Policy Research Challenge

Research Paper

Barriers to Technology Integration in Public Schools in Lahore: Challenges and Limitations

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Policy Statement

A policy should be established to increase funding for all public schools in Lahore. The funds should account for the current market prices of essential modern technologies, such as interactive smartboards, computers, and internet connectivity. Regular visits by government officials should ensure these resources are used effectively.

Abstract

This research identifies the challenges faced while integrating technology in classrooms at public schools in Lahore, focusing on tools like computers, projectors, and LED TVs. Data was gathered through surveys of students, interviews with school principals, and observations of physical factors that hinder technology use. The findings reveal that the main issue is inadequate funding, a problem highlighted repeatedly by both students and principals. Other challenges include a lack of resources such as projectors and computers, insufficient teacher training, and low parental awareness about the benefits of technology in education. To address these issues, it is essential for the government to increase funding for public schools annually, ensure teachers receive regular training to effectively use new technologies, and raise parental awareness about how technology can enhance their children's education, which can, in turn, motivate them to support its integration in schools.

1. Introduction

Technology is all about using machines to make life easier by solving everyday problems. We see this in cars, computers, washing machines, smartphones, and the Internet of Things (IoTs). In the 21st century, technology has become a necessity, shaping every part of our lives (Gopo, 2020, p. 47). From smartphones to household appliances like washing machines, technology is used everywhere to improve efficiency and productivity.

Technology has had a major impact on education. Tools such as computer labs, projectors, interactive whiteboards, e-books, Learning Management Systems (LMS), and online platforms like Google Meet, Microsoft Teams, and Zoom help teachers and students. Specialized software such as Bluebook and Google Forms and innovations like virtual reality, augmented reality, AI tutors, and gamification have also improved the learning experience.

Many developed countries have already incorporated technology into their education systems. They use interactive whiteboards, LMS, remote learning, and educational apps. However, in Pakistan, public schools face challenges in adopting technology. Many lack computer labs, interactive whiteboards, projectors, and other resources (Ayaz, 2024, p. 71). The issues include a lack of teacher training, limited funding, and poor-quality equipment. Key problems are inadequate infrastructure, lack of technical support, and low government investment (Mdhlalose & Mlambo, 2023, p. 58).

This research will identify the challenges faced by public schools in Lahore when trying to integrate technology like computer labs, projectors, and Learning Management Systems. The findings will help inform policymakers and government bodies about these issues. Addressing them will lead to better policies and programs to support technology in schools, improving the overall learning experience for students.

2. Literature Review

Public schools in Pakistan face many challenges in using technology in classrooms. One of the biggest problems is the lack of resources. This includes limited financial, technological, and human resources, which makes it hard to adopt technology. Schools often don't have enough money to buy new devices or maintain them. The high cost of technology, such as computers, projectors, and interactive whiteboards, is a significant barrier. Because of this, many schools struggle to integrate technology into teaching. Also, the equipment they do have is often outdated or not working properly, which further prevents effective use in classrooms. In addition, there is a shortage of technical support to fix problems when they arise (Muneer, Ibrahim, & Begum, 2023, p. 248).

Poor infrastructure makes the situation worse. Many public schools in Pakistan face frequent power outages, which disrupt lessons and make it hard to use digital tools. A stable internet connection is also missing in many schools. Without reliable internet, it is impossible for students to access online resources or benefit from digital learning platforms. The shortage of computers and outdated hardware further limits how much technology can be used in classrooms. Many teachers also struggle to learn how to use technology effectively because they are not given enough training. Even if schools have some technological resources, the lack of skilled teachers who know how to use them limits their effectiveness (Akhtar & Roshan, 2022, p. 615).

Teacher training is another major issue. Many teachers in public schools have little or no experience with digital tools. Effective use of technology in classrooms requires teachers to understand how to use these tools to improve teaching. However, most teachers are not trained in these areas. Teacher training programs that do exist usually focus only on basic computer skills, leaving teachers unprepared to use more advanced digital tools for education. Even if they do have some training, there is often no follow-up or ongoing support, which

means that teachers continue to rely on traditional teaching methods that don't make full use of available technology. Because of this, teachers are often hesitant to use technology in their lessons, and when they do, it’s not always effective (Arreerard, 2022, p. 750).

There is also a lack of clear policies for using technology in schools. While some policies, like the Digital Pakistan Policy (2018), aim to increase digital literacy and access to the internet, the implementation of these policies is slow. These policies face several challenges, such as limited funding, bureaucratic delays, and unclear strategies for how technology should be used in education. The National Education Policy (2017-2025) outlines goals for integrating technology in schools, but progress has been slow due to problems with resource allocation and policy enforcement. Local and national authorities often do not work well together, which leads to inconsistencies in how technology is adopted in different areas of the country (Education Profiles, 2024).

Addressing these challenges is essential for improving technology integration in education. When technology is used effectively in schools, it can transform the learning experience. For example, technology can make lessons more engaging by allowing students to interact with virtual labs, simulations, and educational software. These tools can provide students with hands-on learning experiences and allow them to learn at their own pace, which can motivate them to study more. Technology also supports different learning styles, which helps teachers tailor lessons to the needs of all students. If students have access to these resources, they can develop important skills such as problem-solving and critical thinking (Kumar, Ahmad, & Lodhi, 2024, p. 388).

However, to make this a reality, schools need better policies, improved infrastructure, and more teacher training. Without these changes, technology cannot reach its full potential to improve learning outcomes. One important goal should be to bridge the digital divide,

ensuring that all students, regardless of where they live, have equal access to technology. Schools must also provide ongoing support to both teachers and students to help them make the most of digital tools. By improving these areas, technology can become an essential part of education in Pakistan, helping students succeed in a rapidly changing world.

3. Methodologies

This research paper examines the challenges faced by public schools in Lahore while integrating technology into their education systems. The study identifies the gaps and issues faced during the integration process and offers recommendations to improve the integration of technology in these schools.

3.1. Survey:

Surveys were conducted with students from three public schools in Lahore: Government High School F Block Gulberg II, Government Girls High School Barkat Market Garden Town, and Government Boys High School Ali Raza Abad. These schools were chosen because of the limited use of technology in their classrooms. The survey aimed to gather information on students' interactions with technology, their comfort with it, the extent of its use in their classrooms, and how often they observe its integration in their education. The survey included semi-open-ended questions that focused on the challenges students face with technology integration. A total of 50 responses were collected from the students. The findings of these surveys helped identify key issues students encounter with technology use in their schools and shaped the recommendations for improving technology integration in the future (Tariq, Yasin & Azim, 2023, p. 194).

3.2. Interview:

Interviews were conducted with principals and managers from the selected schools who have been overseeing technology integration in their schools for at least two years. These interviews were aimed at understanding the challenges they face in implementing technology and the reasons why technology has not been effectively integrated into their schools. Each interview consisted of five main questions, followed by additional follow-up questions to gather more detailed insights into the issues they encounter. The consent of all participants was obtained before the interviews, and they were recorded with permission to facilitate easier reference during the analysis process. These informal interviews provided valuable perspectives on the barriers to technology adoption and highlighted potential solutions. The insights gathered through these interviews contributed to the development of actionable recommendations for improving the integration of technology in public schools.

3.3. Ethnography:

Ethnography was practiced to observe the physical and environmental factors affecting technology integration. Researchers visited the three schools to observe the availability of basic technological tools such as projectors, computer labs, and whether ICT is recognized as a subject. Observations were made to identify visible factors that either hindered or supported technology integration in the schools. The observations were rated on a scale from 1 to 10, with 1 indicating no integration of technology and 10 showing full utilization. These ethnographic observations helped highlight the practical barriers to technology integration, such as the lack of equipment, infrastructure, and resources that hinder the effective use of technology in classrooms. The ethnography provided a clear picture of the physical challenges that schools face and reinforced the findings from the surveys and interviews.

4. Results and Discussions

To view summarized findings, go to page 11

Upon conducting the surveys, the results were more or less what we were expecting. Below are some charts that highlight some key sayings of what the students believe regarding technology integration. Here the students were asked about their thoughts on the lack of technology. Our findings show that 88.9% of the respondents believed that there is a lack of technology while only 11.1% said there is sufficient technology.

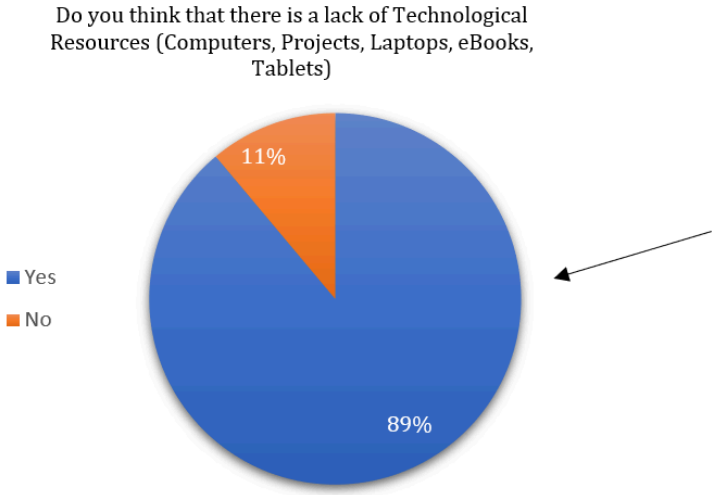


Figure 1

The chart shows that a large majority, 89% of people, believe there is a lack of technological resources like computers, laptops, and eBooks. Only 11% do not feel there is a lack of these resources. These findings are based on collective responses from Government Girls High School Barkat Market Garden Town and (2009) Government High School F Block Gullberg II & Government Boys High School Ali Raza Abad.

Box 1

We then asked the students about their take on the barriers of integrating technology in their schools. All the respondents voted for the lack of proper devices, where they also indicated the lack of financial resources. Other issues identified here included unreliable connectivity, teachers not using technology, and in the other option of the survey, funding issues were again identified.

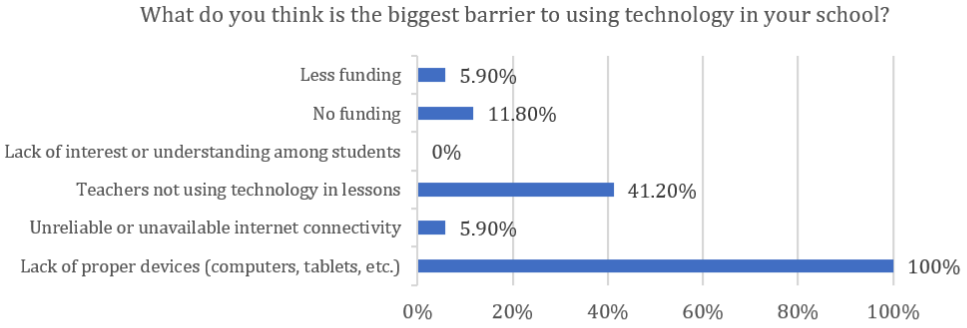


Figure 2

	Lack of proper devices (computers, tablets, etc.)	Unreliable or unavailable internet connectivity	Teachers not using technology in lessons	Lack of interest or understanding among students	No funding	Less funding
Findings	100%	5.90%	41.20%	0%	11.80%	5.90%

Table 1

In Figure 3, we can see that at these public schools, due to the lack of technology, students are not often encouraged or provided with assignments involving the use of technologies, such as a computer. 77.8% of all respondents say they are rarely encouraged to use technology, with another 11.1% saying never and only a small 11.1% of all the students believed that they are often given assignments involving technology.

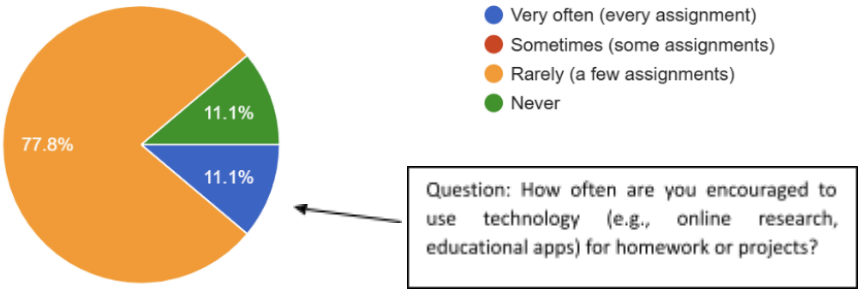


Figure 3

Upon questioning the students regarding the technologies that are used, out of all of the respondents, 52.3% believe no technology is used while 43.2% selected Computers/Laptops which in this case meant that the teacher connected the one working computer to an LED TV to show all the students.

Figure 4 illustrates the distribution of technology usage in classrooms, revealing that 52.3% of classrooms reported no technology use, 43.2% used computers/laptops, and 4.5% used tablets.

Box 2

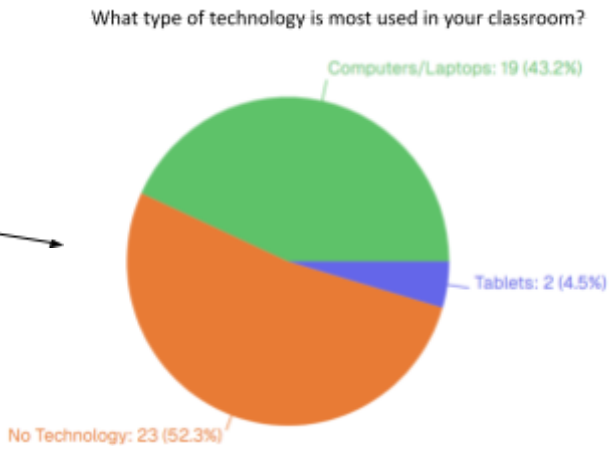


Figure 4

Lastly, when the students were questioned regarding their take on technology, every single respondent voted for how the integration of technology will indeed improve the learning experience.

These survey results give us an insight on the integration issues faced while also giving us reasons on why these issues need to be addressed as soon as possible.

After conducting our interviews, we were able to answer many of our questions. The biggest challenge that public schools faced was lacking funding and financial support to integrate technology. It was analysed that teachers were paying out of their own pockets for computer repairs, utility bills, along with installation of resources like projectors and LED TVs. No funding was provided by the government for upgrading technology or integrating projectors in classrooms. Teachers believed that a Rs. 300,000 annual budget for a school with 300 students was insufficient (this means Rs. 1,000 per student annually). The interviewee suggested that government officials should conduct regular visits to monitor and maintain technological facilities, as the costs are too high for teachers to cover independently. Teachers had low salaries yet still invested their own money to improve technology for the betterment of students.

Another issue, linked with low funding, was acquiring and maintaining computer resources for teaching and administrative purposes. There were only 16 computers for 80 students (20 students per computer), resulting in many students sitting on the floor and observing rather than participating. This meant there was a lack of inventory in the school. Computers were also outdated, last updated in 2015 in Government Girls High School Barkat Market Garden Town and way back in 2009 in Government High School F Block Gullberg II and Government Boys High School Ali Raza Abad; meaning that classrooms were far away from being equipped with the latest technology. 2 years ago, the syllabus was last updated; but the teachers lacked software on school computers to teach the new syllabus. Even though an LED TV was installed by the teachers and administration contributing from their own pocket, the students had to sit on the floor and listen to lectures due to lack of seating arrangements. For example, at Government High School F Block Gullberg II, the IT lab was established in

2009, and since then, no repairs or upgrades had been made to the computer systems. Out of the 16 computers provided by the government, only 1 was in working condition (6.25% of computers functional), while the others were outdated or non-functional. Labs were also not maintained, further contributing to the poor state of the technology. The one IT teacher, for the entire school, was overburdened, responsible for teaching around 300 students while also handling administrative work due to unskilled clerks. There was no learning management system (LMS) to share resources, with teachers relying on WhatsApp groups to distribute notes.

When it came to the level of training provided to teachers, IT teachers did not receive adequate training; the few training sessions offered were basic and unhelpful. No professional development programs were in place to improve teachers' technological skills, despite their willingness and capability to utilise technology effectively.

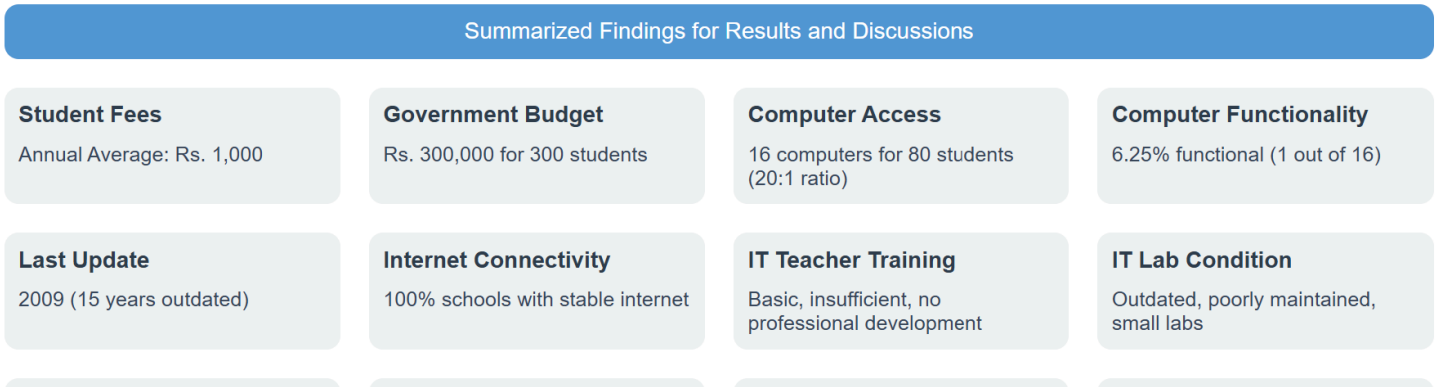
As for internet and electricity connectivity, the internet was easily accessible (100% of respondents agreed on internet availability) and electricity was uninterrupted due to an Uninterruptible Power Supply (UPS backup system). But again, all the interviewees emphasized the fact that even with stable internet and electricity, they were of no use, as the computers in the labs were either non-functional or outdated. The schools majorly only had 1 LED TV connected to a computer for teaching, making it insufficient to meet the needs of all students.

As for perceptions of teachers, students, and parents; they would be playing a major role in influencing the adaptation to technology integration, however, the lack of interest and knowledge from parents and teachers again hinder adoption. Parents lacked awareness and motivation regarding their children's exposure to and integration of technology in education. They were disengaged and showed little interest in the integration of technology or their

children's technological education. Students were also largely unaware of technology due to its limited availability in schools. Students also lacked access to computers at home, further limiting their exposure to technology. Teachers were highly dedicated and believed that students are the future of the country, thus often making personal sacrifices to improve technology in schools. The interviewee emphasized that teachers are skilled and can deliver quality education if provided with the necessary technological facilities. The interviewee emphasized that government support is crucial to ensuring students in public schools can compete globally. The interviewee stressed upon the fact that if the government wishes to match private school standards to public schools, then that can only be done if proper funding and investments are provided to meet IT requirements.

Upon practicing ethnography, the results came out to be not the best. We were only allowed to take photos at one school, Government Boys High School Ali Raza Abad. However, we did physically examine the IT facilities, such as computer labs and computer systems, at all the schools. Upon practicing ethnography, we gave a combined rating to all three schools of 3 (on a scale of 1 to 5), which meant that there was, indeed, an absence of proper technologies and very little access was provided to the students and teachers. Upon practicing ethnography, we found out that very few computers were in working condition, and the computers provided by the government were very old; NComputing computers were present, which is an outdated piece of technology. Computer labs were quite small to cater to all the students and many accessories of the computers, such as the keyboards and mice, were in poor condition.

Below are the Summarized Findings for the Results and Discussions Headings:



5. Conclusion

After conducting our research, we concluded that there are several issues faced while integrating technology in public schools in Lahore. These include the lack of technological devices in these public schools, the lack of training provided to the teachers by the government, the lack of interest by parents and the absence of awareness among the students. However, the biggest issue that we were able to identify, after conducting all the interviews, surveys and ethnography, was the absence of funds provided by the government to these schools to integrate and implement technology in their schools.

Even though policies, some have been mentioned above as well, such as the 2017-2025 National Education Policy and 2018 Digital Pakistan Policy exist, the issue still stands as funds are not provided to this and the core elements of these policies go to vain. However, there are no such policies that actually address the funding issue faced by these public schools. This absence of such an important policy leads to the other policies that have already been developed be of no use.

We believe a policy should be derived where adequate funds are provided to public schools in Lahore. The policy should consider inflation and accordingly provide each school with enough funds to integrate and upgrade technology while also fulfilling other requirements, such as utility bills and other administrative costs. We believe this policy will help the school, as with an increase in the yearly budget, the public schools will be able to meet all their needs to upgrade and maintain the latest technologies, which include the latest computers and projectors.

Upon conducting the interviews, we also believe that there should be a policy of the government where regular visits by the government officials are made to ensure that

technology is present in the public schools and existing policies, such as the 2017-2025 National Education Policy and 2018 Digital Pakistan Policy are being properly implemented.

Teacher training was also a major concern of the interviewees; thus, we believe that regular teacher training should be provided by the Directorate of Public Instruction (Colleges) Punjab, which is responsible for the teacher training in Punjab, each year regarding the latest softwares and other technology related knowledge so that the teachers are skilled enough to be able to use technology.

We believe with these new policies and proper implementation of a few older ones, we will be able to overcome the issues faced while integrating technology and have the bare minimum amount of technology in all public schools across Lahore.

Below are the Summarized Findings for the Conclusion:

Key Issue	Details	Recommendation
Lack of Technological Devices	Public schools in Lahore lack essential technological devices such as computers, projectors, and LED TVs.	Government should allocate sufficient funding to purchase and maintain these devices.
Inadequate Teacher Training	Teachers are not receiving adequate training in using new technologies or software updates.	Regular teacher training on the latest technologies should be provided by the Directorate of Public Instruction (Punjab).
Lack of Government Funding	No funds are allocated by the government to support technology integration, leading to the failure of existing policies.	A policy should be developed that provides sufficient funding for technology integration, addressing inflation and other needs.
Lack of Parent and Student Awareness	Parents and students are unaware of the importance of technology in education, hindering its integration.	Awareness programs should be implemented to educate parents and students about the benefits of technology in education.
Absence of Policy Addressing Funding	Existing policies like the 2017-2025 National Education Policy and 2018 Digital Pakistan Policy do not	New policy should specifically address the issue of adequate funding for public

	address the funding gap for technology in schools.	schools to implement technology.
Need for Regular Monitoring	There is no ongoing monitoring of technology integration in schools, leading to the ineffective implementation of policies.	Government officials should conduct regular visits to schools to ensure that technologies are in place and policies are followed.
Impact of Improved Funding	Increased funding will enable schools to upgrade and maintain technology, meet administrative costs, and support utility bills.	Providing more funding will allow schools to upgrade technologies like computers and projectors, ensuring sustainability.

Table 2

6. Keywords and Abbreviations

6.1 Keywords:

Technology Integration: The process of incorporating technology into public school education systems.

Public Schools: Government-funded educational institutions.

Barriers to Technology: Factors hindering the adoption of technology in schools.

Lack of Funding: Insufficient financial resources for purchasing and maintaining technology.

Teacher Training: Educational programs to equip teachers with skills for using digital tools.

Parental Awareness: Understanding among parents of the benefits of technology in education.

Digital Divide: Disparity in access to technology between different schools or communities.

Infrastructure: Physical and digital frameworks, such as electricity and internet connectivity, required to support technology.

Learning Management Systems (LMS): Software applications for managing educational resources and interactions.

Outdated Equipment: Old or non-functional technological devices like computers and projectors.

2017-2025 National Education Policy: A framework outlining technology integration in Pakistani schools.

2018 Digital Pakistan Policy: A government initiative to improve digital literacy and internet access.

Ethnography: Observational research to understand real-world barriers to technology integration.

Government Monitoring: Regular inspections by officials to ensure technology policies are implemented.

Policy Recommendation: Suggestions for creating or updating policies to enhance technology in education.

6. 2 Abbreviations

LMS: Learning Management Systems

ICT: Information and Communication Technology

IoTs: Internet of Things

UPS: Uninterruptible Power Supply

Rs.: Pakistani Rupee (Currency)

IT: Information Technology

7. Glossary

i. **Technology Integration**: Incorporating digital tools and systems into educational methods to enhance learning experiences.

ii. **Public Schools**: Government-run schools providing free education, typically facing funding and resource challenges.

iii. **Barriers to Technology**: Obstacles preventing effective implementation of technology in schools, such as lack of resources or training.

iv. **Digital Divide**: The gap between those who have access to modern technology and those who do not.

v. **Learning Management System (LMS)**: A software application that organizes and delivers educational content and tracks learning progress.

vi. **Information and Communication Technology (ICT)**: Technologies used for storing, retrieving, transmitting, and manipulating information.

vii. **Internet of Things (IoTs)**: Networked devices that collect and exchange data, playing a growing role in education and other sectors.

viii. **Uninterruptible Power Supply (UPS)**: A device providing backup power to prevent disruptions during electrical outages.

ix. **2017-2025 National Education Policy**: Pakistan’s framework for educational reforms, including the integration of technology.

x. **2018 Digital Pakistan Policy**: An initiative aimed at improving internet access, digital literacy, and technology adoption in various sectors.

xi. **Outdated Equipment**: Technological tools and systems that are no longer efficient or functional for current needs.

xii. **Teacher Training**: Professional development programs designed to help educators effectively use technology in classrooms.

xiii. **Parental Awareness**: Understanding among parents about the value and impact of integrating technology into education.

xiv. **Infrastructure**: The foundational facilities, such as power supply, internet, and buildings, required for technology integration.

xv. **Ethnography**: A qualitative research method that involves observing participants in their natural environments to understand behaviors and challenges.

xvi. **Interactive Smartboards**: Digital whiteboards that allow interactive engagement through touch or specialized tools.

xvii. **Gamification**: Using game design elements in non-game contexts, like education, to increase engagement and motivation.

xviii. **Virtual Reality (VR)**: A simulated environment created using digital tools to enhance learning experiences.

xix. **Augmented Reality (AR)**: An interactive experience where real-world environments are enhanced by computer-generated elements.

xx. **AI Tutors**: Artificial Intelligence-based programs designed to provide personalized learning experiences and support.

xxi. **Educational Software**: Digital applications designed to aid teaching and learning processes.

xxii. **Policy Monitoring**: The process of regularly evaluating and enforcing policies to ensure their implementation.

xxiii. **Digital Literacy**: The ability to use technology effectively for accessing, managing, and communicating information.

xxiv. **Interactive Whiteboards**: Large touch-sensitive displays used in classrooms for teaching and collaboration.

xxv. **Projectors**: Devices used to display visual content on large screens in educational settings.

xxvi. **E-books**: Digital versions of textbooks or reading materials used as learning resources.

xxvii. **Overcrowding in Schools**: A situation where the number of students exceeds the available resources, affecting learning outcomes.

xxviii. **Stakeholders in Education**: Groups or individuals, such as teachers, students, parents, and policymakers, who have an interest in educational systems.

xxix. **Policy Recommendation**: Suggestions to improve existing systems or address gaps through structured guidelines.

xxx. **Bureaucratic Delays**: Administrative inefficiencies that slow down the implementation of policies or programs.

xxxi. **Digital Learning Platforms**: Online tools and applications that facilitate remote education and collaborative learning.

xxxii. **Electricity Backup Systems**: Equipment designed to ensure uninterrupted power supply, crucial for operating technology in schools.

xxxiii. **Teacher Dedication**: The commitment shown by educators to improve learning experiences, often involving personal sacrifices.

xxxiv. **Financial Constraints**: Limited budgets that restrict the purchase and maintenance of technological resources in schools.

xxxv. **Outdated Policies**: Government policies that fail to address modern-day challenges or technological advancements.

xxxvi. **Global Competitiveness in Education**: The ability of an education system to produce students who can compete effectively in the global job market.

xxxvii. **Resource Allocation**: Distribution of financial and technological resources to support specific educational objectives.

xxxviii. **Government Funding**: Monetary support provided by authorities to enable schools to improve infrastructure and resources.

xxxix. **Student Motivation**: Encouraging learners to actively engage with and benefit from technology-enhanced education.

xl. **Collaborative Learning Tools**: Digital platforms that enable group learning and teamwork among students.

xli. **Policy Enforcement**: Ensuring that rules and regulations are adhered to by schools and institutions.

xlii. **Digital Transformation**: The process of adopting digital technologies to fundamentally change educational practices.

xliii. **Modern Classroom Tools**: Advanced technologies like smartboards, tablets, and interactive software used for teaching.

xliv. **Technological Disparities**: Unequal access to technology among schools or regions, often due to socioeconomic factors.

xlv. **Functional IT Labs**: Properly equipped computer laboratories that support the integration of technology into education.

xlvi. **Awareness Campaigns**: Initiatives to inform parents and communities about the importance of technology in education.

xlvii. **Digital Education Standards**: Guidelines defining the optimal use of technology in schools for effective learning.

xlviii. **Outcomes-Based Education**: An approach focusing on achieving specific educational goals, often enhanced through technology.

xlix. **Accessibility in Education**: Ensuring all students, including those with disabilities, can use technological resources effectively.

l. **National Education Standards**: Benchmarks set by governments to define the quality of education, including the role of technology.

li. **Software Updates**: Regular improvements to educational applications to ensure they meet current teaching needs.

lii. **Parental Disengagement**: Lack of involvement by parents in supporting or understanding their children's technological education.

liii. **School Inventories**: The collection of physical and digital resources available for teaching and administration.

liv. **Policy Implementation Gaps**: Differences between the intended outcomes of policies and their actual execution.

lv. **Sustainability in Education**: The capacity to maintain technological integration over time without exhausting resources.

lvi. **Educational Equity**: Ensuring that all students, regardless of background, have equal access to quality education.

lvii. **Professional Development Programs**: Training sessions to improve the skills and knowledge of teachers and administrators.

lviii. **Technology Upgrades**: Replacing outdated tools and systems with newer and more efficient versions.

lix. **School Leadership Roles**: Responsibilities of principals and administrators in implementing technology policies.

lx. **Collaborative Teaching Methods**: Strategies that combine technology with teamwork among educators to enhance student learning.

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