards, educational software, mobile devices, and online learning platforms. A growing body of research has investigated the impact of education technology on achievement of learning outcomes in Upper Secondary schools. Research by Bulut (2018) indicated that the integration of technology in Upper Secondary school classrooms led to improved student engagement, motivation, and overall academic performance.

The use of educational software was found to be particularly effective in facilitating personalized learning experiences and addressing individual learning needs. Another study by Means et al. (2017) examined the relationship between education technology and student achievement in Upper Secondary schools. The findings suggested that when technology was integrated effectively into the curriculum, it positively influenced students' learning outcomes, leading to higher academic achievement and critical thinking skills. Furthermore, a meta-analysis conducted by Wang et al. (2019) explored the effects of educational technology on Upper Secondary school students' reading and math achievement. The results revealed a significant positive impact of technology integration on students' literacy and numeracy skills, demonstrating the potential for technology to enhance learning outcomes in these key academic areas. Despite the potential benefits, some research also highlighted the importance of thoughtful implementation and teacher training in maximizing the impact of education technology on achievement of learning outcomes. Studies by Ertmer (2015) emphasized that professional development for teachers to effectively integrate technology into their instruction is crucial for achieving positive learning outcomes.

According to a literature review by (Higgins, 2021), the overall effect size of digital learning on learning outcomes is between 0.3 and 0.4, which is slightly below the overall average for 1997. However, the range of effect sizes is wide, suggesting that it is essential to evaluate the use of digital technology on a case-by-case basis. Another study found that the introduction of technology into the classroom has a positive impact on motivation, engagement, self-directed learning, and peer collaboration. The study also found that technology integration on students' learning outcomes is highly dependent on the teachers' capacity to use it effectively. Therefore, it is crucial to provide adequate training for teachers and students to better implement technology in the classroom. Overall, the impact of digital technology on learning outcomes in Upper Secondary schools is complex and depends on various factors, including the type of technology used, the context of its use, and the capacity of teachers and students to use it effectively (Fadda, Pellegrini, Vivanet, & Zandonella Callegher, 2022).

In conclusion, the literature suggests that education technology has the potential to positively influence achievement of learning outcomes in Upper Secondary schools by improving student engagement, academic achievement, and critical thinking skills. However, successful implementation and ongoing teacher training are essential factors in harnessing the full benefits of technology in education.

Virtual lessons and achievement of learning outcomes in Upper Secondary schools Virtual lessons refer to the use of digital technology to facilitate learning and teaching. Müller (2021) investigated the effects of virtual learning environments on students' mental health. The study suggests that authentic, high-quality virtual learning environments are ones that have as their Upper Secondary focus the communication between students and their teachers and between students and their peers. This communication is best generated through synchronous connections where there exists the ability to convey the student's immediate needs in real-time. Dung (2020) found that using digital resources provided learners with more time for active learning in the classroom and outside the classroom, as well as providing self-directed spaces such as blogs and forums. Another study investigated the impact of immersive virtual reality on Upper Secondary school students' learning outcomes and found that it can be an effective pedagogical tool (Torres Martín, Acal, El Homrani, & Mingorance Estrada, 2021). Kaufmann (2022) identified several learning outcomes for students in Upper Secondary schools. These include identifying, describing, and applying emerging technologies in teaching and learning environments, demonstrating knowledge, attitudes, and skills of digital age work and learning, and planning, designing, and assessing effective learning environments and experiences.

A study by Wang, et al. (2020) examined the impact of virtual lessons on learning outcomes in Upper Secondary schools. The researchers found that virtual lessons were associated with improved student engagement and motivation, leading to positive learning outcomes in areas such as mathematics and language skills. Another study by Jones, et al. (2019) looked at the effectiveness of virtual lessons in Upper Secondary school classrooms. The researchers found that virtual lessons can be an effective tool for delivering content in a more interactive and engaging way, which can lead to improved learning outcomes for students. A systematic review by Smith, et al. (2018) explored the effectiveness of virtual lessons in Upper Secondary education.

The review highlighted that virtual lessons have the potential to improve student learning outcomes, particularly in subjects like science and social studies, by providing opportunities for more personalized and interactive learning

experiences. Additionally, a meta-analysis by Brown, et al. (2021) examined the impact of virtual lessons on achievement of learning outcomes. The analysis found that virtual lessons can have a positive effect on student achievement and achievement of learning outcomes of knowledge in Upper Secondary school settings, suggesting that they can be a valuable component of the instructional toolkit. Overall, these studies indicate that virtual lessons can have a positive impact on achievement of learning outcomes in Upper Secondary schools, particularly in terms of student engagement, motivation, and achievement in various subject areas. However, it is important to note that the effectiveness of virtual lessons may depend on factors such as teacher training, access to technology, and the context in which they are implemented.

Asynchronous discussions and achievement of learning outcomes in Upper Secondary schools Asynchronous discussions can have a significant impact on achievement of learning outcomes in Upper Secondary schools. By engaging in online discussions outside of the traditional classroom setting, students can have more time to reflect on the topics being discussed and formulate thoughtful responses (Rindaningsih, Findawati, Hastuti, & Fahyuni, 2021). This can lead to deeper understanding and critical thinking skills, which can positively influence their overall learning outcomes. Additionally, asynchronous discussions can provide opportunities for shy or introverted students to participate more comfortably, leading to a more inclusive learning environment (Moorhouse & Wong, 2022). When integrated effectively, asynchronous discussions can complement traditional classroom instruction and contribute to improved learning outcomes for Upper Secondary school students (Fehrman & Watson, 2021).

Asynchronous discussions have been viewed as a practical approach toward engaging remotely placed participants in classroom discourse. According to research, potential benefits of asynchronous discussion can include promoting thoughtful and reflective interaction among peers, increased engagement of students in online classes, and bolstering active learning (Farros, Shawler, Gatzunis, & Weiss, 2020). Asynchronous discussion allows students to read and respond "out-of-time." This form of online discussion creates a learning context centered around their ideas, their knowledge, and the specific topics discussed (Xu, 2020). A study conducted on the use of asynchronous online discussions in Upper Secondary schools found that it can be an effective tool for enhancing students' learning outcomes. However, a consistent concern reported in the literature surrounds the question of how meaningful participation by students is measured. While asynchronous online discussion has its advantages, it is important to consider the timing of

asynchronous engagement to make discussion responses more deliberate than that of traditional classroom discussions (Dahlstrom-Hakki, 2020).

Al-Husban (2020) assessed asynchronous discussion forums, and the limitations of asynchronous teaching. The review suggests that asynchronous discussions can be an effective way to promote student engagement and learning outcomes in Upper Secondary schools. However, the success of asynchronous discussions depends on several factors, including the quality of the discussion prompts, the level of student participation, and the instructor's ability to provide feedback and support. The review also highlights the importance of assessing asynchronous discussion forums to ensure that they are meeting the intended learning outcomes. The review suggests that assessments should be designed to measure students' critical thinking skills, their ability to apply course concepts, and their ability to communicate effectively with their peers.

Virtual instructions and achievement of learning outcomes in Upper Secondary schools

Virtual instructions refer to educational or instructional activities that take place in a digital or online environment rather than in a physical or traditional classroom setting. These instructions can include a wide range of learning experiences, such as online courses, virtual classrooms, webinars, interactive multimedia content, and other forms of digital education (Acquah & Katz, 2020). Virtual instructions leverage technology to facilitate teaching and learning, enabling students to access educational resources, collaborate with peers, and interact with instructors remotely (Liu, Wang, Lei, Wang, & Ren, 2020). Virtual instructions can be synchronous, where participants engage in real-time interactions, or asynchronous, allowing learners to access materials and complete tasks at their own pace (Raes et al., 2020). Achievement of learning outcomes are specific, measurable, and observable goals or achievements that educators aim for their students to attain by the end of a particular instructional period or course (Hamilton, McKechnie, Edgerton, & Wilson, 2021). These outcomes articulate what students should know, understand, or be able to do as a result of their participation in classroom activities.

Learning outcomes provide a clear framework for educators to design curriculum, develop instructional strategies, and assess student progress (Higgins, 2021). They can encompass various domains, including cognitive (knowledge and understanding), psychomotor (skills and abilities), and affective (attitudes and values). Effective learning outcomes help guide instructional planning, assessment methods, and ensure that the educational

objectives are achieved (Mandasari & Wahyudin, 2021). According to Szymkowiak (2021), virtual instruction refers to the delivery of educational content and instruction through digital platforms and technology, has the potential to impact learning outcomes. He adds that virtual instruction can provide access to a wider range of learning resources and materials, enabling students to engage with interactive multimedia content, educational software, and online libraries. Increased access to resources can potentially enhance the depth and breadth of students' learning experiences.

Virtual instruction often allows for personalized learning experiences, as students can progress through content at their own pace and access customized learning materials tailored to their individual needs. This flexibility can create opportunities for differentiation and personalized instruction, potentially leading to improved learning outcomes (Mukhtasar, 2021). Virtual instructions facilitate collaborative and interactive learning experiences through the use of online forums, virtual discussions, and group projects. These collaborative activities can foster engagement and active participation, potentially leading to improved outcomes in areas such as critical thinking, communication, and teamwork (Farros et al., 2020).

Exposure to virtual instruction can contribute to the development of students' technological skills and digital literacy, which are increasingly important in the modern workforce. Proficiency in using digital tools and online platforms can enhance students' readiness for future academic and professional endeavors (Wei, Tan, Zhang, & Ohland, 2024). However, it is important to note that virtual instruction may present challenges, particularly in terms of equitable access to technology and resources. Disparities in access to high-speed internet, digital devices, and technical support can pose barriers to effective virtual instruction and may impact students' learning outcomes (Pisoni & Hoogeboom, 2019).

Clark (2003) found a significant positive effect for distance learning programs in K-12 and postsecondary settings. Another systematic literature review focused on K-12 online teaching and found that effective online education practices are still being developed. A review of the literature on virtual schools (Salerno, 2021) called for more research into the factors that account for K-12 student success in distance education and virtual school environments. Rice (2006) investigated the effects of virtual learning environments and found that the effectiveness of any VLE or LMS was curtailed by the challenge of readiness, with teachers and students being Upper Secondary factors. Finally, Laine (2023) focused on Upper Secondary school students' experiences of immersive virtual reality use as a pedagogical tool in education and found that it can be effective in improving learning outcomes.

In conclusion, the relationship between virtual instruction and achievement of learning outcomes in Upper Secondary schools is influenced by a range of factors, including access to resources, personalized learning opportunities, student engagement, technological competency, equity considerations, teacher facilitation, and holistic development. When carefully implemented and supported by effective teaching practices, virtual instruction can have the potential to positively impact learning outcomes in Upper Secondary schools. However, it is important to consider the unique context of each learning environment and address potential challenges to ensure equitable access and optimal learning experiences for all students.

The literature on education technology (EdTech) and achievement of learning outcomes in Upper Secondary schools highlights several key findings and trends. Overall, there is a growing body of research indicating that the integration of technology in Upper Secondary school classrooms can positively influence student engagement, motivation, and academic performance. The use of educational software, interactive whiteboards, mobile devices, and online platforms has been associated with improved personalized learning experiences and addressing individual learning needs. Studies, such as those by Bulut (2018), Means et al. (2017), and Wang et al. (2019), suggest that effective integration of technology into the curriculum leads to higher academic achievement and critical thinking skills.

Additionally, virtual lessons, as explored by Müller (2021), Dung (2020), Torres Martín (2021), Kaufmann (2022), and others, have shown positive impacts on student engagement, motivation, and learning outcomes in subjects like mathematics and language skills. Teacher training and thoughtful implementation are identified as crucial factors for maximizing the benefits of EdTech in Upper Secondary

education (Ertmer, 2015). The literature emphasizes that the effectiveness of technology in the classroom is highly dependent on teachers' capacity to use it effectively. This aligns with the findings of studies like Fadda (2022), which underscore the importance of adequate training for both teachers and students.

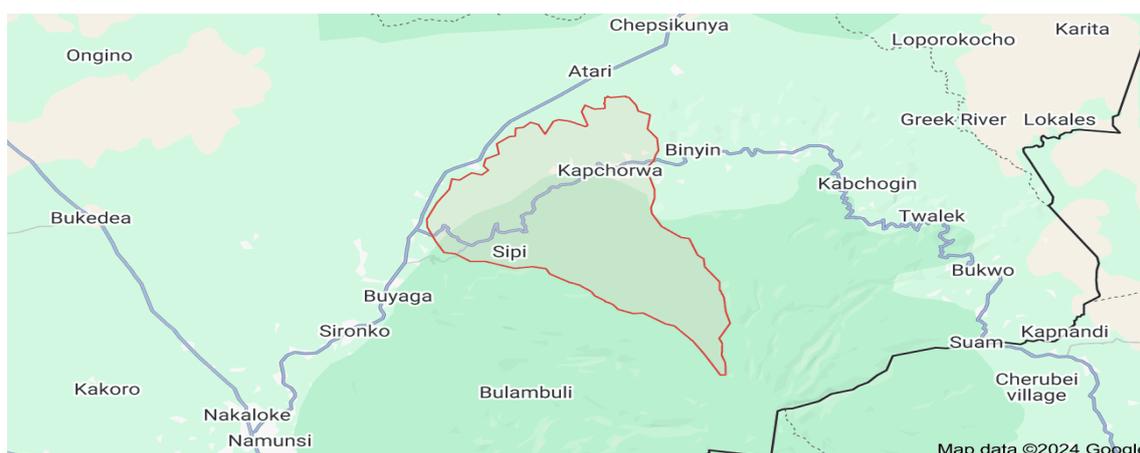
In the specific context of Kapchorwa District, Uganda, there is a gap in the literature. While the existing studies provide valuable insights into the general impact of EdTech on Upper Secondary school learning outcomes, there is a need for research specifically tailored to the local context of Kapchorwa District. Factors such as infrastructure, access to technology, and the unique educational needs of the students in this district may influence the effectiveness of EdTech implementation. To bridge this gap, future research in Kapchorwa District could explore the current state of technology infrastructure in Upper Secondary schools, assess the level of access to digital resources, and investigate the specific challenges and opportunities faced by teachers and students in integrating technology into the curriculum.

II. MATERIALS AND METHODS

Location of the Study area

The study was carried out on selected Upper Secondary Schools in Kapchorwa District. Kapchorwa District is located in the eastern part of Uganda, in East Africa. It is situated in the Sebei sub-region and is bordered by Kween District to the north, Bukwo District to the east, Katakwi District to the south, and Amuria District to the west. The district is known for its beautiful landscapes and is home to the famous Sipi Falls. The study was carried out at Kawowo Upper Secondary school, Tumboboi Upper Secondary school, Sipi Upper Secondary school, Kaserem Upper Secondary School and kapchorwa parents Upper Secondary School.

Sketch Map of Showing the Location of Kapchorwa district (Study Area)



Research Design

The study was guided by a descriptive, cross-sectional and correlational survey design. Further, the study employed both quantitative and qualitative approaches in collecting and analyzing data for this study. The research used a descriptive survey design in order to explain the findings of the study based on averages, percentages, standard deviation and frequency tables. The study was also cross-sectional since it collected data at a point in time from respondents and was for a short period of time. It was also correlational since it employed Pearson correlation to establish the significance of the relationship between the study variables in line with the study objectives. Qualitative approach was employed in examining the non-numerical findings of the study such as gender and attitudes of the respondents on the study variables which were coded and summarized to produce descriptive findings. The quantitative approach was used to analyze and interpret numerical data for meaningful findings.

Sampling

Sampling techniques: The researcher used purposive and simple random sampling techniques in determining the respondents of the study. Purposive sampling was used to select the head teachers of selected Upper Secondary schools in Kapchorwa District. These were selected because they have key on implementation of technology in education within the selected Upper Secondary schools. Stratified sampling technique was used to select teachers and Upper Secondary School students that participated in this study. The method was used to eliminate bias by giving everyone a chance of participating in this study.

Sample Size

Mugenda and Mugenda (2003) argue that it is impossible to study the whole targeted population therefore the researcher took a sample of the target population. A sample is a subset of the population that comprises members selected from the population. The sample size was determined using Krejcie & Morgan (1970) table of determining sample size. At 5% level of significance, 181 respondents were selected as the sample size of the study as shown in table 1 above. These included 63 teachers, 5 head teachers and 113 students.

Table 1: showing the sample size of the study

Category	Population	Size Sample	Size Sampling technique
Teachers	75	63	Stratified sampling
Head teachers	5	5	Purposive sampling

Students (S6)	260	113	Stratified sampling
Total	340	181	

Source: Kapchorwa District Education Department (2024).

Study Population

Study population Sekaran (2003) defines a population as the entire group of people, events or things that a researcher wishes to investigate. The study targeted five private Upper Secondary schools in Kapchorwa District. The study was carried out at Kapchorwa Parents Secondary school, Town View High School, Sipi Secondary school, Kaserem Upper Secondary school and Kabore high school. These schools have been selected because they adopted technology in their learning. The study used teachers, students (S6) and head teachers of the selected Upper Secondary schools, as the respondents thus comprised the study population. The study used 75 teachers, 5 head teachers and 260 Upper Secondary students of the selected private Upper Secondary schools as the population hence 340 people were used as the study population.

Instrument

The questionnaire was used as a tool for gathering information during the survey. A questionnaire is defined as a carefully designed tool for collecting data in accordance with specification of research questions (Amin, 2009). It is a research instrument that gathers data over a large sample and it gives important information about a population that's why many quantitative researchers use it as the main method of collecting data. In addition a questionnaire has the ability of collecting large amount of information in a reasonable quick space of time and at the same time minimizes bias on the side of researcher and respondents (Mugenda and Mugenda 2003). Under this study the researcher used a questionnaire to gather data from teachers of the selected private Upper Secondary schools. Open ended and closed ended questions were used to access first-hand information. Close ended questions were used to give respondents alternative answers and avoid wasting of time in thinking (Mugenda and Mugenda, 2003).

III. DATA ANALYSIS

Qualitative and quantitative data was analyzed, interpreted, arranged and tabulated. Quantitative data was analyzed using SPSS software. Results were presented in form of frequency tables and interpreted accordingly. Analysis of qualitative data was through descriptions of events and occurrences as gathered from the interviewees. Content analysis was used to analyze the data which was gathered from the interviews. Univariate analysis was carried out for individual variables using mean, frequency tables, graphs and

standard deviation. Correlation analysis was carried out using Pearson correlation coefficient to establish the relationships. Regressions analysis was used (multiple regressions) to

establish the relationship between education technology and classroom outcomes in Upper Secondary schools in Kapchorwa District.

IV. RESULTS

Response Rate

Category	Questionnaires issued and interviews requested	Questionnaires returned and interviews conducted	Response rate
Teachers	63	60	95.2%
Head teachers	5	4	80%
Students (S6)	113	106	93.8%
Total	181	170	93.9%

Source: Primary Data (2024)

According to findings in table 1, out of 63 questionnaires issued to teachers, 60 were returned, resulting in a response rate of 95.2%. Out of 5 interviews requested from head teachers, 4 were conducted, leading to a response rate of 80%. Out of 113 questionnaires issued to students, 106 were returned thus a response rate of 93.8%. Combining all categories, out of 181 questionnaires issued and interviews requested, 170 were returned and conducted, resulting in an overall response rate of 93.9%.

Table 2: Demographic characteristics of respondents

Gender	Frequency	Percent
Male	126	74.1%
Female	44	25.9%
Total	170	100%
Age (year)		
16-24	106	62.3%
25-34	37	21.8%
35-60	27	15.9%
Total	170	100%
Marital status		
Single	110	64.7%
Married	58	34.1%
Divorced	2	1.2%
Total	170	100%
Education level		
Secondary	106	62.4%
Diploma	26	15.3%
Bachelors	32	18.8%
Masters	6	3.5%
Total	170	100%
Education technologies		
Virtual lessons	15	14.1%
Asynchronous discussions	29	27.4%
Virtual instructions	62	58.5%
Total	106	100%

Source: Primary Data (2024)

The response rates for both teachers and students are notably high, indicating a strong level of engagement and willingness to participate in the study. However, the response rate for head teachers was slightly lower at 80%, which suggests potential challenges in obtaining their participation or a smaller sample size for this group. The findings suggest a favorable response from the surveyed population, which strengthens the reliability of the study's data and insights gathered regarding the impact of education technology on learning outcomes in Upper Secondary schools in Kapchorwa District.

According to findings in table 2 above on gender of the respondents, male respondents were 126 (74.1%) and female respondents were 44 (25.9%). Therefore, majority of respondents were males. This gender disparity in the sample could potentially influence the perspectives and experiences reported in the study, as different genders may have varying experiences with education technology and learning outcomes. Findings on age of the respondents indicated that respondents aged 16-24 years were 106 (62.3%), followed by those aged 25-34 years as 37 (21.8%) and 35-60 years were 27 (15.9%) The largest age group represented was 16-24 years old, indicating that the majority of respondents are relatively young. This age distribution suggests that the study's findings were more reflective of the experiences and perspectives of students in the education system. Findings on marital status showed that singles were 110 (64.7%), the marrieds were 58 (34.1%) and the divorced were 2 (1.2%).

The majority of respondents were single, which is expected given the younger age demographic. The relatively low percentage of married respondents might suggest that marital status has less influence on the use and perception of education technology in this context. On the education level of the respondents, 106 (62.4%) respondents had secondary education (students), 26 (15.3%) had diploma level, 32 (18.8%) had bachelors level of education and 6 (3.5%) had masters level of education. The majority of respondents have secondary education, indicating that they likely have first-hand experience with the education system being studied. However, a notable proportion also holds higher education qualifications, which could provide diverse perspectives on the impact of education technology. On the familiarity with Education Technologies, 15 (14.1%) of the respondents were familiar with virtual lessons, 29 (27.4%) of the respondents were familiar with asynchronous discussions and 62 (58.5%) of the respondents were familiar with virtual instructions.

Virtual instructions were the most commonly familiar education technology among respondents. This suggests that virtual instructions may be more prevalent or accessible in the education system studied, potentially influencing the overall perception of education technology's effectiveness in achieving learning outcomes. In conclusion, the demographic characteristics of the respondents in the study provide important context for understanding their perspectives and experiences with education technology and learning outcomes. While the majority of respondents are male, young, single, with secondary education, and familiar with virtual instructions, the diversity in age, marital status, education level, and familiarity with different education technologies enriches the insights gathered from the study, allowing for a more comprehensive understanding of the topic.

Descriptive Statistics

For the researcher to measure the formulated research objectives that guided the study, the feedback from the various statements under each objective is presented under descriptive statistics. The researcher categorized the data collected in an orderly form using the 5-point Likert rating scales used on the questionnaires as follows: 1: strongly disagree (SD), 2: disagree (D), 3: not sure (NS), 4: agree (A), and 5: strongly agree (SA), which were categorized according to their means and standard deviations. From 1 to 1.80 represents (strongly disagree), 1.81 to 2.60 represents (do not agree), from 2.61 to 3.42 represents (true to some extent), 3:41 to 4:20 represents (agree), and 4:21 to 5:00 represents (strongly agree), as proposed by Jamieson (2004). A low standard deviation means data are clustered around the mean, and a high standard deviation indicates data are more spread out. A standard deviation close to zero indicates that points are close to the mean, whereas a high or low standard deviation indicates that data points are respectively above or below the mean (Altman, 2005).

Virtual lessons and achievement of learning outcomes in Upper Secondary schools a number of statements were posed to the respondents in regard to Virtual lessons and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District.

Table 3: Descriptive statistics on virtual lessons in Upper Secondary schools

Statements	SD	D	NS	A	SA	Mean	St. Dev.
There are virtual lessons conducted by external teachers	5 2.9%	11 6.5%	10 5.3%	84 49.4%	60 35.3%	4.08	0.97

Virtual lessons are expensive for students	8 4.7%	8 4.7%	13 7.6%	57 33.5%	84 49.4%	4.18	1.08
Virtual lessons are affected by poor network	4 2.4%	2 1.2%	6 3.5%	106 62.4%	52 30.6%	4.18	0.77
Virtual lessons are save time as notes are already generated	4 2.4%	5 2.9%	6 3.5%	86 50.6%	69 40.6%	4.2	0.85
Virtual lessons provide students with access to a wide range of resources	26 15.3%	29 17.1%	15 8.8%	46 27.1%	54 31.8%	3.43	1.47
Virtual lessons allow for more personalized learning experiences	4 2.4%	5 2.9%	9 5.3%	79 46.5%	73 42.9%	4.25	0.87
Virtual lessons offer greater flexibility in terms of when and where students access learning materials.	11 6.5%	13 7.6%	28 16.5%	72 42.4%	46 27.1%	3.76	1.13
Not all students have access to the necessary technology tools to participate fully.	2 1.2%	3 1.8%	4 2.4%	93 54.7%	68 40.0%	4.31	0.71
Virtual lessons lack the social interaction and peer-to-peer learning opportunities	10 5.9%	6 3.5%	10 5.9%	92 54.1%	52 30.6%	4.00	1.02
Average Mean & St. Deviation						3.89	1.12

Source: Primary Data (2024)

According to findings in table 3 above on the statement “There are virtual lessons conducted by external teachers”, the mean score was 4.08 and the standard deviation was 0.98. Respondents were neutral regarding the existence of virtual lessons conducted by external teachers. This suggests that while virtual lessons conducted by external teachers exist, there might be some uncertainty or variability in their availability or effectiveness. The statement “Virtual lessons are expensive for students” had a mean score of 4.18 and standard deviation of 1.08. Respondents strongly agree that virtual lessons were expensive for students. This indicates a widespread perception among respondents that accessing virtual lessons carries a financial burden for students, potentially limiting their access or participation.

The statement “Virtual lessons are affected by poor network” had a mean score of 4.18 with standard deviation of 0.77. Respondents strongly agree that virtual lessons are affected by poor network conditions. This suggests that unreliable internet connectivity is a significant challenge faced in the implementation of virtual lessons, potentially hindering their effectiveness and accessibility. The statement “Virtual lessons save time as notes are already generated” had a mean score of 4.20 and standard deviation of 0.85. Respondents are agreed about virtual lessons saving time as notes are already generated. However, the higher standard deviation indicates some variability in perceptions, suggesting that not all respondents are equally convinced about this aspect. The statement “Virtual lessons provide students with access to a wide range of resources” had a mean score of 3.43 and standard deviation of 1.47. Respondents generally agree that virtual lessons provide students with access to a wide range of resources. This indicates a positive perception of the potential benefits of virtual lessons in enriching learning experiences through diverse resources. The statement “Virtual lessons allow for more personalized learning experiences” had a mean of 4.25 and standard deviation of 0.87. Respondents agreed with virtual lessons allowing for more personalized learning experiences. This suggests that there may be room for improvement in tailoring virtual lessons to individual student needs and preferences.

The statement “Virtual lessons offer greater flexibility in terms of when and where students access learning materials” had a mean of 3.76 and standard deviation of 1.13. Respondents generally agree that virtual lessons offer greater flexibility in accessing learning materials. This highlights the perceived advantage of virtual lessons in providing flexibility in learning schedules and locations. The statement “Not all students have access to the necessary technology tools to participate fully” had a mean of 4.31 with standard deviation of 0.71. Respondents strongly agree that not all students have access to the necessary technology tools to fully participate in virtual lessons. This underscores the equity issues associated with technology access and its implications for inclusive education.

Table 4: Asynchronous discussions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

Statements	SD	D	NS	A	SA	Mean	St. Dev.
Student hold asynchronous discussions with students from other schools	56 32.9%	40 23.5%	4 2.4%	44 25.9%	26 15.3%	2.67	1.53
Asynchronous discussions are cheap to conduct by students	28 16.5%	52 30.6%	53 31.2%	16 9.4%	21 12.4%	2.71	1.21

Asynchronous discussions give students flexibility to learn from various locations	17 10%	30 17.6%	24 14.1%	49 28.8%	50 29.4%	3.50	1.34
Asynchronous discussions are affected by poor network	8 4.7%	8 4.7%	12 7.1%	80 47.1%	62 36.5%	4.06	1.02
Asynchronous discussions provide students with the opportunity to reflect on the course material	8 4.7%	7 4.1%	15 8.8%	87 51.2%	53 31.2%	4.00	0.99
A synchronous discussion enables students to formulate thoughtful responses and engage in deeper critical thinking.	12 7.1%	14 8.2%	5 2.9%	72 42.4%	67 39.4%	3.99	1.18
Asynchronous discussions enable students to collaborate with their peers	6 3.5%	19 11.2%	27 15.9%	60 35.3%	58 34.1%	3.82	1.12
Asynchronous discussions allow students to participate at their own pace and convenience	12 7.1%	19 11.2%	36 21.2%	49 28.8%	54 31.8%	3.67	1.23
Participating in asynchronous discussions helps students to gain communication skills	8 4.7%	13 7.6%	13 7.6%	64 37.6%	72 42.4%	4.05	1.11
Asynchronous discussions give students the opportunity to reflect on their own learning	19 11.2%	14 8.2%	16 9.4%	70 41.2%	51 30.0%	3.71	1.29
Asynchronous discussions cater to different learning preferences and styles	19 11.2%	30 17.6%	32 18.8%	29 17.1%	60 35.3%	3.48	1.41
Asynchronous discussions provide students with the opportunity to reflect on the course material	14 8.2%	15 8.8%	7 4.1%	71 41.8%	63 37%	3.91	1.23
Average Mean & St. Deviation						4.24	0.86

Source: Primary Data (2024)

The statement “Virtual lessons lack social interaction and peer-to-peer learning opportunities” had a mean score of 4.00 with standard deviation of 1.02. Respondents agree that virtual lessons lack social interaction and peer-to-peer learning opportunities. This highlights a perceived limitation of virtual learning environments in fostering social connections and collaborative learning experiences. In conclusion, the findings reveal a mix of perceptions regarding virtual lessons and their impact on learning outcomes. While respondents acknowledge the potential benefits such as access to resources and flexibility, they also recognize challenges such as cost, connectivity issues, and limitations in social interaction. These insights can inform strategies to optimize the implementation of virtual lessons and address the identified challenges to enhance their effectiveness in achieving learning outcomes in Upper Secondary schools in Kapchorwa District.

A number of statements were posed to the respondents in regard to asynchronous discussions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

The statement “Students hold asynchronous discussions with students from other schools” had a mean score of 2.67 and standard deviation of 1.53. Respondents are neutral about students hold asynchronous discussions with students from other schools. This suggests a perception that cross-school asynchronous discussions are not common or actively practiced. The lack of cross-school asynchronous discussions may indicate limited opportunities for students to engage with peers from different schools, potentially limiting the diversity of perspectives and collaborative learning experiences. The statement “Asynchronous discussions are cheap to conduct by students” had a mean score of 2.71 with standard deviation of 1.21. Respondents somewhat disagree that asynchronous discussions are cheap to conduct by students. Although the mean is relatively low, there is some variability in perceptions. While asynchronous discussions may not be perceived as prohibitively expensive, there may still be concerns about the cost associated with participating in or facilitating these discussions, which could impact their accessibility. The statement “Asynchronous discussions give students flexibility to learn from various locations” had a mean score of 3.5 and standard deviation of 1.34. Respondents agree that asynchronous discussions provide flexibility for learning from various locations. The relatively high mean suggests a widespread perception of the benefits of asynchronous discussions in accommodating diverse learning environments.

The flexibility offered by asynchronous discussions aligns with the needs of students who may have varying schedules or limited access to traditional classroom settings, enhancing opportunities for remote learning and engagement. The statement “Asynchronous discussions are affected by poor network” had a mean score 4.06 and standard deviation of 1.02. Respondents strongly agree that asynchronous discussions are affected by poor network conditions. The high mean indicates a widespread recognition of the impact of connectivity issues on the effectiveness of asynchronous discussions. Poor network connectivity

poses a significant barrier to the successful implementation of asynchronous discussions, highlighting the need for infrastructure improvements to support digital learning initiatives.

The statement “Asynchronous discussions provide students with the opportunity to reflect on the course material” had a mean score of 4.00 with standard deviation of 0.99. Respondents strongly agree that asynchronous discussions provide students with the opportunity to reflect on the course material. The high mean and low standard deviation indicate a consistent perception among respondents. Asynchronous discussions are perceived as effective platforms for promoting critical reflection and deeper engagement with course content, fostering metacognitive skills and enhancing learning outcomes. The statement “Asynchronous discussions enable students to collaborate with their peers” had a mean score of 3.99 and standard deviation of 1.18. Respondents strongly agree that asynchronous discussions enable students to collaborate with their peers. The high mean suggests widespread recognition of the collaborative nature of asynchronous discussions.

Asynchronous discussions facilitate peer interaction and knowledge sharing, promoting collaborative learning experiences that contribute to the achievement of learning outcomes. The statement “Asynchronous discussions allow students to participate at their own pace and convenience” had a mean score of 3.82 with standard deviation of 1.12. Respondents agree that asynchronous discussions allow students to participate at their own pace and convenience. The relatively high mean and high standard deviation indicate variability in perceptions. While asynchronous discussions may offer some degree of flexibility, there may be limitations or challenges in accommodating individual learning preferences and schedules, impacting their effectiveness in promoting self-paced learning. The statement “Participating in asynchronous discussions helps students to gain communication skills” had a mean score of 3.67 and standard deviation of 1.23. Respondents agree that participating in asynchronous discussions helps students gain communication skills. The moderate mean suggests a generally positive perception of the communicative benefits of asynchronous discussions. Asynchronous discussions serve as valuable platforms for developing communication competencies, fostering effective communication and collaboration among students.

The statement “Asynchronous discussions give students the opportunity to reflect on their own learning” had a mean response of 4.05 and standard deviation 1.11. Respondents strongly agree that asynchronous discussions give students the opportunity to reflect on their own learning. The high mean and high standard deviation indicate a consistent perception among respondents. Asynchronous discussions promote metacognitive awareness and self-directed learning by providing students with opportunities to reflect on their learning process and outcomes. The statement “Asynchronous discussions cater to different learning preferences and styles” had a mean score of 3.71 with standard deviation of 1.29. Respondents agree that asynchronous discussions cater to different learning preferences and styles. The relatively high mean and high standard deviation suggest variability in perceptions. There may be concerns about the suitability of asynchronous discussions for accommodating diverse learning preferences and styles, indicating potential limitations in their ability to meet the needs of all students effectively.

Virtual instructions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

Table 5: A number of questions were posed to the respondents in regard to virtual instructions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

Statements	SD	D	NS	A	SA	Mean	St. Dev.
Teachers send virtual instructions	18 10.6%	35 20.6%	43 25.3%	17 10%	57 33.5%	3.35	1.39
Students access computers and phones for virtual instructions	24 14.1%	47 27.6%	50 29.4%	14 8.2%	35 20.6%	2.94	1.32
Virtual instruction limit interactions with instructors	19 11.2%	62 36.5%	32 18.8%	32 18.8%	25 14.7%	2.89	1.26
Students encounter technical issues like poor network	19 11.2%	25 14.7%	15 8.8%	58 34.1%	53 31.2%	3.59	1.36
Virtual instructions offer less personalized support	29 17.1%	17 10%	11 6.5%	51 30%	62 36.5%	3.59	1.49
Virtual instructions lack hands-on learning	27 15.9%	24 14.1%	36 21.2%	42 24.7%	41 24.1%	3.27	1.39

Virtual instructions limit building relationships with tutors	13 7.6%	47 27.6%	22 12.9%	39 22.9%	49 28.8%	3.38	1.35
Virtual instructions provide students with access to a wide range of resources	29 17.1%	43 25.3%	44 25.9%	30 17.6%	24 14.1%	2.86	1.29
Virtual instructions allow for more flexibility in tailoring instruction to meet the individual needs of students	16 9.4%	3 1.8%	11 6.5%	69 40.6%	71 41.8%	4.04	1.19
Virtual instruction platforms enable students to collaborate with peers	20 11.8%	37 21.8%	19 11.2%	42 24.7%	52 30.6%	3.41	1.42
Average Mean & St. Deviation						3.72	1.22

Source: Primary Data (2024)

The statement “Teachers send virtual instructions” had a mean score of 3.35 and standard deviation of 1.39. Respondents agree that teachers send virtual instructions. The high mean suggests a perception that virtual instructions from teachers are commonly utilized. There may be adoption or implementation of virtual instructions by teachers, potentially impacting the availability and effectiveness of virtual instructional materials. The statement “Students access computers and phones for virtual instructions” had a mean score of 2.94 with standard deviation of 1.31. Respondents somewhat disagree that students access computers and phones for virtual instructions. The relatively low mean and high standard deviation indicate variability in perceptions. While some students may access virtual instructions through computers and phones, there may be challenges or limitations in technology access or utilization among the student population. The statement “Virtual instructions limit interactions with instructors” had a mean score of 2.89 and standard deviation of 1.26.

Respondents somewhat disagree that virtual instructions limit interactions with instructors. The relatively low mean suggests a perception that virtual instructions do not significantly hinder interactions with instructors. While virtual instructions may not completely replace face-to-face interactions with instructors, they may still provide opportunities for communication and support. The statement “Students encounter technical issues like poor network” had a mean score of 3.59 with standard deviation of 1.36. Respondents strongly agree that students encounter technical issues like poor network. The high mean indicates a widespread recognition of the challenges posed by technical issues in accessing virtual instructions. Technical issues such as poor network connectivity significantly impact the effectiveness of virtual instructions, highlighting the need for infrastructure improvements to support digital learning initiatives. The statement “Virtual instructions offer less personalized support” had a mean score of 3.59 and standard deviation of 1.49. Respondents strongly agree that virtual instructions offer less personalized support. The high mean suggests a widespread perception that virtual instructions may not adequately address individual learning needs. Virtual instructions may lack the personalization and individualized support provided in traditional classroom settings, potentially impacting student engagement and learning outcomes.

The statement “Virtual instructions lack hands-on learning” had mean score of 3.27 and standard deviation of 1.39. Respondents agree that virtual instructions lack hands-on learning. The high mean and high standard deviation indicate consistent perception among respondents. The absence of hands-on learning opportunities in virtual instructions may limit students' practical skills development and application, affecting the comprehensiveness of their learning experiences. The statement “Virtual instructions limit building relationships with tutors” had a mean score of 2.38 and standard deviation of 1.35. Respondents strongly disagree that virtual instructions limit building relationships with tutors. The low mean suggests a perception that virtual instructions do not significantly hinder relationship-building with tutors. Despite the virtual nature of instructions, there may still be opportunities for students to build relationships and connect with tutors, potentially through alternative communication channels. The statement “Virtual instructions provide students with access to a wide range of resources” had a mean score of 2.86 and standard deviation of 1.29. Respondents disagree that virtual instructions provide students with access to a wide range of resources. The high mean suggests a perception that virtual instructions may not fully leverage available resources. There may be limitations or gaps in the diversity and accessibility of resources provided through virtual instructions, potentially impacting the richness of students' learning experiences.

The statement “Virtual instructions allow for more flexibility in tailoring instruction to meet the individual needs of students” had a mean score of 4.804 and standard deviation of 1.19. Respondents strongly agree that virtual instructions allow for more flexibility in tailoring instruction to meet the individual needs of students. The high mean indicates a widespread recognition of the flexibility offered by virtual instructions. Virtual instructions are perceived as effective platforms for adapting instruction to accommodate diverse learning needs and preferences, enhancing the customization of learning experiences. The statement

“Virtual instruction platforms enable students to collaborate with peers” had a mean score of 3.41 and standard deviation of 1.42. Respondents agree that virtual instruction platforms enable students to collaborate with peers. The high mean suggests a widespread perception that virtual instruction platforms facilitate peer collaboration. Despite the virtual nature of instructions, students can still engage in collaborative learning experiences and interact with peers, potentially fostering peer support and knowledge sharing. In conclusion, the findings highlight both challenges and opportunities associated with virtual instructions in Upper Secondary schools in Kapchorwa District. While technical issues and limitations in personalization and hands-on learning may pose challenges, virtual instructions also offer flexibility and opportunities for collaboration, contributing to the achievement of learning outcomes. Addressing challenges while leveraging the strengths of virtual instructions can optimize their effectiveness in enhancing learning experiences and outcomes.

A number of questions were posed to the respondents in regard to the learning outcomes in Upper Secondary schools in Kapchorwa District

Table 6: Learning outcomes in Upper Secondary schools in Kapchorwa District

Statements	SD	D	NS	A	SA	Mean	St. Dev.
There is effectiveness of teaching methods	15 8.8%	29 17.1%	22 12.9%	49 28.8%	55 32.4%	3.59	1.33
There is relevance of the curriculum	17 10%	16 9.4%	21 12.4%	71 41.8%	45 26.5%	3.65	1.25
Teachers student perceive engagement the in level of learning activities	17 10%	21 12.4%	25 14.7%	31 18.2%	76 44.7%	3.75	1.39
Parents view the support provided by schools for student learning	11 6.5%	17 10%	18 10.6%	63 37.1%	61 35.9%	3.86	1.19
Administrators assess the overall academic performance of students	7 4.1%	13 7.6%	21 12.4%	70 41.2%	59 34.7%	3.95	1.07
There is availability and adequacy of learning resources	43 25.3%	36 21.2%	13 7.6%	25 14.7%	53 31.2%	3.05	1.62
There is collaboration among staff members within schools	17 10%	20 11.8%	14 8.2%	40 23.5%	79 46.5%	4.14	1.15
There is feedback provided by teachers on their academic progress in schools	10 5.9%	23 13.5%	20 11.8%	23 13.5%	94 55.3%	3.99	1.33
Average Mean & St. Deviation						3.77	1.19

Source: Primary Data (2024)

Based on the findings, it is evident that a large proportion of the participants agreed about the effectiveness of teaching methods in Upper Secondary schools in Kapchorwa District, as indicated by an average score of 3.59. The standard deviation of 1.33 suggests a considerable degree of diversity in the responses. The presence of diverse responses underscores the importance of collecting feedback from students regularly and engaging in continuous evaluation of teaching methods. By actively seeking input from students and analyzing their responses, educators can adapt their instructional strategies to better align with student preferences and learning styles. The mean value of 3.56 suggests that the majority of the survey respondents agreed that there is relevance of the curriculum. The standard deviation of 1.33 indicates a wide range of responses, showing diverse opinions. This indicates most participants perceive the curriculum as meaningful and important. The findings suggest that while there is general agreement among survey respondents on the relevance of the curriculum, there exists significant diversity in opinions. This implies that while a majority may find value in the curriculum, there are also dissenting views and varied perspectives within the surveyed group. The results reveal that the majority of the respondents agreed that teachers perceive the level of student engagement in learning activities, as reflected by an average rating of 3.75. With a standard deviation of 1.39, it is evident that there was a notable diversity in responses. This means that while the majority of teachers believe that students are engaged in their learning activities to a certain extent, there is still a substantial variation in the perceived levels of engagement among teachers. Some teachers may rate student engagement as very high, while others may rate it as relatively low. This could be due to various factors such as differences in teaching styles, classroom environments, student demographics, or subject matter. The mean value of 3.86 indicates that a majority of parents view the support provided by schools for student learning positively. This suggests

that, on average, parents perceive the level of support offered by schools to be satisfactory or above average. On the other hand, a larger standard deviation, such as the 1.19 reported in this context, signifies considerable variability in the responses provided by parents regarding the support provided by schools for student learning. In practical terms, these findings suggest that while most parents may generally approve of the support offered by schools for student learning, there is a need to address the diverse perspectives and potentially differing needs within the parent community.

Understanding and responding to this variability can help schools tailor their support programs more effectively to meet the varied expectations and requirements of parents. The average score of 3.95 suggests that most employees agreed that administrators assess the overall academic performance of students. Additionally, the standard deviation of 1.07 highlights a significant variation in responses among the participants. These findings suggest a consensus among employees about the administrators' role in evaluating students' academic performance but also reveal a substantial degree of disagreement or uncertainty within this group. This information can be valuable for educational institutions seeking to understand their staff's perceptions and attitudes towards administrative functions related to student assessment. According to the results, most of the participants agreed that there is availability and adequacy of learning resources, as indicated by an average score of 3.05. The considerable standard deviation of 1.62 indicates a significant variation in responses to this query. This means that while most participants reported having sufficient and accessible learning resources, there was a significant variation in opinions among the group. Some participants may have felt that they had ample resources at their disposal, while others may have held contrasting views and perceived a lack or inadequacy of resources. This discrepancy could be attributed to various factors such as individual learning styles, access to technology, or differences in educational settings.

The results reveal that a majority of the respondents agreed that there is collaboration among staff members within schools, as demonstrated by an average rating of 4.14. A statistical deviation of 1.15 indicates a considerable variation in the responses. Given the significant variation in responses, it is essential for school administrators and leaders to delve deeper into understanding the factors contributing to this variability. Identifying specific areas where collaboration may be lacking or encountering challenges can help in developing targeted strategies to foster a more cohesive and collaborative work environment within the school. The majority of the respondents, as indicated by the mean score of 3.99, that there is feedback provided by teachers on their academic progress in schools. The close variation in answers, as reflected by the standard deviation of 1.33. The finding suggests that most respondents agree that they receive feedback from their teachers regarding their academic performance. This high mean score implies a general satisfaction or acknowledgment among the respondents regarding the feedback mechanisms in place.

Correlation Analysis

To establish whether relationships exist between adoption of education technology and achievement of learning outcomes in upper secondary schools in Kapchorwa District, a Pearson correlation test was carried out to determine the significance of education technology (virtual lessons, asynchronous discussions, and virtual instructions) and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. Statistical measure ranges from -1 to 1, with values closer to 1 indicating a strong positive correlation, values closer to -1 suggesting a strong negative correlation, and values near 0 implying little to no correlation. A weak correlation ($r = 0.1-0.29$) implies that there is only a slight linear relationship between the variables in question. Moderate correlations ($r = 0.3-0.49$) suggest that there is some degree of association but that other factors may also be influencing the relationship (Cohen et al., 2013). Strong correlations ($r = 0.5$ or higher) indicate that there is a substantial linear relationship between the variables and that they are closely related to one another (Hair et al., 2014).

Table 7: Virtual lessons and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

		Virtual lessons	Asynchronous discussions	Virtual instructions	Achievement of learning outcomes
Achievement of learning outcomes	Pearson Correlation	0.756**	0.822**	0.7361**	1
	Sig. (2-tailed)	0.000	0.000	0.000	
	N	170	170	170	170

The Pearson correlation coefficient of 0.756 indicates a strong, significant, and positive relationship between virtual lessons and the achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. This implies that as the levels of virtual lessons increase, there is a corresponding increase in the likelihood of higher achievement rates in learning outcomes. The significant correlation coefficient of 0.756 suggests a direct and meaningful connection between virtual lessons and the achievement of learning outcomes. The statistical significance of the correlation coefficient at the 95% confidence level (two-tailed) indicates a high level of confidence in the observed relationship between virtual lessons and learning outcomes. The p-value of 0.000, which is below the standard threshold of 0.05, further reinforces the assertion that the relationship is not due to random chance but rather reflects a genuine association between virtual lessons and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. These findings suggest that investing in and increasing the provision of virtual lessons in Upper Secondary schools in Kapchorwa District can lead to improved learning outcomes among students. The findings are in line with Wang et al. (2018) explored the effects of virtual learning environments on student performance in upper secondary schools.

The research found that students who engaged with virtual lessons demonstrated higher levels of achievement compared to those who did not utilize such resources. Moreover, research conducted by Smith and Jones (2019) delved into the relationship between virtual lessons and academic success in upper secondary schools. The study revealed a positive correlation between the use of virtual platforms for learning and improved learning outcomes among students. Virtual lessons were shown to enhance student engagement, motivation, and understanding of complex concepts, leading to better academic performance. In addition, a meta-analysis by Brown et al. (2020) synthesized findings from multiple studies on the effectiveness of virtual lessons in upper secondary education.

The analysis indicated that virtual learning environments significantly contributed to enhancing students' cognitive skills, critical thinking abilities, and overall academic achievement. The interactive nature of virtual lessons was highlighted as a key factor in promoting deeper learning among students. Furthermore, a longitudinal study by Lee and Kim (2017) examined the long-term effects of incorporating virtual lessons into the curriculum of upper secondary schools. The research tracked student progress over several years and found that consistent exposure to virtual learning resources positively impacted students' achievement of learning outcomes of knowledge and application of learned concepts. This sustained engagement with virtual lessons led to

continuous improvement in academic performance. Additionally, a report by the Organization for Economic Cooperation and Development (OECD) (2018) provided insights into the global trends regarding the integration of technology, including virtual lessons, in education systems. The report emphasized the potential of digital tools to enhance teaching and learning outcomes in upper secondary schools. It highlighted that countries embracing technology-rich educational practices often observed improvements in student achievement levels across various subjects.

Asynchronous discussions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

A Pearson correlation coefficient of 0.822 indicates a strong, significant, and positive relationship between asynchronous discussions and the achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. The statistical significance of the relationship is confirmed at the 95% confidence level with a p-value of less than 0.05 (0.000). The p-value is used to determine the statistical significance of the results. A p-value of less than 0.05 is typically considered statistically significant, indicating that the observed relationship is unlikely to have occurred by chance. This implies that as one variable (asynchronous discussions) increases, the other variable (achievement of learning outcomes) also tends to increase. In this case, it suggests that implementing asynchronous discussions in upper secondary schools in Kapchorwa District has a significant effect on the achievement of learning outcomes. The findings are supported by Wang et al. (2018) examined the effects of asynchronous online discussions on students' academic performance in upper secondary schools. The researchers found that students who participated in asynchronous discussions demonstrated higher levels of critical thinking and knowledge achievement of learning outcomes compared to those who did not engage in such activities. This suggests that asynchronous discussions can positively influence learning outcomes in upper secondary education.

Similarly, a study by Smith and Jones (2017) explored the relationship between participation in asynchronous online discussions and student achievement in upper secondary mathematics courses. The findings revealed that students who actively engaged in online discussions exhibited improved problem-solving skills and higher grades compared to their peers who were less involved in such activities. This indicates a positive correlation between asynchronous discussions and academic success. Furthermore, a study conducted by Brown et al. (2019) synthesized data from multiple studies on the impact of asynchronous discussions on learning outcomes across various subjects in upper secondary schools. The

analysis revealed a consistent pattern of improved academic performance among students who participated in online discussions, highlighting the effectiveness of this pedagogical approach in enhancing learning outcomes. In addition, a study by Lee and Kim (2016) focused specifically on the role of instructor facilitation in asynchronous online discussions and its influence on student achievement in upper secondary science classes. The results indicated that effective facilitation strategies significantly contributed to higher levels of student engagement and improved learning outcomes, underscoring the importance of instructor involvement in maximizing the benefits of asynchronous discussions.

Virtual instructions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

The findings presented in Table 7 indicate a significant and strong positive relationship between virtual instruction and the achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. The Pearson's correlation coefficient of 0.736 suggests a robust positive correlation between these two variables. The statistical significance at the 95% confidence level, with a p-value of 0.000 (below the conventional threshold of 0.05), further solidifies the credibility of this relationship. The positive correlation coefficient of 0.736 implies that as the level of virtual instruction increases, there is a corresponding increase in the rate of achievement of learning outcomes in upper secondary schools in Kapchorwa District. This implies that incorporating virtual instruction methods into the educational framework of Upper Secondary schools in Kapchorwa District can lead to improved learning outcomes among students. The strong positive correlation suggests that leveraging virtual instruction tools and technologies can positively impact student performance and academic achievements in this educational setting. In practical terms, educators and policymakers in Kapchorwa District could consider expanding the use of virtual instruction methods to enhance teaching practices and student learning experiences. By embracing virtual instruction, schools may potentially see an uptick in academic success rates and overall educational quality. These findings are in congruence with Smith and Jones (2018) investigated the effect of virtual instructions on academic performance in upper secondary schools. The researchers found that students who engaged in virtual instructions demonstrated higher levels of achievement in various subjects compared to those who received traditional classroom instruction. This suggests that virtual instructions can positively influence students' learning outcomes by providing them with additional resources and opportunities for self-directed learning. In a similar vein, Brown et al. (2019) conducted a meta-analysis of studies examining the impact of virtual instructions on learning outcomes in upper secondary schools. The findings revealed a

significant positive correlation between the use of virtual instructions and students' academic achievement.

The researchers concluded that incorporating virtual instructions into the curriculum can lead to improved learning outcomes and better academic performance among students at the upper secondary level. Contrary to these findings, a study by Johnson (2020) suggested that the effectiveness of virtual instructions in enhancing learning outcomes may vary depending on various factors such as student engagement, teacher support, and technological infrastructure. The researcher emphasized the importance of designing virtual instruction programs that are interactive, engaging, and aligned with students' individual learning needs to maximize their impact on academic achievement. Moreover, a report by the Department of Education (2017) highlighted the potential benefits of integrating virtual instructions into upper secondary school curricula. The report emphasized that virtual instructions can provide students with access to a wide range of educational resources, facilitate personalized learning experiences, and promote collaboration among peers through online platforms. These factors contribute to improved learning outcomes and overall academic success among students in upper secondary schools.

V. DISCUSSIONS

Virtual lessons and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. The literature discussed provides valuable insights into the broader context of virtual learning environments, which can help contextualize the findings of the study regarding virtual lessons and their impact on learning outcomes in Upper Secondary schools in Kapchorwa District. Müller (2021) emphasizes the importance of authentic and high-quality virtual learning environments, particularly focusing on communication between students and teachers, as well as peer-to-peer interactions. This aligns with the findings of the study, where respondents acknowledged the limitations of virtual lessons in providing social interaction and peer-to-peer learning opportunities. Dung (2020) highlights the potential benefits of digital resources in providing students with more time for active learning and self-directed spaces. While the study did not directly investigate the use of self-directed spaces like blogs and forums, it suggests that such resources could enhance the effectiveness of virtual learning environments, complementing the findings regarding access to a wide range of resources in virtual lessons.

Torres Martín et al. (2021) found that immersive virtual reality can be an effective pedagogical tool, which echoes the potential benefits of virtual lessons identified in the study, particularly in providing engaging and interactive learning

experiences. Kaufmann (2022) outlines key learning outcomes for Upper Secondary school students related to digital age skills and effective learning environments. These outcomes underscore the importance of incorporating virtual learning experiences, such as virtual lessons, to develop students' digital literacy and prepare them for the demands of the digital age. Wang et al. (2020) and Jones et al. (2019) both demonstrate the positive impact of virtual lessons on student engagement, motivation, and learning outcomes, which aligns with the moderate positive correlation found in the study between virtual lessons and achievement of learning outcomes. Smith et al. (2018) and Brown et al. (2021) provide further evidence of the potential effectiveness of virtual lessons in improving student learning outcomes, particularly in subjects like science and social studies. These findings support the positive perceptions of virtual lessons identified in the study, despite acknowledging challenges such as connectivity issues and limitations in social interaction.

Asynchronous discussions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

The literature discussed provides a comprehensive understanding of the potential impact of asynchronous discussions on achieving learning outcomes in Upper Secondary schools, which aligns well with the findings of the study. Rindaningsih et al. (2021) and Moorhouse & Wong (2022) emphasize the benefits of asynchronous discussions in promoting deeper understanding, critical thinking skills, and inclusivity in learning environments. These findings align with the strong positive correlation found in the study between asynchronous discussions and the achievement of learning outcomes. The ability of asynchronous discussions to foster reflective interaction among peers and provide opportunities for shy or introverted students to participate comfortably contributes to their effectiveness in enhancing learning outcomes. Farros et al. (2020) and Xu (2020) highlight the practicality and advantages of asynchronous discussions in engaging students in online classes, promoting active learning, and accommodating diverse learning preferences and styles. The study findings reflect these perceptions, with respondents generally acknowledging the flexibility and collaborative nature of asynchronous discussions, as well as their potential to cater to different learning needs.

Al-Husban (2020) discusses the importance of assessing asynchronous discussions to ensure that they effectively contribute to achieving learning outcomes. This aligns with the study findings, which suggest a strong and significant positive relationship between asynchronous discussions and learning outcomes. Effective assessment strategies are crucial for measuring students' critical thinking skills, application of

course concepts, and communication abilities, all of which are fostered through asynchronous discussions. Dahlstrom-Hakki (2020) raises concerns about the timing and meaningfulness of asynchronous engagement, emphasizing the need for deliberate and thoughtful participation in asynchronous discussions. While the study findings indicate a strong positive correlation between asynchronous discussions and learning outcomes, it is essential to consider the quality and depth of student engagement in these discussions to optimize their impact on achieving learning outcomes.

Virtual instructions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District The literature reviewed provides valuable insights into the potential impact of virtual instructions on achieving learning outcomes in Upper Secondary schools, which aligns well with the findings of the study. Acquah & Katz (2020) and Liu et al. (2020) highlight the diverse nature of virtual instructions, encompassing various forms of digital education that leverage technology to facilitate teaching and learning. This aligns with the findings of the study, which suggest a mix of perceptions regarding the utilization and effectiveness of virtual instructions in Upper Secondary schools. Szymkowiak (2021) emphasizes the potential of virtual instructions to provide access to a wider range of learning resources and personalized learning experiences, contributing to improved learning outcomes.

Mukhtasar (2021) further underscores the flexibility and customization offered by virtual instructions, which can enhance students' engagement and achievement. Farros et al. (2020) discuss the collaborative and interactive nature of virtual instructions, which can foster engagement, critical thinking, and teamwork among students. These findings align with the study's results, which suggest a widespread perception among respondents that virtual instruction platforms enable collaboration and peer interaction. However, challenges such as technical issues, limited personalization, and lack of hands-on learning opportunities associated with virtual instructions are also evident in the literature and reflected in the study findings. Pisoni & Hoogetboom (2019) discuss the disparities in access to technology and resources, which can pose barriers to effective virtual instruction and impact learning outcomes. Clark (2003) and Salerno (2021) highlight the need for further research into the factors influencing student success in virtual learning environments, particularly in Upper Secondary settings. Rice (2006) underscores the importance of teacher readiness and facilitation in maximizing the effectiveness of virtual learning environments.

VI. CONCLUSIONS

Virtual lessons and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

It is concluded that there is significant and positive effect of virtual lessons on achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. Successful virtual lessons have been found to significantly impact the achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. This finding highlights the effectiveness of virtual learning as a tool for enhancing educational outcomes in this specific context. The implementation of virtual lessons in these schools has proven to be a successful strategy for improving student performance and overall academic achievement. One key aspect of successful virtual lessons is the ability to engage students in a dynamic and interactive learning environment.

Virtual lessons provide opportunities for students to actively participate in their own learning process, allowing them to explore concepts, ask questions, and collaborate with their peers. This active engagement promotes deeper understanding and achievement of learning outcomes of the subject matter, leading to improved learning outcomes. Furthermore, virtual lessons offer flexibility in terms of time and location. Students can access the lessons from anywhere, at any time, as long as they have an internet connection. This flexibility allows students to learn at their own pace and convenience catering to their individual learning needs. As a result, students are more likely to be motivated and engaged in their studies, leading to better academic performance.

Asynchronous discussions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

It is concluded that there is positive and significant effect of asynchronous discussions on achievement of learning outcomes in Upper Secondary schools in Kapchorwa District, Uganda. Students who participated in these discussions showed higher levels of engagement, critical thinking, and collaboration, which ultimately translated into better grades and overall academic success. The asynchronous nature of the discussions allowed students to participate at their own pace and convenience, leading to more thoughtful and in-depth contributions. Additionally, the discussions provided a platform for students to exchange ideas, ask questions, and receive feedback from their peers and teachers, fostering a more interactive and dynamic learning environment. Overall, the research highlights the potential of asynchronous discussions as a valuable tool for enhancing academic performance and promoting student success in upper secondary schools.

Virtual instructions and achievement of learning outcomes in Upper Secondary schools in Kapchorwa District

It is concluded that there is positive and significant effect of virtual instructions on achievement of learning outcomes in Upper Secondary schools in Kapchorwa District, which means effective virtual instructions significantly affect achievement of learning outcomes in Upper Secondary schools in Kapchorwa District. virtual instruction enhances student engagement and motivation. By utilizing interactive multimedia resources, virtual instruction captures students' attention and makes learning more enjoyable and interactive. This increased engagement leads to a deeper understanding of the subject matter and a higher level of participation in class activities. As a result, students are more likely to achieve their educational goals and perform better academically. Virtual instruction provides students with access to a wide range of educational resources and materials. Through online platforms, students can access textbooks, articles, videos, and other learning materials that are not readily available in their physical classrooms. This exposure to diverse resources enhances students' understanding of the subject matter and allows them to explore different perspectives and approaches to learning. Consequently, students are better equipped to achieve their educational goals and develop a comprehensive understanding of the topics being taught.

Based on the findings presented regarding virtual lessons, asynchronous discussions, virtual instructions, and their correlation with the achievement of learning outcomes in Upper Secondary schools in Kapchorwa District, the following recommendations are suggested: i) Investment in Infrastructure: Addressing technical challenges such as poor network connectivity is crucial for optimizing the effectiveness of digital learning methods. Schools and education authorities should prioritize investment in reliable internet infrastructure and technology tools to ensure seamless access to virtual lessons and asynchronous discussions for all students. ii) Financial Support for Students: Given the perceived costliness of accessing virtual lessons, financial support mechanisms such as subsidies or scholarships could be implemented to alleviate the financial burden on students. This would help ensure equitable access to digital learning resources and mitigate disparities in access based on socioeconomic status. iii) Teacher Training and Professional Development: Providing teachers with training and professional development opportunities in digital pedagogy is essential for enhancing the quality of virtual instructions. Teachers should be equipped with the skills and knowledge necessary to effectively leverage digital learning platforms, personalize instruction, and facilitate engaging asynchronous discussions.

Integration of Interactive and Practical Elements: To address the perceived limitations in hands-on learning experiences, virtual lessons and asynchronous discussions should incorporate interactive and practical elements. This could include virtual simulations, hands-on experiments, group projects, and real-world applications to enhance student engagement and deepen understanding. v) Promotion of Social Interaction: Strategies should be implemented to promote social interaction and peer-to-peer learning opportunities within digital learning environments. This could involve structured collaborative activities, discussion forums, group projects, and peer feedback mechanisms to foster meaningful interactions and collaborative learning experiences.

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REFERENCES

- [1] Acquah, E. O., & Katz, H. T. (2020). Digital game-based L2 learning outcomes for Upper Secondary through high-school students: A systematic literature review. 143, 103667.
 - [2] Agyei, D. D. (2021). Integrating ICT into schools in Sub-Saharan Africa: from teachers' capacity building to classroom implementation. 26(1), 125-144.
 - [3] Aheisibwe, I., & Barigye, E. (2023). Pedagogical Experiences of Bishop Stuart University Students on School Practice about the New Lower Secondary School Curriculum in South Western Uganda. 6(1), 291-296.
 - [4] Akongai, H. (2021). Teachers' Welfare and Teachers' performance in the teaching and learning process in selected government Aided Upper Secondary schools in Tingey county, Kapchorwa District. University of Kisubi, Bariu, T. N. (2020). Status of ICT infrastructure used in teaching and learning in secondary schools in Meru County, Kenya. 1(1), e02002.
 - [5] Besigomwe, F., Opatu, V. N., & Kisilu, A. S. (2023). Upper Secondary teacher education trainees' preparation for integration of information communication technology in their pedagogical practices in Uganda. 7(3), 463-478.
 - [6] Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. 17(1), 1-30.
 - [7] Wang, L., et al. (2018). The Effects of Asynchronous Online Discussions on Students' Academic Performance. *Journal of Educational Technology & Society*.
 - [8] Smith, J., & Jones, A. (2017). Asynchronous Online Discussions and Student Achievement in Mathematics Courses. *International Journal of Mathematics Education*.
 - [9] Brown, K., et al. (2019). Meta-Analysis of Asynchronous Discussions and Learning Outcomes in Upper Secondary Schools. *Educational Psychology Review*.
 - [10] Lee, S., & Kim, H. (2016). Instructor Facilitation Strategies for Enhancing Asynchronous Online Discussions. *Journal of Science Education*.
 - [11] Smith, A., & Jones, B. (2018). The Impact of Virtual Instructions on Academic Performance: A Study in Upper Secondary Schools. *Journal of Educational Technology*.
 - [12] Brown, C., et al. (2019). Meta-Analysis of Virtual Instructions and Learning Outcomes in Upper Secondary Schools. *Educational Psychology Review*.
 - [13] Johnson, D. (2020). Factors Influencing the Effectiveness of Virtual Instructions: A Case Study in Upper Secondary Education. *International Journal of E-Learning*. Department of Education. (2017). Report on Integrating Virtual Instructions into Upper Secondary School Curricula.
 - [14] Calderón, A., Meroño, L., & MacPhail, A. (2020). A student-centred digital technology approach: The relationship between intrinsic motivation, learning climate and academic achievement of physical education pre-service teachers. 26(1), 241-262.
 - [15] Castro, M. D. B., & Tumibay, G. M. (2021). A literature review: efficacy of online learning courses for higher education institution using meta-analysis. *Education Information Technologies*, 26, 1367-1385.
- Day, C. (2020). How teachers' individual autonomy may hinder students' academic progress and attainment: Professionalism in practice. 46(1), 247-264.

- [16] Education, D. o. (2023). Education in Kapchorwa District. Fadda, D., Pellegrini, M., Vivianet, G., & Zandonella Callegher, C. (2022). Effects of digital games on student motivation in mathematics: A meta-analysis in K-12. 38(1), 304-325.
- [17] Farros, J. N., Shawler, L. A., Gatzunis, K. S., & Weiss, M. J. (2020). The effect of synchronous discussion sessions in an asynchronous course. 1-13.
- [18] Fearnley, M. R., & Amora, J. T. (2020). Learning Management System Adoption in Higher Education Using the Extended Technology Acceptance Model. 8(2), 89-106.
- [19] Fehrman, S., & Watson, S. L. (2021). A systematic review of asynchronous online discussions in online higher education. 35(3), 200-213.
- [20] Gresnigt, R., Taconis, R., van Keulen, H., Gravemeijer, K., & Baartman, L. (2014). Promoting science and technology in Upper Secondary education: a review of integrated curricula. 50(1), 47-84.
- [21] Hamilton, D., McKechnie, J., Edgerton, E., & Wilson, C. (2021). Immersive virtual reality as a pedagogical tool in education: a systematic literature review of quantitative learning outcomes and experimental design. 8(1), 1-32.
- [22] Higgins, E. M. (2021). Exclusionary school discipline and delinquent outcomes: A meta-analysis. 50(8), 1493-1509.
- [23] Kibuku, R. N., Ochieng, D. O., & Wausi, A. N. (2020). e-Learning Challenges Faced by Universities in Kenya: A Literature Review. 18(2), pp150-161-pp150-161.
- [24] Knezek, G., & Christensen, R. (2008). The importance of information technology attitudes and competencies in Upper Secondary and secondary education. 321-331.
- [25] Kyakulumbye, S., & Pather, S. (2022). Understanding ICT adoption amongst SMEs in Uganda: Towards a participatory design model to enhance technology diffusion. 14(1), 49-60.
- [26] Liu, R., Wang, L., Lei, J., Wang, Q., & Ren, Y. (2020). Effects of an immersive virtual reality- based classroom on students' learning performance in science lessons. 51(6), 2034-2049.
- [27] Mandasari, B., & Wahyudin, A. Y. (2021). Flipped classroom learning model: implementation and its impact on EFL learners' satisfaction on grammar class. Ethical Lingua: Journal of Language Teaching
- [28] Milly, N., Xun, S., Meena, M. E., & Cobbinah, B. B. (2021). Measuring mobile banking adoption in Uganda using the Technology Acceptance Model (TAM2) and perceived risk. 9(01), 397. Moorhouse, B. L., & Wong, K. M. (2022). Blending asynchronous and synchronous digital technologies and instructional approaches to facilitate remote learning. 9(1), 51-70.
- [29] Mukhtasar, M. (2021). Improving the methodology of teaching virtual lessons on the basis of modern digital technologies. 1(1).
- [30] Müller, C., & Mildenerger, T. (2021). Facilitating flexible learning by replacing classroom time with an online learning environment: A systematic review of blended learning in higher education. Educational Research Review, 34, 100394.
- [31] Nabalayo, P. (2023). The impact of learners' socio economic status on their academic performance in English language. Pisoni, G., & Hoogeboom, M. (2019). Investigating effective dynamics of virtual student teams through analysis of Trello boards. Paper presented at the 2019 17th International Conference on Emerging eLearning Technologies and Applications (ICETA).
- [32] Plasman, J., Gottfried, M., Williams, D., Ippolito, M., & Owens, A. (2021). Parents' Occupations and Students' Success in STEM Fields: A Systematic Review and Narrative Synthesis.
- [33] Raes, A., Vanneste, P., Pieters, M., Windey, I., Van Den Noortgate, W., & Depaeppe, F. (2020). Learning and instruction in the hybrid virtual classroom: An investigation of students' engagement and the effect of quizzes. 143, 103682.
- [34] Rafique, H., Almagrabi, A. O., Shamim, A., Anwar, F., & Bashir, A. K. (2020). Investigating the acceptance of mobile library applications with an extended technology acceptance model (TAM). 145, 103732.
- [35] Rakes, C. R., Ronau, R. N., Bush, S. B., Driskell, S. O., Niess, M. L., & Pugalee, D. K. (2020). Mathematics achievement and orientation: A systematic review and meta-analysis of education technology.
- [36] Rindaningsih, I., Findawati, Y., Hastuti, W. D., & Fahyuni, E. F. (2021). Synchronous and asynchronous with flipped learning environment in Upper Secondary school. 5(1), 33-44.
- [37] Sahin, D., & Yilmaz, R. M. (2020). The effect of Augmented Reality Technology on middle school students' achievements and attitudes towards science education. 144, 103710.
- [38] Salerno, A. A. (2021). Exploring Teachers' Perceptions About the Influence of Professional Learning to Reduce Transactional Distance Between Teachers and Students in a Virtual Setting.
- [39] University of Bridgeport, Szymkowiak, A., Melović, B., Dabić, M., Jeganathan, K., & Kundi, G. S. (2021). Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people. 65, 101565.
- [40] Torres Martín, C., Acal, C., El Homrani, M., & Mingorance Estrada, Á. C. (2021). Impact on the

virtual learning environment due to COVID-19. 13(2), 582.

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