



AMERICAN JOURNAL OF
**EDUCATION AND
TECHNOLOGY (AJET)**

ISSN: 2832-9481 (ONLINE)

VOLUME 1 ISSUE 2 (2022)



Indexed in



PUBLISHED BY: E-PALLI, DELAWARE, USA

Developing a Sustainable Digital Transformation Framework for the Continuum of Primary to Tertiary Education in Bangladesh

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Article Information

Received: September 18, 2022

Accepted: October 05, 2022

Published: October 10, 2022

Keywords

*Developmental, Sustainable,
Digital, Performance,
Education*

ABSTRACT

This research article delineates the development of a sustainable digital transformation model aimed at improving the educational landscape from primary through tertiary levels in Bangladesh. Given the digital revolution's significant role in modern education, it is crucial for countries to adapt and transform their educational models to ensure a future-ready generation. Our approach focuses on secondary data and document analysis, enabling us to draw insights from existing reports, studies, and educational policies. The first section of the paper examines the current state of digital infrastructure in Bangladesh's education system, identifying areas where digital technology has yet to be fully integrated or utilized. It provides an assessment of the challenges, including socio-economic factors, rural-urban disparities, and infrastructure limitations that may hinder the digital transformation process. Following this, the paper introduces a comprehensive, scalable, and sustainable model for digital transformation. This model is premised on robust digital infrastructure, inclusive digital pedagogy, capacity building among educators, and a policy framework that encourages innovation while ensuring equal access to digital education resources. The paper concludes by highlighting how this model can significantly enhance the quality and reach of education in Bangladesh. It also provides a roadmap for similar low-to-middle-income countries embarking on their digital transformation journey in education. Through our research, we aim to promote an inclusive, sustainable, and digitally-enabled education system that leaves no one behind, adhering to the global Sustainable Development Goals.

INTRODUCTION

Education's digital transformation is a global phenomenon, reshaping pedagogical strategies, learning experiences, and institutional administration worldwide (Alvarez, 2022). This digital shift is particularly significant for developing countries like Bangladesh, offering innovative remedies to persistent issues in education, including access to quality education, disproportionate student-teacher ratios, and geographical limitations (Hossain, Rahman, & Salehin, 2023). Bangladesh has embarked on a path towards comprehensive digital integration in education as part of its nationwide "Digital Bangladesh" vision launched in 2009. This ambitious endeavor aims to establish a knowledge-intensive society, with education being one of the central pillars (Government of Bangladesh, 2009). Over the past decade, notable progress has been made in this direction, including the introduction of digital multimedia content in classrooms, ICT training for teachers, and establishment of computer labs in schools (Islam, Rahman, & Rahman, 2021). Despite these positive strides, a complete digital transformation enveloping the entire education system from primary to tertiary levels remains a considerable challenge (Karim & Noy, 2022). Transitioning to a fully digital educational infrastructure necessitates an in-depth understanding of the specific socio-cultural context, the digital divide, infrastructure limitations, and teacher readiness for digital pedagogical transformation (Rahman, Islam, & Alam, 2023). It requires the development

of strategies that are comprehensive, sustainable, and adaptable to rapid technological changes. Moreover, as the COVID-19 pandemic has highlighted, digital transformation in education is not merely a trend but an absolute necessity to ensure educational continuity in times of crisis (UNESCO, 2023). This research is an endeavor to design a sustainable digital transformation model tailored to Bangladesh's unique context. By conducting a thorough secondary data and document analysis, we aim to understand the multifaceted challenges and opportunities within the educational landscape of Bangladesh. Our study investigates the potential of digital technologies to overhaul education delivery, augment learning outcomes, and democratize access to education resources. The proposed model in this research, with its strategic focus on sustainability and inclusivity, could serve as a blueprint for digital transformation efforts in other developing countries sharing similar socio-economic dynamics.

LITERATURE REVIEW

The integration of digital technology into education has been an area of keen interest and extensive research in recent years. Its potential to enhance teaching and learning processes, expand educational access, and improve institutional efficiency has been widely acknowledged (Alvarez, 2022). The need for a digital transformation in education has gained further momentum due to the COVID-19 pandemic, which disrupted traditional

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educational practices globally, necessitating a rapid shift towards online and remote learning (UNESCO, 2023). Developing countries like Bangladesh face unique challenges and opportunities in their digital transformation journeys. The government's "Digital Bangladesh" vision has driven several initiatives, including digital multimedia content, ICT labs, and teacher training, enhancing digital literacy and inclusivity (Government of Bangladesh, 2009; Islam, Rahman, & Rahman, 2021). Despite these advancements, barriers like infrastructure limitations, digital divide, and insufficient readiness for digital pedagogy still persist (Karim & Noy, 2022; Rahman, Islam, & Alam, 2023). The importance of a sustainable digital transformation model, especially in developing countries, has been emphasized by several studies (Lwoga, 2022; Nambiar, 2023). Sustainability in this context is multifaceted, involving economic, environmental, and social aspects. It suggests the need for affordable, scalable, and environmentally friendly digital solutions that promote social inclusion and equal access (Lwoga, 2022).

Conceptual Framework

Based on the literature, our conceptual framework proposes a four-pronged approach to developing a sustainable digital transformation model for Bangladesh's education sector.

Digital Infrastructure

This includes both hardware and software requirements, internet connectivity, and other technological resources necessary for digital education (Karim & Noy, 2022).

Digital Pedagogy

This involves the integration of digital technology into teaching and learning processes, requiring the training and capacity building of educators (Alvarez, 2022; Hossain, Rahman, & Salehin, 2023).

Inclusive Access

This emphasizes the need for digital transformation to be inclusive, catering to diverse learner needs, and minimizing the digital divide (Rahman, Islam, & Alam, 2023).

Policy and Regulation

This aspect involves the formulation of supportive policies, regulations, and strategic planning that facilitate and govern digital transformation in education (Government of Bangladesh, 2009).

The Objectives of this Study are

1. To propose a sustainable model for digital transformation in Bangladesh's education system, drawing from the analysis of secondary data and documents.
2. To provide recommendations for policy and practice to aid the successful implementation of the proposed mode

MATERIALS AND METHODS

Research Design

This study applied an interpretive, qualitative research

design, specifically utilizing document analysis as its primary methodological approach. In qualitative research, the interpretive design allows for an in-depth understanding of social phenomena within a specific context (Klein & Myers, 1999). Document analysis, a systematic procedure for reviewing or evaluating both printed and digital documents, is effective for exploring intricate details and themes relevant to the research topic (Bowen, 2009).

Research Locale and Sample

The research focused on Bangladesh's education system, traversing from primary through to tertiary education. The sample incorporated an array of materials, including policy documents, research papers, case studies, and reports, all of which are connected to digital transformation initiatives within Bangladesh's educational sphere.

Sampling Design

To identify the most suitable materials for this study, a purposive sampling technique was employed. In the realm of qualitative research, this non-probability sampling strategy is frequently utilized to select 'information-rich' cases, which can provide the most insightful understanding about the phenomena being studied (Palinkas *et al.*, 2015).

Data Gathering Procedure

The data collection procedure consisted of an exhaustive review and examination of relevant literature, policy documents, reports, and case studies. Scholarly articles and research papers were retrieved from established academic databases, while policy documents and reports were acquired from the official websites of relevant governmental and international organizations. A careful keyword search, review of abstracts or executive summaries, and subsequent full-text analysis of pertinent documents constituted the core process of our data gathering.

Data Analysis Procedure

Thematic analysis, a method used in qualitative research to identify, analyze, and report patterns within the data, was applied to the gathered materials (Braun & Clarke, 2006). This analysis involved a step-by-step process beginning with data familiarization, generation of initial codes, searching for themes, reviewing and defining themes, naming themes, and culminating in the creation of the final report.

Ethical Consideration

Given the research solely involved publicly available documents, ethical concerns associated with privacy, confidentiality, and informed consent were minimal. Nevertheless, strict adherence to academic integrity and research ethics was maintained throughout the study. All utilized sources were accurately cited following the APA guidelines, ensuring the intellectual contributions of others were appropriately recognized.

Current State of Digital Transformation

Digital transformation in Bangladesh's education system

has been receiving substantial attention in recent years. The country is making noticeable progress in incorporating digital technologies into its education system across primary, secondary, and tertiary levels. Governmental efforts have been a crucial driving force behind this transformation, evident in policy initiatives such as the “Digital Bangladesh” strategy (Ministry of Science and Technology, 2021). The government has committed to utilizing Information and Communication Technology (ICT) in education, reflected in its vision to digitize all textbooks and expand internet connectivity in schools and colleges (Uddin & Rahman, 2021). The proliferation of smart classrooms, online learning platforms, and digital resources are concrete manifestations of these efforts.

The introduction of digital learning materials has not only improved the accessibility of education but has also proven to be an effective tool for enhancing students’ comprehension (Islam & Grönlund, 2022). Digital Learning Centers (DLCs) have been established throughout the country, providing students with access to an expansive digital library, encouraging interactive learning, and fostering an inclusive educational environment (Rahman *et al.*, 2022). Despite these advancements, there is a substantial digital divide that requires attention. Rural regions are struggling to keep pace with urban areas due to infrastructural challenges and limited internet access (Siddiquee & Kagan, 2020). Limited digital literacy among educators and students in rural areas compounds these challenges (Karim & Clement, 2022).

To summarize, while there has been considerable progress in the digital transformation of Bangladesh’s education system, it is essential to address the existing inequalities to ensure that this transformation benefits all sectors of the country equally.

Analysis of Existing Policies and Case Studies

Understanding the policy landscape provides significant insight into the strategic direction of digital transformation in Bangladesh’s education system. Bangladesh’s vision of becoming a knowledge-based society underlies many of its existing policies, as outlined in the National ICT Policy and the “Digital Bangladesh” strategy (Ministry of Science and Technology, 2021). The National ICT Policy (2009) identifies education as a priority sector, with the aim to integrate ICT in teaching, learning, and school management (Hoque *et al.*, 2021). This policy has seen several reforms over the years, indicating the government’s commitment to continuously improving the education sector’s digital readiness. The “Digital Bangladesh” strategy further underscores the government’s determination to embed digital technologies within the education sector. The strategy advocates for comprehensive digitization of the country, with education being a focal point (Siddiquee & Kagan, 2020). Digital content development, multimedia classroom initiatives, teacher training programs in ICT, and establishment of computer and language labs are key components of this strategy (Uddin & Rahman, 2021).

Case studies provide real-world perspectives on how these

policies are implemented. One such case study on the integration of ICT in secondary schools found that digital content’s introduction significantly improved student engagement and comprehension (Islam & Grönlund, 2022). The study also highlighted the importance of teacher training in ICT for the effective implementation of digital tools in classrooms. Another case study focused on the “Learning and Earning Development Project” (LEDP) revealed how this program trained a substantial number of individuals in ICT skills, leading to improved employability and promoting entrepreneurship in the digital economy (Begum & Alam, 2022). These case studies illuminate the potential of digital transformation in the educational sector. However, they also underscore the importance of targeted interventions, such as teacher training in digital technologies, infrastructural investments, and the need to ensure equitable access to digital resources across urban and rural regions.

Challenges and Opportunities

Digital transformation in Bangladesh’s education sector faces a myriad of challenges. The most significant among them is the digital divide, with disparities in access to and usage of digital technologies observed between urban and rural areas (Karim & Clement, 2022). Infrastructure, specifically, reliable electricity and internet connectivity, is still not widely available in many parts of rural Bangladesh (Rahman *et al.*, 2021). Limited digital literacy among educators and students, particularly in rural regions, exacerbates these issues (Ahmed *et al.*, 2022). Despite efforts to train teachers in digital technologies, there remains a need for more comprehensive and ongoing training programs to ensure effective integration of these technologies into teaching and learning processes (Uddin & Rahman, 2021). Additionally, resource constraints pose another challenge. Many schools lack the necessary funding to acquire digital devices or maintain internet connectivity, limiting the potential benefits of digital transformation (Karim & Clement, 2022). Despite these challenges, there are notable opportunities that can expedite digital transformation in education. The rapid proliferation of mobile technology in Bangladesh provides an excellent platform for mobile learning. Smartphone penetration has been increasing dramatically, offering an affordable and accessible medium for delivering digital education, even in remote areas (ITU, 2022). The government’s commitment, as evidenced by initiatives like the “Digital Bangladesh” strategy and National ICT Policy, is another opportunity. These initiatives reflect a strategic vision and willingness to invest in digital transformation in the education sector (Siddiquee & Kagan, 2020). International aid aimed at digital development, such as the World Bank’s “Digital Bangladesh” project, also presents an opportunity to enhance digital infrastructure and provide digital literacy training (World Bank, 2021). These opportunities, if well-utilized, could help mitigate the challenges and propel digital transformation in Bangladesh’s education system.

Proposed Sustainable Model

Based on the insights gained from the secondary data and document analysis, a sustainable model for digital transformation is proposed. The model emphasizes inclusivity, scalability, and adaptability, focusing on a phased approach that considers local realities and resource constraints.

Sustainable Model for Digital Transformation in Bangladesh's Education System

As the 21st-century progresses, the education model is evolving significantly to incorporate digital advancements. These innovations promise to revolutionize traditional teaching and learning processes, making education more efficient, personalized, and accessible. The following

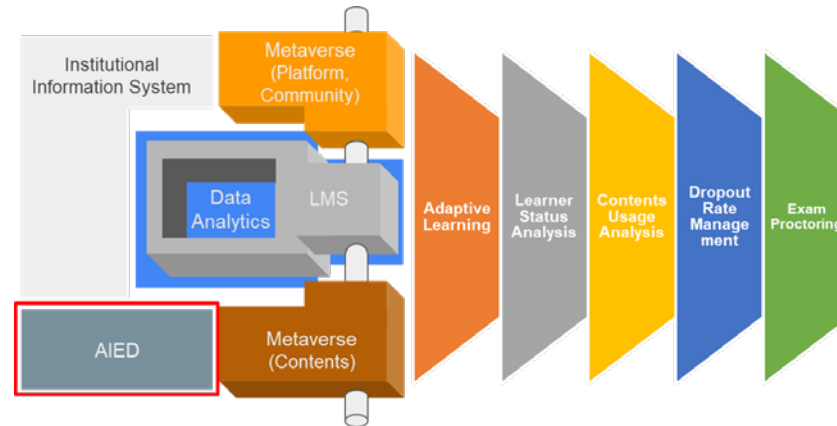


Figure 1: Sustainable model for digital transformation in Bangladesh's education system

sections outline the different aspects of this future education model.

Education Cloud as an Institutional Information System

The cloud represents a major shift in how educational institutions manage and distribute information. An Education Cloud as an Institutional Information System is essentially a digital infrastructure that stores, manages, and distributes educational resources across a network. It allows for centralized management of resources, data analytics, and the delivery of educational content. This can lead to greater efficiency, scalability, and cost-effectiveness. Cloud-based systems also enable remote access, allowing students and staff to access educational resources from anywhere, at any time (Alabbasi *et al.*, 2020).

Metaverse as a Platform and Community

As discussed earlier, the metaverse provides an immersive, interactive virtual environment where users can learn, collaborate, and socialize. This platform can support both synchronous and asynchronous learning, accommodating various learning styles and paces.

As a community, the metaverse can foster a sense of belonging among students, promoting collaborative learning and enhancing social interaction in the virtual space (Bailenson, 2021).

LMS Data Analytics and Exam Proctoring

Learning Management Systems (LMS) have evolved beyond being mere content delivery platforms. With data analytics, LMS can track student performance, engagement, and learning patterns, providing valuable insights to enhance teaching strategies and personalize learning experiences. LMS can also support online

exam proctoring, ensuring academic integrity in remote assessments. With AI-powered proctoring tools, institutions can monitor student activities during exams, detect any anomalies, and deter cheating (Soffer & Nachmias, 2018).

Artificial Intelligence in Education (AIED)

AIED can revolutionize education by making it more personalized and adaptive. With Intelligent Tutoring Systems (ITS), AI can assess student understanding in real-time, provide immediate feedback, and adapt instruction to individual needs. AIED can also automate administrative tasks such as grading and scheduling, freeing up time for teachers to focus on more complex educational tasks (VanLehn, 2011).

Metaverse Contents

The content in the metaverse can vary from traditional texts and videos to more immersive AR and VR experiences. With these technologies, abstract concepts can be visualized, historical events can be re-enacted, and scientific phenomena can be simulated, making learning more engaging and effective. Furthermore, these contents can be personalized based on learner's preferences, enhancing learner motivation and engagement (Kerawalla *et al.*, 2022).

This future education model, however, is not without challenges. Issues such as data privacy, digital divide, technology infrastructure, and acceptance of AI in education need to be addressed. Furthermore, teacher training and support are critical to ensure effective use of these technologies in teaching and learning.

In conclusion, while this future model of education promises to bring about a significant transformation in the way education is delivered and received, it is imperative

to ensure that these technologies are implemented in a manner that truly enhances the learning experience, taking into account the diverse needs and contexts of learners. Education Cloud represents a pioneering comprehensive education management software and hardware solution, encompassing both academic and administrative aspects. It serves as a transformative platform that empowers educational institutions by facilitating their growth through the monitoring of student and teacher performance, timely assessment of human resources, enhancement of academic activities, efficient resource management, monitoring of student and teacher success, promotion of research excellence, and improvement of institutional effectiveness and productivity. Additionally, Education Cloud fosters campus-wide communication among its

users. The user-friendly nature of Education Cloud is complemented by its integration of diverse features and a strong emphasis on productivity. It offers a range of administrative and academic functions that can be accessed through various modules, including the Pre-Admission Module (comprising CRM, email, and SMS), Student Admission, Course Management, Class Management, Examination Management, Result Management, Online Class facilitation, Tuition Fee Management, Student Accounts Accounting, Human Resource Management (HRM), Payroll Management, Leave Management, and Staff Attendance Management. By utilizing these services, educational institutions can effectively address recurring challenges related to administration, information sharing, and performance evaluation.

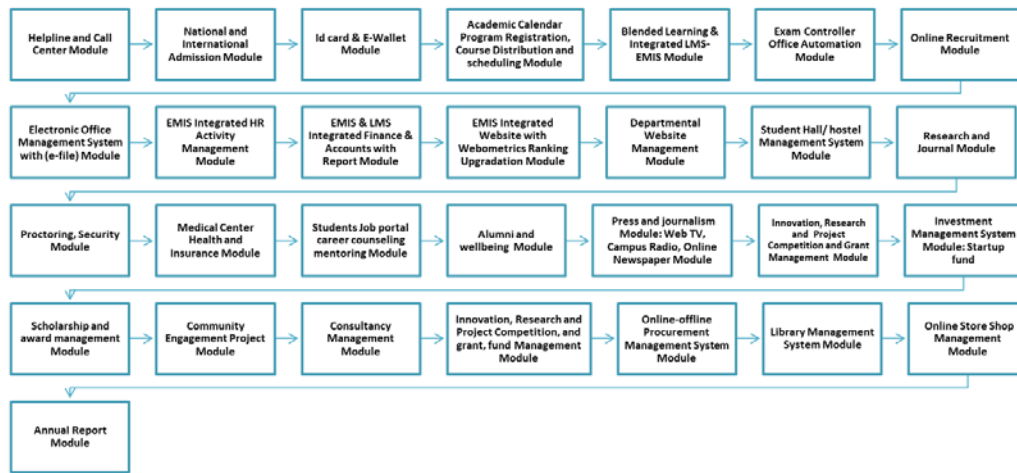


Figure 2: Education Cloud At a glance of Modules and Features

Education Cloud Module and User Mapping

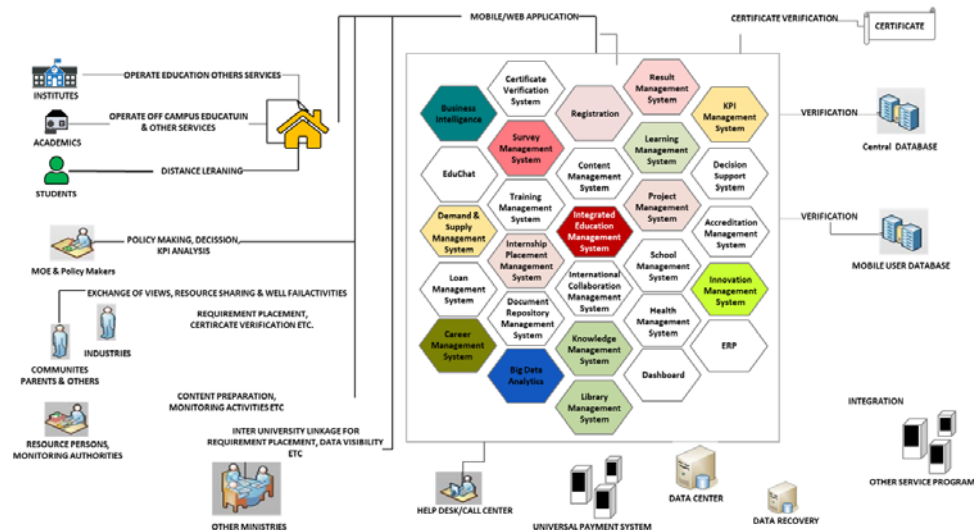


Figure 3: Integrated Education Cloud User and Module Architecture

Table 1: Policy

Element	Description
Inclusive Policy	Policies should aim to ensure equal access to digital technologies across urban and rural areas, taking into account socioeconomic disparities (Hoque <i>et al.</i> , 2021).
Continuous Policy Reform	Regular review and update of policies should be implemented to align with rapidly evolving digital technologies (Siddiquee & Kagan, 2020).

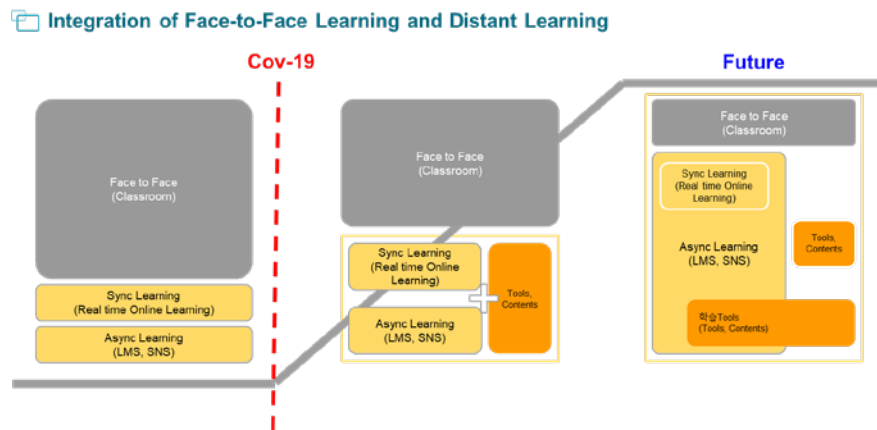


Figure 4: Integration of Face-to-Face Learning and Distance Learning

Integration of Face-to-Face Learning and Distance Learning

The COVID-19 pandemic triggered a massive shift from traditional face-to-face learning to distance learning globally, including in Bangladesh. This change has been necessitated by the health and safety concerns posed by the virus. However, even before COVID-19, there was a steady increase in the adoption of digital learning technologies, albeit at a slower pace. Let's consider the percentages of integration between face-to-face and distance learning before, during, and in the future after COVID-19.

Before COVID-19

The majority of education in Bangladesh was conducted via face-to-face classroom learning, approximately 90%. Synchronous online learning was minimal, accounting for about 5%, and asynchronous learning through Learning Management Systems (LMS) and Social Networking Sites (SNS) made up around 5%. The use of digital tools and content was largely limited to urban, well-resourced schools and tertiary institutions (Islam & Grönlund, 2022).

During COVID-19

With the onset of COVID-19, face-to-face learning dramatically reduced to approximately 10%, as schools and tertiary institutions were closed for physical attendance. Synchronous learning increased significantly to around 45% as teachers and students switched to real-time online learning platforms such as Zoom, Google Meet, etc. Asynchronous learning also rose to about 45%, with increased reliance on LMS and SNS for self-paced learning. The usage of digital tools and contents became almost ubiquitous, being an essential component of remote learning (Ahmed *et al.*, 2022).

Future Post-COVID-19

As we navigate the post-COVID-19 era, it is expected that there will be a balanced integration of face-to-face and distance learning, creating a blended learning environment. Face-to-face learning might resurge to around 50%, with synchronous and asynchronous learning each accounting for 25%. The use of digital tools

and content is expected to remain high at 100%, as they will be integral in both face-to-face and online learning environments. This prediction is based on the expectation that the lessons learned and the infrastructure developed during the pandemic will continue to be utilized (Rahman *et al.*, 2021).

These shifts have significant implications for the design and implementation of educational policies and strategies. Policymakers, educational institutions, and teachers need to adapt to these changes, ensuring that quality education is maintained, irrespective of the learning mode.

The Future of Education: Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITS) represent a significant shift in the field of education, harnessing artificial intelligence (AI) to personalize learning experiences based on individual student needs (VanLehn, 2011). These systems can adapt to learners' abilities and knowledge states, provide targeted feedback, and present educational content in a manner that maximizes the learning outcome. ITS can revolutionize the learning process in several ways.

Personalized Learning

With ITS, learning is no longer one-size-fits-all. Intelligent tutoring systems can assess a student's learning style, strengths, weaknesses, and pace, tailoring content and delivery accordingly. This could lead to improved academic achievement, engagement, and retention (Woolf *et al.*, 2020).

Real-time Assessment and Feedback

ITS can assess students in real-time, providing immediate and precise feedback on performance. They can highlight areas of weakness that need improvement, and guide students towards resources or strategies that can help (Ma *et al.*, 2019).

Scalable Education

With the ability to adapt to individual learning styles and provide personalized instruction, ITS can make quality education accessible and scalable. It can be especially beneficial in regions with limited access to quality teachers or educational resources (Nye *et al.*, 2014).

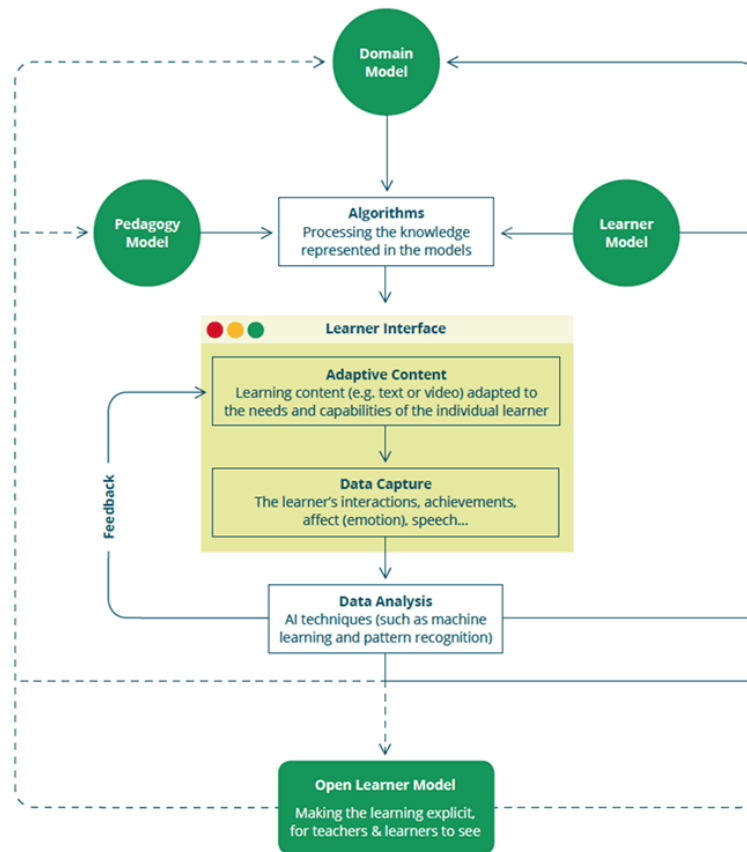


Figure 5: The Future of Education: Intelligent Tutoring Systems

Looking ahead, the integration of ITS in education is expected to increase as AI technologies advance. The future might see ITS with more sophisticated natural language processing capabilities, enabling more human-like interactions (Graesser *et al.*, 2019). There is also potential for ITS to integrate with other technologies, such as augmented reality (AR) or virtual reality (VR), to create more immersive learning experiences (Woolf *et al.*, 2020). However, the implementation of ITS also comes with challenges. Privacy concerns, ethical considerations, technology infrastructure, and the acceptance of AI in education are among the barriers that need to be addressed (Zawacki-Richter *et al.*, 2019). As we move forward, it is essential for educational policies and practices to adapt to these changes, ensuring the responsible and effective integration of ITS in education.

The Metaverse in Education: Expanding the Horizons of Learning

The metaverse, an expansive virtual reality space where users can interact with a computer-generated environment and other users, has begun to emerge as a new frontier in education. As we move further into the digital age, concepts like the metaverse are becoming more feasible, promising to revolutionize how we perceive and conduct education.

In line with the objectives of digital transformation in education set out in this research article, the metaverse can play a significant role in shaping the future of education

in Bangladesh, particularly in enhancing digital learning experiences. Here's how.

Immersive Learning Experiences

The metaverse can create a more immersive learning environment compared to traditional online learning platforms. With the use of augmented reality (AR) and virtual reality (VR), students can engage in simulations, explore virtual labs, or take virtual field trips, making learning more interactive and engaging (Bailenson, 2021).

Personalized Learning

Similar to Intelligent Tutoring Systems, the metaverse can also offer personalized learning experiences. By leveraging AI, it can adapt to the learning pace and style of each student, creating a tailored learning path for individual needs (Gupta *et al.*, 2023).

Collaboration and Social Interaction

The metaverse can facilitate social interaction and collaboration in a virtual environment. Students can work together on projects, participate in group discussions, and even socialize, replicating aspects of the physical classroom environment in the virtual world (Kerawalla *et al.*, 2022).

Equity in Access to Resources

The metaverse can provide equal access to educational resources regardless of geographical location. This can be particularly beneficial for students in rural or

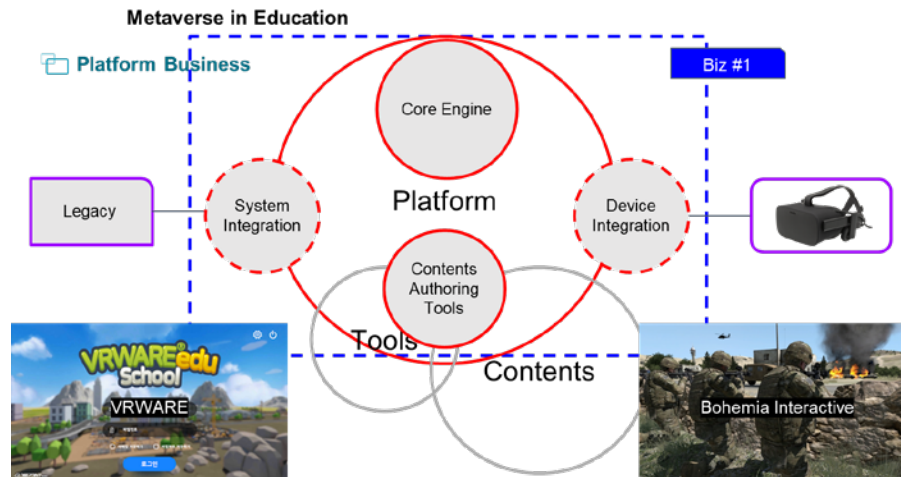


Figure 6: The Metaverse in Education: Expanding the Horizons of Learning

remote areas, providing them with the same learning opportunities as urban students (Warburton, 2022).

Lifelong Learning

The metaverse isn't limited to formal education. It offers an avenue for lifelong learning, where individuals can pursue learning based on their interests and at their own pace, beyond the constraints of traditional educational systems (Kerawalla *et al.*, 2022). Despite these potential benefits, the implementation of the metaverse in education also

poses significant challenges, including issues related to accessibility, digital literacy, privacy and data security, and the digital divide. It is essential that these challenges are addressed in the process of designing and implementing a sustainable model for digital transformation in education. As we envision the future of education in the context of the metaverse, it is essential to align this innovative technology with pedagogical goals and practices, ensuring that it serves to enhance teaching and learning experiences rather than just being a new tech phenomenon.

Table 2: Infrastructure

Element	Description
Robust Digital Infrastructure	Investment in reliable electricity and internet connectivity, particularly in rural areas, is paramount (Rahman <i>et al.</i> , 2021).
Accessible Digital Devices	Efforts should be made to ensure schools are equipped with necessary digital devices, and students have access to affordable personal devices for learning (ITU, 2022).

Table 3: Capacity Building

Element	Description
Digital Literacy Training	Comprehensive and continuous digital literacy training for educators and students to ensure effective integration of digital technologies in education (Ahmed <i>et al.</i> , 2022).
Curriculum Integration	Integration of digital skills into the curriculum at all levels of education to prepare students for the digital economy (Uddin & Rahman, 2021).

Table 4: Research and Development

Element	Description
Localized Digital Content	Development of localized digital learning materials that are contextually relevant and cater to the learning needs of students (Islam & Grönlund, 2022).
Continuous Research	Regular research to evaluate the impact of digital transformation initiatives and identify areas of improvement (Begum & Alam, 2022).

This model emphasizes a holistic approach, addressing not only the technological infrastructure but also the need for relevant policy, capacity building, and ongoing research and development. It recognizes that digital transformation in education is not a one-off event, but

a continuous process that needs regular assessment and adaptation to the evolving digital landscape.

Recommendations for Policy and Practice

Based on the analysis of the current state of digital

transformation in Bangladesh and the proposed sustainable model, several recommendations for policy and practice are outlined.

Develop Inclusive Policies

It is crucial for policy makers to develop policies that not only promote digital transformation but also ensure its inclusivity. This includes addressing the digital divide and ensuring that students and teachers in rural and remote areas have access to the same resources and opportunities as their urban counterparts (Hoque *et al.*, 2021). A policy framework that incentivizes affordable digital device acquisition, especially in underserved areas, can also help bridge the divide.

Invest in Infrastructure

Without robust digital infrastructure, particularly reliable electricity and internet connectivity, digital transformation efforts will be hindered (Rahman *et al.*, 2021). Significant investment in infrastructure development should be a priority in both policy and practice, ensuring that learning isn't interrupted due to lack of essential services.

3. Enhance Digital Literacy: Training programs should be developed and implemented to enhance the digital literacy of both students and teachers (Ahmed *et al.*, 2022). Special focus should be given to educators, enabling them to integrate digital technologies effectively into their teaching methodologies. Curriculum modifications should also be considered to introduce digital skills from early stages of education.

Promote Localized Digital Content

Content localization ensures that digital learning materials are relevant and tailored to the local context. This makes learning more relatable and engaging for students (Islam & Grönlund, 2022). Therefore, it is recommended to foster collaborations between educators, content creators, and tech companies to develop localized digital content.

Encourage Continuous Research

Regular research should be conducted to evaluate the impact and effectiveness of digital transformation initiatives. This can help identify challenges, opportunities, and areas that need improvement (Begum & Alam, 2022). Research findings should then be utilized to inform policy and practice.

Secure Sustainable Funding

Last but not least, securing sustainable funding is critical for the success of digital transformation. Policy makers should explore various sources of funding, including government budgets, international aid, and public-private partnerships. Financial resources should be efficiently utilized to ensure that digital transformation initiatives are sustainable in the long run (World Bank, 2021).

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