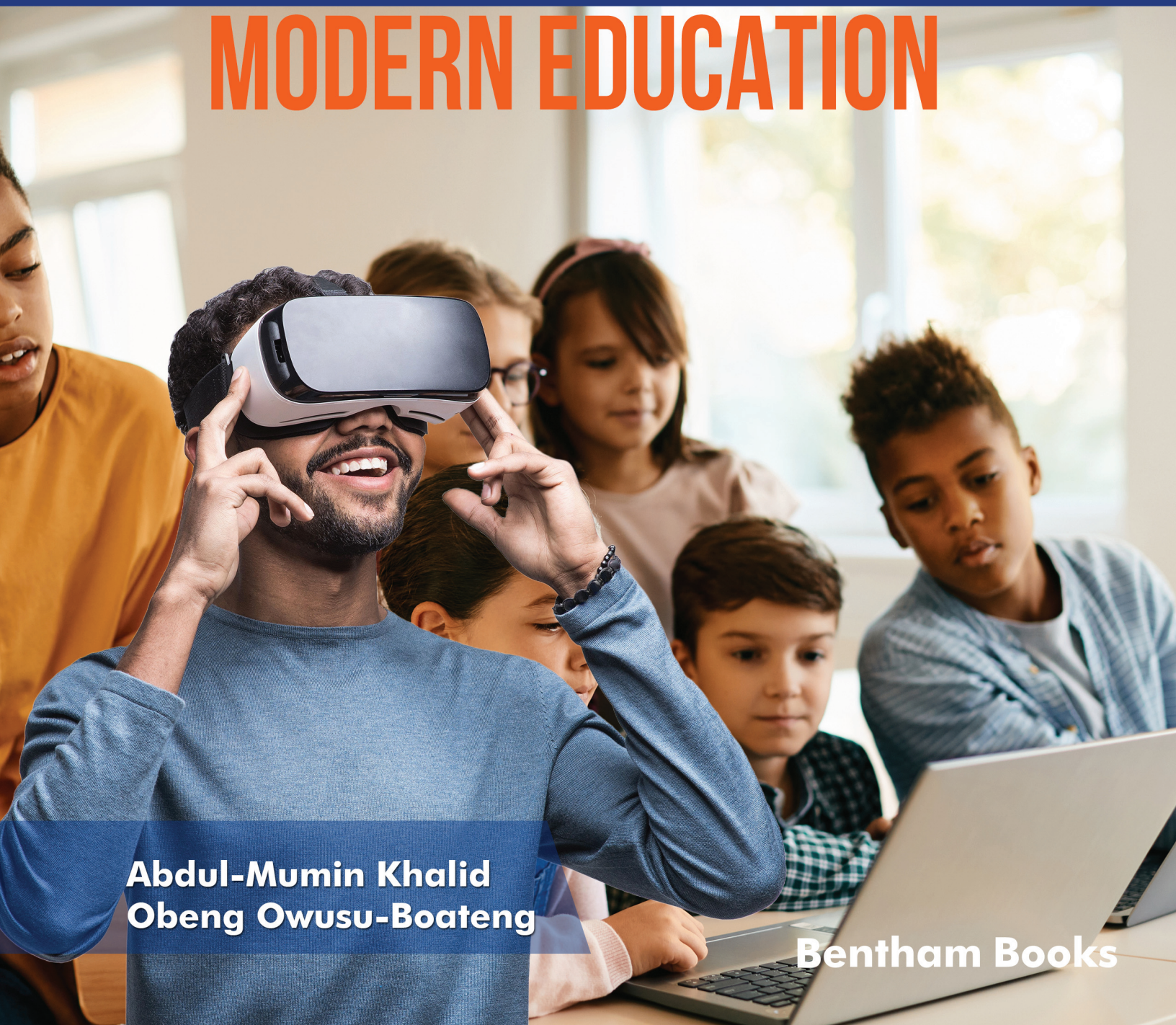
NAVIGATING THROUGH TECHNOLOGY IN MODERN EDUCATION



Abdul-Mumin Khalid
Obeng Owusu-Boateng

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Navigating through Technology in Modern Education

Authored by

Abdul-Mumin Khalid and Obeng Owusu-Boateng
Department of Mathematics/ICT Education
E. P. College of Education, Bimbilla
Ghana

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Authors: Abdul-Mumin Khalid & Obeng Owusu-Boateng

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PREFACE

The evolution of technological advances has transitioned from individual initiatives to interconnected networks of tools and programs that facilitate global connectivity and contribute to the resolution of both personal and global issues. The utilization of digital innovation has exhibited capabilities to supplement, enhance, and revolutionize the field of education. The significance of digitization in the education industry cannot be overstated. The utilization of technology in education provides enhanced opportunities for both students and teachers, facilitates a more welcoming and practical learning environment for individuals with disabilities, and contributes to the improvement of engagement among students. Digital transformation in education has a profound effect on enhancing the learning experience for students, teachers, and other stakeholders engaged in the educational process. These modifications prioritize enhancing student involvement and ease of use by incorporating interactive elements and allowing for personalized learning experiences. Consequently, online education has become more affordable, extensive, and accessible. The book covers a wide range of topics:

Introduction to Digital Transformation in the Education Sector

Digital Transformation in the Education Sector: Benefits and Challenges

Factors for Adopting Technology in the Education Sector

Adoption of E-Learning in the Education Sector

The Adoption of Artificial Intelligence in the Education sector

The Adoption of Big Data in the Education Sector

The Adoption of the Internet of Things in the Education Sector

CHAPTER 1

Introduction to Digital Transformation in the Education Sector

Abstract: The social behaviors of humans have been profoundly impacted by recent developments in hardware and software technologies, from education to health, transport, manufacturing and trade. By transferring physical education into digital formats, COVID-19's effects on education have significantly accelerated digital evolution in Ghana and around the world. Education received a lot of attention during the Industrial Revolution of the twenty-first century. However, a few of the difficulties in getting data from the source to the end consumers are the expense of the infrastructure, problems with network connectivity, and digital platforms. Another criterion for assessing the progress of digitization and its effects on developing and developed nations is the economic variety of the populace. Personalized learning, academic advising, data collecting, management, and other areas are all heavily reliant on digital transformation, which highlights a trend.

Keywords: Digital Transformation, Education, Internet, Technology, University.

1. INTRODUCTION

From the publishing industry to the music business, the Internet has had a profound effect on the dissemination of information. The field of education is also undergoing a period of transformation. These days, “digital transformation” is a buzzword on every teacher's lips. The COVID-19 pandemic has prompted a shift in how technological advances are used in educational settings (Al-Shakarchi, 2022). Stakeholders in the education system include students, faculty, parents/guardians, and government/regulatory agencies. The necessity for effective operation, cost management, and performance in terms of set goals is, however, universal across all organizational contexts (Gartner, 2023). To better serve both their students and teachers, higher education institutions are undergoing a digital transition. To fully realize the benefits of the digital age and a digital revolution necessitates rethinking traditional methods of instruction and administration. However, because of advances in technology and new ways of thinking, it is now possible to convert lecture materials into digital form and make them widely available online. Not only does this necessitate cutting-edge tools,

but also cutting-edge practices. Not just technical expertise but also command of management is an extremely scarce commodity in the field of education. Prospective leaders in today's organizations need to be able to sort through a plethora of digital projects, accelerate innovative cycles, and restructure their organizations to better accommodate novel methods. Students in the modern era need access to a wealth of digital materials. Prospective students are continuously on the lookout for innovative educational possibilities that go beyond the standard lecture format. To provide high-quality education, educational institutions must innovate and adapt to meet the changing demands of today's students. One of the hallmarks of our day is the widespread adoption of digital technologies. It appears that developing nations are falling behind in these areas as the fourth industrial revolution (Industry 4.0) is examined through digitization and things such as the internet, big data, coding, and smart manufacturing (Parlak, 2017). Industry 4.0, as defined by Bates (2015), places an emphasis on education that is relevant to the requirements of an economic order and a market transformed by digital technology. Our educational system is not in sync with these ideas; today's students are still being taught in classrooms that appear little different from those of decades past, and the demands of modern education are being ignored, at least in part. Therefore, all students in postsecondary education must have the knowledge and skills necessary to make effective use of information and communication technologies (ICT) and digital learning technology in the classroom. The purpose of this chapter is to serve as a guide for further research on the correlation between students' ICT engagement and their digital learning. The implementation and utilization of instructional technologies have proven challenging in developing countries and have not always resulted in proportional advances in student learning outcomes. The chapter moves in this approach by thinking about how online settings will change the nature, breadth, and method of schooling.

2. LITERATURE

2.1. Digital Transformation

The term “digital transformation” encompasses a wide range of concepts, from IT upgrades (such as cloud computing) to process improvements and even the creation of entirely novel digital business models. Many government agencies use this word to describe relatively small projects like moving services online or updating older systems (Gartner, 2023) because of budgetary constraints. A digital revolution, as defined by Norton *et al.* (2020), is a shift in the way labor is organized due to the introduction of new digital technology and business strategies. It is more than just dropping in a new piece of software; it requires harmony among digital tools, people, and structures. Digital transformation, as

defined by Mahlow and Hediger (2019), involves the strategic and in-depth development of new competencies and models *via* digital technology.

2.1.2. DT in Educational Sector

Incorporating technology into the classroom has been shown to greatly improve students' engagement with course material. For instance, since many students learn best by seeing rather than hearing, schools can benefit from having projection screens connected to computers so students can glance at their notes instead of just sitting and listening to the teacher. The class set of courses is standardized using different technologies (Mustapha, 2018). To help students keep learning even when they are not in class, these technologies consolidate a variety of learning resources into a single location, such as study questions, examinations, and exercises. It is encouraging that technology may play a wide variety of roles in the classroom, from supplementing more traditional methods to replacing them entirely. Given the foregoing, it is clear that many learners have benefited from the incorporation of technology into the classroom. Mustapha (2018) and Akinsola and Animashun (2007) are right to draw attention to the significance of technology in the classroom.

2.1.3. Types of Technologies Use in the Educational Sector

As has been seen above, the digital revolution is not a novel idea or process in education; rather, it is a global phenomenon that has already shown promising results in some places (World Economic Forum, 2016). In this section, we will look at six patterns that help define what the digital revolution means in the real world (Aleksandrov et al., 2018): 1) Augmented, Virtual, and Mixed Reality (AR, VR, and MR), (2) Tools for the Classroom, (3) Remodeled Classrooms, () Machine learning/AI, (5) Customized Instruction, and (6) The Use of Games. Looking at successful implementations of digital advances in education strengthens professional bonds and gives teachers more agency. Teachers at all levels are learning the benefits of using technology in the educational setting.

2.1.4. Robot Educator

Making robots that can teach is a multi-faceted endeavor. Learning robots are a clear example of the fruition of interdisciplinary research and development to aid in the classroom. It has the potential to pique students' attention, encourage their creative potential, and make better use of information technology to expand their horizons and expand their access to information. Learning robots are smart teaching tools that can serve as a potent adjunct to teachers in a variety of classroom settings. By interacting with a computer, students can improve their capacity to study independently and actively seek solutions to problems. The

CHAPTER 2

Digital Transformation in the Education Sector: Benefits and Challenges

Abstract: Students, staff members, and other stakeholders' demands are all shifting rapidly due to advances in electronic technology as well as information analytics. Many of the executives of today are neither tech-savvy nor digital natives, yet they nonetheless recognize the importance of technology in maintaining a competitive edge and fuelling expansion. The study identified many benefits, including facilitating learning and boosting classroom efficiency, facilitating the monitoring of student achievement and growth in the classroom, helping students and teachers work together better, providing unique educational opportunities, increasing efficiency in the classroom and monitoring academic progress. The chapter also identified the following challenges of using DT in the education sector: ineffective digital fixes, uneven availability, developing bad study routines, possible inaccuracies and inability to express oneself. The DT revolution may present some difficulties for institutions, but it is ultimately beneficial to the industry as a whole. It can play a huge role in inspiring both students and educators to adopt cutting-edge methods and outlooks.

Keywords: Benefits, Challenges, Digital transformation, Education sector, Technology.

1. INTRODUCTION

Because of its growing importance in the modern educational framework, information and communication technology (ICT) is a one-of-a-kind mechanical system for any company or country (Nguyen & Luu, 2020). In fact, it is employed as a clever means of communication, one that is perceptive enough to capture the radical alterations in the educational setting and adapt accordingly (Muneer, 2020). As a result, the increasing demand for students' skills and knowledge in the era of globalization has led to a growing interest in incorporating ICT into the classroom. The holistic utilization of technology and human, corporate, and educational drivers guides and supports the digital transformation of instructional processes. To prepare students for the demands of the 4th Industrial Revolution along with other global concerns, such as reducing the negative consequences of climate change by raising public knowledge of its causes and solutions, Education 4.0 emphasizes the development of a wide range of abilities, including critical

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thinking, communication, and problem-solving. As much as DT has benefits, it also has limitations. Hence, examining the benefits and challenges for managers of higher education is crucial. The chapter aims to unveil the benefits and challenges of DT in educational settings.

2. LITERATURE

2.1. Benefits of Technology in the Education Sector

The potential technological advances in the classroom are limitless.

• More Quickly Accessible Data

Students have access to a wealth of resources, which is one of the greatest benefits of technology in the classroom. At any time and from anywhere, you have access to a wealth of reliable knowledge in the form of websites, tutorial sites, videos on YouTube, e-books, PDFs, and so on (Clarifi Education PBC., 2023). With the introduction of the World Wide Web, kids are seeing the first-ever impact technology has on teaching. Learners' computers, tablets, and mobile phones all have the potential to access vast amounts of data and information with only a few taps or swipes. As a result, you can do things like lesson planning and writing papers alone. Therefore, technology broadens students' horizons and encourages independent study.

• More Options for Educational Resources

The internet has made a vast library of educational resources available to students. These resources might be anything from academic publications and papers to online databases and the personal blogs of teachers and authors. If you are in high school, you will find these to be really helpful. If you have all the relevant data, facts, and figures on hand, you will have an easier time writing academic papers. A student's work can benefit from using the available facts to back up an argument, prove a hypothesis, or arrive at the right conclusion. There is no need to exert an inordinate amount of effort while using technology to improve students' academic performance (Clarifi Education PBC., 2023).

• Expands Opportunities for Study at a Distance

The ability to study from afar is a major perk of the Internet for students. With the advent of the internet, distance learning has become a viable option. Through the use of a computer screen or online discussion forum, students can acquire the same knowledge. During a virtual meeting, students from the same university can exchange files, links, and information. Traditional classroom time is being

supplemented with online instruction, and the result is improved student performance in both contexts. They supplement the education of kids, especially the weaker ones, by attending classes outside of school hours online. Furthermore, students who are interested in pursuing their passions in areas like Data Analytics that are not included in the standard school curriculum can do so by enrolling in an appropriate online course. Other emerging educational institutions provide purely online courses in a wide range of disciplines and professions. Some of the most well-known places to take extensive online classes are Coursera, edX, and Udemy.

• Modify Educational Practices

One of EdTech's many advantages is that it makes teaching simpler for everyone involved. Teachers have the option of working with students remotely or coordinating extracurricular activities. This improves their teaching skills, aids student learning, and ultimately leads to higher test scores (Clarifi Education PBC., 2022). Also, because of the widespread use of mobile and desktop apps, pupils now have access to digital attention coaches. They assist educators in keeping track of students' assignments (Clarifi Education PBC., 2023) and facilitating classroom management. They can monitor pupils' progress on assignments and alert them if they are running late. To monitor and help their kids' academic progress, many schools and teachers today use Internet resources. They can quickly see who is struggling academically or who is falling behind. They can help guide them in the right direction and aid in their academic progress.

• Boosts Students' Ability to Communicate in the Classroom

This is a significant advantage of modern technology for universities. Higher-level students improve their communication skills through exposure to numerous technological resources and online learning opportunities. Many students feel uncomfortable raising their hands or talking to professors in front of their peers. Yet, they can open up and participate fully in online meetings and lectures (Clarifi Education PBC., 2023) despite their usual shyness and reserve. During their separate periods in front of the screen, they can engage in any form of digital communication they like. Students who want to succeed in school and their careers in the future must have strong communication skills. Better communication skills allow students to articulate their ideas and contribute meaningfully to class discussions.

• Makes Learning Entertaining

Young children are notoriously difficult to corral into a classroom setting. They have a short attention span. Similarly, it can be difficult for older pupils to

CHAPTER 3

Factors for Adopting Technology in the Education Sector

Abstract: Information communication and technology (ICT) is a key driver in most industries including education. The goal of this chapter is to look at the major factors that drive the adoption of digital tools in the education sector. Such factors include the role of educator/professor/lecturer, context factors, governmental actions, university factors, organizational culture and leadership, skills in information and communication technology, obtainability of resources, involved parties, value and developments, advances in technology, superiority of information, data science and business intelligence, and compatibility. Teachers and mentors should push their pupils to use ICT for research, communication, and problem-solving to boost their academic performance and opportunities. Both the availability of tools and the quality of those tools affect students' perspectives and intentions to engage in digital learning. ICT-based digital learning choices should be utilized by students. While some see ICT as a way to boost classroom efficiency, teamwork, the quality of instruction, and student outcomes, the reality is that its usage in schools has been widespread for only a short period and that many people are either uninterested or actively opposed to it.

Keywords: Adopting technology, Digital, Education sector, Factors, ICT.

1. INTRODUCTION

Many businesses are implementing extensive transformation programs to take advantage of the opportunities presented by the digital revolution or to simply keep up with the competition. Digital transformation in education talks about the widespread use of ICT to improve classroom instruction and student outcomes. When used effectively, technology can facilitate more equitable learning, provide access to knowledge and data, enhance the instructional process, and boost student achievement (UNESCO, 2021). In the wake of the COVID-19 pandemic, ICT has been increasingly acknowledged as a tool that may ensure students have access to a high-quality education even when institutions are closed. It can also be used to discover and implement novel approaches to education. In light of this growing interest, this chapter briefly investigates how the adoption of new digital tools in the classroom might aid in the revitalization of teaching and learning across all levels of schooling and improve the quality, efficiency, equity, and

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sustainability of the educational system as a whole. Very few studies have examined the transformative potential of ICT in schools; instead, they focused on the needs and impediments to adoption. Therefore, it is vital to think of the adoption of technology as a decision made by the teacher based on a positive set of attitudes and beliefs that influence the attitude-intention-behavior relationship if one is to gain an understanding of the process. The determinants of this adoption include social influence and conducive settings, as well as the expectation of performance and effort, among others (Aleksandrov *et al*., 2018). Action research, or reflecting on and refining learning tasks and activities that incorporate digital tools for pedagogical purposes, is one such circumstance. The teacher's characteristics, such as gender, age, experience, and willingness to volunteer, also matter. Finally, the deployment of technology is not enough to alter education on its own; teachers also need to be retrained to create a more innovative, collaborative, individualized, and supportive classroom setting. The term "digital transformation" refers to the process of permeating an organization with digital technology to make major changes to its operations and increase its value to students. As a result of this shift in mindset, businesses must be willing to constantly question established practices, try new things, and learn from their mistakes. Digital transformation is at the top of the company's list of tasks, yet many academic institutions are inaccurate in their assessments of their levels of digital transformation.

The need for digital literacy and digital equity is the driving force behind most of the important self-learning and ICT trends, especially in developing nations. Internal circumstances, such as the need for professional development, discipline, systematicity, and creative-reflective thinking, are necessary for educators to realize the relevance of digital self-learning in enhancing their professional competence. Similarly, research shows that social networks have a significant role in empowering educators to use ICT. The widespread adoption of m-learning (using mobile devices like smartphones, tablets, laptops, and netbooks) in higher education institutions has the potential to expand access to higher education, but it will only succeed with the help of automation of services and the digital savviness of faculty members. Therefore, it is necessary to examine and analyze essential elements responsible for adopting technology to improve student achievements in terms of ICT use and digital learning technologies. In light of this, the authors of this research set out to determine what factors affect students' adoption of ICT and digital learning technologies at the tertiary level. As a result, progress toward the objectives is slow, and much work remains. In this paper, we will examine the most important factors for moving forward and completing a successful digital transformation in the arena of electronic education.

1.1. Contributions of the Chapters

The findings of this study add to the body of knowledge in management, both theoretically and practically. Governments can use the findings of the evaluation to inform their decisions about higher education. It is useful for private schools, colleges, and universities that are aggressively trying to expand their enrollment through digital means. Understanding what motivates today's learners to adopt or not accept specific services in online learning is now crucial. These are vital questions, and the present study provides answers that could aid educational institutions in formulating effective methods in response to them. Therefore, schools should think carefully about everything when formulating rules to draw in and keep online students.

2. LITERATURE

2.1. Digital Transformation

No industry, no matter how big or narrow its focus is, can afford to ignore the digital transformation (DT). By adopting an entirely novel leadership mode, innovative instruments, new techniques of work, and new perspectives and businesses, this strategy enables management systems to improve their processes, resulting in improved performance, effectiveness, and competitiveness. DT is now an important strategic issue for any executive to address. It expands students' horizons outside the classroom by providing means to speed up their development while also generating long-term competitive benefits and ensuring the safety of their operations. By streamlining administrative procedures and student-teacher communication, DT boosts the educational system's bottom line. The term “digital transformation” refers to the process through which a company modifies its basic operations to better serve its customers. Customers in the academic sector may include students, teachers, and administrators, among others. The educational sector is becoming increasingly competitive, making digital transformation a must for educators to adapt and thrive in the new digital world by embracing digital technologies, approaches, and mindsets. A thorough and long-lasting digital transformation requires an understanding of the obstacles that may stand in the way. This paper aims to survey the literature on incorporating digital transformation into management education and to examine its practical application concerning four dimensions: time, place of origin, industry, and the focus of digital transformation.

2.2. Digital Transformation in Education

Technology has an impact on every part of our educational system, from K-12 to higher learning. The transmission and reception of information are undergoing

CHAPTER 4

The Adoption of E-Learning in the Education Sector

Abstract: Technology has recently become a major component of the educational field and learning process as it provides students with opportunities to learn more effectively and operate efficiently in this age of technological advances. The study has identified the factors among students that can enable or inhibit students from using online learning platforms. Based on the theoretical foundation, the factors influencing e-learning are environmental, organizational, technological (smart-device use), subjective norms, self-efficacy, accessibility and flexibility. User adoption of e-learning is greatly influenced by the strength and dependability of the underlying information technology infrastructure. The present state of e-learning in universities and the results of previous studies on the topic are also described.

Keywords: Adoption, Education, e-Learning, Online, Platform, Technology.

1. INTRODUCTION

All facets of daily life have been altered by the proliferation of ICT due to the constant improvement of technology applications and tools (Kjellsdotter, 2020).

The internet has made the world a smaller place, eliminating physical barriers to what were once considered professional and personal relationships across the globe (Memon & Meyer, 2017). Similarly, ICT has created a new trend in the educational system that has brought about considerable improvements with good effects. The use of information and communication technology (ICT) tools in the classroom has many advantages that add up to a more thorough and effective grasp of difficult-to-grasp scientific principles and methods.

Technology in higher education is changing the way professors do their jobs, particularly in terms of the services they provide to students (Al-Ghurbani *et al*., 2022). Professors work to increase the amount of technology available to students as colleges and universities increase their use of technology in instruction (Al-Ghurbani *et al*., 2022). Insight, investigation, and communication across national boundaries have all been revolutionized by technological advancements. Due to technological advancements, it is now possible for universities to teach anyone,

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anywhere in the world. More and more schools are seeing the benefits of incorporating technology into the classroom. This rapid pace of period integration has provided higher education with a model to explore innovative methods of instruction. The goals of Al-Awidi and Aldhafeeri (2017), Tarman (2016, 2017), and Tarman and Chigisheva (2017)—proponents of digitizing the curriculum in higher education—are to raise standards of instruction and to broaden and update their application. The shift from conventional methods of education to those that make use of modern information and communication technology is well underway at present. The Faculty of Distance Learning places a strong emphasis on the organization of the learning process in an online learning environment, and this area of academic study is constantly developing and expanding. The term "e-learning" can also apply to the use of ICTs to improve students' access to online teaching and learning materials, as well as to the provision of Web 2.0-based collaboration environments and tools for students. Web 2.0 is a collection of programs that enhance and modify social interaction and communication (Martins *et al*., 2019). The term "e-learning" is broad enough to encompass numerous contexts, procedures, and instructional strategies. This research synthesis looks at the effects of information and communication technology (ICT) on college and university students. It is clear from the conclusions of the topics investigated under e-learning literature that some areas, such as comprehensive aspects leading to e-learning, still require continuing investigation. Most studies only looked at one stakeholder, like students, revealing a large gap in the research. The goal of this chapter is to investigate the causes behind the expansion of e-learning and to present methods for attracting more interested parties.

Not many of the publications we looked at employed the TOE framework (Namisiko, Munialo, & Nyongesa, 2014). To our knowledge, the TOE paradigm is the only one to consider all three of these important aspects of technology adoption (Nkhoma & Dang, 2013). When studying the adoption of technological innovation like e-learning, the TOE framework considers the institution's technological, environmental, and organizational aspects from a broad perspective. None of the competing hypotheses adequately accounted for the interplay between the technological, environmental, and organizational factors of adoption. Therefore, this chapter blends TAM with TEO conceptually to comprehend such elements that influence e-learning.

1.1. Contribution

This research will help universities understand the barriers to e-learning and work toward resolving them. This will allow universities to focus their efforts and resources where they will have the greatest impact, increasing the likelihood of the program's success. If it works, it will allow universities to begin using e-

learning, which will provide a new medium for efficient education and wider participation. The research has practical implications since it alerts university administration to the existence of certain characteristics that promote or inhibit the adoption of e-learning. Universities taking the plunge into e-learning adoption now have access to information that was probably previously unavailable to universities in developing countries: a thorough understanding of the nature and determinants of e-learning's success. Therefore, colleges and universities considering implementing an e-learning program should evaluate their IT infrastructure, perceived user-friendliness, course material, and e-learning curriculum with a critical eye. Those involved in creating and implementing e-learning systems, as well as academic instructors and administrators, will find this chapter useful. This chapter fills a need in the literature by addressing the dearth of studies focusing on e-learning in less-developed nations.

2. LITERATURE

2.1. E-Learning

Studies that made use of technology or electronic appliances in any way, shape, or form are included here. In higher education, "e-learning" is defined as "the application of ICT to improve or facilitate studying" (OECD, 2005).

Hsbollah and Idris (2009) describe a learning care management system as a web-based educational system that makes use of information technology and networked computers. E-learning, or electronic learning, has emerged as a result of developments in information and communication technology.

E-learning is the teaching-learning process that takes place in an electronic environment, also known as virtual instruction, *via* the Internet, online learning, and distance learning (Singh & Thurman, 2019). With the advent of e-learning, traditional obstacles to the dissemination of information have been overcome.

Therefore, it has become a versatile and inexpensive method of giving high-quality education to those who would otherwise have little or no opportunity to receive it. Traditional education relies heavily on e-learning (Massive open online courses (MOOCs)) because of its adaptability, wide resource-sharing capacity, and cost-effective scalability (Allen & Seaman, 2011). Learning and technology are two distinct aspects of e-learning (Aparicio *et al*., 2016). Aparico *et al.* (2016) define learning as "the cognitive process of acquiring knowledge and new skills", with technology acting as a "powerful enabler" of this process. Computer-assisted instruction (CAI; Zinn, 2003) is the foundation of today's most popular online education platforms. People, technology, and services are the three pillars upon which the theoretical framework for creating an e-learning system rests (Aparicio

CHAPTER 5

The Adoption of Artificial Intelligence in the Education Sector

Abstract: The objective of this chapter is to elucidate the integration of artificial intelligence (AI) within the education sector while also examining the advantages of AI in education based on existing scholarly literature. Artificial intelligence (AI) addresses various contemporary difficulties in the field of education, including bridging the technological divide between learners and educators, ensuring trustworthy and ethical learning systems, facilitating distance learning, and advancing the development of high-quality data as well as solutions for the current educational process. The potential implications of artificial intelligence (AI) in the field of education are vast, as this technology has the capability to effectively address various challenges within the online education system.

Keywords: Adoption, Artificial intelligence, Education, Students, Sector technology.

1. INTRODUCTION

While Artificial Intelligence (AI) has emerged as a game-changing technology, its potential applications in the classroom have been largely ignored. This is not surprising given that education is predicated on interpersonal skill sets (knowledge exchange and communication) that do not necessitate the use of artificial intelligence.

There has been a recent spate of papers discussing the benefits of artificial intelligence in the classroom, but most of them center on the students rather than the teachers. No industry is immune to the transformative power of artificially intelligent technology (AI), and education is no exception.

In the next three years, up to 47% of learning management products will have artificial intelligence features, according to the education industry. Although AI-driven solutions have been available in EdTech for some years, widespread adoption has been gradual (Karandish, 2021). But the pandemic changed everything, and teachers had to rely on online education.

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Eighty-six percent of teachers now believe that technological advancements should be incorporated into every aspect of classroom instruction. Artificial intelligence has the potential to enhance the educational experience for students and faculty alike. Importantly, AI offers some novel possibilities for incremental improvements in the classroom. When added up and considered over a longer period, these small improvements can have a major impact on outcomes like student engagement and performance.

AI can also be utilized to aid educators, streamline processes and offer timely insights that will make their jobs easier overall. AI, or artificial intelligence, is the process of programming a computer to mimic human intelligence and behavior. It is a method for programming computers to mimic human thought processes. The purpose of AI is to perform like a human being. Artificial intelligence (AI) has several potential applications in the field of education, among others.

The use of AI to solve problems like language processing, reasoning, planning, and cognitive modeling is increasing the demand for technology in the classroom. As Majeed (2023) points out, AI can help with the synthesis and structuring of knowledge to enable the dissemination of content in a different learning method. There is a wide range of reactions to the prospect of using AI in the classroom, from exhilaration to worry to a slew of unanswered concerns. Some people are hopeful that AI will revolutionize classroom instruction, while others are worried about the dangers it could pose to society. In recent years, the education sector has attracted increased attention from AI developers because of the widespread impact of AI applications in this area. One of the most significant trends in education is the increased use of information and communication technology and its applications (Educause, 2021). Learning and teaching are only two areas where AI is finding more and more uses in the educational sector. Horizon Research predicted a 43% growth in AI applications between 2018 and 2022. The same group's analysis expected an even larger increase in the use of AI technology than had previously been seen (Educause, 2021). The future of AI and its function in education are inextricably connected (Ahmad *et al.*, 2021). Artificial intelligence (AI) is here to stay, and there are already tools available to help teachers use it effectively in the classroom. In this piece, we will look at what AI is, how it can help schools, and what problems it can solve.

2. LITERATURE

2.1. Artificial Intelligence (AI)

AI is a technology that can reason, understand human language, and do tasks such as resolving complicated problems, diagnosing medical conditions, and maintaining vehicle functionality. It can acquire unfamiliar languages, execute

chess, and paint impressionist-style imitations. An AI system, or a computerized intelligence system, is a sort of computer software that can perform tasks often performed by intelligent humans (Majeed, 2023). It is important to stop thinking about AI as a singular technique and instead view it as an umbrella word that encompasses several different technologies and techniques, such as NLP, NN, DM, ML, and algorithms (Baker & Smith, 2019). Artificial intelligence is the capability of machines to do tasks normally associated with human or animal intelligence. It is the practice of teaching computers to solve issues and make judgments autonomously using only the massive amounts of unstructured data already available, such as text and images. There is no denying the impact of fields like philosophy, economics, neurology, and cognitive science on the field of artificial intelligence (Zawacki-Richter *et al.*, 2019), even though its origins can be traced back to computer science and engineering. Systems with AI capabilities may recognize patterns in data, learn from new data, and correct mistakes, allowing them to perform jobs that previously required human intellect. Because this definition of intelligence is both very broad and awkwardly tautological, artificial intelligence is typically described as the practice of making machines that can accurately respond to and anticipate changes in their immediate surroundings (Tuomi, 2018). The application of AI to the subject of education has been revolutionary because of the emphasis it places on achieving concrete outcomes.

2.2. Adoption of AI in the Education Sector

According to a study by Hamdan (2017), the use of AI in the classroom can help teachers save time and money by allowing them to better utilize digital resources and cutting-edge online platforms. Recent research has produced an Artificial Intelligence Teaching System (AITS) that electronically assesses student achievement (Majeed, 2023). The system's ability to instruct and absorb knowledge of search strategies is useful for both students and instructors. The results of the algorithm were found to be highly comparable to those of human tutors, according to an analysis of 400 evaluations. Since AI-assisted evaluation allows students to better comprehend their learning and do it in a timely and correct manner, it may lead to a fresh crop of more inspired learners (Luckin, 2017). The possibility that computers might one day replace humans as educators is a major concern in the field of artificial intelligence research (Humble & Mozelius, 2019). To prepare for the future, governments and countries must develop a profile of the ideal educator who can integrate with these systems of support (Wogu, Misra, Olu-Owolabi, Assibong, & Udoh, 2018). Professors can transcribe their lectures with the help of a voice-to-text tool. Students are expected to do some pre-lecture reading and to have questions ready; alternatively, they can follow along and take notes during the lecture without trying to record every

CHAPTER 6

The Adoption of Big Data in the Education Sector

Abstract: Big Data enables higher educational institutions the ability to efficiently use information technology resources to enhance the effectiveness of education and performance. This chapter explores the meaning of big data applicable to educational institutions, identifies the factors that affect the adoption of big data approach in higher education institutions, especially for strategic management purposes and aims to examine the challenges of adopting big data in higher education institutions. The literature sources are from journals on scientific studies and articles, and research papers. The benefits of BD in the education sector include academic productivity, teaching efficiency, organization of processes, freedom of tech stack/tech stack independence, reduction in student dropout, managing the business's finances and operations, maintaining open and honest communication, multiplication of data, accelerating the instructional process and personalization. The driving factors are the TEO framework (organizational, technological and environmental), *etc.*

Keywords: Big data, Colleges, Education, Learners, Students, Technology, Teachers, Universities.

1. INTRODUCTION

As new technologies arise, the world quickly adapts to accommodate them. Many people today rely on various pieces of technology (Shorfuzzaman, Hossain, Nazir, Muhammad, & Alamri, 2019).

Every second, these gadgets generate a staggering amount of data (ur Rehman *et al*., 2019). Current applications and technological advances are being devised to accommodate this huge data. Evaluation of information and storing are two areas where these tools and methods are used (Kalaian, Kasim, & Kasim, 2019; Anshari, Alas, & Yunus, 2019).

Scholars are starting to take a keen interest in big data. Mikalef, Pappas, Krogstie, and Giannakos (2018) outline the various attempts to describe and describe big data. The academic community has recently shown a great deal of interest in big data (Baig *et al*., 2021; Rani & Kant, 2020).

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Large and complex data sets, known as “big data”, necessitate robust methods of storage and analysis. By “big data” we mean extremely huge datasets amassed to discover and study previously unknown relationships between variables.

Big data is necessary because typical data processing software and systems are unable to handle data of this complexity. Big Data technology allows for the collection of massive amounts of data in the form of a database, which can subsequently be used to retrieve patterns among the people or systems studied.

With the use of Big Data, we can gain crucial insight into the data collection process. It is a great improvement over using Excel or some other antiquated program to process data. Text analytics makes it possible for big data and its AI to converge by analyzing all of the data's textual components (Moreno & Redondo, 2016).

The scanned texts are examined based on the categories into which they have been classified and divided. The process of analyzing these writings entails discovering commonalities and tracing the movement of ideas from one to the next. The education sector benefits greatly from big data analytics since it allows for more rapid decision-making and gives institutions a competitive edge through the prompt analysis and application of information.

To further improve student and institution outcomes, several educational institutions are embracing big data analytics for real-time event monitoring and forecasting (Vikas, 2021). Big data analytics also helps schools streamline administrative tasks and boost student participation with timely information. Moreover, big data analytics is employed by a variety of decision-makers to enhance the capacity of educational institutions to make decisions and optimize sales strategies. As a result, the need for data-driven decisions to boost educational quality in the Asia-Pacific region is a major factor propelling the expansion of big data in the education market (Vikas, 2021).

Effective evaluation of huge amounts of data created by educational systems is crucial for fostering appropriate responses to new problems, which in turn improves the quality of learning outcomes (Murumba & Micheni, 2017b).

Since there are several technical challenges associated with big data, such as the need for ongoing upgrades to resources and knowledge, universities and colleges will require substantial funding to address these issues. There are valid privacy concerns, especially about information gathered online. This, together with the digital gap that exists in many countries, creates obstacles to harnessing the potential of big data for the benefit of those who use the educational system.

The use of Big Data (BD) is receiving a lot of attention from top-level executives in many different industries. Despite the abundance of scholarly data (Murumba & Micheni, 2017a), it has not been thoroughly investigated in the education sector. Predicting the circumstances and events that lay the groundwork for a seamless adoption requires the BD theoretical model in the classroom. Therefore, the purpose of this research is to create a model for pinpointing the educational context elements that affect BD. Meanwhile, moderating variables can also have a substantial impact on the proposed model's predictor-BD correlations.

However, in big data research, moderating effects have not been investigated at all. Studies by Asheghi-Oskooeea and Mazloomi (2018) and Baig *et al.* (2021) are just two examples of studies that evaluate the impact of age and size as moderating factors. Therefore, this research aims to construct a theoretical model that accounts for the factors that affect decision-makers' adoption of big data in the educational sector.

1.1. Contributions

This paper reviews the literature and offers recommendations for implementing big data in colleges and universities. For big data to be widely implemented in education, this research can be of assistance to policymakers, managers, and service suppliers. Numerous pedagogical practices have been revolutionized as a result of big data. The capacity to keep tabs on educational institutions is one of the most revolutionary changes brought about by big data. Future educational reform will look very different from current practices. Big data analytics is the study of massive amounts of data using novel techniques and advanced computer programs. Data scientists consider the following three aspects when doing their analyses: Data can be described in terms of their “volume” or total amount; their “velocity” or how quickly they are moved and processed; and their “variety” or different forms and characteristics. Students in higher education should be guided to build abilities in any field through a system that emphasizes the improved quality of results from education. The goals of both students and teachers must be taken into account while designing software for educational purposes. Recognition of facial features and voice-based learning are two examples that, if developed, would revolutionize how quickly students learn. The effective execution of BD systems may coincide with the review's suggested suggestions and repercussions for BD systems professionals and application programmers. Incorporating and endorsing BD activities in one's company is a first step in capitalizing on the benefits of revolutionary technology, and this chapter provides practitioners with a starting point. This chapter also adds to the growing body of scholarship on concepts and models of technological adoption and acceptance, which many scholars have argued should be extended to new contexts.

CHAPTER 7

The Adoption of the Internet of Things (IoT) in the Education Sector

Abstract: The Internet of Things (IoT) is causing a sea change in the educational system. IoTs are revolutionizing the classroom by making lessons more interactive and interesting for both teachers and students. An understanding of why IoT is becoming a vital component of daily instruction and learning is gained in this chapter, along with a discussion of the challenges and relevance of the technology in question. According to the study's findings, students can work together in real-time thanks to IoT devices. Smart whiteboards, for instance, enable collaborative brainstorming, note-taking, and writing amongst a group of people. Moreover, VR programs can imitate real-world circumstances, providing pupils with a more comprehensive education. Teachers can tailor their lessons to each student's individual needs with the aid of IoT devices. Teachers can make a greater impact on student's academic performance and engagement if they take into account how their students learn best. There are various ways in which humankind will profit from IoT development, but these gains will not be free. Some of the biggest drawbacks of the Internet of Things are security concerns, technological dependency, and employment insecurity. Governments throughout the world are investing time and energy to find solutions to these challenges and unlock the full potential of the IoTs. The capacity to employ Internet of Things technologies to create an interesting, dynamic learning environment is crucial for the future of education. Incorporating Internet of Things (IoT) devices into the classroom allows teachers to provide a more individualized, collaborative learning environment that boosts student engagement and achievement.

Keywords: Education, IoTs, Internet, Students, Teachers, Technology.

1. INTRODUCTION

The advent of digital tools has influenced new approaches to and goals for learning. Intelligent devices, IoT, Artificial Intelligence (AI), augmented reality (AR), virtual reality (VR), blockchain technology, and computer programs are just a few examples of the adaptable and disruptive advances in technology that have created new possibilities for enhancing education (Gaol & Prasolova-Frland, 2021; OECD, 2021). Therefore, in recent years, educational institutions around the world have made it a priority of their educational objectives to adopt approaches or regulations about technological integration (European Commission,

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2019) and boost the amount they invest in ICT incorporation (Fernández-Gutiérrez *et al.*, 2020; Lawrence & Tar, 2018). Opportunities for HEIs to improve infrastructure robustness, scalability, and agility while maintaining autonomy are greatly enhanced by the Internet of Things (IoT). According to Villa-Henriksen *et al.* (2020), the IoT "enables both humans and objects to connect with virtually any place, at any moment, and any place; connectivity with everything and to anybody without a specific path and service." More than that, the Internet of Things broadens the reach of online education to more learners and more procedures (Al-Emran *et al.*, 2020). In addition to reducing expenses, the IoT allows students the flexibility to attend class from anywhere, including on campus, at home, or even on public transportation. Therefore, the Internet of Things is predicted to provide remedies that will transform pedagogical practices (Ramlowat & Pattanayak, 2019). The Internet of Things (IoT) is revolutionizing the educational experience for both students and teachers. Learning is made easier and more interesting through the technology's use of internet-connected physical gadgets and objects. The current significant increase in IoT use can be attributed to two factors: the constant pressure to innovate and the universal aspiration to improve one's degree of intelligence (Campbell, 2022). This chapter discusses the barriers and significance of IoT and gains insights into why this technology is becoming an integral part of daily learning and teaching methodologies.

2. LITERATURE

2.1. Internet of Things (IoT)

To link and share data across many different devices and systems over the internet, the "Internet of Things" (IoT) consists of a network of such devices and objects that contain software, sensors, and other technologies (Campbell, 2022). The term "smart home" might refer to appliances like smart fridges and voice-controlled assistants, or it can refer to more intricate industrial structures like robots and buyer-grade devices. The Internet of Things, or IoT, is a network of physical objects equipped with varying degrees of processing power, memory, communications capabilities, and other hardware and software components to exchange and assemble data. Financial services, tourism, education, telecommunications, and many more all make use of IoT in some way. The main argument for deploying IoT in the education sector is that it improves both the quality of education and the value of the physical facilities and the surrounding environment. When all systems are employed in a smart school (one that employs IoT), students are more likely to benefit from individualized instruction. Wi-Fi networks are utilized by the campus's smart gadgets to communicate with one another and receive commands (Ravindra, 2023) and data (Ravindra, 2022). Colleges and universities can benefit greatly from implementing an IoT

computational nervous system because of the many ways in which it can aid in managing institutional resources, pedagogy, campus safety, and information dissemination. IoT, with its cutting-edge capabilities, might be seen as a different approach to managing a school.

2.2. Adoption of Internet of Things in the Education Sector

It is undeniable that the Internet has become the preferred method of interaction for scientists and engineers. The IoT is a dynamic force in the educational landscape. Traditional educational methods are becoming more effective and accessible as a result of the widespread adoption of internet-based technologies. Utilizing IoT in the classroom has been a revolutionary step forward. After the pandemic, several schools quickly adopted IoT solutions to improve safety and efficiency. To make life easier for administrators, educators, pupils, and parents, they implemented Internet of Things (IoT)-enabled gadgets into their educational infrastructure (Campbell, 2022). The Internet of Things (IoT) is now the spotlight attraction online. It will soon lay a solid groundwork for us all, and our lives will be completely revolutionized as a result. The Internet of Things is a powerful resource that can ease the burden of living in today's fast-paced world. It has the potential to create a fantastic situation, but it also has some drawbacks. Keep in mind that the Internet of Things is still a very novel concept that is only just beginning to get traction in terms of adoption. When it comes to incorporating Internet of Things (IoT) devices into their workflow, the education industry is among the most innovative and effective. This is because educators in this field recognize the potential for these tools to make learning more inclusive, collaborative, and engaging for students of all backgrounds. Using IoT devices, educators can track their student's progress in real time and ensure they have constant access to relevant content and effective means of communication. Based on IoT admission systems, flipped classes, orangery heating systems, and student feedback, this article examines innovative applications of IoT, the campus model, and the adoption of IoT at universities. Additionally, the results of both regular schooling and IoT flipped classrooms are evaluated based on student comments. Smart buildings, smart learning, sustainability, technological awareness, and waste and water management are only a few of the advantages of IoT applications that are addressed in the article (Zhamanov *et al.*, 2017). Lei *et al.* (2017) make a similar case for using flipped classes to better educate students about the Internet of Things. There are fourteen students registered in the IoT development course, and the instructors are making good use of the opportunity to tailor instruction to the diverse learning styles and needs of their students through group work, one-on-one discussions, and coaching. Finally, the IoTs development course contributes to better educational outcomes.

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Abdul-Mumin Khalid

The author started his circular education in 2001 at Jilo Primary School in Bimbilla. He proceeded to Business Senior High in Tamale for secondary education.

His academic qualifications include M.Phil. Applied Mathematics, Bachelor's degree in Education in Mathematics, Diploma of Education in Science and Mathematics and Ph.D. student in Mathematics at the University for Development Studies.

He is currently a tutor at E. P. College of education, Bimbilla. He is a part-time Mathematics lecturer in the University for Development Studies, (UDS). He is currently the chief of Yalzoli Yaashenaa in the suburb of Yalzoli, Zabzugu in the Northern part of Ghana.

Obeng Owusu-Boateng

Obeng Owusu-Boateng is a licensed professional ICT educator, from Bimbilla, in the Northern Region of Ghana. He currently works as senior ICT assistant, senior research/teaching assistant in the Department of Mathematics/ICT, E.P. College of Education, Bimbilla. His research interests are: e-learning, online learning and education, technology enhanced learning, blended instruction/learning, distance education and recently, teaching and learning amidst Covid-19 in higher education. He is currently a first-year M.Phil. in ICT education student at the University of Education, Winneba. He has authored three international peer-reviewed journal papers to his credit. In January, 2024, the author was appointed as the deputy officer in charge of International Relations and Collaborations at the E. P. College of Education, Bimbilla.