The Gulf Arab States Educational Research Center (GASERC)

Digital Transformation in Education

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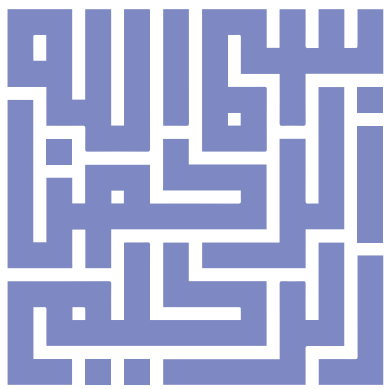

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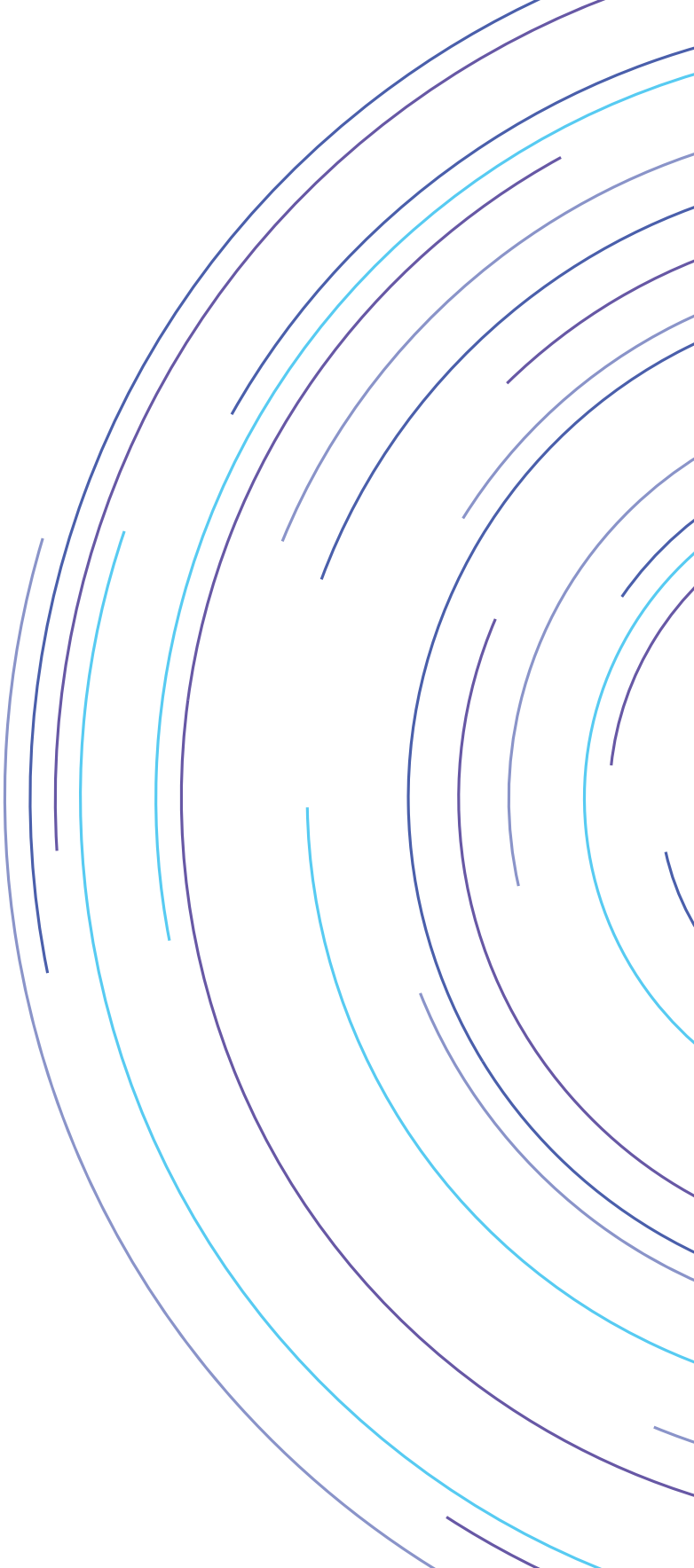

Editorial by
Dr. Mohammed Mutair Al-Sharija
The Editor-in-Chife and Director of GASERC

We at the Gulf Arab States Educational Research Center (GASER) are delighted to announce the launch of our new publication, "**Specialized Scientific Reports**", through which we aim to provide a distinctive scientific service to educational policymakers, educators, researchers, and those interested in educational issues within the Gulf countries. Our goal is to highlight the most pressing and significant educational topics, conducting in-depth reviews and systematic analyses of research literature published in peer-reviewed scientific journals across the Gulf region. This will allow us to extract key findings from these publications and present them in a practical, clear, and accessible manner that meets the needs of educational policymakers.Additionally, this report serves as a valuable resource for researchers and practitioners, providing them with evidence based insights and highlighting gulf experiences in education.

In this first issue of the scientific series, now in your hands, we have chosen to focus on a fundamental issue that has become one of the educational priorities at both regional and global levels: the issue of "**Digital Transformation in Education**". Specifically, we aim through this issue to highlight the opportunities and challenges faced by Gulf countries in integrating modern digital technologies into education, an issue intensified by rapid changes in our contemporary era, including the global crisis posed by the COVID-19 pandemic and its profound impacts on education systems and methods of educational delivery. These transformations have compelled countries worldwide, including those in the Gulf, to reconsider their educational strategies and reshape their educational practices, emphasizing the importance of using technology to enhance educational quality and meet the demands of the digital age and future labor markets.

The selection of "Digital Transformation in Education" as the topic of this report reflects our recognition of the necessity for adopting clear and deliberate policies in this field to maximize the benefits offered by modern technology, especially with the growing urgent need to provide a more flexible, interactive educational environment capable of adapting to unexpected circumstances faced by countries in the region, as witnessed during the COVID-19 pandemic. Therefore, this report offers a comprehensive and accurate review of recent Gulf studies examining the impact of integrating technology in education on educational outcomes, highlighting key models and initiatives implemented, such as distance learning, digital platforms, augmented reality technologies, and artificial intelligence. Additionally, it underscores the most significant obstacles impeding effective and efficient digital transformation implementation in Gulf countries.

Guided by our deep belief at GASERC in the pivotal role of scientific research in shaping educational policies, this report emphasizes practical and concise research summaries that offer educational policymakers in the Gulf region a comprehensive and realistic perspective on the opportunities provided by technology integration, alongside outlining critical obstacles and challenges requiring practical solutions to ensure successful digital transformation. This is achieved by monitoring the outcomes of recent studies covering various aspects of the educational landscape in GCC countries, including digital infrastructure realities, human and institutional readiness, and assessing the effectiveness of educational platforms adopted during crises, highlighting their direct and indirect impacts on students, teachers, and parents.

The importance of digital transformation in education lies in its strategic inevitability for Gulf countries aspiring toward a more prosperous and globally competitive future. Digital transformation contributes to enhancing students' competencies in 21st-century skills, such as critical and creative thinking,

collaboration, and communication, while enabling equitable and easier access to knowledge resources. This ensures the principle of "education for all" aligns with the United Nations Sustainable Development Goals (SDGs) and the national future visions of Gulf countries, embedding digital transformation and advanced technology at the heart of their economic, social, and educational development strategies.

In the concluding section of this report, we provide educational policymakers with a set of recommendations derived from our analysis of Gulf literature, reflecting priorities and requirements for achieving a successful and sustainable digital transformation in education. These include focusing on developing technical infrastructure, enhancing digital competencies among educators and learners, supporting necessary institutional and organizational structures to effectively implement technology, and emphasizing the importance of strategic partnerships between public and private sectors to support digital transformation in educational institutions.

In conclusion, we hope this report marks an effective beginning for our new project at the Center, contributing to enriching educational knowledge in the Gulf region and providing essential support for educational policymakers and researchers in educational fields. Ultimately, we aim to achieve a qualitative leap in Gulf education that meets our aspirations in building a generation capable of keeping pace with rapid global changes and achieving sustainable development grounded in modern technological foundations and authentic educational values.

Report Topic: Digital Transformation in Education

Dear Reader,

This first issue of the "Specialized Scientific Reports" series, published by GASERC, sheds light on one of the most pressing educational issues currently facing educational systems in the Gulf region, namely, "Digital Transformation in Education." The selection of this topic comes in response to the rapid technological developments and global changes driven by the technological revolution, whose impacts became significantly pronounced during the COVID-19 pandemic and the subsequent shifts in educational concepts and methods. Today, digital education is no longer just an optional supplement; it has become an urgent necessity, requiring a re-evaluation of traditional educational practices and the adoption of clear digital policies and strategies aligned with the future development goalf of Gulf countries.

This report discusses in detail the promising opportunities provided by integrating modern technologies into education to enhance learning quality and raise student performance levels in various academic and professional fields. It reviews and analyzes a range of recent Gulf studies examining the effects of using e-learning platforms and advanced technologies such as augmented reality and artificial intelligence, in addition to online and distance learning. The report also presents various applied models from Gulf countries, demonstrating the positive role of technology in enhancing students' digital skills, improving their interaction with educational content, and increasing their motivation towards learning.

Additionally, the report addresses critical challenges associated with the digital transformation process in education, whether these challenges are technical, human-related, organizational, or social, and explores how to address them through effective policies to enhance the chances of successful and sustainable transformation. In conclusion, the report provides a set of practical recommendations aimed at helping decision-makers in Gulf countries respond effectively to the requirements for successful digital transformation, guiding their efforts towards building a comprehensive digital educational system that achieves Gulf societies' aspirations for education aligned with global changes and meets the future labor market needs.

The Editor

Integrating Technology in Education: Promising Opportunities and Potential

In recent years, educational systems in Gulf countries have increasingly emphasized integrating digital technologies into various stages of education, driven by global advancements in modern technology and challenges posed by recent events, such as the COVID-19 pandemic. This growing interest is motivated by the aspiration to enhance educational quality and develop educational outcomes that align with the demands of the digital era and future labor market needs.

Distance learning stands out as a significant feature of integrating technology into education, gaining unprecedented momentum during the COVID-19 pandemic, which necessitated radical changes in teaching and learning methods. Emergency circumstances prompted educational institutions to swiftly adopt digital solutions, highlighting the potential of distance learning to provide a flexible and inclusive educational environment beyond geographical and temporal constraints. By utilizing modern technology, this model enabled opportunities for self-directed learning and access to diverse educational resources, including recorded lectures, interactive assessments, and discussion forums. Additionally, it supported ongoing education and professional development, enabling individuals to acquire new skills without adhering to traditional schedules.

Numerous Gulf studies have explored the impact of distance learning, especially during the COVID-19 pandemic, on achieving educational objectives. Among these studies is the work of Al-Duwi (2022), which aimed to investigate the positive and negative effects of distance learning systems during the pandemic, as well as identify obstacles to implementation and strategies to overcome them from the perspective of Bahraini families. The study employed a descriptive-analytical approach, considered most suitable for examining the phenomenon under investigation. A purposive, non-random sample of 140 Bahraini families participated, with data collected from household heads via an electronic questionnaire designed to

address the study's primary axes. The study utilized two data analysis methods: quantitative for statistical data analysis, and qualitative for deeper interpretation of findings.

The results revealed numerous benefits of distance learning for students, including enhancing their internet skills and learning capabilities, promoting on-time attendance discipline, increasing self-reliance and confidence, and improving their proficiency with modern educational technologies—skills that traditional education did not equally emphasize. Statistical analyses indicated significant disparities among families based on socio-economic levels, favouring families with higher socio-economic status, particularly those living in independent villas, compared to those residing in other types of housing. This finding highlights the disparities in accessing distance learning opportunities, which are influenced by socio-economic factors. The study concluded by emphasizing the necessity of promoting equitable remote education opportunities through improved digital infrastructure and support for resource-limited families, focusing on developing flexible educational policies to sustain digital education in the future (Al-Duwi, 2022).

In Bahrain, another study (Kamali, 2020) aimed to investigate the effectiveness of online learning during school closures amid the COVID-19 pandemic, and how it was managed by the Ministry of Education, focusing particularly on student-teacher and student-school interactions during the lockdown. The study relied on two dependent variables to measure these interactions: perceived learning and perceived satisfaction, to assess the educational benefits acquired during the closure period. A quantitative method was employed, analyzing a survey completed by 130 students using simple regression analysis. Additionally, a qualitative approach was utilized, analyzing secondary data to understand the Ministry of Education's evaluation of e-learning quality, alongside students' perspectives during the closure period. Based on findings from both methods, the study concluded that online learning during the lockdown in Bahrain effectively maintained the continuity of education, despite challenges faced by students and teachers. Results

indicated that interactions between students and teachers, as well as between students and schools, had a positive impact on both perceived learning and student satisfaction, highlighting the pivotal role of digital interaction quality in enhancing the educational experience. Furthermore, the study revealed that students with prior e-learning experience showed greater satisfaction and competence in managing this learning approach compared to others.

Distance learning is closely linked to the use of e-learning platforms, providing unprecedented opportunities to enhance student learning by offering a flexible and interactive educational environment that transcends temporal and spatial limitations. Among recent Gulf studies highlighting the opportunities provided by e-learning platforms is a study titled "The Role of E-Learning Platforms in Achieving Emotional and Social Learning Outcomes from the Teachers' Perspective in Al-Batinah North Governorate, Sultanate of Oman" (Al-Kahaliah, 2024). The study aimed to explore the role of these platforms in developing students' affective and social skills. The researcher employed a descriptive-analytical approach, collecting data from a sample of 286 male and female teachers using a questionnaire designed to measure the impact of educational platforms on self-awareness, self-management, social communication, and responsible decision-making. Findings indicated that teachers perceived e-learning educational platforms as moderately effective in achieving affective and social learning outcomes. Statistically significant differences were noted between the perceptions of male and female teachers, favoring male teachers, while no significant differences were found concerning teachers' years of experience.

Additionally, the study demonstrated that educational platforms enhance social interaction and support students' ability to express their emotions and manage relationships. However, challenges included weak digital infrastructure and limited experience among some teachers in utilizing interactive technologies. The study concluded by recommending enhanced efficiency in using electronic educational platforms to achieve affective and social learning outcomes through intensive teacher training, improved technological infrastructure, and the development of interactive content

that supports emotional and social learning. The study further recommended integrating these platforms with traditional teaching strategies to ensure a comprehensive educational environment that effectively supports students' affective and social development (Al-Kahaliah, 2024).

Another study aimed to identify the extent of digital platforms' contributions to students' distance learning during the COVID-19 pandemic from the perspective of parents in several schools in the United Arab Emirates (Al-Absi, 2023). The researcher employed a descriptive-analytical approach and developed a 52-item questionnaire, which was distributed across three main axes: the educational contributions of digital platforms to distance learning, students' attitudes toward these platforms, and the challenges students faced during distance learning from the perspective of their parents. The study sample consisted of 56 families from the emirates of Sharjah, Ajman, and Al Ain, part of the emirate of Abu Dhabi. Results revealed that digital platforms significantly contributed to students' education from parents' viewpoints, and students' attitudes toward these platforms were also highly positive. Nevertheless, the findings highlighted certain challenges students encountered during distance learning via digital platforms, particularly during the initial stages of the pandemic. Given these results, the researcher recommended the importance of equipping students with essential digital skills to maximize the benefits of digital educational resources and methods.

Regarding the use of electronic platforms in early childhood education, a study conducted in Saudi Arabia (Al-Shareeda, 2023) evaluated the distance learning experience through the "Rawdati" platform during the COVID-19 pandemic. The study explored the perspectives of kindergarten teachers and parents, highlighting the advantages and challenges they faced during this experience. Employing a mixed-methods approach that combines quantitative and qualitative methods, the study utilized surveys and interviews to facilitate comprehensive data analysis. The research sample included 65 kindergarten teachers and 280 parents who participated in the survey, along with 3 teachers and 7 parents interviewed for deeper

insights. Results showed that both teachers and parents moderately agreed on the success of the distance learning experience via the "Rawdati" platform, with statistically significant differences in evaluations, where teachers were more positive compared to parents.

Additionally, the study found no statistically significant differences in teachers' responses based on the number of children in class, nor were there differences in parents' responses related to gender or educational level. Among the key advantages identified, distance learning helped children acquire skills in using modern technologies and fostered self-directed learning. The study concluded by providing recommendations to enhance the distance learning experience in early childhood education, emphasizing the need for specialized training courses for teachers, implementing hybrid or blended learning under normal conditions, and increasing parents' awareness of how to effectively engage with electronic platforms (Al-Shareeda, 2023, p. 121).

In recent years, groundbreaking technologies have emerged, poised to fundamentally transform the education sector. Innovative technologies such as augmented reality (AR) and artificial intelligence (AI) applications have created unprecedented educational opportunities. Augmented reality offers students an interactive learning experience that bridges the real and virtual worlds, simplifying complex concepts, particularly in fields such as science and engineering. Artificial intelligence applications provide advanced tools for analyzing student performance, offering personalized learning experiences tailored to individual needs, and enabling intelligent assessment systems that deliver immediate feedback to both students and teachers. As these technologies continue to evolve, their potential to enhance educational quality and create more interactive, inclusive learning environments grows, contributing significantly to lifelong learning principles and ensuring equal opportunities for learners across various settings.

Among Gulf studies highlighting educational opportunities inherent in modern technologies is research conducted in Jeddah, Saudi Arabia, aiming to identify the impact of augmented reality

(AR) technology on developing creative thinking and speaking and listening skills among sixth-grade students in English language courses (Al-Omari, 2021). The study employed AR technology through the "Mondly AR" app, involving a randomly selected sample of 100 students. Results were compared between an experimental group and a control group. The findings demonstrated significant improvements in speaking and listening skills within the experimental group, alongside notable advancements in creative thinking and academic achievement. The study concluded that employing augmented reality technology enhances learning and intellectual skill development, highlighting the need for its integration into curricula.

Another study examined the impact of using artificial intelligence (AI) technology within an e-learning environment on developing futuristic thinking skills and academic achievement in science among middle school female students (Al-Jeriwi, 2020). The research sample consisted of 40 third-grade middle school female students from a private school in Riyadh, divided into two groups: an experimental group learning in an AI-supported environment and a control group receiving traditional education. Results showed significant improvements in futuristic thinking skills and academic achievement in the experimental group compared to the control group. The study recommended emphasizing teachers' use of artificial intelligence technology and incorporating futuristic thinking skills more extensively into scientific curricula.

A similar study aimed to identify the skills required for employing artificial intelligence applications to enhance learning outcomes among high school students, drawing on global experiences and theoretical frameworks (Al-Roumi & Al-Qahtani, 2022). Using descriptive, documentary, and survey methodologies, the study analyzed these skills' roles in improving learning outcomes across five key domains (classroom environment, content and teaching methods, assessment, teacher, and student). It also assessed the current reality in Saudi high schools, identifying legislative, developmental, technical, educational, and cultural requirements, and highlighted related obstacles. The study included a sample of 30 experts and 414 school principals. Results indicated a significant role for arti-

ficial intelligence applications in improving learning outcomes, although actual application in Saudi schools was weak, showing advantages for private education and doctoral degree holders. The study defined three skill levels: enabling skills (for leaders), targeted skills (for teachers and students), and outcome skills (for students), emphasizing the importance of leveraging global experiences to enhance these skills.

Another recent study (Gharamallah bin Misfer Al-Ghamdi, 2022) evaluated the effectiveness of utilizing innovative digital learning technologies in developing students' mathematical processes. The study used a meta-analysis approach to analyze outcomes from previous studies published in Arab scientific journals, specifically in Saudi Arabia, between 2010 and 2020. It aimed to determine the efficacy of these digital technologies in developing mathematical processes at various educational stages, employing quantitative methods and effect size calculations for comparison. The study population included 132 published studies within the specified period, while the sample comprised 76 studies meeting meta-analysis criteria, demonstrating appropriate homogeneity for statistical analysis.

The study's findings revealed generally high average effect sizes for using innovative digital learning technologies, affirming their effectiveness in developing students' mathematical processes. Moreover, the results indicated substantial effect sizes for digital technologies in enhancing collective mathematical processes, as well as individual areas such as problem-solving, reasoning, mathematical communication, mathematical proficiency, computation, and estimation.

The study concluded by confirming the effectiveness of digital learning technologies in mathematics education, particularly in developing mathematical processes. These results are interpreted based on the characteristics and principles of these technologies, such as their diversity, improved communication, engaging teaching strategies, motivation support, and academic achievement. The

study provided recommendations for utilizing these findings to establish research priority maps addressing research gaps in digital learning technology usage for mathematical process development, alongside proposals for future studies (Gharamallah bin Misfer Al-Ghamdi, 2022).

In a study by Al-Sharari and Khalaf (2020), an adaptive e-learning environment was designed to align with students' various learning styles (visual, auditory, reading/writing, and kinesthetic). This environment aimed to assess its impact on academic achievement and motivation among third-grade intermediate students in the Social Studies and Citizenship course in Al-Qurayyat, Saudi Arabia. The researchers prioritized developing a digital educational environment tailored to student needs, significantly enhancing their educational experience and improving interaction and engagement levels.

To achieve the study objectives, an achievement test was developed to measure students' comprehension of course content, and a motivation-to-learn scale was used to evaluate how the adaptive environment influenced students' motivation. The study involved 70 students divided into two equal groups: the experimental group learned through the adaptive e-learning environment, while the control group utilized traditional methods. Results indicated that the experimental group significantly outperformed the control group with substantial statistical differences and large effect sizes, confirming the effectiveness of adaptive e-learning in enhancing academic performance and student motivation.

Additionally, the results showed that kinesthetic learners within the experimental group performed better compared to students with other learning styles, suggesting that specific learning styles might benefit more from adaptive learning environments. Based on these findings, the study recommended promoting awareness about adaptive e-learning's importance and encouraging educational institutions to expand its study and broader implementation due to its positive impact on learning outcomes and student engagement (Al-Sharari & Khalaf, 2020).

Another study evaluated the impact of designing a digital visual library for teaching visual arts from the perspectives of primary and secondary school students in Oman (Fawzi, Al-Amri, & Al-Yahyaiya, 2022). Researchers adopted a descriptive-analytical method, employing a 57-item questionnaire distributed across seven main axes. Findings indicated a generally high impact of the digital visual library on students' learning, unaffected by differences in educational levels or governorates. The study recommended enhancing e-learning in visual arts through digital visual libraries, training teachers and students on their use, and enriching current curriculum content.

Among the research evidence highlighting the vast educational potential of modern technologies is a recent World Bank report (2022), which provides a comprehensive review of digital transformation in Saudi education during the COVID-19 pandemic. Based on an extensive survey involving 18,000 students, teachers, school principals, educational supervisors, and parents, findings indicated that over two-thirds of teachers observed improvements in students' academic achievement and critical thinking skills through digital platforms. Teachers reported that students developed various skills, including digital literacy, independent learning, time management, innovation, and problem-solving. Teachers also expressed high satisfaction with the training and support provided during the digital transition. The report recommended additional efforts to identify students needing special support, ensuring digital devices and internet access for successful digital and blended learning experiences. It emphasized professional development for teachers to reduce educational disparities and guarantee high-quality educational opportunities for all students.

This literature review of Gulf research highlights numerous benefits positively reinforcing the significance of technology integration in education. Increasing reliance on technology has expanded diverse educational opportunities, significantly contributing to students' digital skill development, enhancing self-management and independent learning, and boosting their motivation and active participation in education.

Study findings demonstrate that technology integration fosters students' creative and critical thinking, enhances communication and innovative content engagement, and makes learning more engaging and interactive. Modern technologies like augmented reality and artificial intelligence provide rich, personalized learning experiences tailored to individual student needs, positively influencing academic performance and future skills.

Furthermore, the results of the literature review indicated that digital technologies improve access to diverse educational resources, facilitating lesson and educational activity engagement anytime, anywhere. This allows learners to derive greater benefits from education, regardless of temporal or spatial constraints. Results consistently indicate substantial improvements in learning outcomes across various subjects, emphasizing digital skills essential for future labor market demands.

Despite these advantages, technology integration in education encounters certain challenges and difficulties that impede effective digital transformation, which will be addressed in the following section.

Integrating Technology in Education: Challenges and Obstacles

As digital transformation in the education accelerates, numerous challenges have emerged that hinder the effective integration of technology into educational processes. Despite the significant benefits digital education offers, such as improving the quality of learning, enhancing student skills, and expanding access to learning resources, multiple obstacles require systematic handling to ensure the sustainability of this transformation. These challenges encompass human, technical, administrative, social, and logistical aspects. This section addresses the primary barriers to integrating technology in education within Gulf countries by analyzing recent Gulf studies on this topic.

In Saudi Arabia, there has recently been significant interest in digital transformation within the education sector, aligning with the Kingdom's Vision 2030, which aims to develop an innovative educational system based on technology. One of the most prominent initiatives launched by the Ministry of Education to promote digital learning and develop the educational environment is the "Future Gate" project. It was crucial to examine the real-world challenges facing this project to ensure the effective and efficient achievement of its goals and provide necessary solutions to support digital transformation in Saudi schools.

One study addressing this issue is titled "The Challenges of Digital Transformation in Public Schools that Apply Future Gate in Kingdom of Saudi Arabia" (Al-Mufiz, Al-Eifan, and Al-Rayes, 2021). The study aimed to identify the challenges facing digital transformation in these schools and propose suitable ways to overcome them from the perspective of digital transformation officials in the schools. Utilizing a descriptive survey methodology, the study applied a questionnaire to a sample of 362 officials from five educational departments covering Riyadh, Medina, Eastern Province, Tabuk, and Asir.

The study's findings indicated moderate overall challenges

in applying digital transformation, with human-related challenges ranking highest. These included additional workload burdens associated with digital transformation, insufficient parental support for digital transformation efforts, and resistance to the culture of change toward digital transformation. Organizational and technical challenges ranked second and third, respectively, at moderate levels. These challenges included inadequate financial support for digital transformation requirements, insufficient regulatory frameworks for digital work in schools, weak technological infrastructure, frequent system breakdowns, poor technical support and updates for devices, systems, and networks, and inadequate security protection systems for devices and data.

The study concluded with several recommendations to overcome these challenges, notably training school personnel in digital transformation technologies, encouraging parental support for digital transformation efforts in schools, providing alternative funding through partnerships between schools and community institutions, preparing school leadership to lead digital transformation effectively, and formulating a clear strategy for digital transformation in education, including an analysis of internal and external factors affecting the success of digital transformation practices in education (Al-Mufiz et al., 2021, pp. 673-674).

In Saudi Arabia, another similar study (Al-Ghamdi, 2021) aimed to identify the availability of requirements supporting digital transformation in "Future Gate" schools, aligned with Saudi Arabia's Vision 2030. The study employed a descriptive methodology and utilized a structured questionnaire covering several key domains: digital infrastructure in schools, digital curricula, digital management, information security, and digital teachers. The study also identified obstacles limiting the success of digital transformation in schools. The study's sample consisted of 220 school leaders, assessing the current state of these requirements.

The findings indicated that the availability level of requirements supporting digital transformation in schools was moderate across all domains. Specifically, the domains of digital school in-

frastructure, curricula, digital management, information security, and digital teachers had mean scores of (1.98), (2.1), (1.98), (2.06), and (2.08), respectively. The mean score for obstacles hindering digital transformation was (2.26), reflecting significant challenges requiring further efforts, particularly in providing robust internet networks within classrooms, supplying technical devices like smart boards and computers or tablets for students, developing digital curricula content, and enhancing information security.

Based on these results, the study proposed several practical recommendations, primarily enhancing technological infrastructure in schools, preparing digital teachers through specialized training programs, and intensifying efforts in digital curriculum development and information security environments to ensure successful and sustainable digital transformation aligned with Saudi Arabia's Vision 2030.

Given the exceptional conditions imposed by the COVID-19 pandemic on the educational system and the subsequent launch of electronic learning platforms as the primary means for virtual learning continuity, early-grade teachers faced compounded challenges due to students' young age and difficulties in managing distance learning. This required thorough scientific investigation into these challenges to effectively address and overcome them, ultimately improving educational quality during crises.

One of the studies addressing this issue is by Al-Bisher (2022), which aimed to identify the challenges faced by early-grade female teachers in applying distance learning through the "Madrasati" platform in the context of the radical changes imposed by the COVID-19 pandemic on education in Saudi Arabia. The study used a descriptive approach and distributed a questionnaire to a sample of 400 early-grade teachers to explore these challenges from their perspective. Two main categories of challenges were identified: challenges related to teachers and those related to students and their parents.

The study's results indicated that teachers faced moder-

ate-level personal challenges, such as their inability to verify the credibility of students' excuses for absence or leaving classes, lack of direct communication between teachers and students, frequent interruptions of online connections, posing significant barriers to effectively managing the educational process, in addition to increased workloads for teachers during distance learning.

Challenges associated with students and their parents were more difficult, especially those related to ease of cheating in the e-learning environment, interruptions due to multiple devices connected to the internet during online classes, negative impacts of the absence of direct social interactions on students' understanding of educational material, unsuitable home environments for distance learning, parents' skepticism regarding the effectiveness of distance education, and students' weak technical skills. The study also revealed statistically significant differences in teachers' assessments of these challenges attributed to years of experience and training courses in e-learning, underscoring the importance of ongoing teacher training to enhance their proficiency with e-learning tools and techniques.

The study recommended creating a stimulating educational environment for early-grade students through the use of technological innovations, awareness programs for parents on the importance of e-learning, sufficient support for students experiencing social and financial difficulties, training courses for early-grade teachers in e-learning methods, introducing a dedicated curriculum on distance learning ethics to guide students' ethical behavior during virtual classes, and providing technical support to ensure successful distance education at early educational stages (Al-Bisher, 2022, pp. 72-73).

In the Omani context, a study by Al Hadhrami and Al Saadi (2021) investigated the advantages and challenges of implementing e-learning during the COVID-19 pandemic from the perspective of parents of students in Cycle Two (grades 5-9) in Oman, evaluating their experiences while supervising their children's learning through the Ministry of Education platforms during school closures and the

shift to distance learning. The researchers employed a descriptive methodology using an electronic questionnaire randomly distributed to a sample of 346 parents of Cycle Two students (grades 5-9) in South Al-Batinah governorate. A five-point Likert scale was used to measure parental attitudes regarding the advantages and challenges encountered during their children's e-learning experience. The questionnaire addressed technical, financial, personal, and logistical challenges.

Results revealed several challenges faced by parents during distance education, notably technical issues such as poor internet connectivity and difficulties accessing e-learning platforms. Financial challenges included some families' inability to purchase necessary technological devices or afford internet services. Logistical challenges related to time management and children's psychological unpreparedness for e-learning came next, while personal challenges regarding parents' lack of technical skills and insufficient training from the Ministry of Education ranked last in terms of difficulty.

Analyzing demographic variables, the results showed no statistically significant differences in parents' perceptions of e-learning advantages and challenges based on gender or educational level. The study concluded with several recommendations to enhance the quality and effectiveness of future e-learning in Oman, emphasizing the necessity of upgrading schools' technical infrastructure, providing financial and technical support to low-income families, offering specialized training programs for parents to enhance their technical skills, and advocating for adopting blended learning models as an effective option combining traditional and electronic education advantages, creating flexible and secure learning environments during exceptional circumstances (Al Hadhrami & Al Saadi, 2021, p. 37).

In Kuwait, a recent study by Al-Enezi (2024) addressed the extent to which Kuwait's educational policies align with the requirements for quality e-learning, given that the quality of e-learning is a cornerstone for achieving contemporary societal aspirations and advancing the educational process. The significance of this study arises amidst organizational and technical challenges significantly

impacting the future of education in Kuwait, especially considering the increasing shift toward e-learning triggered by global changes, particularly following the COVID-19 pandemic.

The study aimed to determine the appropriateness of current educational policies in Kuwait regarding the material, technical, and human requirements essential for quality e-learning. Employing a descriptive approach, the study utilized a questionnaire to gather data from faculty members at Kuwait University, with a sample size of 93 participants.

Results indicated that the appropriateness of Kuwait's educational policies for meeting the material requirements of quality e-learning was moderate, highlighting gaps in necessary infrastructure, such as inadequate physical resources within educational institutions. Similarly, findings revealed a moderate level of policy suitability regarding technical requirements, emphasizing the need to upgrade and enhance technological infrastructure and learning platforms.

Concerning human resource requirements for quality e-learning, results again reflected moderate suitability, underscoring faculty members' need for further training and professional development in effectively using digital tools and modern technologies for remote teaching. The study highlighted significant barriers, including inadequate faculty training and development programs and limited access to technical support.

The study recommended engaging specialists in distance education and leveraging international expertise and experiences to enhance the quality of electronic education. It also suggested organizing intensive training programs for faculty members to bolster their technological capabilities in using modern technologies and digital platforms, thus contributing to the overall improvement of e-learning quality.

Given these findings, the study concluded by emphasizing the necessity of adopting a clear and comprehensive strategy to devel-

op current educational policies, ensuring an effective response to modern quality requirements for e-learning. This strategy should encompass upgrading digital infrastructure, enhancing human capabilities, and ensuring technical sustainability, thereby aligning Kuwait's educational system with global developments in e-learning and meeting the evolving needs of students and society (Al-Enezi, 2024).

In Kuwait, a study by Safar and Agha (2020) aimed to identify obstacles to employing distance education and learning in public general and higher education during the COVID-19 pandemic from teachers' perspectives. The researchers utilized a descriptive analytical approach, distributing an electronic questionnaire to a stratified random sample of 2,607 male and female teachers from various specializations and educational stages. Data were collected during the second semester of the 2019/2020 academic year.

The study results identified three primary types of obstacles negatively affecting distance learning implementation: administrative, academic, and logistical barriers. Findings revealed that the impact of these obstacles was "very high" in all three dimensions. Administrative barriers had the most significant impact, including inadequate preparation of human resources regarding necessary ethical and legal practices, lack of appreciation and incentives for educators' digital empowerment efforts, outdated laws and regulations not aligned with digital advancements, and ineffective leadership selection processes. Additionally, feasibility studies and incentive-based accountability were absent in development projects.

Academic barriers ranked second, including the lack of preparation among learners and parents for electronic, networked, and mobile distance education strategies and the absence of a comprehensive national educational platform accessible to all educational institutions. Moreover, issues in the process of developing academic human resources, insufficient technical and academic support, difficulties faced by teachers in creating and developing digital content, and inappropriate assessment methods negatively impacted educational quality.

Logistical barriers identified included insufficient availability of necessary hardware, software, and equipment; limited financial and material support; and a scarcity of specialized human resources, such as engineers and educational technology specialists. Additionally, outdated networking and communication systems within educational institutions hinder effective communication, and inadequate availability of digital educational resources, such as e-books, journals, and open educational resources, negatively impact the educational process.

The study also revealed statistically significant differences in teachers' evaluations of obstacles based on gender, nationality, specialization, educational qualifications, type of school, years of experience, and educational stage. Female teachers reported greater sensitivity and were more affected by obstacles than male teachers. Non-Kuwaiti teachers experienced higher levels of administrative and logistical difficulties. Teachers with literary specializations reported more significant academic difficulties compared to their counterparts in scientific disciplines, who managed these challenges better. Teachers with bachelor's degrees faced greater technical and academic difficulties compared to those holding higher qualifications such as master's and doctoral degrees.

Regarding the type of school, teachers in public schools reported higher levels of administrative and logistical barriers due to limited financial and technological support compared to their peers in private schools. Differences were also noted based on professional experience, with less experienced teachers more affected by technical and academic barriers, whereas more experienced teachers adapted better to sudden transitions to e-learning. Finally, clear differences were observed according to educational stage, with teachers in lower educational stages, such as primary schools and kindergartens, encountering greater challenges in class management and student interaction through distance learning, compared to teachers in higher educational stages like intermediate and secondary schools, who adapted better to e-learning requirements.

Based on these results, the study recommended several

measures to enhance the effective implementation of distance education and learning in Kuwait's educational institutions. These included launching awareness campaigns to foster digital culture, benefiting from previous studies to develop effective solutions for successful digital transformation in education, establishing a national cloud-based educational platform with high-quality educational content, and enhancing professional training for educational staff in ICT. Additionally, the study suggested establishing a national authority specializing in distance education, updating educational legislation and policies to align with the digital age, and benefiting from successful local and international experiences in this field (Safar & Agha, 2020, pp. 74-75).

Al-Duwi's study (2022) examined the impacts of the COVID-19 pandemic on distance education from the perspective of Bahraini families, focusing on the positive and negative aspects as well as the challenges encountered in implementing this system. Among the significant findings regarding obstacles, Bahraini families faced various technical and human-related challenges. These included weak infrastructure in certain areas, difficulty maintaining consistent internet connectivity, and teachers' inability to manage classes effectively during distance learning. Additionally, frequent internet disruptions during classes significantly impeded the continuity of education. The study also highlighted inadequate experience among teachers and students in handling distance learning systems as a major challenge, indicating that many teachers and students lacked sufficient training to effectively use necessary technological tools, negatively impacting educational quality.

To address these challenges, the study recommended several measures, such as enhancing technological infrastructure, providing affordable laptops or smart devices for students, training teachers and students in modern technologies, and raising awareness among parents and the community about the importance of technology in education. The study further emphasized the need to develop objective and transparent student assessment methods and promote better interaction between teachers and students during online classes to enhance the quality of remote education (Al-Duwi, 2022).

The challenges of e-learning increase when considering students with special needs, particularly those with learning disabilities, who face additional hurdles compared to their peers. Although e-learning offers increased accessibility to education, it often lacks the necessary adaptations enabling these students to fully benefit, placing extra demands on educators. Al-Ghamdi's study (2022) specifically focused on exploring the challenges faced by teachers of students with learning disabilities using e-learning during the COVID-19 pandemic in Taif, Saudi Arabia.

Employing a qualitative phenomenological approach, semi-structured individual interviews were conducted with eight teachers (six males and two females) experienced in teaching students with learning disabilities during the pandemic. Data were analyzed using thematic analysis, categorizing the major challenges and identifying the most impactful issues affecting the educational process.

The results identified five main challenges: communication difficulties during teaching, challenges in diagnostic assessments, overall teaching performance decline, local cultural barriers, and technological difficulties. Each main challenge encompassed multiple sub-challenges, such as direct communication issues with students and parents, difficulties teaching specific skills like writing, internet connectivity problems, and the inadequacy of devices used.

Teachers indicated that the abrupt shift to e-learning without prior preparation led to difficulties in effectively communicating with students, especially those with attention deficit or hyperactivity. The inability to conduct accurate distance assessments negatively affected educational quality. Additionally, teachers faced technological barriers due to insufficient training and inappropriate devices. Cultural factors, such as parents intervening by providing answers for their students, also had an adverse effect on learning. The lack of adequate training for teachers in using modern technologies and e-teaching strategies emerged as a significant challenge.

Based on these findings, the researcher recommended devel-

oping specialized training programs for teachers of students with learning disabilities, establishing mechanisms for distance diagnosis and assessment, and creating interactive programs tailored to the characteristics of this student group. Additionally, the study emphasized the importance of training students in effective technology use. Ultimately, the study underscored the importance of leveraging these challenges to enhance e-learning quality, particularly during emergencies and crises, considering individual differences among students with learning disabilities to ensure educational success (Al-Ghamdi, 2022).

One primary concern associated with integrating technology into education is ensuring cybersecurity, which poses a fundamental challenge to digital transformation plans, especially with the increased use of digital technologies in educational environments. As educational institutions increasingly adopt technological tools and electronic systems for managing learning and delivering educational services, risks related to cyber-attacks and breaches of personal data for students and teachers rise significantly. Consequently, educational institutions must implement robust and effective strategies for data protection and raise digital security awareness.

A study conducted in Kuwait by Al-Dhafiri, Al-Enezi, and Al-Enezi (2024) addressed this issue, examining the cybersecurity awareness of middle school teachers in Kuwait and its relationship with their level of technology integration in teaching. The researchers adopted a descriptive survey methodology, involving a sample of 124 male and female teachers. Results indicated that teachers' cybersecurity awareness had not reached the desired proficiency level, with no statistically significant differences related to gender or years of experience, although differences emerged in favor of teachers specializing in scientific and practical fields.

Additionally, the findings revealed a moderate level of technology integration among teachers, again showing no significant differences based on gender or years of experience. However, teachers in scientific and practical fields (mathematics, science, computing, and electronics) demonstrated higher levels of technol-

ogy integration compared to other specializations. The study identified a statistically significant positive correlation between teachers' cybersecurity awareness and their level of technology use in teaching. Consequently, the study emphasized the need to enhance teachers' cybersecurity awareness and develop their technological skills, given the positive impact on educational quality and digital security within school environments (Al-Dhafiri et al., 2024).

Among the challenges hindering digital transformation in education are those related to school leadership roles. School leaders face new responsibilities requiring advanced digital skills and adaptability to rapidly evolving technological developments. Key challenges include insufficient training and technical support, resistance among some leaders toward change, limited understanding of the benefits of digital tools, and increased administrative pressures to manage technology alongside traditional roles. Addressing these challenges requires developing new leadership strategies that promote innovation and effective technology use in education.

A study by Alkubaisi (2024) examined the changing roles of educational leadership resulting from school digitization in Qatar. Employing a sequential explanatory mixed-methods approach, the study investigated school leaders' acceptance of technology and the influence of age and gender on their attitudes and behaviors toward its adoption. Given the rapid digital transformation in education, school leadership now demands adopting new roles. The study highlighted how technology has impacted educational leadership in Qatar following the "Education for a New Era" reform initiated in the early 2000s.

The study employed the UTAUT2 model, which explains technology acceptance in terms of perceived usefulness, effort expectancy, social influence, and facilitating conditions. It also relied on the Full Range Leadership Theory (FRLT), distinguishing between transformational, transactional, and passive leadership styles. Quantitative data from surveys administered to 20 school leaders were analyzed, followed by qualitative interviews providing deeper insights into leaders' views regarding their evolving roles.

Quantitative findings indicated that older leaders had less technological knowledge and experience than younger ones, and males were more influenced by peers in technology adoption than females. About 85% of leaders reported awareness of digital tools, with 64% confirming they had received training. Regarding behaviors and acceptance, 86% indicated possessing the required digital skills, while 43% acknowledged that social influence impacted their decisions.

Qualitative findings revealed that leaders viewed technology as an effective tool to enhance administrative and educational performance. Nevertheless, they highlighted challenges such as inadequate support and training. Two primary themes emerged: first, technology enhances administrative and educational efficiency; second, obstacles hinder adoption, such as insufficient training, resistance from some staff, and weak supporting infrastructure.

Overall, the study demonstrated that digital transformation in education has introduced new roles for educational leaders, requiring them to adopt digital leadership strategies to enhance learning and school administration. Continuous professional development programs are essential to support leaders in this digital transition, improving their competencies and helping them keep pace with technological advancements. Based on these findings, the study recommended providing strong institutional support for school leaders, increasing training opportunities, and promoting a culture of digital acceptance to ensure effective technology integration in the educational system (Alkubaisi, 2024).

Bastami's study (2023) investigated the impact of the Qatar Education e-platform on teachers and students in public schools following the COVID-19 pandemic. The research employed a mixed-methods approach, combining quantitative and qualitative methods, including interviews with 20 teachers and a questionnaire completed by 350 students. The study aimed to understand how the digital platform transformed teachers' roles, students' acceptance levels, and the challenges faced by both groups.

Findings indicated that the Qatar Education e-platform transformed teachers' roles from mere information conveyors to digital guides, highlighting the necessity for teachers to acquire technical skills to effectively utilize the platform in teaching. While some teachers found motivation in using e-learning, others perceived the digital shift as burdensome, primarily due to the need to modify curricula and provide continuous support to students.

From the students' perspective, the majority did not prefer learning through the platform, although they expressed a moderate level of satisfaction with their digital experience. Major obstacles reported by students included increased academic stress, limited interaction with teachers, and a lack of motivation and enjoyment during online learning. The study identified several key challenges, such as increased workloads for teachers, poor communication with parents, and difficulties adapting curricula to digital education. For students, the primary challenges included limited productive communication with teachers and insufficient engagement on the platform.

The study concluded that the successful digital transformation of Qatar's education system requires increased technical support, ongoing teacher training, and a more engaging digital learning environment. It also recommended improving technological infrastructure and developing new strategies to enhance student-teacher interactions, thus ensuring a more effective educational experience. The results highlight a gap between available technological capabilities and teachers' and students' preparedness, calling for institutional intervention to support technology adoption tailored to educational practitioners' needs (Bastami, 2023).

These findings align with another study conducted in Kuwait by AlShamali, Hajeeh, and AlKhayat (2023), evaluating the e-learning system from students' perspectives during the COVID-19 pandemic. A questionnaire was distributed to students across various educational stages, with 830 participants, though only 500 responses were analyzed due to incomplete data. The study aimed to assess students' acceptance of e-learning compared to traditional educa-

tion and identify the challenges and opportunities presented by this educational model.

The results showed that most students preferred traditional classroom-based education despite their strong technological skills, with 97% reporting proficiency in computer and internet use. However, 80% noted significant differences between traditional and digital learning experiences, 50% found e-learning uninteresting or demotivating, and only 40% supported the idea of fully adopting e-learning in the future.

Students reported various challenges during e-learning, particularly limited interaction with teachers, with 65% preferring face-to-face communication. Increased academic burdens due to self-managed time and difficulties collaborating in virtual groups (reported by 58%) further impacted student engagement. Additionally, several students lacked an adequate home study environment, adversely affecting their concentration and academic performance.

The study indicated that successful e-learning hinges on several factors, including suitable digital infrastructure, sufficient support for teachers and students, and instructional strategies enhancing digital interaction. Family support significantly improved the e-learning experience, as over 70% of students reported receiving family assistance during this period.

The study recommended targeted training programs for teachers and students to use technology effectively, improving interactive communication methods between students and teachers, and developing curricula suited for digital environments. Furthermore, it emphasized the importance of providing support to students through educational institutions and their families to ensure effective learning experiences. Overall, the study concluded that e-learning in Kuwait served as a temporary solution during the pandemic but was not a complete substitute for traditional education, as students still preferred direct classroom interactions (AlShamali et al., 2023).

Based on the previous review of Gulf literature, integrating technology into education in the Gulf countries faces numerous challenges impacting the effectiveness of digital transformation in education. These challenges range across human, technical, administrative, and social dimensions, necessitating comprehensive strategic planning to maximize the benefits of technology in educational processes.

Regarding human-related challenges, the lack of digital skills among some teachers significantly hampers the success of digital education, as some educators lack sufficient experience in effectively utilizing modern technological tools. Teachers also face additional workloads due to their reliance on electronic education and the need to design interactive educational activities suitable for digital environments. Furthermore, resistance to change among some educational staff members hinders the smooth adoption of digital solutions.

Technical challenges include inadequate digital infrastructure in some regions within Gulf countries, where robust and stable internet networks are not universally available, affecting the continuity of electronic education. Frequent disruptions in electronic education systems further compromise teaching and learning efficiency. Additionally, insufficient availability of technological devices and equipment for all students widens the digital education accessibility gap, obstructing equal educational opportunities for all learners.

Organizational and administrative challenges encompass insufficient financial support for updating infrastructure and providing digital devices, limiting schools' capacity for comprehensive digital education implementation. Some educational institutions also lack clear regulations governing digital transformation processes, resulting in weak policy implementation regarding technology integration. Moreover, the absence of comprehensive digital transformation strategies leads to fragmented and inconsistent implementation of digital initiatives, reducing their long-term effectiveness.

Lastly, previous studies indicate that social and psychological

challenges negatively affect the effectiveness of digital transformation in education. Despite significant advancements in digital education, some families remain inadequately prepared to support this shift, as parents struggle to adapt to new requirements for monitoring their children's online learning. Cultural factors, such as inappropriate parental involvement in educational processes, can negatively impact students' autonomy in learning. Additionally, increased reliance on distance learning has reduced direct social interactions between students and teachers, adversely affecting learners' psychological and social aspects.

To overcome these challenges, several measures are recommended, including developing training programs to enhance teachers' digital skills, improving technological infrastructure, and establishing more flexible regulatory policies supporting digital transformation. Efforts should also focus on raising parental awareness regarding the importance of electronic education and ensuring equitable access to digital educational tools and resources. These aspects will be further explored in the subsequent section.

Requirements for Successful Digital Transformation in Education: Recommendations for Policymakers

Digital transformation in education is a fundamental pillar for building advanced educational systems that meet sustainable development aspirations in GCC countries. Research conducted in the Gulf region underscores the vast opportunities presented by digital transformation to enhance educational processes and outcomes, although it also highlights significant challenges. Considering the findings of Gulf studies discussed in this report, which outline both opportunities and challenges, we recommend the following actions for education policymakers in the GCC countries to ensure the success and sustainability of digital transformation:

1. Developing Digital Infrastructure:

GCC countries should prioritize developing high-speed internet networks and expanding their coverage to all residential areas, particularly in remote and low-income regions. Policies should ensure affordable provision of essential digital devices, such as tablets and computers, to all students and teachers, promoting equity and equal access to digital education.

Additionally, there is a need to regularly update cybersecurity infrastructure to protect personal data and ensure user privacy. Another technical requirement is establishing comprehensive national cloud-based educational platforms that provide high-quality digital content aligned with curricula, enhanced with interactive materials that foster effective student-teacher engagement. Continuous and accessible technical support is essential.

To respond effectively and swiftly to future emergencies, as experienced during the COVID-19 pandemic, GCC countries must enhance the readiness of educational systems through pre-prepared technological emergency plans.

2. Building Human Capacity:

Comprehensive and continuous training programs should be developed for all teachers and faculty members across educational institutions, focusing on enhancing their skills in using digital tools and teaching strategies suitable for digital environments. Training should also include the use of advanced technologies such as artificial intelligence and augmented reality, which have been proven effective in enhancing learning.

Building specialized human resources to support digital transformation, including engineers, e-learning specialists, and cybersecurity experts, is crucial, alongside providing appropriate incentives for educational staff successfully adopting digital educational practices.

3. Developing Digital Educational Content:

Merely providing digital infrastructure is insufficient without developing high-quality interactive digital educational content covering various fields and educational stages, addressing diverse learner needs. Content must meet recognized quality standards and leverage open educational resources.

4. Enhancing Administrative and Regulatory Policies:

A clear and comprehensive national digital transformation strategy must be established, including flexible policies adaptable to rapid technological advances in education. This strategy should define explicit quality standards for digital teaching and learning processes and develop effective ongoing evaluation mechanisms.

Educational policies should be regularly reviewed and updated to reflect technological advancements and international standards in digital learning.

5. Raising Awareness on Digital Transformation in Education:

Wide-ranging awareness campaigns should target parents, students, teachers, and the broader community, highlighting the benefits of using technology in education to foster broader acceptance and adoption.

Enhanced collaboration between educational institutions and the private sector is essential, aiming to support digital transformation initiatives and engage local communities in funding, development, and technical support for e-learning.

6. Securing Adequate Funding for Digital Transformation:

Adequate and sustainable budgets should be allocated to support digital transformation efforts, supplemented by additional funding sources such as private-sector partnerships and attracting local and international investments in educational technology.

Investment in educational research related to digital transformation should be increased, fostering research partnerships with leading global institutions to exchange experiences and learn from successful international practices.

7. Ensuring Equity in Digital Transformation:

Policies should clearly define criteria for employing digital education technologies tailored to students with special needs, providing specialized interactive digital content and learning environments. Training for teachers and specialists should also include strategies for adapting e-learning to meet the specific needs of these students.

8. Promoting Digital Learning Ethics:

Educational policies should promote an ethical framework governing digital education practices, clearly defining

assessment and examination mechanisms and interaction protocols within digital environments.

9. Continuous Evaluation of Digital Transformation Effectiveness:

Systems for continuous monitoring and evaluation must be developed to measure the effectiveness of digital transformation, utilizing data-driven insights to enhance educational performance. Clear performance indicators should be established for continuous improvement based on empirical evidence.

Implementing these recommendations within educational policies across the GCC region will help overcome identified challenges and achieve better, sustainable outcomes in digital education, providing high-quality education capable of meeting future demands.

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