



# Digital Learning in Pakistan: Analyzing Implementation, Effectiveness, and Socio-Economic Impacts

Noor ul Ain

Lahore College for Women University Lahore

\*Correspondence: [noorulain1114@gmail.com](mailto:noorulain1114@gmail.com)

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The integration of digital learning tools in Pakistan's public schools is at a pivotal stage, driven by government initiatives and international aid. This study investigates the current state of digital learning in Pakistan, evaluating the implementation, usage, and effectiveness of these tools amidst evolving educational needs and socio-economic challenges. By employing a mixed-methods approach, combining quantitative data from surveys and tool inventories with qualitative insights from interviews and focus groups, this research aims to provide a comprehensive overview of digital learning's impact. Our findings reveal that digital tools are predominantly used in primary education, with a significant emphasis on content creation and learning management systems. Despite substantial investments, challenges persist, including disparities in access, infrastructure limitations, and the disconnect between technology and local educational needs. The study highlights the effectiveness of digital tools in enhancing learning experiences but also underscores the limitations of a one-size-fits-all approach, particularly in rural and underserved areas. The discussion reflects on the historical and cultural dimensions of Information and Communication Technology for Development (ICTD) in Pakistan, noting a shift from universalist to situated approaches in technology implementation. It emphasizes the need for contextually relevant and culturally sensitive strategies to address educational disparities effectively. In summary, while digital learning tools offer valuable opportunities for educational advancement, their success hinges on addressing infrastructural and contextual challenges. This research advocates for a more nuanced approach to EdTech, prioritizing local needs and integrating diverse educational practices to foster inclusive and effective learning environments.

**Keywords:** Digital Learning Tools, Public Schools in Pakistan, Educational Disparities, ICT for Development (ICTD), EdTech Implementation, Contextual Challenges.

## Introduction:

Pakistan is currently in the early phases of integrating computers into its public school system. Following the nation's information technology (IT) policy, the Pakistani government has initiated various programs to encourage computer usage in public schools. Some of these initiatives have begun as pilot projects, which may continue or be discontinued based on their success or the availability of funding from both governmental and international aid agencies. Other projects have been introduced under policy frameworks from entities such as the Federal Ministry of Science and Technology (MOST) and the federal and provincial ministries of education.

The economic rationale used by policymakers in Pakistan often justifies the introduction of technology in a narrow, technocratic sense, rather than as a means to create knowledge that could improve people's lives by broadening their perspectives, fostering a deeper understanding of local, national, and global issues, and encouraging active participation in the democratic process. The skills imparted through a techno-centric curriculum are often disconnected from

the kind of knowledge needed to address the social and human development challenges that Pakistan faces today. Merely teaching technical skills that may soon become outdated does not equip Pakistani students with the critical capabilities necessary to understand and navigate the complex social realities of their society or the rapidly changing, interconnected global world.

Different societies have unique circumstances and therefore set different goals for educating their youth. However, certain universal goals, such as respect for law, diversity, human life, the responsibilities of citizenship, and democracy, are common across educational systems. Educational technology has the potential to enhance communication, provide diverse and vast resources, and support educational endeavors. Yet, when technology is used solely to produce better technicians, it limits the broader educational and pedagogical possibilities that technology can offer. If students are not taught with the goal of learning how to learn, they will struggle to keep pace with the rapid advancements in technology. As technology quickly becomes obsolete, the technical skills imparted without continuous updates will soon become inadequate, leaving students unprepared for the future.

In the last ten years, there has been a notable change in the focus of communication for growth, with a strong emphasis on digitization. The growing preference for digital technology as a solution to the issues encountered by emerging regions is the cause of this phenomenon. With the rise of FinTech, EdTech, and mobile health, governments and the public are now investing significant amounts of money from both public and private sources into these new technologies. The goal is to use technology solutions to eradicate diseases, poverty, and illiteracy. The current fervent conversation on digital technologies evokes memories of a comparable enthusiasm witnessed in the early 2000s with the advent of the diffusion of technology approach. This method sought to aid recently sovereign nations in confronting the substantial socioeconomic obstacles and deep-seated disparities that arose from years of colonization. In the 1990s, the concept of Information and Communication Technology for Development (ICTD) arose, in line with the prevalent neo-liberal mindset.

### **Literature Review:**

The advancement of technology and the widespread use of social media have emerged as optimal solutions to sustain the learning process during exceptional circumstances, such as the COVID-19 pandemic. Consequently, it is essential to address various challenges related to technology, finance, skilled instructors, and learning to develop a robust pedagogical infrastructure for e-learning [1]. Expertise in Information Science (IS) and Learning Science (LS) is considered critical for enhancing learning designs, particularly in addressing the digital disparities faced by students during the COVID-19 crisis [2]. For example, network failures and insufficient bandwidth have negatively impacted the use of MOODLE (Modular Object-Oriented Dynamic Learning Environment), which relies on strong network connectivity and signals [3]. The digital divide remains a significant issue, with economic costs and connectivity concerns presenting major challenges for students during online education [4][5].

Attitudes toward e-learning have generally shifted in a positive direction, with recognized benefits including reduced travel, time and cost savings, and greater flexibility. However, drawbacks such as reduced personal interaction and increased technical challenges persist [6]. On the other hand, the delivery of inter-professional online learning can be highly beneficial within educational institutions [7]. Various factors influence the success of e-learning, including internal factors such as attitudes, self-efficacy, and access, as well as external factors like social support [8]. Additionally, issues such as boredom and anxiety, exacerbated by low income and limited affordability of data packages, contribute to significant obstacles in accessing internet signals, particularly in geographically disadvantaged areas [9]. The combination of economic inequalities, ineffective e-learning systems, and fear of academic loss has resulted in increased mental pressure for students during the COVID-19 pandemic [10].

The synchronous mode of e-learning has been found to enhance personal participation and interaction between students and teachers. In contrast, asynchronous e-learning improves cognitive engagement but can lead to feelings of isolation among learners [11]. Educational institutions predominantly utilize synchronous e-learning, which has been shown to increase student motivation due to its accessibility for a geographically dispersed audience [12]. Furthermore, there is a direct relationship between 'personal creative performance' and a 'supportive environment,' with the former being less influenced by supportive teams and organizational obstacles [13]. However, students have reported challenges such as poor internet connectivity and misunderstandings of tasks [14]. Selecting the appropriate method and media to deliver specific content is crucial for reducing the content's ambiguity [15]. Educators should employ various strategies to enhance the effectiveness of online education, such as delivering content through media similar to traditional classrooms, conducting interactive sessions (discussion and feedback), and using blended learning tools [16]. There is substantial evidence that web-conferencing-based learning in an interactive instructional setting leads to higher satisfaction compared to traditional learning methods [17]. Additionally, the use of 'e-guests' from different regions enables students to interact with specialists who would otherwise be inaccessible in a traditional classroom setting [18].

While ICT-mediated learning can contribute to a cognitive divide due to limited cognitive skills in self-directed learning, the brain possesses a remarkable capacity to acquire new skills over time and with personal interest [19]. Previous research emphasizes that the digital and technological divides are not merely about access to or usage of digital technology, but about the ability to integrate digital technology into meaningful social practices [20] and to derive benefits from it [21]. To mitigate the challenges posed by this new mode of learning, researchers must invest greater effort in clearly categorizing these challenges and developing new strategies, supported by government and educational policymakers, to establish adequate infrastructure and training programs.

#### **Methodology:**

##### **Objective:**

To analyze and evaluate the digital learning landscape in Pakistan, with a focus on the implementation, usage, and effectiveness of digital learning tools during and after the COVID-19 pandemic.

##### **Research Design:**

A mixed-methods approach will be employed, combining quantitative data analysis with qualitative insights to provide a comprehensive understanding of the digital learning landscape.

##### **Data Collection**

##### **Quantitative Data:**

- **Survey Data:** Utilize the existing survey data from 17 organizations and 2,366 teachers. This data includes information about digital tools, their users, purposes, and the specifics of various interventions.
- **Tool Inventory Analysis:** Analyze the data tables related to digital tools, including their primary and secondary users, the types of products, and their intended purposes.
- **Intervention Analysis:** Examine the data on interventions, focusing on their purposes, locations, languages, settings, target demographics, and socio-economic backgrounds.

##### **Qualitative Data:**

- **Interviews:** Conduct semi-structured interviews with key stakeholders, including representatives from the 17 organizations, educators, and policymakers. These interviews will provide deeper insights into the challenges and successes of digital learning implementations.

- **Focus Groups:** Organize focus groups with teachers and students to understand their experiences and perceptions of digital learning tools and interventions. This will help contextualize the quantitative findings.

### Data Analysis:

#### Quantitative Analysis:

- **Descriptive Statistics:** Use descriptive statistics to summarize the data on the usage of digital tools, including frequencies, percentages, and distributions.
- **Comparative Analysis:** Compare the use and effectiveness of digital tools across different variables such as school level, type of product, device requirements, and geographic location.
- **Correlation Analysis:** Explore correlations between the use of specific types of digital tools and the reported effectiveness of interventions.

#### Qualitative Analysis:

- **Thematic Analysis:** Analyze interview and focus group transcripts to identify recurring themes and patterns related to the challenges, successes, and impacts of digital learning tools.
- **Content Analysis:** Examine the qualitative feedback on specific digital tools and interventions to understand the nuanced experiences of users and stakeholders.

#### Evaluation of Effectiveness:

- **Impact Assessment:** Assess the impact of digital learning tools on student learning outcomes and engagement by comparing pre- and post-intervention data, where available.
- **User Satisfaction Surveys:** Conduct additional surveys to gauge the satisfaction of students, teachers, and administrators with the digital tools and interventions.
- **Case Studies:** Develop case studies of successful and unsuccessful interventions to identify best practices and areas for improvement.

#### Reporting and Recommendations:

- **Comprehensive Report:** Prepare a detailed report summarizing the findings from both quantitative and qualitative analyses. Include insights on the effectiveness of digital tools, challenges faced, and recommendations for future implementations.
- **Policy Recommendations:** Provide actionable recommendations for policymakers and educational institutions based on the research findings. Focus on areas such as infrastructure improvements, teacher training, and strategies to address digital divides.
- **Dissemination:** Share the results with stakeholders through presentations, workshops, and publications to ensure that the insights and recommendations reach a broad audience.

#### Follow-Up:

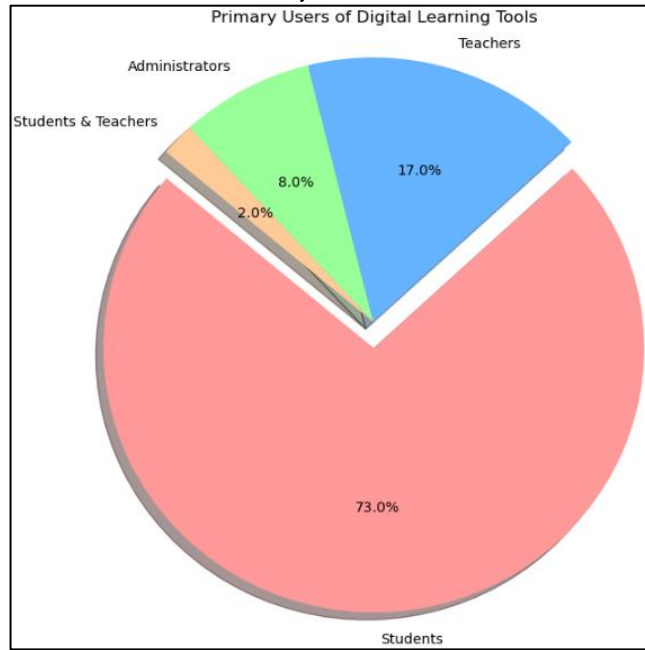
- **Longitudinal Study:** Propose a longitudinal study to track the long-term impact of digital learning tools and interventions on student outcomes and educational equity.
- **Ongoing Monitoring:** Recommend the establishment of a monitoring system to continuously evaluate the effectiveness and usage of digital learning tools and adapt strategies as needed.

By combining quantitative and qualitative methods, this methodology aims to provide a thorough analysis of the digital learning landscape in Pakistan, offering valuable insights for improving digital education in the country.

#### Results:

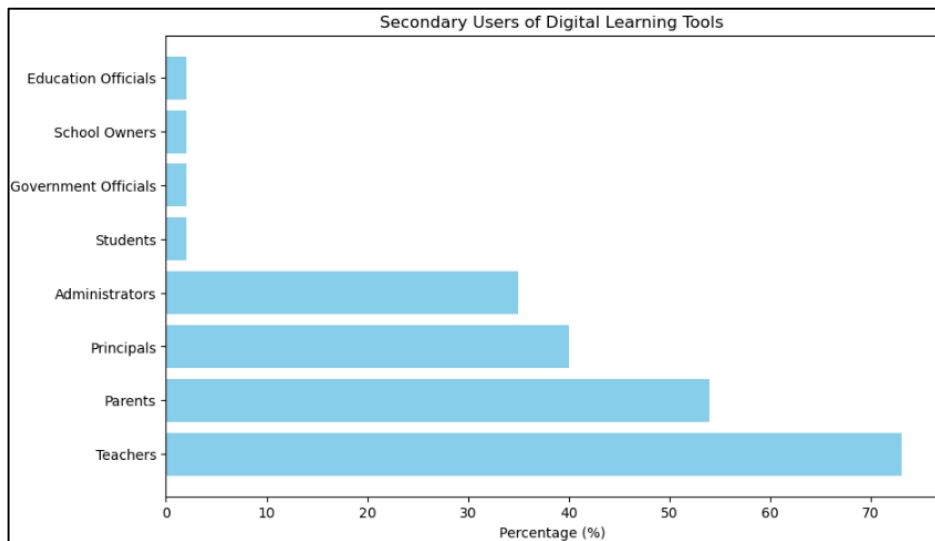
The survey reveals that the majority of digital learning tools in Pakistan are primarily designed for students, constituting 73% of the tools. Teachers are the primary users of 17% of

the tools, while administrators utilize 8%. A very small portion, just 2%, of the tools are intended for both students and teachers simultaneously.



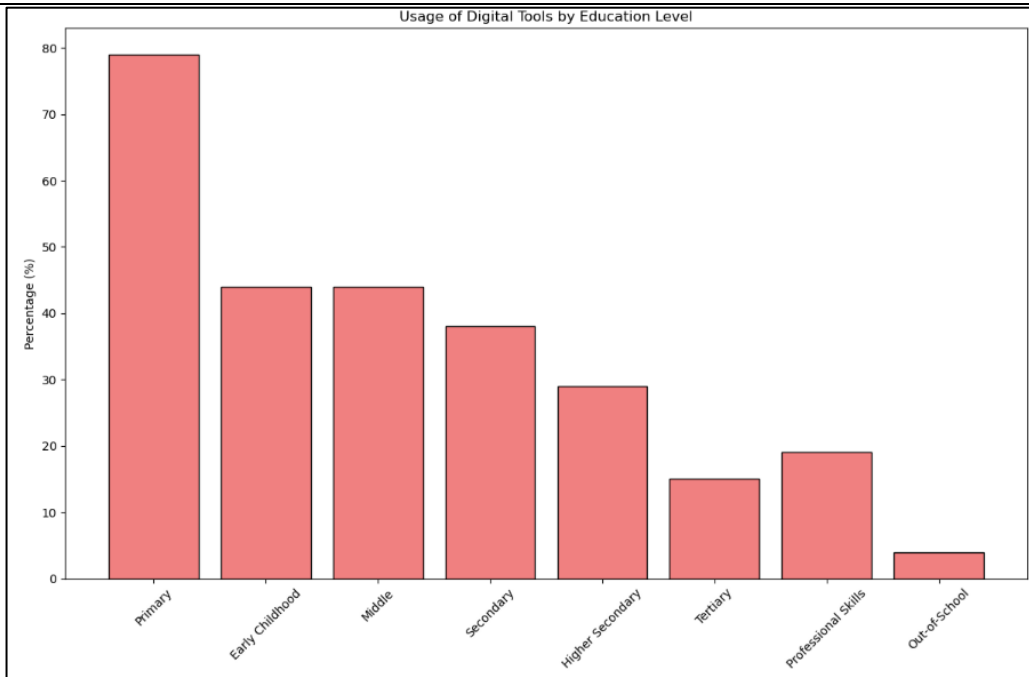
**Figure 1:** Primary users of digital learning tools.

In terms of secondary users, teachers are again the most common, involved with 73% of the tools. Parents use 54% of the tools as secondary users, while principals and administrators follow with 40% and 35%, respectively. Secondary usage by students, government officials, school owners, and education officials is notably less common, each representing only 2% of the tools.



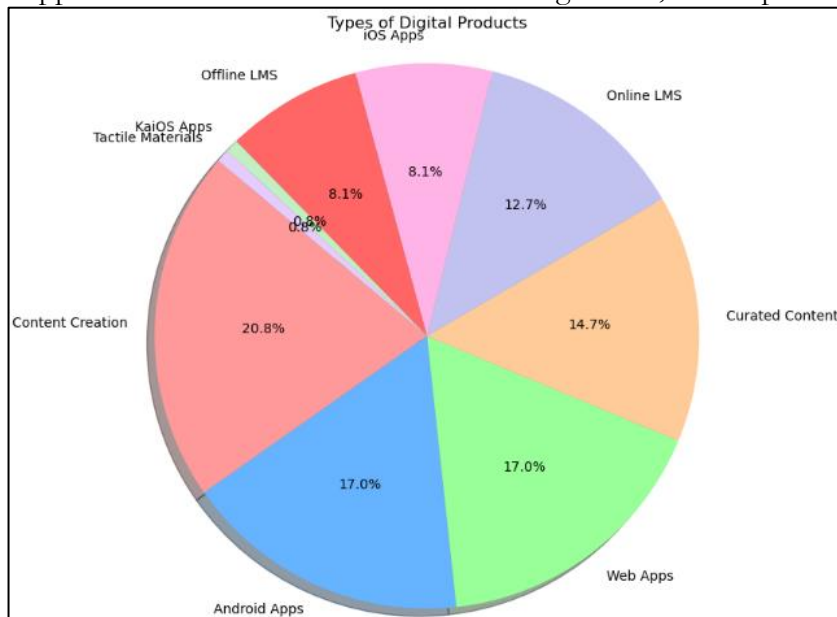
**Figure 2:** Secondary users of digital learning tools

The digital tools surveyed are predominantly employed in primary schools, with 79% of the tools used at this level. Early childhood education and middle schools each account for 44% of the tools. Tools are less frequently used in secondary (38%), higher secondary (29%), tertiary education (15%), and professional skills training (19%). A minimal 4% of the tools are utilized for out-of-school children (OOSC) or non-formal education.



**Figure 3:** Usage of digital tools by education level.

Regarding the types of digital products, the most prevalent are content creation tools, which make up 54% of the surveyed products. Android and web-based applications are each used for 44% of the tools. Other significant types include curated content (38%), online learning management systems (33%), and iOS apps or offline LMS (21% each). Less common products include KaiOS apps and tactile materials like smart learning blocks, each representing 2%.



**Figure 4:** Types of digital Products.

The primary purposes of these digital tools vary, with the majority serving as learning resources or repositories (66%). Many tools also function as teaching aids (40%), learning management systems (48%), and learning platforms (35%). Additional purposes include teacher professional development (21%) and communication and collaboration (25%). Most digital tools require mobile phones (83%) or tablets (81%). Laptops and desktop computers are also commonly needed (69% and 63%, respectively). A smaller percentage of tools require televisions (19%) or radios (10%).

Power and connectivity needs vary among the tools. In terms of power, 52% operate on battery power, 23% require constant electricity, and 25% can function with intermittent electricity. For internet connectivity, 63% of the tools need intermittent or partial connectivity, 25% require full connectivity, and 13% can operate offline. A significant majority of the digital tools (71%) were not part of any specific intervention. However, 29% were implemented as part of an intervention strategy. The interventions aimed at various purposes: 69% focused on in-school learning, 62% on learning during school closures, 54% on learning at home, and 46% on remedial learning. The interventions were most frequently carried out in Sindh (85%), Khyber Pakhtunkhwa (69%), and Punjab (62%).

Interventions were predominantly conducted in English and Urdu (92% each), with smaller percentages in Sindhi (15%), Pashto, and Pakistan Sign Language (8% each). The majority of these interventions took place in public schools (62%) and NGO schools (54%), with a strong focus on both rural (92%) and urban (85%) settings. The target demographics for the interventions were primarily low-income students, representing 85% of the interventions. Middle-income students were targeted by 54% of interventions, while high-income students were the focus of 15%. In terms of school levels, interventions primarily targeted primary school students (77%), followed by middle school students (62%) and secondary school students (38%). The subjects addressed by the interventions included literacy and numeracy (92% each), STEM subjects (77%), and arts or life skills (31% each).

Teacher professional development was a key component of many interventions, with 69% including in-person workshops and online training. Follow-up visits and teacher learning circles were also common, included in 46% and 31% of the interventions, respectively. Evaluations were conducted for 62% of the interventions, indicating a significant focus on assessing the effectiveness of these digital learning tools and interventions. These findings provide a detailed overview of the state and impact of digital learning tools and interventions in Pakistan, highlighting their extensive use, diverse applications, and varying effects across different regions and demographic groups.

### **Discussion:**

The development of Information and Communication Technology for Development (ICTD) in Pakistan reflects a dynamic interplay of historical, cultural, and socio-economic factors. Historically, Pakistan has experienced a rapid evolution in its approach to technology and development, with an initial emphasis on technology as a key driver of modernization and progress. This perspective often mirrored the hierarchical and optimistic views prevalent in the early discourse on ICTD, which suggested that technology could directly address developmental challenges and improve the lives of the disadvantaged.

However, this early optimism has given way to a more nuanced understanding of ICTD in Pakistan. The post-colonial critique and the shift towards recognizing indigenous knowledge systems have significantly influenced how ICTD is perceived and implemented. Pakistan's development narrative has been shaped by its unique socio-political context, including the challenges of navigating a post-colonial legacy and addressing regional disparities. In the early 2000s, Pakistan's ICTD efforts were characterized by a universalist approach, which emphasized the transfer and diffusion of technology from more developed nations to the local context. This strategy focused on the technological and commercial aspects of innovation, often overlooking the socio-cultural and economic factors that impact technology adoption and use. The universalist approach assumed that technological advancements could be seamlessly integrated into Pakistan's socio-economic fabric, without sufficient regard for the local context.

Recent developments in Pakistan's ICTD landscape have shifted towards a more situated approach, acknowledging the importance of contextualizing technology within local environments. The situated knowledge perspective highlights the need to understand technology within the specific socio-cultural and economic contexts of Pakistan. This approach challenges

the simplistic notion of technology transfer and emphasizes the role of local actors in adapting and implementing technology in ways that align with their needs and realities. In Pakistan, the implementation of educational technology (EdTech) serves as a prime example of these evolving perspectives. Despite significant investments in EdTech, challenges remain in ensuring that technology effectively addresses the diverse needs of students across different regions. The push for platformization and standardization in EdTech, while aimed at achieving scalability, often fails to account for the varied educational contexts and infrastructural constraints present in Pakistan.

Students and educators in Pakistan face several barriers to effectively utilizing EdTech. These barriers include limited access to technology, inadequate infrastructure, and a lack of locally relevant content. For many students in rural and underserved areas, the promise of EdTech as a transformative tool for education remains unfulfilled. The disconnect between the technology provided and the actual educational needs and contexts of students highlights the limitations of a one-size-fits-all approach. Moreover, the emphasis on self-directed learning through EdTech has raised concerns about its practicality for students who may lack the necessary support and resources. In many cases, the expectation that students will independently navigate and benefit from digital learning tools overlooks the challenges they face, such as limited access to reliable internet and the need for ongoing guidance from educators and parents.

Educators in Pakistan have also voiced concerns about the effectiveness of EdTech platforms. Many find that these platforms do not adequately address the complexities of the Pakistani educational system, which often requires a more comprehensive approach to teaching and assessment. The reliance on digital tools that focus on standardized testing and short-answer questions can create a mismatch with the broader educational goals of fostering critical thinking and in-depth understanding. In conclusion, the discussion of ICTD in Pakistan underscores the importance of moving beyond simplistic, universal approaches to technology and development. It highlights the need for ICTD strategies that are contextually relevant, culturally sensitive, and inclusive of local experiences. To effectively harness the potential of ICTD, Pakistan must embrace a more nuanced and participatory approach that recognizes the diverse realities of its population and addresses the specific challenges faced by its educational and developmental sectors. As Pakistan continues to navigate its development path, it is crucial to ensure that ICTD efforts are aligned with the needs and aspirations of its people, fostering a more equitable and inclusive approach to technological advancement and development.

### **Conclusion:**

The integration of digital learning tools in Pakistan's educational system presents both significant opportunities and notable challenges. Our study underscores the potential of these tools to enhance educational outcomes by providing diverse resources and learning platforms. However, it also highlights that the impact of digital learning is contingent upon addressing several critical factors. Firstly, the disparity in access to technology and infrastructure remains a major obstacle. While digital tools are predominantly used in primary education, their effectiveness is often limited by uneven distribution of resources and connectivity issues. To fully realize the potential of digital learning, it is essential to address these infrastructural gaps and ensure equitable access to technology across different regions and socio-economic groups.

Secondly, the disconnect between the technology provided and the actual needs of the educational system reveals the limitations of a universal approach to EdTech. The effectiveness of digital tools is significantly influenced by their alignment with local educational contexts and cultural practices. A more nuanced approach that considers the specific needs and conditions of different regions is crucial for improving the relevance and impact of digital learning initiatives.

Thirdly, the focus on technical skills and content creation tools, while important, should be complemented by strategies that foster critical thinking, creativity, and self-directed learning. As technology rapidly evolves, it is vital to equip students with skills that go beyond technical



proficiency, enabling them to adapt to future advancements and address complex societal challenges. In conclusion, the integration of digital learning tools in Pakistan's educational system must evolve from a purely technocratic perspective to one that embraces contextual relevance and inclusivity. By addressing infrastructural disparities, aligning technology with local educational needs, and promoting broader educational goals, Pakistan can enhance the effectiveness of its digital learning initiatives. Future efforts should focus on developing and implementing strategies that support equitable access, culturally relevant content, and holistic learning experiences, ensuring that digital tools contribute to meaningful and sustainable educational advancements.

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