Smart education: opportunities, challenges and future of traditional education

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Abstract: The landscape of education has witnessed a shift from the traditional system of education to smart classrooms. This paper argues that traditional education remains an integral part of the teaching and learning process while exploring the opportunities of smart education and traditional education. Smart education leverages cutting-edge technologies such as AI, VR and the IoT to enhance the learning experience, making it more personalised, interactive and accessible. However, the integration of smart education into traditional systems is not without its challenges such as privacy concerns, the need for teacher training and so on. This study delves into these challenges, providing insights into how they can be addressed to maximise the benefits of smart education. The paper draws a conclusion by outlining how smart education can effectively be integrated with traditional education using various strategies while recommending further empirical and comparative studies that will measure its effect on learning outcomes.

Keywords: smart education; traditional education; challenges; opportunities; smart learning; technology integration; technologies; innovation; teaching; learning.

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1   Introduction

The current century has witnessed a tremendous shift from the traditional system of education to smart classrooms. Smart education also known as digital education or e-learning, in an emerging learning environment that advocates the necessity for learners to learn in real-life situation technologies (Gros, 2016; Spector, 2014). According to Zhu et al. (2016), smart education is the concept of learning in the digital age. Hence, it is founded on two types of technologies namely smart devices and intelligent technologies which are more prevailing technologies in this century, although distinct but are not independent of each other. Smart devices are electronic devices connected to other devices that can operate independently and interactively to a certain extent. Intelligent technologies, on the other hand, are used to create, analyse and personalise learning. According to Ikechukwu and Amos (2023), an intelligent learning environment comprises both smart devices and intelligent technologies to give room to a more personalised form of learning with different pedagogical approaches. Therefore, the integration of technology into the educational landscape is referred to as smart education. According to Abik and Ajhoun (2012), technology integration in the learning process has revealed new opportunities of learning which has served as a medium of communication and dissemination of pedagogical contents. Thus, smart education is here to stay. The 21st century has seen tremendous advancements in technology tools such as the worldwide web, automated systems, virtual classrooms, gamified learning resources and personalised adaptive learning platforms which unleashes the learner's potentials to progressive learning while learning at their own pace, receiving real-time feedback and evaluation of their progress (Ikechukwu and Amos, 2023). With these considerations in mind, smart education opens up a plethora of new options and opportunities for teaching and learning. Individual interactive learning experiences are introduced through smart devices and intelligent technologies such as virtual reality, multimedia devices, the internet of things and so on. These resources, which are both intriguing and engaging, pique learners' interest, boost their motivation and encourage active engagement (Dominic et al., 2022). However, despite the unlimited possibilities for smart education in terms of utilisation and production, it is not without its own set of obstacles.

Traditional education, as it is known, is as old as man himself. It has undergone numerous revisions and adjustments over the years. This educational system prioritises the instructor as the primary source of knowledge and information, while learners remain passive recipients of that knowledge and information. The opportunities and challenges of traditional education continue to be a topic of discussion in academic forums, leading to the emergence of new educational systems (Mabuan and Ebron, 2017; Toquero, 2020).

Integration of smart education and traditional education has arisen in recent years as a dynamic answer to the difficulties confronting the educational systems (Toquero, 2020; Chukwuemeka et al., 2021). Technological advancement continues at an unparalleled rate, resulting in innovative approaches and explorative methods to teaching and learning. Smart education, with its use of smart gadgets and intelligent technologies, continues to transform how knowledge is transmitted and gained, while traditional education, with its time-tested pedagogical approaches, remains an essential component of the teaching and learning process. This paper discusses the integration of smart education and traditional education, as well as the implications for educators, students, researchers and policymakers.

2   Literature review

2.1   Traditional education, opportunities and challenges

Traditional education has profound roots in long-standing pedagogical techniques and well-established structure and methodologies that have served as the cornerstone of educational systems for millennia. It is an age-old technique that prioritises face-to-face interactions between teachers and students. It employs the talk-and-chalk method of instruction, in which the instructor is the primary source of knowledge and pupils are compelled to maintain their positions and participate in the same activities at the same time. A consistent and predictable environment conducive to learning is provided, and this is a major asset of traditional education. Learners acquire time management by following defined timetables, personal and interpersonal discipline through classroom discipline and social skills through extracurricular activities. Curricular activities, on the other hand, emphasise the relevance of analytical, critical, creative and problem-solving skills. The curriculum is designed to require learners to engage with curricular content, think creatively, and build problem-solving skills. Considering its ease of use, this is the most often used technique of instruction. According to Hafeez (2021), although there are numerous learning techniques available for learners based on learning environments and situations, traditional lecture strategy is the most applicable learning strategy around the globe.

Traditional education lay emphasis on direct methods of instruction with the use of textbooks and structured classroom environments. The main objectives of traditional education are to impart knowledge, develop critical thinking and foster social interaction among learners. Yang et al. (2019) recommended the use of traditional learning strategies only when information transmission is the primary goal. This is because this method of instruction gives the most privilege for the uninterrupted transmission of information. It provides a structured approach to teaching and learning, thereby ensuring that learners acquire a solid foundation in fundamental concepts. It has been imparted to schools around the world in classrooms using the tools of a blackboard, chalkboard, textbooks, assessments and assignments. Enrolled students are required to attend physical classes at least five days a week with some extracurricular activities occurring during and outside the school hours. The requirement for the physical presence of learners in schools, at least five times in a week, helps the learners to be self-disciplined and develop time management and organisation skills, which is required in most professional occupations. Learners are often required to perform group activities, and hands-on experiential learning which foster a comprehensive understanding of the subject matter, and build the spirit of teamwork.

Furthermore, traditional teaching approaches such as lectures, Socratic discussions and hands-on activities foster environments in which students can actively participate with their classmates during the teaching and learning process. Traditional education instils in students a sense of community and collaboration. Learners are given the opportunity to interact face-to-face with their peers in classes, boosting cooperation and collaborative learning. They learn social skills such as empathy and community involvement, as well as fundamental life skills such as communication, language, networking, interpersonal and so on.

Remarkably, the instructor is crucial to traditional education, allowing them to advise and motivate pupils as well as provide feedback at regular intervals. This contributes to

the development of a meaningful teacher-learner relationship, which improves the educational experience by building mentorship and support networks.

However, trends in academic failure among learners have exposed the limitations of this one-size-fits-all approach. Hafeez (2021) concluded that the traditional learning strategy does not help students build critical thinking abilities. Considering the individual differences amidst learners in terms of their needs, learning preferences, learning styles, intelligence and motivation, it is often difficult, if not impossible, to cater for all these differences at once.

The lack of flexibility in terms of pace and content, although discussed as an opportunity, also comes with its disadvantages. In most cases, this results in a situation whereby the teacher becomes too verbose and often boring thereby leading to demotivated and disengaged learners, especially for those learners with hyperactivity traits or different learning styles and abilities. In addition, the fixed and rigid structure of traditional education hinders both the teachers' and learners' exploratory abilities. In some cases, there is little or no time to explore topics outside the structured curriculum or pursue individual interests. This may impede creativity, adaptability and intellectual curiosity.

Furthermore, there is limited personalisation of the learning process. The most common approach to teaching in a traditional classroom is the lecture method. This method utilises a set of fixed procedures that caters for the needs of the average student. Allen et al. (2016) found that the traditional lecture method lacks innovation, creativity, critical thinking skills and other important learning abilities in the learners while many researchers such as Osmani et al. (2018) and Habibzadeh et al. (2019) concluded that the traditional lecture method is not suitable for learner's mental ability.

Moreover, traditional education employs a wide range of resources whose attainment can be impeded by financial, geographical or socio-economic factors thereby limiting teachers' and learners' access to these resources. Besides, some textbooks and encyclopaedias are produced in such a way that their mere bulky sight is enough to discourage some learners from even attempting to open them.

These opportunities and weaknesses of traditional education do not diminish its value; rather, they highlight the areas where smart education can be integrated into it, to bring about effective and efficient teaching and learning of subject matters.

2.2   Smart education

The development of smart cities calls for the graduation of smart citizens through smart education. In smart education, learners are taught in a smart learning environment, with access to up-to-date digital resources and interactive learning systems. It actively provides the necessary learning guidance, hints, supportive tools or learning suggestions in the right place, at the right time and in the right form (Gros, 2016).

Smart education, sometimes called smart learning environment, is a learning environment that is '*effective, efficient and engaging*' Spector (2014). It provides '*real-time and ongoing evidence of changes in knowledge, instilling skills which are seamlessly transferred to learners as they move from one learning context to another*' (Chen et al., 2016). Smart education '*represent a new wave of educational systems, involving an effective and efficient interplay of pedagogy, technology and their fusion towards the betterment of learning processes*' (Shoikova et al., 2017).

According to Hwang (2014), the key features which define smart education are context-aware, adaptive support and adaptive interface. Adaptive learning support and flexible user interface must be provided based on the learner's online and real-world status. User interfaces include such devices as smart technologies such as smartphones, laptops, smart watches and so on. Unlike traditional education, smart education lacks a rigid structure. Learners can obtain new knowledge even in their leisure times. Learners are motivated to learn based on their competencies, learning styles and interests. Moreover, there is provision of personalised assignments, and formative feedback. Smart education includes pedagogical strategies that support:

1) Conversation by engaging learners in dialogues or facilitating group dialogues on a relevant topic or problem in real-time;

2) Reflection through the generation of self-assessment based on individual student's progress and performance, preferably suggesting activities and attributes in the learning environment that can be adjusted to improve overall effectiveness;

3) Innovation, smart education is founded on new and emerging technologies and leverages innovative technologies in creative ways to support teaching and learning;

4) Self-organisation of the teaching and learning resources, and control mechanisms to improve performances over time, based on data that are automatically collected and used to refine how learners interact with various circumstances in the learning environment.

Hwang (2014) further highlighted that the learning environment for smart education should have components such as the ability to detect and take into account the real-world contexts, situate learners in real-world scenarios, adapt learning interfaces for individual learners, adapt learning tasks for individual learners, provide personalised feedback or guidance, provide learning guidance or support across disciplines, provide learning guidance or support across contexts, recommend learning tools or strategies, consider learners' online learning status, consider learners' real-world learning status, facilitate both formal and informal learning, take multiple personal and environmental factors into account, interact with users via multiple channels and provide learners with support in advance, across real and virtual contexts.

2.3   Opportunities and challenges of smart education

According to Zhu and He (2012), 'the essence of smarter education is to create intelligent environments by using smart technologies, so that smart pedagogies can be facilitated as to provide personalised learning services and empower learners to develop talents of wisdom that have better value orientation, higher thinking quality, and stronger conduct ability'.

Unlike traditional education, smart education does not require the physical attendance of enrolled students in school. It uses a variety of smart devices and intelligent technologies to deliver instruction in a way that is learner focused and engaging. The teacher no longer retain autonomy in knowledge, rather serves as a guide that helps students navigate their learning process through personalised learning.

A major feature of smart education is flexibility and personalisation of knowledge (Hussain et al., 2018). It is not merely the idea of improving learning but also emphasises the need for adaptation, taking the environment where learning takes place into account. The choice of learning method depends entirely on students' personal characteristics such as intelligence, learning preferences, learning styles, personality and level of exposure and so on.

Zhu et al. (2016) identified ten key features which define smart learning, which are

1) *Location-aware*: in smart learning the location in real time is the important data that the systems need in order to adapt the content and situation to the learner;

2) *Context-aware*: able to explore different activity scenarios and information;

3) *Socially-aware*: sensing social relationships;

4) *Interoperable*: able to set standards for different resources, services and platforms;

5) *Seamless connection*: able to provide continuous service when any device connects;

6) *Adaptable*: able to push learning resources according to access, preference and demand;

7) *Ubiquitous*: able to predict learner demands before it is clearly expressed, providing visual and transparent access to learning resources and services;

8) *Whole record*: able to record learning path data for mining and in-depth analysis, then providing reasonable assessment, suggestions and pushing on-demand service;

9) *Natural interaction*: able to transfer the senses of multimodal interaction, including position and facial expression recognition;

10) *High engagement*: immersion in multidirectional interactive learning experiences in technology-enriched environments.

Smart education involves the 'effective and coherent use of information and communication technologies to reach a learning outcome using a suitable pedagogical approach' (Demir, 2021). It is a system of education that 'benefit students, educators and educational institutions directly while fostering sustainable learning and growth' (Al-Majeed et al., 2014). It influences diverse technologies to enhance quality education.

The ability to transcend physical and geographical boundaries forms a crucial opportunity of smart education. Online platforms create opportunities for teachers and learners to connect regardless of their location or time constraints, thereby endorsing accessibility and inclusiveness. This gives learners limitless access to educational resources as opposed to what exists in traditional education. Technological tools such as multimedia resources and virtual intelligence promote learning experiences that are both interactive and immersive, thereby motivating the learners to actively participate in the learning process. Digital platform-based games motivate students and help them to learn with full focus and participation. Play-based digital learning strategy improves the learners' ability to experience, create, communicate and visualise by accepting play challenges (Haruna et al., 2023; Hafeez, 2021).

In addition, the wealth of knowledge and information contained in the worldwide web enables learners to diversify their learning experience, while expanding their knowledge, beyond the confinement of the traditional classrooms. This is made easier

with the advancement of data analytics and artificial intelligence tools such as the conversational AI, multifaceted language processes, educational social media platforms, to mention a few.

Furthermore, teachers and learners can connect with experts in various fields from across the globe, thereby enabling collaborative and exchange learning that transcends physical and geographical boundaries (Shen et al., 2023). Collaborative learning which also means cooperative learning allows for learners to situate in an environment with the aim of learning a particular thing. Huang et al. (2012) highlighted that cooperative systems for learning provide necessary functionalities and well-prepared mechanisms to support student online teamwork. This can further expose the teachers and learners to intercultural perspectives and broaden their knowledge. Moreover, access to ongoing and recent studies and research has been made easy through online libraries, online journals, DOI and so on.

Despite the various opportunities of smart education, users encounter several challenges and disadvantages in its use. For instance;

- *Internet distractors*: The internet is flooded with distractors. In the course of using the internet in carrying out research and assignments, students have often reported serious cases of distractions, in the form of pop-up advert links, incoming chat notifications and social media updates. Students have often reported issues of temptations in clicking the pop-up notification regardless of its content, leading to the next click and the next click until they eventually put aside their original intention of studying unlike in traditional education. This is especially true in the case of video viewing platforms such as YouTube, TikTok, Instagram, Facebook, which are loaded with contents of similar interest occurring in immediate sequence.

- *Poor human interaction*: Lack of social learning gives rise to the problem of poor interpersonal skills. There is limited human interaction between teachers and learners, leading to the inability for learners to comprehend non-verbal clues, reading-between-the-lines, social-emotional and interpersonal relationship skills. This results in improper/insufficient monitoring of learners in the completion of coursework, which may be piled up until the last minute before their examinations. Besides, the engaging nature of smart education with its benefits, possesses a great problem to the development of socio-cultural and socio-emotional personality traits.

- *Poor handwriting skill*: There is a huge gap between digital literacy and the acquisition of physical skills, e.g., handwriting. Smart education has put an unfortunate end to the use of pen/pencil and exercise books, thus producing students with illegible handwritings and in extreme cases, writing deficiency. Excessive dependence on technology has resulted in laziness amidst teachers and learners alike.

- *Issues of technical accessibility and connectivity*: The crux of smart education is smart devices and intelligent technologies, whose potentials cannot be reached without internet connectivity. Learners from low-income regions are heavily at a disadvantage due to the unavailability of these resources, resulting in inequalities. Besides, technical issues, electricity disruptions, network disruptions or gadget malfunctions can negatively impact the teaching and learning process. There are also cybersecurity traits such as malware, data breach, privacy and potential AI induced biases.

These opportunities and challenges of smart education demonstrate its multifaceted nature, leaving room for its integration with traditional education so as to harness its full potential, for teaching and learning.

2.4   Integration of smart education with traditional education

In recent years, the need to integrate smart education and traditional education has become increasingly prevalent, as it holds limitless potential for fostering innovative, engaging and personalised learning experiences. By integrating the strengths of both smart education and traditional education, while eliminating their respective challenges, educators can create an educational framework that can equip learners with the necessary skills for survival in the 21st century.

Smart education can be integrated into traditional education through *blended instruction*. Blended instruction is a system that combines traditional face-to-face classroom with online learning resources. Learners are given access to multimedia learning materials such as projectors, video animations and animated instructions using PowerPoints, interactive modules, gamified learning and virtual reality. This aids the reinforcement of the comprehension of concepts taught by the teacher and internalisation of knowledge.

Furthermore, *flipped classrooms*, in which course materials are made accessible to students prior to the lesson, can be used to create an interactive and engaging classroom (Makinde, 2017; Chukwuemeka et al., 2021). This will reduce the constraints on the limited time allocated to classroom lessons. More time will be available for classroom discussions, hands-on activities and collaborative exercises, with the teacher as the facilitator.

Interactive whiteboards through online learning platforms can be further used by teachers to personalise instructional methods, and students to personalise the learning process.

Creation of school learning platforms, where course materials are made available to students throughout the school year as well as participation in quizzes, submission of assignments and social discussion forums, will provide flexibility for students to learn at their own pace without the constraints of time. These platforms can also serve as collaborative and communication tools for video conferencing, group discussion and sharing of documents even outside of school hours.

In addition, the risks and costs incurred on field trips and excursions to distant locations can be greatly reduced through intelligent technologies such as *virtual reality and augmented reality*. In cases where these are not available, *multimedia documentaries* may be projected within the confines of the classroom.

Furthermore, learners can access global resources and personnel, through participation in virtual guest lectures, cross-cultural exchange of knowledge using the resources in their eLearning classrooms (Abik and Ajhoun, 2012; Agyei and Voogt, 2012). This will also give room for teachers to enhance their professional development by interacting with fellow professionals worldwide.

3 Opportunities and challenges of integrating smart education with traditional education

A major benefit of this endeavour is the enhanced accessibility to educational resources through online platforms. For example, internet for research purposes, computers has made computer aided instruction possible, spreadsheets and other sophisticated software are used by teachers for assessments and scheduling of class activities, web pages and blogs are developed for learning activities, grading class activities and result checking has been easier and quicker, interactive white boards used to enhance classroom interactivity and so forth (Chukwuemeka and Iscioglu, 2016; Elçi, 2012). This will ensure that learners can access learning resources from across the world, any place and at any time. Besides, the personalisation of learning experiences for individual learners can completely eliminate the issues of individual differences faced in the process of instruction delivery by providing divergent study materials that are adaptable to learner's characteristics (Hussain et al., 2018). Adaptive learning can ensure that learners learn according to their personal preferences, mental ability and at their own pace. The issues by expert with regards to judging a fish by its ability to climb a tree, or an elephant by its ability to swim can be completely eradicated with personalised instruction and assessment.

Engaging resources such as gamified instructions, animated coursework and so on can boost learners' motivation, while capturing and retaining their interest throughout the lesson. For the teachers and school administration, data analytics and AI will ease the storage, access, retrieval and analysis of learners' details within the shortest period of time, while reducing the costs incurred on human resources.

However, challenges facing the integration of smart education with traditional education are the need for adequately trained personnels (Elçi, 2012). It is interesting to note that materials that can be used for this integration, while lacking in most cases, rot out as a result of lack of technical know-how (Dominic et al., 2020). There is also the problem of effectively and efficiently balancing the integration of smart education resources, while maintaining the retention of traditional teaching methods. Hence, teachers and learners should be adequately trained to use these resources to their full potential.

Moreover, the issues regarding cybersecurity and privacy are perhaps one of the most conspicuous problems for the integration of smart education into traditional classrooms. Smart education systems often collect vast amounts of data about students, including their learning patterns, preferences and even biometric data in some cases. Ensuring that this data is securely stored, transmitted and used only for educational purposes is crucial to protect students' privacy. On the other hand, vicious malware, computer viruses and cyber hacking and other cyber threats can compromise the security of both student and institutional data. Robust cybersecurity measures, such as firewalls, intrusion detection systems and regular security audits, are essential to mitigate these risks.

Furthermore, equity, in terms of affordability and availability of the necessary resources, should be addressed, to ensure that all students have equal access to smart education resources within the confinement of their traditional classrooms.

Generally, the integration of smart education with traditional education requires a careful tactic that can combine technological and pedagogical procedures to bring about effective teaching and learning. The goal of this endeavour is the introduction of personalised, engaging and interactive learning experiences, while maintaining academic integrity and excellence.

4   Suggestion for further studies

This contribution provides a conceptual introduction in the integration of smart education with traditional education. Further studies are therefore required to measure the effect of integrating smart and traditional education on learning outcomes, examine the potential challenges and their possible solutions. Furthermore, comparative studies on the long-term effects on students' engagement, interest, academic achievement, skills development, as well as the adaptability of learners to the ever-evolving technological landscape should also be considered.

Considering the aforementioned, researchers can enhance the current understanding of the integration of smart education with traditional education, improve the technological pedagogical content knowledge and approaches of teachers, inform policy and contribute to the advancement of educational technology in ways that benefit all stakeholders of education.

5   Conclusion

Smart education can be effectively integrated with traditional education through various strategies such as blended learning approaches, incorporating interactive digital content, utilising online platforms for collaborative learning, and fostering a flipped classroom model. Additionally, personalised learning paths, adaptive technologies, and the thoughtful integration of educational apps can enhance the traditional classroom experience. By seamlessly weaving smart education tools into the fabric of traditional teaching methods, educators can create a dynamic and engaging learning environment that caters to diverse learning styles while leveraging the benefits of technology to augment the educational process. Technology can be effectively used to bring about meaningful teaching and learning while maintaining the time-tested pedagogical excellence of traditional education such as the adoption of blended instructions, flipped classrooms, interactive platforms, gamified learning resources and virtual realities can offer immense opportunities for global collaboration, access to ongoing and current researches as well as, equip learners for the necessary skills needed to survive in digital age.

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