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Review of Virtual and in-Person Learning Strategies for Contemporary Higher Education: A Case of Tertiary Students, Ghana

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Abstract: *This study is to review virtual and in-person learning strategies. Learning to complete an intellectual programme and graduating successfully, have always been the objective of every student who embarks on an education. However, the exigencies of time (example school fees, transportation to campus and back, and learning and working simultaneously for some students) and a conducive learning environment have been enormous problems that confront students in completing their education and graduating successfully. Both qualitative (analyses) and quantitative (variance tests) were employed to thoroughly review data collected from both tertiary students in Ghana and libraries. 84% of respondents prefer virtual / online learning and 16% not; in another vein, 73% prefer in-person learning and 27% not. Moreover, 71% are in favour of virtual learning for further studies as against 29% for in-person. The above data is in response to the learning environment conducing for completing tertiary education and graduating successfully. Therefore, it can be concluded that majority of the respondents are in favour of virtual learning. Virtual learning consequently, should be promoted in tertiary institutions globally, as it is strategic for success of most students for higher education in these modern times.*

Keywords: Learning, strategies, virtual/online, in-person, technology, tertiary and contemporary.

INTRODUCTION

Education is defined by Hornby (2020) as a process of teaching, training and learning in schools or colleges to improve / expand knowledge and develop skills. Again, Naka and Shimahara (2024) described education as the transmission of the values and accumulated knowledge of a society / environment for better performance and cohesion of the citizenry; it is related to what social scientists entitled socialization. Furthermore, Dictionary.com (2024) expounded on education as the process of imparting / acquiring knowledge, developing the powers of reasoning and judgment, and preparing oneself intellectually for an enhanced life.However,

teaching, which is part of education, is the giving of lessons to students in a school, college, university, etc. to make them dexterous in their field of study (Hornby, 2020). Moreover, according to Jackson (n.d.), teaching is the process of attending to peoples' needs, experiences and feelings, and intervening to enable them learn particular things and beyond what is given; it is a three (3) dimensional process where the teacher and the student realize their tasks through the curriculum and mainly in a classroom situation.

Furthermore, learning is described by Hornby (2020) and Geektonight (2023) as enduring change in a behaviour through an experience to gain knowledge / skill from an occurrence. Through the knowledge / skill gained, the learner attains education.The advent of technology has brought in its wake virtuality, which has taken a centre stage to make humans have advantage in performing many tasks remotely from the source and without their physical presence. Cambridge Dictionary (2024a) defined virtual as an environment created by computer technology and appearing to exist but not existing in the physical world; virtual has also been known to connote an almost particular thing or quality, i.e. things / items of similar in nature / performance. Hornby (2020) also defined virtual as something made to appear to exist using computer software and in addition using the software on technology, which has enabled the development of an online / virtual library.

In-person, on the other hand, means physical / face-to-face presence of a person in carrying out an activity / task, example a classroom with students and a teacher providing lessons for the students. According to Cambridge Dictionary (2024b) and Campbell (2024), in-person refers to activities / events that take place with persons physically present and together in the same place, instead of online / phone / video link; it is about an appearance carried out personally in another's presence. In this contemporary times, virtual learning has become popular and competes strongly with in-person learning. As technology continues to evolve and daily penetrates every aspect of human life, there has been a significant impact in the classroom; computer science, information technology and technology expert-teachers have been the leaders championing this impact in the classroom (Temple, 2021). According to Temple (2021), global digital skills have developed and both teachers and students are at home with technology. Most schools are therefore, enjoying using technology to teach students, leading to virtual learning in these schools, especially the distance learning institutions.

Virtual learning (sometimes called distance learning) generally refers to an environment where students take their lessons through digitally based curriculum taught by instructors through online lectures, via video and/or audio; the instruction can take place either self-paced / asynchronous or in a real time / synchronous environment (Coursera, 2023). In another vein, Raouna (2024), described online / virtual learning (also known as e-learning) as a digital learning which encompasses a broad spectrum of educational activities facilitated through technologies; this is a form of education where instruction and learning take place over the internet and through digital learning tools / machines / platforms, such as learning management systems (LMS).

An LMS, primarily, is where learning / training meets technology; this is a software application for virtual learning, which helps to manage, deliver and track all learning activities in either a

school, corporate office or home (Pappas, 2024). As technology becomes predominant in human lives, the education industry has been quick to transform itself into the digital platforms to deliver learning experiences beyond the limitations of the traditional physical (in-person) classrooms. Currently, instead of the traditional face-to-face interactions in a physical classroom, online / virtual learning has become popular and relies heavily on technology to deliver educational content; this also facilitates communication between instructors and learners, and on top assesses learners' progress through online assignments and examinations (Raouna, 2024).

Globally, virtual learning environment has been in use for over three (3) decades and according to Coursera (2023), it is a good choice for people who enjoy learning privately, without restrictions on space and time; some of the learning environments allow the attendance of class at scheduled times whilst others are structured for learning at one's own pace. Virtual learning can be convenient, flexible and affordable, as the students have the autonomy with the intensity and modulation of learning and simultaneously, enjoying the benefits of guided tuition (Coursera, 2023).

Background and Statement of Problem

Education is currently acquired through either virtual or in-person teaching / learning in institutions, globally. The question that agitates the minds of most scholars is which of the two (2) learning methods provides the best approach to acquire education in these contemporary times of technological advancement?

Technology as an innovation is making humans, globally, have simple and cost-effective way to live, exist and enjoy life. It is a tool which should be utilized to the fullest by all. Technology has also brought about Artificial Intelligence (AI), as an added tool to help humans accomplish difficult tasks which were not easy to achieve in the former times. AI can be used to customise learning experience, which could lead to better engagement and knowledge retention amongst students; machine learning (ML), an aspect of AI, is leading the way for big data to be explored and analysed fully (Runciman, 2024). This has led to the introduction of social media platforms, like Facebook, Whatsapp, X (formerly Twitter), LinkedIn and many others, which could collect views / messages globally from users and give feedback instantly for effective decisions making by organizations and individuals.

Based on the above, what prevents the education industry, globally, from coming out with a policy to instruct all tertiary institutions to revamp their educational systems to include virtual / online learning systems? This is a question to ponder over by all academics. This method of acquiring knowledge could make a student complete his / her education faster, technology-friendly, cost-effective and share notes globally with peers.

The researcher benefited from the distance learning programme organized by the University of Leicester, Leicester, UK and SMC University, Zug, Switzerland to acquire his MBA and PhD degrees, respectively. The fee incurred in these levels of education by the researcher was at a far lower cost, but high quality of lessons using technology, as compared to the in-person learning at institutions, which comes with huge cost and a host of encumbrances to deal with.

The researcher has therefore, decided to review virtual and in-person learning strategies of tertiary education and come out with the strengths and challenges associated with them. There is currently, a missing gap of knowledge on how prospective students would be guided to select the best learning environment for their higher education, based on resources available to the student. This has led to some students starting tertiary education with all the enthusiasm, but unable to complete and graduate successfully.

The conclusions and recommendations from this study, hopefully, would enlighten prospective students to know the best learning system (virtual / in-person) to adopt, with regards to the strengths and challenges associated with these learning systems, when decisions are being made for tertiary education.

Objectives of the Study

The main purpose of this research, therefore, is to review the virtual / online and in-person learning environments of higher education offered by tertiary institutions and recommend the strengths and challenges associated with them; this, hopefully would enable students to decide on the best option for adoption and completion of education, and subsequently, graduating successfully.

Objectives of the study are therefore:
i. To examine the difference between virtual and in-person learning,
ii. To assess the component-types of learning environments for students – virtual and in-person, and
iii. To propose the conducive learning environment for completing education and graduating successfully.

Research Questions and Hypotheses

The research questions that would command and collect reliable data from respondents to achieve the objectives are:

i. RQ1: What is the difference between virtual and in-person learning?
ii. RQ2: What is the component-types of learning environments for students - virtual and in-person?
iii. RQ3: Which learning environment is conducive for completing education and graduating successfully?

The three (3) research questions were important for developing further sub-questions for compiling questions of the questionnaire for collecting primary data from the selected students. The research questions dealt with the difference between virtual and in-person learning; component-types of learning environment for a student – virtual and in-person; and the learning environment conducive for completing education and graduating successfully – virtual / in-person. These are all about the relationship between virtual and in-person learning - what they are, the component-types of learning environment and the type conducive for completing education and graduating successfully. The last two (2) RQs are concerned with the component-

types of learning environment (virtual and in-person) and conducive type for consideration by a student for his / her tertiary education.

Considering the quantitative aspect of the mixed method, variance (hypothetical) test was applied for RQ1, RQ2 and RQ3, as the research questions deal with *difference / relationship* between two (2) items – virtual and in-person.In accordance with Research Question 1 (RQ1), Hypothesis 1(HR_1) indicates that there is a difference between virtual and in-person learning, whereas the corresponding Null hypothesis ($H1_1$) is that there is no significant difference between them. Similarly, RQ2 and HR_2 indicate that there is a difference between the component-types of learning environments – virtual and in-person, whereas the Null hypothesis ($H1_2$) is that there is no significance difference between them. Finally, RQ3 and HR_3 indicate that there is a significant difference between the learning environments (virtual and in-person), when considering the prospect of completing education and graduating successfully. The Null hypothesis ($H1_3$), on the other hand, is that there is no significant difference / relationship between the learning environments with prospect of completing education and graduating successfully.

Significance of the Study

Learning to complete an intellectual programme and graduating successfully, has always been the objective of every student who embarks on an education. However, the exigencies of time, example cost to incur, activities to go through whilst undergoing learning (example transportation to campus, and learning and working simultaneously), and a conducive learning environment have often contributed, by and large, to help students to complete their education and graduate successfully.

According to Naka and Shimahara (2024), education is the transmission of the values and accumulated knowledge of a society / environment for better performance and cohesion of the citizenry; and it is comparable to what social scientists called socialization. In addition, Dictionary.com (2024) mentioned that education is the process of imparting / acquiring knowledge, developing the powers of reasoning and judgment, and preparing oneself intellectually for an enhanced life. Furthermore, learning has been defined by Geektonight (2023) as a relatively enduring change in behaviour / probable behaviour because of direct / indirect experience gained; thus, learning is a change in behaviour through an experience gained from an occurrence. Smith (2020) also described learning as a process that is often under control and wrapped up within the environment of activity; it involves signals and senses, attending to them, looking for corrections and meanings, and framing them for actions.

Acquisition of learning is very important in the development of every person, as it would enable the person to better manage activities appropriately in any situation / environment s/he finds her / himself, help attain a higher status in life and achieve the desires of the heart. However, how one acquires learning through education, which becomes knowledge, for the proper management and guidance of self for better handling of tasks and problems, is very important. Education is very costly to attain these days, as it needs money, time, transportation, good health and a conducive environment for studies to enable the assimilation of ideas taught by the instructor. The author is, therefore, worried and concerned about the decisions students /

parents (on behalf of their wards) make for the type of learning environment that would enable completion of programmes and graduating successfully. Acquiring a good level of education is sine qua non for every student in these contemporary times.

However, the global economic situation, which is biting very hard on everybody needs the making of good decision to select the best learning environment (virtual / in-person) within available financial constraints, very important for consideration by prospective tertiary students. The missing gap of knowledge on how prospective tertiary students would be guided to select the best learning environment (virtual / in-person) for education would be reviewed / investigated; hopefully, a concept would be propounded to enable students take the best decision for higher education. Furthermore, Alarifi and Song (2024) alerted that virtual / online learning has not been comprehensively explored to enable any proper comparison between virtual and in-person education, making this study very important.

Scope of the Study

The research is about the review of virtual and in-person learning systems for contemporary higher education. The researcher is concerned about the current global hyper cost-of-living expenses when a student opts for an in-person student-status and away from home; where renting of accommodation, tuition fee, transportation charges, feeding cost and many other expenses are to be borne by the student (or parents) in this technologically advanced global village. However, data would equally be collected on both virtual / online and in-person tertiary education systems and analysed to help students decide on the best choice of learning, depending on the prevailing constraints for acquiring a higher education. The author collected and used primary data from tertiary students in Ghana. There are many tertiary students (both foreign and local) attending different institutions in Ghana, comprising universities, technical universities (formerly polytechnic), teacher training colleges, vocational schools, among others. These institutions are either private or public in nature, and train students to become future technocrats, academics, industrialists, etc.

Hopefully, the researcher would gather reliable and raw data from respondents about their views on virtual and in-person learning systems to acquire education. Expectantly, the study would assemble data on fair ideas on the subject-matter from respondents to enable the researcher to come out with good findings; this would assuredly provide knowledge on the missing gap on how prospective tertiary student would be guided to select the best learning environment for higher education. Enthusiastically, the conclusions and recommendations from the findings were generalized to help prospective students, globally, to be guided to select the best learning environment for higher education.

LITERATURE REVIEW

The review has been organized to examine the different dynamics of education; the process of imparting / acquiring knowledge to develop the powers of reasoning for an enhanced life. Learning encompasses a broad spectrum of activities, which could be facilitated through technologies and/or persons physically present / together in the same place (Dictionary.com,

2024; Raouna, 2024; Coursera, 2023; Campbell, 2024). These dynamics of different activities in education would be investigated in the literature review.

The meaning of education

Education has been described by Naka and Shimahara (2024) as the transmission of the values and accumulated knowledge of a society / environment for better performance and cohesion of the citizenry; and it is connected to what social scientists called socialization. Again, Dictionary.com (2024) explained education as the process of imparting / acquiring knowledge, developing the powers of reasoning and judgment, and preparing oneself intellectually for an enhanced life.Education means different things to different people, and various factors could contribute to a person's understanding of what education hopes to achieve, including their background, position in the society and circumstances (Robinson & Robinson, 2022). Furthermore, Robinson and Robinson (2022) reiterated that, the word 'education' is often confused with terms like 'learning', 'training' and 'school', and explained them as follows:

i. **education** is a methodical system of learning,
ii. **learning** is the process of acquiring new skills and understanding,
iii. **training** is focused on learning specific skills, and
iv. **school** is a community of learners, where persons come together to learn with and from each other.

Purposes and benefits of education

Robinson and Robinson (2022) mentioned that education should expand one's consciousness, capabilities, sensitivities, cultural understanding and enlarge global view. Based on the above, Robinson and Robinson (2022) suggested that today's climate change (woes) should challenge students to engage in the global economic issues of environmental well-being, which would preserve the environment for future generations, including those yet unborn. At the UN Climate Change Conference in Paris 2015 (COP21), there was an agreement on 12 December 2015 which came into force on 4 November 2016 and warned against allowing global temperatures to rise beyond 1.5 degrees; recent studies and every indication pointed out that it would go beyond that point very soon (Brown, 2024). This is a reminder to governments to implement the green revolution in their various countries.
Concluding, Robinson and Robinson (2022) gave an overview of four (4) purposes education should be concerned with. These are: personal, cultural, economic and social.

i. **Personal** – education should enable students to engage with the world they live in and around them. There is a deep connexion between global experience and how individuals feel about it, as each student has unique strengths and weaknesses, outlooks and personalities. Each student has his / her own aptitudes and dispositions, and different ways of understanding lessons, thereby making him / her personal. Education is therefore, about cultivating the minds and hearts of students and engaging them to achieve the desires of their hearts.The Universal Declaration of Human Rights emphasises that 'all human beings are born free and equal in dignity and rights', and education should be directed to the full development of the human personality and the strengthening of respect for human rights and fundamental freedoms.

Unfortunately, this principle is always disregarded, creating many problems in the current educational system (Robinson & Robinson, 2022).

ii. **Cultural** – schools should teach students to understand their own cultures and respect the diversity of other cultures. Culture is about the values, norms and forms of behaviour that characterise social groups. As education is one way that communities pass on their values, norms and behaviour from one generation to the other, so it is for preserving a culture against outside influences and to others for promoting cultural tolerance.
However, as the globe becomes more connected and a small village, it is becoming more complex culturally and living with diversity is not just an ethical choice, but a practical imperative. Therefore, there should be three (3) cultural priorities for schools to help students to:

a. understand their own cultures,
b. understand other cultures, and
c. promote a sense of cultural tolerance and co-existence.
This could enrich the lives of all communities by celebrating their own cultures, and the practices and traditions of other cultures (Robinson & Robinson, 2022).

iii. **Economic** – education should enable students to become economically responsible and independent. Thus, governments should take keen interest in education, as they know that an educated workforce is essentially, to creating economic prosperity. Leaders of the Industrial Revolution knew the importance of education to critically create the types of work force they required, even during those days. In connecting students with their unique talents and interest, divisions between academic and vocational programmes should be dissolved and foster practical partnership between schools and the global working environment. This would help students experience working environments as part of their education and not when it is time for them to enter the labour market (Robinson & Robinson, 2022).

iv. **Social** – education should enable students to become active and compassionate citizens, as life is densely woven around social systems. The benefits derived from these systems depend on working together to sustain them. The empowerment of students should be balanced by practising the values and responsibilities of collective life, and of democracy too. Freedom in democratic societies is not automatic, as they came from centuries of struggle against tranny, autocracy and those who foment sectarianism, hatred and fear. Those struggles are not over, as observed by John Dewey cited in Robinson and Robinson (2022), 'Democracy has to be born anew every generation and education is the midwife'.For democracy to be sustained, it would depend upon most of the people to be active within the democratic process and students cannot be left out. Therefore, schools should engage students to becoming active, proactive and democratic participants. An academic civics course will scratch the surface, but nurturing a deeply rooted respect for democracy would need the essentials of giving students real-life democratic experiences long before they come of age to vote in national elections (Robinson & Robinson, 2022).

UNESCO and education

According to UNESCO (2024), education transforms lives and as it cherishes this, it has therefore, incorporated in its mission peace, eradication of poverty and sustainable drive of development; furthermore, education is a human right issue for all to assess and this should be matched with quality, just as illustrated by Robinson and Robinson (2022).UNESCO (2024) also informed that it is the only organisation within the United Nations agency with a mandate to encompass all aspects of education; in that sense and additionally, it has been entrusted to lead the Global Education 2030 Agenda through Sustainable Development Goal (SDG) 4. The Goal 4 is to ensure inclusive and equitable quality education and endorse lifelong learning opportunities for everybody; it also supports the reduction of disparities and inequalities in education, both in terms of access and excellence (UNDP, 2024).Moreover, UNESCO has a roadmap to attain the SDG 4 through its Education 2030 Framework for Action (FFA); this would provide a global and regional leadership in education, strengthens education systems and responds to contemporary global challenges through education with gender equality. Consequently, UNESCO's work encompasses educational development from pre-school to the highest level and there are themes, including citizenship and sustainable development, human rights and gender quality, health and HIV, and technical and vocational skills development for all (UNESCO, 2024).

The meaning of virtual / online Learning

Virtual / Online leaning has been defined by Raouna (2024) as digital learning which incorporates a broad continuum of educational activities facilitated through digital technologies; it consists of instructions of learning given over the internet and through digital learning tools / platforms. Again, Raouna (2024) declared that virtual learning is known as e-learning and depends heavily on technology to deliver the educational content, expediates communication between instructors and learners, and in addition assesses the learner's progress through electronic / digital assignments and examinations.Furthermore, Coursera (2023) described virtual / online learning as an environment where students study a digital-based curriculum, which is taught by instructors via video and/or audio. The instructions could be given either in a self-paced / asynchronous or in a real-time / synchronous setting. In addition, one (1) of the applications used for online learning is Learning Management Systems (LMS), which is explained by Pappas (2024) as a software used to manage, deliver and track all learning activities in either a school, corporate office or home.

History of virtual / online learning

According to Raouna (2024), the roots of online learning are intensely interwoven with the development of computing technology and the advent of the internet; its progression can be traced back to the mid-20th century when the innovators began to explore the potential of technology to enhance educational capabilities. Additionally, Raouna (2024), has revealed that to better understand virtual / online learning and how it has travelled to become what it is today, there is the need to go back in time and read through the key milestones of the evolution of this important education break through.

The Internet Revolution and the first online learning

The widespread of the internet in the 1990s made a significant break through in the development of virtual / online learning and coupled with the emergence of the World Wide Web (www), democratized access to information and communication; this paved the way for the development of web-based learning platforms and created online courses (Raouna, 2024). Specifically, the online educational network, termed 'Electronic University Network' (EUN), became available on Commodore 64 and Disk Operating System (DOS) computer systems, leading to the first online course which was launched one (1) year later by the University of Toronto. Other educational institutions, organisations and individuals then began to explore the potential of the internet to deliver educational content and the facilitation of interactive learning proficiencies (Raouna, 2024). See Appendix 1 for the table of period / year and key developments in virtual / online learning.

Contribution of Learning Management Systems (LMS) to Virtual / Online Learning

The late 20th and early 21st centuries witnessed the rise of Learning Management Systems (LMS), which provided centralized platforms for organising, delivering and tracking virtual / online learning activities (Raouna, 2024).

Learning Platforms, such as **Modular Object-Oriented Dynamic Learning Environment** (MOODLE), was the first open-source LMS to be introduced and this revolutionized the way educational content (lessons, assignment and exams) was delivered. Furthermore, this facilitated the collaboration between instructors and learners in virtual / online environment (Raouna, 2024). During those days, learners used downloadable desktop application from which they chose the preferred content to export onto their computer systems (Raouna, 2024). The period 2010s saw the advent of **Massive Open Online Courses** (MOOCs), which further transformed the landscape of the virtual / online learning. MOOC brought out the offering of free or low-cost access to courses from leading universities and institutions, thereby making millions of learners to be reached globally. MOOC popularized the concept of open and accessible online education (Raouna, 2024).

Virtual / online learning continues to evolve rapidly, and it is driven by the advancement in technology, pedagogy and learning science. Since the 21st century, the e-learning industry has grown by 900%, and by the end of 2025, it is expected to triple. The online learning market would likely reach $336.98b in 2026 and the total projected estimation reaching $1trillion by 2032 (Raouna, 2024).

The e-learning environment is no doubt being fashioned out by innovations such as **adaptive learning, virtual learning and artificial intelligence,** which are providing learners with more personalized, immersive, and engaging education capabilities with real impact on personal and professional lives (Raouna, 2024).

Covid-19 and Virtuality

The year 2020 marked an extraordinary period in the lives of humans, as there was a global disruption characterized by Covid-19 pandemic. Governments, institutions and businesses worldwide were grounded to a halt (Alarifi & Song, 2024). This was the time virtual meetings

of almost all activities and distance learning for education, became vogue. Many educational institutions quickly transitioned into distance learning (e-learning) to ensure continued access to education for their students (Alarifi & Song, 2024). Unfortunately, the effects of this desperate and widespread shift to virtual / online learning have not been comprehensively examined to enable a proper comparison between online and in-person education, as opined by Alarifi and Song (2024).

Lockee (2021) added that Covid-19 forced the educational institutions, globally, to engage in the ubiquitous virtual learning; though online / distance learning had been used before to maintain continuity in education, especially during times of earthquakes, the scale of use for the Covid-19 crisis was unprecedented. Now, the question everybody has been looking for an answer is that the forced shift to virtual learning during the moment of change saved education, as humanity would have to re-imagine how learning could be delivered (Lockee, 2021).

Types of virtual learning

Raouna (2024) and Coursera (2023) mentioned three (3) types of virtual / online learning and named them as synchronous, asynchronous and hybrid / blended. These are described below.

i. **Synchronous** – students attend virtual / online live-streamed lectures, where the instructor streams the presentation and allow students to ask questions in real-time, via webcam, microphone, or live chat, for a more hands-on learning experience (using Zoom, Skype or Google Meet). This is good for students who benefit from the constant learning structure and pacing of the lectures (Raouna, 2024; Coursera, 2023).
ii. **Asynchronous** – pre-recorded lectures are watched by students on their own time. The instructor posts either a video and/or audio file along with lecture notes. There are normally quiz within the lecture notes to ensure students watch the lectures and are abreast with the class schedule. Typically, the instructor or an assistant would be available, via email or text chat. There are different students who partake in this type of lectures, including current and at times past students; they usually communicate and learn from each other, such as through a forum, where they discuss the pertinent details of the lecture notes others may not have gathered / captured from the lectures (Raouna, 2024; Coursera, 2023).
iii. **Hybrid / Blended** – makes use of both virtual and in-person learning. This is also most popular for classes that require a laboratory component. This type is principally for those students who want freedom to learn at the best of their times but also prefer some structured lectures and communication with the instructor (Raouna, 2024; Coursera, 2023).

Deciding to go in for virtual / online learning

The decision to pursue a virtual / online learning involves assessing the pros and cons of the structure and types of the learning environments available (Coursera, 2023). Some factors for consideration when deciding to go in for virtual learning are:
i. confidence in your ability to use the required technology – comfortability with the use of technology as a student, is a plus and certainty to turn to a virtual / online learning (Coursera, 2023).

ii. discipline – since accountability for a virtual learning environment is very important, there would be the need to be disciplined when studying, participating in discussions and managing time preciously (Coursera, 2023).
iii. excellent time management skills – setting aside ample time in one's schedule to study and participate in class would help to succeed in the learning programme.

There is the need to carve out the same time every day to complete one's studies. Example, if there is a class that meets three times every week, there would be the need to set aside days and times where devotion, at least one hour, would be given to studying or preparing towards it; there is every indication that the outcome and output would be great to behold (Coursera, 2023). Opting for virtual / online learning demands getting away from distractions and there should be a focus on one's studies; there may also be the need to have a dedicated spot or rotation of places, that are exclusively used for learning (Coursera, 2023).

Ten (10) Benefits of Virtual / Online Learning
Coursera (2024) elucidated on the benefits of virtual / online learning as an option to learn a new language, improve upon a specific technical skill or earn an academic degree; in terms of statistics, 44% undergraduate and 52% graduate students in the USA enrolled exclusively in virtual / online programs in 2020. Furthermore, Coursera (2024) added that online learning is a popular alternative to in-person, because it removes major barriers to education and expands the reach of education, thereby making it more equitable and easily accessible.
The ten (10) benefits therefore, are:

i. **there is no need to relocate or commute** – virtual learning brings the classroom to your home (room), no matter the type of qualification one is interested in to achieve – academic degree, professional certificate, etc. Some of the most renowned educational institutions can easily be accessed online and one is not limited by borders or paying a fee for parking of vehicle on campus; instead, the programme can be reached virtually across nations / globally, without the need to relocate (Coursera, 2024).
ii. **the learning space can be decided** – learning either synchronous or asynchronous online debars one from getting to the classroom and instead turn to the available computer system. Carrying of books, laptop or other necessities is not needed, making learning very comfortable, as whatever would be needed is within the dedicated space being occupied, example, corner of a room or table (Coursera, 2024).
iii. **keep working while enrolled** – a lot of students work as part-time or full-time employees while attending college or taking educational programmes designed to enhance their skills set. However, the rigid scheduling of many in-person educational programmes could make it hard / difficult to balance the professional work obligations with that of the educational ones.
Virtual / online learning, on the other hand, is often designed to be more flexible and could be factored into one's work schedule so as not to put the professional work life on hold whilst pursing the education (Coursera, 2024).
iv. **building on current or learning entirely new skills** – changing one's entire career could easily be done from a corner of room, as there are many courses, certificate programs, etc. that have been designed to provide lectures / tutorials on career-relevant skills.

Current career skill set could also be strengthened by taking similar courses designed to teach specific workplace / technical skill that would help one to advance and there is a catalogue of schools to choose from, as they are endless (Coursera, 2024).

v. **learning can be done from top universities or industry-leading companies** – many prestigious colleges and universities currently offer online degree programmes. There is no difference between a degree earned online and in-person from a prestigious university, as the online learning would expose the student to more rigorous coursework / skills development whilst discharging official professional work simultaneously.

Furthermore, many organisations currently offer programmes designed to help employees learn new aspects of a career / skill set and IBM, Google and Meta offer professional certificates through Coursera to expand employees' industry knowledge (Coursera, 2024).

vi. **schedules are flexible, and learning could be done at one's own pace** – virtual / online academic structure vary but generally are designed to be more flexible than in-person classes. This helps the student to access the programmes at suitable times and in addition learn at own pace.

Studying is laborious and takes time, so when the individual student can fit into the schedule, it may create the flexibility needed to establish an education plan that works for him / her (Coursera, 2024; Coursera, 2023).

vii. **money could be saved in online compared to in-person learning** – beyond tuition fees, there are many associated costs, such as accommodation, feeding and transportation costs when attending college / university in-person. However, virtual / online learning students tend to benefit from lower overall cost, because there is less overhead cost associated with operating the learning environment (Coursera, 2024; Raouna, 2024).

According to the Education Data Institute cited in Coursera (2024), the cost per credit hour is often much lower for online courses than in-person; example the Public 4 – Year online programme per-credit hour cost $321 as compared to Public 4 – Year on campus of $729 and Private 4 – Year online per-credit hour cost $505 as compared to Private 4 – Year on campus of $1,598. The difference is quite substantial, as virtual / online courses are far lower in cost than that of in-person (Coursera, 2024).

viii. **choosing between self-paced and accelerated options** – the virtual / online learning allows the student to choose and set the pace of coursework, and if an accelerated degree pace is selected, the student could complete the course faster; this is so, as s/he can move through the courses more rapidly, as opposed to waiting for a new lesson each week. This would enable the virtual / online student to earn his / her degree quicker (Coursera, 2024).

ix. **engagement with a global peer network** – global availability of virtual / online learning lends students to interact with colleague students globally, which may foster broader and more diverse opinions and learning. In addition, students may have the opportunity to engage with classmates as much as possible and share resources with colleagues, globally. This would empower students to stay in touch and keep each other on track (Coursera, 2024; Raouna, 2024).

x. **strengthening of important transferable skills** – apart from bolstering one's subject knowledge when learning virtual / online, transferable skills, like communication, critical thinking, adaptability, etc. can be honed to the advantage of the student.

Virtual / Online learning often requires greater time management and self-discipline, because the student is responsible for logging in to complete his / her lessons rather than following an

in-person class schedule that dictates where and when to be. Virtual / Online learning also sharpens the student ability to work independently or without supervision, which becomes a vital skill amongst students (Coursera, 2024).

Advantages and disadvantages of virtual / online learning
According to Coursera (2023), there are advantages and disadvantages associated with virtual / online learning, and they are provided below.

Advantages of virtual / online learning
Virtual / online learning provides students with:
i. access to coursework from anywhere, at any time and making learning super convenient,
ii. asynchronous learning classes give an immense amount of flexibility for lecturers and students,
iii. online courses are associated with higher retention and graduation rates,
iv. students taking virtual learning benefit from increased access and cost savings as much as 50 percent,
v. completing courses virtually can also increase students' digital aptitude and prepare them for life in the workforce, and
vi. teachers are allowed to conduct more frequent assessments to help ensure students stay on track, as tests are conducted digitally and with near-immediate feedback and scoring (Coursera, 2023).

Disadvantages of virtual / online learning
There are disadvantages in virtual / online learning, and these include:
i. technology offers opportunities, like the ability to learn from home, however, it may also malfunction and interrupts the study,
ii. learning from a screen might not make the study fully immersive, as compared to in-person,
iii. not sitting next to other students in a classroom, may lead to feeling of lack of collaboration or networking (though not to individualistic students),
iv. interruptions from family members may disrupt the lessons (if phone is not shut down) and noise in the background or around would affect focus,
v. failure and non-reliable internet supply will seriously affect the study,
vi. setting up technological gadgets for online learning may cost a lot of money to the provider, and
vii. both the lecturer and students must be technologically good and abreast with proper technology use to benefit from virtual / online learning (Coursera, 2023).
See Appendix 2 for a Table of Advantages and Disadvantages of virtual / online learning.

In-person / physical learning
In-person learning means physical / face-to-face presence of a person being tutored in a classroom by a teacher and/or not with other students. According to Cambridge Dictionary (2024b) and Campbell (2024), in-person learning refers to activities of a teacher giving lessons to persons physically present and together in the same place, instead of online / phone / video link; it is about the appearance of a teacher giving lessons to students personally together in a classroom.

Advantages and disadvantages of in-person learning

According to James (2024), as the globe continues to adapt to the ever-changing landscape of education and technology, the discussions between in-person and virtual / online learning has turned out to be more prominent to enable students and parents to decide on the best method for themselves and their wards, respectively. Both methods have their unique advantages and disadvantages, and it is important to consider the following components of in-person learning when deciding on which method is best to select from to help make an informed decision (James, 2024); those for virtual / online learning have already been discussed above.

Advantages of in-person learning

Among the advantages are:

i. face-to-face interaction – there is the opportunity of face-to-face interaction with teachers and peers. This allows for immediate feedback, clarification of doubts, and the ability to engage in discussions and collaborative activities.

ii. socialization – for a traditional classroom setting, students have the urge to interact, share notes and socialize with peers. This fosters an important social skills and emotional development, which can lead to the formation of friendships and a sense of belongingness within a community.

iii. structured environment – provision of a structured atmosphere with set schedules and routines. This could help students develop time management skills, sense of discipline and preparing them for future academic and professional endeavours (James, 2024).

Disadvantages of in-person learning

Some of the disadvantages are:

i. limited flexibility - this requires students to adhere to a fixed schedule and location, which may not be suitable for every student. Some students with other commitments may be challenged, including those who prefer a more flexible learning environment to enable them take up employment positions to cater for family needs.

ii. commute and logistics – students are involved in commuting to a physical location, which can be time-consuming and incurring transportation costs. Moreover, there may be logistical challenges, example finding a parking space or dealing with traffic.

iii. distractions and interruptions – likelihood of facing distraction and interruptions from peers in the classroom (example, talking) and external factors (example, disaster affecting means of transport and telephone calls from parents), respectively. This could seriously impact students' focus and concentration, thereby hindering their learning experience (James, 2024).

METHODOLOGY

There are challenges and weaknesses, as well as advantages and strengths, associated with both virtual and in-person learning strategies, and students (both matured and young) would have to decide on the best learning environment for higher education. Education and learning are laborious and very difficult, respectively, to venture into, and therefore critical examination and assessment should be critically done by prospective students before decisions are made for further studies. This research, therefore, investigates, reviews and assesses the two (2) types of

learning strategies and recommends the best for learning, depending on the circumstances prevailing within the ambit of a prospective student.

Consequently, the main objective of this study was to review virtual / online and in-person learning strategies and how students would be guided to select the best alternative, depending on conditions predominant within the domain of the prospective student, to enable completion of education and successful graduation

Survey design methodology was principally utilized to collect primary data from tertiary students in Ghana. The case of tertiary students was conveniently and wittingly selected for the data collection based on the understanding that they are the group of people who most experience the contemporary types of learning environment to complete their educational programmes. As such, they would be knowledgeable to answer the questions (questionnaire) better with regards to the two (2) learning strategies, based on prevalent conditions and therefore, provide factual data needed for conducting the research. An encouraging and respected convenience (non-probability) sizeable sample size was covered, and with significant number of respondents who willingly and enthusiastically completed the questionnaire / survey.

The mixed research technique (both qualitative and quantitative) was adopted for the research, as the study was to thoroughly review the virtual and in-person learning strategies and propose guidelines to help students when selecting learning type for tertiary education in this contemporary times. The mixed research technique was necessary to enable a comprehensive review of relationship / difference between virtual and in-person learning.

The data collected through the sampling strategy was subjected to both qualitative and quantitative analyses (Bell, Harley & Bryman, 2022). The collected data was edited where necessary, coded and analysed into frequencies / ratios which presented averages and summations for good interpretation from the analyses of the primary data (Bell et al., 2022).
The use of Questionnaire for data collection was magnificent, as it provided an effective technique of collecting responses quickly from the respondents. The Questionnaire, as an instrument for data collection was generated, re-arranged into goggle-form, piloted and tested to substantiate the questions, to make sure they were unmistakable to collect good data; this was to encourage the respondents to be trustworthy with the purpose of the research. Questions were reviewed where necessary, based on the response from the respondents, during the pilot study. This was deliberately done to improve the reliability and validity of the questionnaire.

Secondary data was collected from libraries and other trustworthy sources. This was merged with the primary data collected from the questionnaire, where necessary, and coded for easy access. The data which emerged was subjected to qualitative and quantitative tests / limits that confirm or reject the Null hypotheses of the research questions. The data was also keyed into the computer system, accessed, analysed and presented in statistical summary Tables, as illustrated at the bottom of the research (Bell et al., 2022).

The Null hypothesis 1 (Hl_1) is that there is no significant relationship between Virtual and In-person learning. To conduct this test, the variables / questions under 'the difference between Virtual and In-person learning' were subjected to a relationship / difference test to determine the validity of the Hypothesis 1 (HR_1), whether there is a relationship between Virtual and In-person learning. The Null hypothesis is rejected if it is not the most attractive explanation for any relationship.

The second Null hypothesis ($H1_2$) is that there is no significant relationship between the component-types of learning environment – virtual and in-person. To conduct this test, the variables / questions under 'component-types of learning environment' were subjected to a relationship / difference test to determine the validity of the Hypothesis 2, whether there is a relationship between the component-types of learning environment – virtual and in-person. The third Null hypothesis (Hl_3) deals with the fact that there is no significant relationship / difference in the types of learning environment with the prospect of completing education and graduating successfully. To conduct this test, the variables / questions under 'types of learning environment with the prospect of completing education and graduating successfully', were subjected to a relationship / difference test to determine whether there is a difference in the types of learning environment with the prospect of completing education and graduating successfully.

Findings that emerged from the study (through qualitative analyses and quantitative tests) were then put together, which led to conclusions and recommendations to be drawn from the results. Respondents who were interested in a copy of the outputs from the research were informed to indicate through a request, and at the same time were aware that their participation was confidential and voluntary; this was indicative in the bio data.

ANALYSES AND DISCUSSIONS OF RESULTS

This data gathered from respondents through the questionnaire survey was edited where necessary, coded, categorized, summarized, analysed and interpreted for presentation (Bell et al., 2022). In total, 90 Questionnaire Forms were distributed (using Online Google Forms) to the sampled tertiary students in Ghana. 76 out of the 90 Questionnaire Forms sent out were responded to, duly completed and returned.
This gave the total Questionnaire for the analysis to be 76 out of 90 sent out, which yielded a response rate of 84%; this was quite good, as it completely represented the views of tertiary students in Ghana, and by extension the student population of tertiary education, globally.

Bio Data Statistics

The bio data of the respondents included features, such as sex, educational level and type of university education (public or private) being pursued. These features were found to be indicators of the importance of respondents in their university education and were therefore, very vital for the research.
For sex, the study identified two (2) types – 'Female' and 'Male'. 'Female' obtained 53% and 'Male' obtained 47%, indicating that the respondents were mostly women; the number of females was therefore, more than that of male in this research. See Table 1.

For the educational level, the study identifies the types – '1st Degree', 'Masters' and 'Doctorate'; however, the prominent educational level who completed the Questionnaire Forms was 1st Degree, which scored 54%. Those with Masters' degree had 45% and PhD had 1%. See Table 2.

Regarding the Type of institution, there were 2 different types – 'Public' and 'Private'. Private scored 76% and Public 24%; Public tertiary institutions, therefore, were in the majority, 76%. See Table 3.

Detailed Findings & Analyses of Results

Difference between Virtual / Online and In-Person learning

The question on 'What is Virtual / Online learning' - the scores received from the respondents were: (a) - An education where instruction and learning take place over the internet and through digital learning tools' – 100%. See Table 4.

About the question on 'What is In-person learning' provided the following scores from the answers supplied: (a) – 'Physical / face-to-face presence of a person being tutored in a classroom by a teacher and with(out) other students' – 97%. The rest of the answers together scored 3%. See Table 5.

Regarding the question on the 'Difference between Virtual / Online and In-person learning', the scores from the answers of the respondents were: (a) – 'Virtual is where instruction and learning take place over the internet and through digital learning tools / machines / platforms and in-person is face-to-face presence of students being tutored in a classroom by a teacher' – 100%. The rest of the answers did not score. See Table 6.

Component-types of learning environment - Virtual and In-person learning

To a question on 'the component-types of Virtual learning' yielded the following scores from the answers: (a) - 'Less cost of education, choosing how to study and no need for commuting / travelling to school' – 32%; (b) - 'Working and learning at the same time, learning can easily be done from most universities (globally) and schedules / lectures could be taken at own pace' – 53%; (c) – selection of an accelerated degree pace could be possible, course could be completed faster and peers could be engaged globally for discussions – 15%. The rest scored 2%. See Table 7.

To the question 'are you comfortable with Virtual / Online learning' produced the following answers: (a) – 'Yes' – 84%; and (b) 'No' – 16%. See Table 8.

A follow-up question to the above (Yes) - 'What are the reasons for choice of previous answer' produced the following answers from the respondents: (a) – 'Cost effectiveness, flexible & convenience' – 45%; (b) – 'Easier & does not involve moving from home to School – 11%; (c) – 'Learning and working at the same time' – 11%; (d) – 'Education can be accessed from anywhere, globally – 11%. The rest together scored 22%. See Table 9.

Similarly, a follow-up question for 'No' - 'What are the reasons for choice of previous answer? produced the following answers from the respondents: (a) – 'Poor network connectivity and the high cost of data' – 57%; (b) – 'Not interactive and lacks socialization between students and lecturer' – 22%. The rest together scored 21%. See Table 10.

To a question on 'the component-types of In-person learning' yielded the following scores from the answers: (a) – 'Sitting next to other students may lead to feeling of collaboration, and learning is physical' – 24%; (b) – 'Failure and non-reliable internet supply will not affect the study and learning is not from screens' – 30%; (c) – 'Opportunity of face-to-face interaction with teachers and peers and provision of a structured atmosphere with set schedules and routines' – 42%. The rest together scored 4%. See Table 11.

To a question on 'are you comfortable with In-person learning' produced the following answers: (a) – 'Yes' – 73%; and (b) 'No' – 27%. See Table 12.

Follow-up question to the above (Yes) - 'What are the reasons for choice of previous answer' produced the following answers and scores from the respondents: (a) - 'Sitting next to other students gives the feeling of collaboration & relationship with peers and tutors' –26%; (b) - Opportunity of face-to-face interaction with teachers and peers, and provision of a structured atmosphere with set schedules and routines' – 32%; (c) – 'Availability of seriousness, engaging & understanding' – 20%. The rest together scored 22%. See Table 13.

Similarly, a follow-up question for 'No' - 'What are the reasons for choice of previous answer' produced the following answers and scores: (a) – 'Stressful commuting from place to place while learning can be done peaceful from home' – 60%; (b) – **'**Too restricted and very costly' – 14%; (c) – 'Does not help in a good work-learning balance' – 14%. The rest of the answers together scored 12%. See Table 14.

Type of learning environment with prospect of completing education and successfully, graduating

About the question on 'Reasons that would contribute to comfortably complete education through Virtual / Online learning and graduate successfully' produced the following scores: (a) – 'Learning cost is far lower to manage' – 35%; (b) – 'Discussions of lessons could be done with peers, globally' – 36%; (c) – 'Schedules / lessons could be accelerated / fast paced' – 29%. See Table 15.

To the question on 'Any additional views / reasons for the previous answer – virtual', produced the following answers and scores: (a) – 'Internet learning could be done from anywhere and would force students to do more research' – 36%; (b) – 'Program enrolment at one's convenience & from the comfort of home' – 18%; (c) – 'Self discipline, time management & internet access provide all the resources' – 18%; (d) – 'Learning & working can be done simultaneously' – 14%; (e) – 'Development of technology skills is the key for success' – 14%. See Table 16.

About the question on 'Reasons that would contribute to comfortably complete education through in-person learning and graduate successfully' produced the following scores: (a) – 'No need for technology to be able to participate in lessons' – 13%; (b) – 'Interaction, sharing notes and socializing with peers are possible' – 33%; (c) – 'Structured atmosphere with set schedules and routines' – 20%; (d) – 'Face-to-face interaction with teachers and peers' – 34%. See Table 17.

To the question 'Any additional views / reasons for the previous answer – in-person, produced the following answers and scores: (a) – 'Students network, bond & learn happily from each other' – 50%; (b) – 'Increase in motivation and accountability, as students are engaged when surrounded by peers and instructors' – 12.5%; (c) – 'Faculty members,

alumni, or other professionals mentor each other for guidance, advice and encouragement' – 12.5%; (d) – 'Easy access to campus resources & direct interaction with authorities' – 19%. The rest scored 6%. See Table 18.

To the question 'Which learning method would you personally prefer for future education, produced the following outcomes: 'Virtual / Online' – **71%**; 'In-person' – **29%.** See Table 19.

Further question on the above 'What should be done to improve your choice of learning for previous question – Virtual / Online, garnered the following answers and corresponding scores: (a) – 'Improved digital network infrastructure, accessibility and stable internet connection' – 44%; (b) – 'A balanced blend of in-person and virtual tutoring for working students' – 17%; (c) – 'Engaging, interactive and informative training sessions to keep students attentive' – 21%. The rest together scored 18%. See Table 20.

Similarly, further question on 'What should be done to improve choice of learning for previous question – In-person, gathered following answers and corresponding scores: (a) – 'Incorporate interactive teaching methods, such as group activities and hands-on projects, to maintain student interest' – 27%; (b) – 'Use of technology to complement traditional teaching to make learning more effective' – 54%; (c) – 'Instructors should provide regular feedback and support to help students stay on track and understand the lectures' – 19%. See Table 21.

DISCUSSION OF RESULTS – QUALITATIVE ANALYSES

Bio data

The findings listed above are views extracted from the responses gathered; they comprised female (53%) and male (47%); indicating that most of the respondents were female. The composition of the respondents was 1st Degree – 54%, Masters – 45% and Doctorate – 1%; indicating that most of the respondents were 1st Degree and Masters' holders. These are learned members of the society and would surely provide knowledgeable and enriched information on education for this important research. Furthermore, the respondents were made up of: Public institution (24%), and Private institution (76%); signifying that those from the private institution were in the majority.

Difference between virtual and in-person learning

Virtual / Online learning was described by the respondents as 'an education where instructions and learning take place over the internet and through digital learning tools'; this scored 100%. This implies that the respondents are familiar with virtual / online learning and would provide good and technical responses to the questions in the Questionnaire to achieve the objectives of the research.

To a question on 'what is in-person learning', the respondents scored: 'Physical / face-to-face presence of a person being tutored in a classroom by a teacher and with(out) other students' – 97%; the others together scored 3%.

Furthermore, the question on the 'Difference between Virtual / Online and In-person learning', the scores were: (a) – 'Virtual is where instructions and learning take place over the internet and through digital learning tools / machines / platforms and in-person is face-to-face presence

of students being tutored in a classroom by a teacher' – 100%. This indicates clearly that the respondents understand and know what are involved in both virtual / online and in-person learning of education. This is very good for the research, and it is anticipated that the results would contribute to knowledge enrichment and close the current knowledge gap to guide prospective tertiary students to select the type of learning environment suitable / favourable for them for their higher education to enable them graduate successfully.

Components of types of learning environment - Virtual and In-person learning

Regarding the question on 'components of types of learning environment - virtual', the respondents obtained the following scores from the answers: (a) - 'Less cost of education, choosing how to study and no need for commuting / travelling to school' – 32%; (b) - 'Working and learning at the same time, learning can easily be done from most universities (globally) and schedules / lectures could be taken at own pace' – 53%; the rest together scored 15%. Answers (a) and (b) together scored 85%, indicating their popularity.

To the question 'are you comfortable with Virtual / Online learning', produced the following answers and scores: (a) – 'Yes' – 84%; and (b) 'No' – 16%. Overwhelmingly, 'Yes′ scored 84%, indicating the importance of Virtual learning to the respondents. At the appropriate stage within the study, this would be analysed thoroughly with results from respondents on comfortability with In-person learning.

The reasons supplied by those who answered 'Yes' to the above question generated the scores below: (a) – 'Cost effectiveness, flexible & convenience' – 45%; (b) – 'Easier & does not involve moving from home to School – 11%; (c) – 'Learning and working at the same time' – 11%; (d) – 'Education can be accessed from anywhere, globally – 11%. The rest together had 22%. The answer (a) scored the highest of 45%.

The reasons supplied by those who answered 'No' to the question above also generated the scores below: (a) – 'Poor network connectivity and the high cost of data' – 45%; (b) – 'Not interactive and lacks socialization between students and lecturer' – 22%. The rest together scored 33%. The most popular answer was (a), scoring 45%.

A question on whether 'students are comfortable with in-person learning' produced the following answers: (a) – 'Yes' – 73%; and (b) 'No' – 27%. For comparison purpose, at the other end of the same question in favour of virtual / online yielded, 84% for 'Yes' and 16% for 'No'. There is a strong indication, from the above, that most of the respondents prefer Virtual / Online learning.

Those with 'Yes' response to being comfortable with in-person learning produced the following answers and scores: (a) - 'Sitting next to other students gives the feeling of collaboration & relationship with peers and tutors' –26%; (b) - Opportunity of face-to-face interaction with teachers and peers, and provision of a structured atmosphere with set schedules and routines' – 32%; (c) – 'Availability of seriousness, engaging & understanding' – 20%. The rest together scored 22%. Most of the respondents were in favour of answer (b), which scored 32%.

Those with 'No' response to being 'comfortable with in-person learning' produced the following answers and scores: (a) – 'Stressful commuting from place to place while learning can be done peaceful from home' – 66%; (b) – 'Too restricted and very costly' – 14%; (c) – 'Does not help in a good work-learning balance' – 14%; (e) – 'Mood of the lecturer determines the atmosphere in the classroom' – 6%. Most of the respondents are in favour of answer (a), which scored 66%.

Learning environment with the prospect of completing education and graduating successfully

The reasons that would contribute to comfortably complete education through Virtual / Online learning and graduate successfully, produced the following answers and scores: (a) – 'Learning cost is far lower to manage' – 35%; (b) – 'Discussions of lessons could be done with peers, globally' – 36%; (c) – 'Schedules / lessons could be accelerated / fast paced' – 29%. Most of the respondents subscribe to answers (a) and (b), as together they scored 71%, i.e. 35% and 36%, respectively.

Additional views / reasons for the previous answer – comfortably complete education through Virtual / Online learning and graduate successfully, produced the following answers and scores: (a) – 'Internet learning could be done from anywhere & would force students to do more research' – 36%; (b) – 'Program enrolment at one's convenience & from the comfort of home' – 18%; (c) – 'Self discipline, time management & internet access provide all the resources' – 18%. The rest together scored 28%. Most of the respondents were in favour of answer (a), which scored 36%.

Similarly, 'reasons that would contribute to comfortably complete education through in-person learning and graduate successfully', produced the following answers and scores: (a) – 'No need for technology to be able to participate in lessons' – 13%; (b) – 'Face-to-face interaction with teachers and peers fosters direct communication, collaboration & engagement ' – 67%; (c) – 'Structured atmosphere with set schedules and routines' – 20%. The most popular answer was (b) and scored 67%.

Additional views / reasons that would contribute to comfortably complete education through in-person learning and graduate successfully', produced the following answers and scores: (a) – 'Students network, bond & learn happily from each other' – 50%; (b) – 'Increase in motivation and accountability, as students are engaged when surrounded by peers and instructors' – 12.5%; (c) – 'Faculty, alumni, or other professionals mentor each other for guidance, advice and encouragement' – 12.5%; (d) – 'Easy access to campus resources & direct interaction with authorities' – 19%. The rest scored 6%. The most popular answer was (a), which scored 50%.

To the most important question of the study, 'which learning method would you personally prefer for future education', produced the following outcomes: 'Virtual / Online' – 71%; 'In-person' – 29%. This is the fulcrum of the study and most of the respondents prefer learning virtually / online (Yes), which scored 71% and 29% was in favour of in-person learning. Virtual

learning should be promoted in tertiary institutions globally, as it holds the key for successful future tertiary education, as most people going for tertiary education bear additional responsibility of working to cater for their families and hope to successfully graduate through virtual / online learning of education.

Education is sine qua non for the development of nations and according to the World Bank (2024), education is a human right issue, powerful driver for development, one of the strongest instruments for reducing poverty and improving health, gender inequality, peace and stability; furthermore, it is the most important determinant for ensuring equity and inclusion.

Further question on 'what should be done to improve choice of learning type' for those in favour of Virtual / Online, produced the following answers and scores: (a) – 'Improved digital network infrastructure, accessibility and stable internet connection' – 44%; (b) – 'A balanced blend of in-person and virtual tutoring for working students' – 17%; (c) – 'Engaging, interactive and informative training sessions to keep students attentive' – 21%; the rest together scored 18%. The popular answer from the respondents was (a), which scored 44%.

Similarly, further question on 'what should be done to improve choice of learning type', for those in favour of in-person, gathered the following answers and corresponding scores: (a) – 'Incorporate interactive teaching methods, such as group activities and hands-on projects to maintain student interest' – 27%; (b) – 'Use of technology to complement traditional teaching to make learning more effective' – 54%; (c) – 'Instructors should provide regular feedback and support to help students stay on track and understand the lectures' – 19%. Most of the respondents favoured the answer (b); which scored 54%.Other information relevant for the study provided by some of the respondents were:

i. Tertiary schools should allow the combination of both virtual and in-person learning.
ii. Peer interaction & creation of a supportive learning environment can create a more engaging and effective in-person learning environment.
iii. Virtual learning is flexible, allows students to learn from anywhere and at their own pace. This flexibility is particularly useful for working professionals, students in different time zones, and those with family commitments, enabling them to balance their studies with other responsibilities.
iv. Cost of learning is far lower to manage in virtual learning. However, internet reliability is a challenge.
v. Government should make the necessary arrangements to make online learning more effective. However, proper education on the importance of virtual learning should be done.
vi. Education is important for development of the populace, the nation and the globe in general.
vii. Flexibility in switching between in-person and virtual learning when circumstances arise could be helpful whenever required for the lecturer and students' convenience.
viii. Having subsidized data at regular intervals would also promote online learning.
ix. Improved technology with computer accessories should be a requirement for every tertiary institution.

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Statistical Analyses / Results – Variance Tests (key component of Regression Analysis) – Quantitative Tests

For RQ1, RQ2 & RQ3, variance tests were used to determine the validity of the hypotheses HR_1, HR_2 and HR_3, as there are relationships between the variables in each of the Research Questions. RQ1 is about difference / relationship between the meanings of Virtual and In-person learning; RQ2 is about the difference / relationship of component-types of learning environment; and RQ3 is about learning environment with the prospect of completing education and graduating successfully. There is the need for comparison of values in each of the hypotheses.

Central tendency measurement of variance test was used to prove all the hypotheses. The Modal values of the variables for each research question then become the best measurement for representing the individual responses to the questions, especially when dealing with categorical or group membership data (Salkind, 2021), as it is in this case. This is so because the *mean* and *median* do not give good representation (Salkind, 2021) of the data in such circumstance.

What is the Difference between Virtual / Online and In-Person learning – RQ1?

Variance test, a key component of regression analysis was used to test the statement above. Using the modal scores (instead of percentage-scores) from Tables 4 to 6 to represent each question (section B of Questionnaire survey) gives Table 23 – See Table 23.

Transferring the modal scores from Table 23 for computing the Mean and Standard Deviation for the scores yields Table 24 – See Table 24.

$\overline{X}$ (Mean) = 225/3 (since there are 3 Questions for this test).
$\overline{X}$ = **75** (the mean value)
The formula for Standard Deviation (s) is given as:
$s = \sqrt{[\Sigma(X - \underline{X})^2]/(n - 1)}$, where X is the modal values; $\underline{X}$ is the mean; and n is the number of observations / questions (3 Question).
Therefore, $s = \sqrt{(6)}/2 = 2.45/2 =$ **1.23**.

Research Question 1 (RQ1) is: Is there a difference between Virtual and In-person learning? The Hypothesis 1 (HR_1) being tested is: There is a significant difference between Virtual and In-person learning. The Null hypothesis is: There is no significant difference between Virtual and In-person learning.

Statement of the Null hypothesis: Hl_1:HR_1,
Where Hl_1 = the Null hypothesis, and
HR_1 = There is a significant difference in Virtual and In-person learning.
Computing for the t-test (text-statistic) value (GeeksforGeeks, 2024);

$$t = (\overline{X} - u)/s/\sqrt{n}$$

where, $\overline{X}$ is the Mean; u is 50 (the assumed mean is calculated based on the fact that before this study by the researcher, both **virtual** and **in-person** learning are assumed to have equal

chance of being selected by tertiary students for further studies, so each has 50% likelihood of being selected); s is Standard Deviation, and n is number of observations / questions.

t = Absolute (75 – 50)/1.23/√3
= (25 * 1.7)/1.23
= **34.55**

Reading from the T-distribution Table for a One-Tail Test and with the degree of freedom 2 (3 – 1) – for a conservative estimate of the population value:

The level of significance at which the hypothesis is being tested is 0.05 (type 1 error – a higher tolerance) and the critical value needed for the rejection of the Null hypothesis for a one-tailed test is **4.3** (Salkind, 2021; GeeksforGeeks, 2024).

Since the obtained value is more than the critical value (**34.55 > 4.3**), the Null hypothesis is rejected and therefore, there is a difference between **virtual / online** and **in-person** learning. Really, virtual and in-person learning can never be same, though the data for the test is from the same sample. This is depicted evidently in the scores obtained for the 2 learning environments from the recipients; case in point, 79% opted for virtual learning as against 21% for in-person learning, for their further studies.

Component-types of learning environment - Virtual and In-person – RQ2?
Variance test, a key component of regression analysis was used to test the statement above. Using the modal scores (instead of percentage-scores) from Tables 7 to 14 to represent each question (section C of Questionnaire survey) gives Table 25 – See Table 25.

Transferring the modal scores from Table 25 for computing the Mean and Standard Deviation for the scores yields Table 26 – See Table 26.

$\overline{X}$ (Mean) = 285/8 (since there are 8 Variables/Questions for this test).
$\overline{X}$ = **35.63** (the mean value)

The formula for Standard Deviation (s) is given as:
$s = \sqrt{[\Sigma(X - \overline{X})^2]/(n - 1)}$, where X is the modal values; $\overline{X}$ is the mean; and n is the number of observations / questions (there are 8 Questions for this test)

Therefore, s = √(3609.9)/7 = **60.08/7 = 8.58.**

Research Question 2 (RQ2) is: Is there a significant difference in the component-types of learning environment – virtual and in-person? The Hypothesis 2 (HR_2) being tested is: There is a significant difference between component-types of learning environment - virtual and in-person learning. The Null hypothesis is: There is no significant difference between component-types of learning environment - virtual and in-person.

Statement of the Null hypothesis: Hl_2:HR_2,
Where Hl_2 = the Null hypothesis, and
HR_2 = There is a significant difference between the component-types of learning environment - virtual and in-person.
Computing for the t-test (text-statistic) value (GeeksforGeeks.org, 2024);

$$t = (\overline{X} - u)/s/\sqrt{n}$$

where, $\overline{X}$ is the Mean; u is 50 (as stated above); s is Standard Deviation, and n is number of observations / questions.

$$t = \text{Absolute } (35.63 - 50)/8.58/\sqrt{8}$$
$$= (14.37 * 2.83)/8.58$$
$$= \mathbf{4.74}$$

Reading from the T-distribution Table for a One-Tail Test and with the degree of freedom 7 (8 – 1) – for a conservative estimate of the population value:

The level of significance at which the hypothesis is being tested is 0.05 (type 1 error – a higher tolerance) and the critical value needed f or the rejection of the Null hypothesis for a one-tailed test is **2.37** (Salkind, 2021; GeeksforGeeks, 2024).

Since the obtained value is more than the critical value (**4.74 > 2.37**), the Null hypothesis is rejected and therefore, there is a difference between the component-types of learning environment - **virtual** and **in-person**. It is a fact that, virtual and in-person learning types are not the same, though the data for the test comes from the same sample.

Which learning environment has the prospect of completing education and graduating successfully – RQ3?
Variance test, a key component of regression analysis was used to test the statement above. Using the modal scores (instead of percentage-scores) from Tables 15 to 21 to represent each question (section D of Questionnaire survey) gives Table 27 – See Table 27.

Transferring the modal scores from Table 27 for computing the Mean and Standard Deviation for the scores yields Table 28 – See Table 28.

$\overline{X}$ (Mean) = 225/7 (since there are 7 Variables/Questions for this test).
$\overline{X}$ = **32.14** (the mean value)

The formula for Standard Deviation (s) is given as:

$s = \sqrt{[\Sigma(X - \overline{X})^2]/(n - 1)}$, where X is the modal values; $\overline{X}$ is the mean; and n is the number of observations / questions (there are 7 Variables/Questions for this test).
Therefore, $s = \sqrt{(4456.86)/6}$ = **66.76/6 = 11.13.**

Research Question 3 (RQ3) is: Is there a difference between the learning environments (virtual and in-person) with the prospect of completing education and graduating successfully? The Hypothesis 3 (HR_3) being tested is: There is a significant difference between the learning environments (virtual and in-person) with the prospect of completing education and graduating successfully. The Null hypothesis is: There is no significant difference between the learning environments (virtual and in-person) with the prospect of completing education and graduating successfully.

Statement of the Null hypothesis: Hl_3:HR_3,
Where Hl_3 = the Null hypothesis, and
HR_3 = There is a significant difference between the learning environments (virtual and in-person) with the prospect of completing education and graduating successfully.
Computing for the t-test (text-statistic) value (GeeksforGeeks.org, 2024);

$$t = (\overline{X} - u)/s/\sqrt{n}$$

where, $\overline{X}$ is the Mean; u is 50 (as stated above); s is Standard Deviation, and n is number of observations / questions.

$$t = \text{Absolute } (32.14 - 50)/11.13/\sqrt{7}$$
$$= (17.86 * 2.65)/11.13$$
$$= \mathbf{4.25}$$

Reading from the T-distribution Table for a One-Tail Test and with the degree of freedom 6 (7 – 1) – for a conservative estimate of the population value:

The level of significance at which the hypothesis is being tested is 0.05 (type 1 error – a higher tolerance) and the critical value needed for the rejection of the Null hypothesis for a one-tailed test is **2.447** (Salkind, 2021; GeeksforGeeks, 2024).

Since the obtained value is greater than the critical value (**4.25 > 2.45**), the Null hypothesis is rejected and therefore, there is a significant difference between the learning environments (**virtual** and **in-person**) with the prospect of completing education and graduating successfully. All the Quantitative tests indicate difference between virtual and in-person learning environments. Furthermore, data from most respondents for the qualitative analyses, vouched for virtual learning. Particularly, when they were asked the preferred learning environment for furthering education, 79% opted for virtual / online learning, while 21% opted for in-person. These learning environments, virtual and in-person, are entirely different and the analyses (qualitative) and variance tests (quantitative) from this research have proven that virtual learning is preferable to most students; this is an eye opener for tertiary institutions. Globally, tertiary institutions should start thinking about how to structure their learning environments to include, at least a segment of virtual learning. For these contemporary times, surely most prospective students for tertiary education favour virtual learning environment due to the numerous advantages it has over in-person learning.

The respondents have provided valuable contributions to this study, and these would help the researcher to come out with good conclusions and recommendations to guide prospective tertiary students to select the best learning environment for tertiary education; this hopefully, would help students to go through their academic lessons with flying colours and graduate successfully.

The above findings from the study have helped the researcher to come out with the following for consideration by stakeholders in tertiary education, globally:

A. 1. **Reasons that would contribute to comfortably complete education through Virtual / Online learning and successfully graduate, are:**
i. Learning cost is far lower to manage.
ii. Discussions of lessons could be done with peers, globally.
iii. Schedules / lessons could be accelerated / fast paced.
iv. Internet learning could be done from anywhere & would force students to do more research.
v. Program enrolment is at one's convenience & from the comfort of home.
vi. Self discipline, time management & internet access provide all the resources.
vii. Learning & working can be done simultaneously.
viii. Development of technology skills is the key for success.

2. Similarly, reasons that would contribute to comfortably complete education through in-person learning and successfully graduate, are:
i. Technology may not be needed to participate in lessons.
ii. Interaction with teachers, sharing notes and socializing with peers are possible.
iii. Structured atmosphere with set schedules and routines.
iv. Students network, bond & learn happily from each other.
v. Increase in motivation and accountability, as students are engaged when surrounded by peers and instructors.
vi. Faculty members, alumni, or other professionals mentor each other for guidance, advice and encouragement.
vii. Easy access to campus resources & direct interaction with authorities.
viii. Availability of quality educational environment makes teaching and learning interesting for lecturers and students.

B. Learning method preferred for future education.
The respondents' data indicate:
i. Virtual / Online – 71%;
ii. In-person– 29%.
This is the fulcrum of the research, and the above data indicates that majority of the respondents favour virtual learning. Virtual learning therefore, should be promoted in tertiary institutions globally, as it holds the key for success of tertiary institutions in these contemporary times. Most prospective tertiary students currently bear additional responsibility of working to cater for their families and hope to successfully graduate through virtual / online learning of education with better conditions, as compared to in-person learning environment.

C. What should be done to improve choice of learning:

1. Respondents who selected **Virtual / Online**, gave the following reasons for their choice:
i. Improved digital network infrastructure, global accessibility and stable internet connection.
ii. A balanced blend of in-person and virtual tutoring for working students.
iii. Engaging, interactive and informative training sessions to keep students attentive.
iv. Students should learn how to effectively use technology for effective virtual learning.
v. Provision of professional development for educators, while increasing student support services.
vi. Tutors should monitor timelines for submission of assignments and institute clock in/out system to monitor attendance.

2. Respondents who selected **In-person** learning, gave the following reasons for their choice:
i. Incorporate interactive teaching methods, such as group activities and hands-on projects, to maintain student interest.
ii. Use of technology to complement traditional teaching to make learning more effective.
iii. Instructors should provide regular feedback and support to help students stay on track and understand the lectures.

CONCLUSION

The study has reviewed Virtual / Online and In-person learning for the modern society and revealed that the difference between virtual and in-person learning is well known and understood by all the respondents, as 100% selected the best answer; virtual is where instruction and learning take place over the internet and through digital learning tools / machines /platforms and in-person is face-to-face presence of students being tutored in a classroom by a teacher.

Furthermore, the study found out that there is the need to introduce Virtual learning in almost all tertiary institutions, globally, as 71% of respondents prefer to have their further studies using virtual / online learning; only 29% vouched for in-person learning for further studies.
Similarly, 84% of respondents are comfortable with Virtual / Online learning and 16% not comfortable; again 73% are comfortable with in-person learning and 27% not comfortable. In terms of comfortability, 84% are for Virtual and 73% for In-person learning, indicating more respondents have strong affinity for Virtual learning than In-person.
The popular reasons giving for Virtual learning are:

i. Cost effectiveness, flexibility & convenience.
ii. Easier & does not involve moving from home to School.
iii. Learning can be done at own pace.
iv. Learning and working can be done at the same time.
v. Education can be accessed from anywhere, globally.
Based on the choice for further studies, the respondents provided their views on what to be done to improve virtual / online learning:
i. Improvement in digital network infrastructure, accessibility and stable internet connection.
ii. A balanced blend of in-person and virtual tutoring for working students.

iii. Engaging, interactive and informative training sessions to keep students attentive.
iv. Tutors monitoring timelines for submission of assignments and instituting clock in/out system to monitor attendance.
v. Internet learning could be done from anywhere & would force students to do more research.
vi. Development of technology skills is the key for success.

Recommendation

The understanding of the difference between Virtual / Online and In-person learning has been confirmed by the study, as the respondents are fully conscious of this and scored 100% on selecting the best answer. Again, the component-types of learning environment for both virtual and in-person have been clearly provided.

Furthermore, most of the respondents prefer Virtual / Online learning to In-person, as 84% vouched for Virtual and 16% for In-person; comparatively, 73% selected In-person and 29% for Virtual. Comparing this data indicates clearly that more of the respondents prefer Virtual learning.

Moreover, 71% are in favour of Virtual learning for further studies as against 29% for In-person. This was in response to the learning environment conducing for completing the higher education and graduating successfully.

From the above, it can conveniently be said that tertiary institutions, especially those which wholly offer in-person learning, should begin to incorporate, at least a segment of virtual learning environment, in their education curriculum to enable them to survive in these contemporary times.

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TABLES

Bio Data

Table 1: Sex

Sex Type	Frequency	Valid Percent	Cumulative Percent
Female	40	53	53
Male	36	47	100

Table 2: Educational Level

Educational Level	Frequency	Valid Percent	Cumulative Percent
1st Degree	41	54	54
Masters	34	45	99
Doctorate	1	1	100

Table 3: Type of Institution

Institution	Frequency	Valid Percent	Cumulative Percent
Public	18	24	24
Private	58	76	100

Difference between Virtual / Online and In-Person learning

Table 4: What is Virtual / Online learning?

Virtual learning	Frequency	Valid Percent	Cumulative Percent
An education where instruction and learning take place over the internet and through digital learning tools /machines / platforms	76	100	100
An education of instructions from the teacher	0	0	100
An education of discussions of materials	0	0	100
A school for learners	0	0	100

Table 5: What is In-person learning?

In-person learning	Frequency	Valid Percent	Cumulative Percent
Physical / face-to-face presence of a person being tutored in a classroom by a teacher and with(out) other students	73	97	97
Learning with a teacher	1	1	98
Learning with colleague Students	1	1	99
Learning by providing answers to questions	1	1	100

Table 6: Difference between Virtual / Online and In-person learning

Difference between Virtual and In-person Learning	Frequency	Valid Percent	Cumulative Percent
Virtual is where instruction and learning take place over the internet and through digital learning tools / machines /platforms and in-person is face-to-face presence of students being tutored in a classroom by a teacher	76	100	100
Virtual is learning instructions and in-person is learning at home	0	0	100
Virtual is learning by memorizing and in-person is learning by speaking to friends	0	0	100
Virtual is free learning by reciting and in-person is learning by recitation	0	0	100

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Component-types of learning environment - Virtual and In-person

Table 7: Components of Virtual learning: Select as Applicable

Reasons for Virtual learning?	Frequency	Valid Percent	Cumulative Percent
Less cost of education, Choosing how to study, and no need for commuting / travelling to school	36	32	32
Working and learning at the same time, learning can easily be done from most universities (globally), and schedules / lectures could be taken at own pace.	59	53	85
Selection of an accelerated degree pace could be possible, course could be completed faster, and learners can be engaged around the globe for discussions	15	13	88

Table 8: Are you comfortable with Virtual / Online learning?

Are you comfortability with Virtual learning?	Frequency	Valid Percent	Cumulative Percent
Yes	64	84	53
No	12	16	100

Table 9: What are the reasons for choice of previous answer? State – Yes

Comfortable with Virtual Learning – Yes	Frequency	Valid Percent	Cumulative Percent
Cost effectiveness, Flexibility & convenience	29	45	45
Less tedious & stressful	6	9	54
Easier & does not involve moving from home to School	7	11	65
Learning can be done at own pace	3	5	70
Learning & working at the same time	7	11	81
Education can be accessed from anywhere, globally	7	11	92
Time is well managed, more learning styles & options to explore more resources for learning	4	6.5	98.5
No disturbances from colleagues	1	1.5	100

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Table 10: What are the reasons for choice of previous answer? State – No

Not comfortable with Virtual learning	Frequency	Valid Percent	Cumulative Percent
Poor network connectivity and the high cost of data	8	57	57
Class/Lectures is less engaging	1	7	64
Students comfortable with face-to-face learning through gestures of facilitator	1	7	71
Lecturers unable to make eye contact with students to tell how students are assimilating	1	7	78
Not interactive and lacks socialization between students and lecturer	3	22	100

Table 11: Components of In-person learning: Select as Applicable:

Comfortable for In-person learning – reasons	Frequency	Valid Percent	Cumulative Percent
Sitting next to other students may lead to feeling of collaboration, and learning is physical	27	24	24
Failure and non-reliable internet supply will not affect the study, and learning is not	33	30	54
lectures, and colleague students would not be available to interact with			
Opportunity of face-to-face interaction with teachers and peers, and provision of a structured atmosphere with set schedules and routines			

Table 12: Are you comfortable with In-person learning?

Are you comfortable with in-person learning?	Frequency	Valid Percent	Cumulative Percent
Yes	53	73	73
No	20	27	100
	46	42	100

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Table 13: What are the reasons for choice of previous answer? State – Yes

Comfortable with In-person learning – reasons	Frequency	Valid Percent	Cumulative Percent
Sitting next to other students may lead to feeling of collaboration & relationship with peers & tutors	13	26	26
Opportunity of face-to-face interaction with teachers and peers, and provision of a structured atmosphere with set schedules and routines	16	32	58
The entire classroom settings bring the consciousness of learning with little to no distractions	3	6	64
No need for networks accessibility which can disturb the continuous engagement during online sessions	4	8	72
Availability of seriousness, engaging & understanding	10	20	92
A physical classroom provides a routine and disciplined setting that helps students focus and manage time effectively.	4	8	100

Table 14: What are the reasons for choice of previous answer? State – No

Not comfortable with In-person learning	Frequency	Valid Percent	Cumulative Percent
Stressful commuting all the way from place-to-place while learning can be done peaceful from home	10	66	66
Too restricted and very costly	2	14	80
Does not help in a good work-learning balance	2	14	94
Mood of the Lecturer determines the atmosphere in the classroom	1	6	100

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Type of learning environment with the prospect of completing education and graduating successfully

Table 15: Reasons that would contribute to comfortably complete education through Virtual / Online learning and graduate successfully: Select as Applicable

Reasons to contribute to completing education in Virtual / Online learning and graduate successfully	Frequency	Valid Percent	Cumulative Percent
Learning cost is far lower to manage	41	35	35
Assignments are not important for submission	0	0	35
Discussions of lessons could be done with peers, globally	43	36	71
Schedules / lessons could be accelerated / fast paced	34	29	100

Table 16: Any additional views / reasons for the previous answer? State

Additional reasons for Virtual learning	Frequency	Valid Percent	Cumulative Percent
Internet learning could be done from anywhere & would force students to do more research	8	36	36
Program enrolment at one's convenience & from the comfort of home	4	18	54
Self discipline, time management & internet access gives all resources	4	18	72
Learning & working can be done simultaneously	3	14	86
Development of technology skills is the key for success	3	14	100

Table 17: Reasons that would contribute to comfortably complete education through in-person learning and graduate successfully: Select as Applicable

Reasons to contribute to completing education through in-person learning and graduate successfully	Frequency	Valid Percent	Cumulative Percent
No need for technology to participate in lessons	15	13	13
Structured atmosphere with set schedules and routines foster discipline and focus	24	20	33
Face-to-face interaction with teachers and peers fosters direct communication, collaboration & engagement	79	67	100

Table 18: Any additional views / reasons for the previous answer? State:

Additional reasons for In-person learning	Frequency	Valid Percent	Cumulative Percent
Students network, bond & learn happily from each other	8	50	50
Increase in motivation and accountability, as students are engaged when surrounded by peers and instructors	2	12.5	62.5
Faculty members, alumni, or other professionals mentor each other for guidance, advice and encouragement.	2	12.5	75
Easy access to campus resources & direct interaction with authorities	3	19	94
Availability of quality educational environment makes teaching and learning interesting for lecturers and students	1	6	100

Table 19: Which learning method would you personally prefer for future education: Select one

Preferred learning method for future education	Frequency	Valid Percent	Cumulative Percent
Virtual / Online	54	71	71
In-person	22	29	100

Table 20: What should be done to improve your choice of learning for previous question.

State – Virtual / Online

What to do to improve choice of learning	Frequency	Valid Percent	Cumulative Percent
Improved digital network Infrastructure, accessibility and stable internet connection	21	44	44
A balanced blend of in-person and virtual tutoring for working students	8	17	61
Engaging, interactive and informative training sessions to keep students attentive	10	21	82
Students should learn more about the use of technology to use it effectively	3	6	88
Provision of professional development for educators, while increasing student support services	1	2	90
Global accessibility, adaptability to change and scalability	2	4	94
Tutors monitoring timelines for submission of assignments and instituting clock in/out system to monitor attendance	3	6	100

Table 21: What should be done to improve your choice of learning for previous question.

State – In-person

What to do to improve choice of learning	Frequency	Valid Percent	Cumulative Percent
Incorporate interactive teaching methods, such as group activities and hands-on projects to maintain student interest.	6	27	27
Use of technology to complement traditional teaching to make learning more effective	12	54	81
Instructors should provide regular feedback and support to help students stay on track and understand the lectures	4	19	100

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Any other information relevant for the study

Table 22: Other information relevant for the study?
Schools should allow the combination of both virtual & in-person learning.
Peer interaction & creation of a supportive learning environment can create a more engaging and effective in-person learning environment.
Virtual learning is flexible, allows students to learn from anywhere and at their own pace. This flexibility is particularly useful for working professionals, students in different time zones, and those with family commitments, enabling them to balance their studies with other responsibilities.
Cost of learning is far lower to manage in virtual learning. However, internet reliability is a challenge.
Government should make the necessary arrangements to make online learning more effective. However, proper education on the importance of virtual learning should be done.
Education is important for development of the populace, the nation and the globe in general.
Flexibility in switching between in-person and virtual learning when circumstances arise could be helpful whenever required for the lecturer and students' convenience.
Having data at regular intervals would also promote online learning
Improved technology with Computer accessories should be a requirement for every tertiary institution.

Table 23

Modal scores for What is the Difference between Virtual & In-person learning?

Q1	What is Virtual / Online learning?	An education where instruction and learning take place over the internet and through digital learning tools/machines/platforms
	Score	76
Q2	What is In-person learning?	Physical/face-to-face presence of a person being tutored in a classroom by a teacher and with(out) other students
	Score	73
Q3	What is the difference between Virtual and In-person learning?	Virtual is where instruction and learning take place over the internet and through digital learning tools/machines/platforms and in-person is face-to-face presence of students being tutored in a classroom by a teacher
	Score	76

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Table 24

Computation of Mean and Standard Deviation for data on Difference between Virtual and In-person learning

Modal Score	Deviations from the Mean	Squared Deviations
X	$(X - \bar{X})$	$(X - \bar{X})^2$
76	1	1
73	-2	4
76	1	1
$\bar{X} = 75$	$\Sigma(X - \bar{X}) = 0$	$\Sigma(X - \bar{X})^2 = 6$
		s = 1.23

Table 25

Modal scores for Component-types of learning environment – Virtual / In-person?

Q1	Component-types of learning environment – Virtual	Working and learning at the Same time, learning can easily be done from most universities (globally), and schedules / lectures could be taken at own pace.
	Score	59
Q2	Are you Comfortability with Virtual learning?	Yes
	Score	64
Q3	Reasons for being comfortable with Virtual Learning	Cost effectiveness, Flexible & convenience
	Score	29
Q4	Not Comfortable with Virtual learning	Poor network connectivity and the high cost of data
	Score	8
Q5	Component-types of learning environment – In-person	Opportunity of face-to-face interaction with teachers and peers, and provision of a structured

		atmosphere with set schedules and routines
	Score	46
Q6	Are you comfortable with In-person learning?	Yes
	Score	53
Q7	Reasons for being comfortable with In-person learning	Opportunity of face-to-face interaction with teachers and peers, and provision of a structured atmosphere with set schedules and routines
	Score	16
Q8	Not comfortable with in-person learning	Stressful commuting all the way from place-to-place while learning can be done peaceful from home
	Score	10

Table 26

Computation of Mean and Standard Deviation for data on Component-types of learning environment - Virtual and In-person

Modal Score	Deviations from the Mean	Squared Deviations
X	$(X - \bar{X})$	$(X - \bar{X})^2$
59	23.37	546.16
64	28.37	804.86
29	-6.63	43.96
8	-27.63	763.42
46	10.37	107.54
53	17.37	301.72
16	-19.63	385.34
10	-25.63	656.90
$\bar{X} = 35.63$	$\Sigma(X - \bar{X}) = 0.0$	$\Sigma(X - \bar{X})^2 = 3609.9$
		s = 8.58

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Table 27

Modal scores for Which learning environment has the prospect of completing education and graduating successfully?

Q1	Reasons that would contribute to comfortably complete education through virtual learning and successfully, graduate.	Discussions of lessons could be done with peers, globally
	Score	43
Q2	Additional reasons for Virtual learning	Internet learning could be done from anywhere & would force students to do more research
	Score	8
Q3	Reasons that would contribute to comfortably complete education through in-person learning and graduate successfully.	Face-to-face interaction with teachers and peers fosters direct communication, collaboration & engagement
	Score	79
Q4	Additional reasons for in-person Learning	Students network, bond & learn happily from each other
	Score	8
Q5	Which learning method would you personally prefer for future education?	Yes
	Score	54
Q6	What should be done to improve your choice of learning for previous question – Virtual / Online	Improved digital network infrastructure, accessibility and stable internet connection
	Score	21
Q7	What should be done to improve your choice of learning for previous question – In-person	Use of technology to complement traditional teaching to make learning more effective
	Score	12

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Table 28

Computation of Mean and Standard Deviation for data on Virtual and In-person

Modal Score	Deviations from the Mean	Squared Deviations
X	$(X - \bar{X})$	$(X - \bar{X})^2$
43	10.86	117.94
8	-24.14	582.74
79	46.86	2,195.86
8	-24.14	582.74
54	21.86	477.86
21	-11.14	124.10
12	-20.14	405.62
$\bar{X} = 32.14$	$\Sigma(X - \bar{X}) = 0.0$	$\Sigma(X - \bar{X})^2 = 4456.86$
		s =11.13

Appendices

Appendix 1

Period/Year	Key Developments in Online Learning
1960s	Beginnings of computer-based training (CBT) using mainframe computers.
1970s	Introduction of PLATO system for computer-assisted instruction.

Period/Year	Key Developments in Online Learning
1980s	Emergence of teleconferencing and satellite-based distance learning.
1990s	The advent of the World Wide Web; the birth of the modern Internet era.
1994	The first online course was launched by the University of Toronto.
1997	Launch of Blackboard, a pioneer in online course management systems.
1999	The term "e-learning" was used for the time in a professional context by Elliott Masie at the TechLearn conference at Disney World.
2002	Massachusetts Institute of Technology (MIT) launches OpenCourseWare, making course materials freely available online.
2005	YouTube was founded, providing a platform for educational video content.
2006	Introduction of Massive Open Online Courses (MOOCs) by Canadian and American universities.

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Period/Year	Key Developments in Online Learning
2015	Introduction of online coding boot camps for technical skill development.
2016	Rise of mobile learning with the proliferation of smartphones and tablets.
2019	Growth of adaptive learning platforms, personalized to individual student needs.
2020	Rapid expansion of online learning due to the COVID-19 pandemic, highlighting its importance and accessibility.
Present	Continued innovation with virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) technologies in education.

Key developments of virtual / online learning

Source: Raouna, K. (2024).

Appendix 2

Advantages of Online Learning	Disadvantages of Online Learning
Flexibility in scheduling and access to materials.	Lack of face-to-face interaction, leading to feelings of isolation.

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Advantages of Online Learning	Disadvantages of Online Learning
Accessibility for learners from diverse geographical locations.	Technical issues such as internet connectivity problems or software glitches.
Variety of resources including multimedia materials and interactive tools.	Greater self-motivation required to stay on track with coursework.
Customization to cater to individual learning styles and preferences.	Limited hands-on learning opportunities for certain subjects or skills.
Cost-effectiveness, often requiring fewer resources than traditional education.	Proneness to distractions like social media or household chores.
Global reach, connecting learners and educators worldwide.	Concerns about the quality and credibility of online programs.
Opportunities for collaboration and networking among learners.	Dependence on technology, leading to potential technical challenges.
Adaptability to diverse learning needs and schedules.	Potential for digital divide, disadvantaging learners without access to technology.

Advantages and Disadvantages of Online Learning

Source: Raouna, K. (2024).