

Access of primary school students to information and communication technologies in Turkey

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Abstract

This comparative research aims to investigate 6- to 10-year-old students' access to information and communication technologies (ICTs), their purposes of using these technologies, and their place in distance education in Turkey. To achieve this aim, the level of students' access to ICT was determined from an interregional and between-countries perspective by reviewing the relevant literature. The document analysis method was used to analyze the contents of the materials in the corpus. Besides, the research study was built on the statistical data published by the OECD, the Turkish Statistical Institute, and the Ministry of National Education, published official documents, news, and other literature materials related to the subject. In the 2019–2020 academic year, 7,383,213 students at public schools of the Ministry of National Education actively used the Education and Informatics Network (EBA) system. Given 5,328,391 students in primary schools only, around 3.6 million students did not have regular access to the EBA system. All the tiers considered, a total of 11 million students could not access the EBA system. To enable the wider student masses to actively use distance education platforms, the online learning environments must be accessible to everyone and usable without any problems.

Keywords: Communication Technology, Distance Education, Information Technology.

Introduction

In the 21st century, countries are educating people to keep up with technological developments. The Internet plays a significant role in accessing information and overcoming geographical barriers, which has accelerated the innovation process through the information and communication technologies (ICTs). In developed, knowledge-rich societies, students have a wide choice of programs, easier access to information, and can learn independently. This helps teachers and students gain up-to-date knowledge and experience (Hussain & Safdar, 2008). For this reason, the integration of ICT into education systems and programs is of great importance for information societies (Aydın, 2016). According to Wu's research (2021), which was done in the context of sustainable education development goals, Italian students' academic performance improved as the usage of information technology in the classroom increased.

The entry of technology into social environments necessitates changes in employment and education (Siddiq et al., 2017). ICT has altered the global education landscape, particularly by establishing global learning environments (OECD, 2005; OECD, 2015). Cross-curricular competencies, such as ICT skills, communication, and problem-solving, are regarded as important skill areas for students' futures (OECD, 2015). In the future, it is expected that people will increasingly interact with simulated realities, such as the metaverse, and solve problems using digital tools. Therefore, students need to develop a comprehensive set of skills and perspectives that support lifelong learning in new and unconventional digital environments (OECD, 2022). Therefore, educational institutions ought to provide future generations with access to these new learning settings. Educational contents prepared using ICT give individuals of all ages the opportunity to progress at their own pace and level, wherever and whenever they want (Aydın, 2016).

As the development rates of the countries increase, so do the education expenditures of the states, while the ratio of the expenditures made by households to the education expenditures decreases. Households in low-income countries

covered 38% of education costs between 2018 and 2019. In high-income countries, this ratio was 16% (World Bank Group Education, 2021). Although countries around the world recognize the central role of ICT in their education systems, the rate at which ICT is used in schools varies considerably across countries. To understand these differences, it is important to understand the policies that determine the direction and development of ICT availability and use (OECD, 2019).

Internet access provides students with individual learning opportunities, increasing their academic success as well as developing skills that support their lifelong learning. According to the research results of Malamud et al. (2019), the digital skills of children with computer and internet access at home show a positive difference compared to the digital skills of children who do not have computer and internet access at home. Countries that cannot access computer and internet technologies are deprived of the gains of countries that use information technologies actively and reach up-to-date information (Kılıç, 2011).

In the present world, where access to information has become digital, the way that information is obtained and presented is extremely important for educational organizations attempting to make a difference in the global competition. In this context, the Ministry of National Education (MoNE) in Turkey, wishing to gain a place in the global competition, initiated the project called “Movement to Increase Opportunities in Education and Improve Technology (FATİH),” providing the broadband internet to all classrooms, enabling students to use information and technology as an effective tool, and increasing the opportunities for teachers and students to access technology (Fatih Project, 2022). According to Ekici and Yılmaz (2013), the FATİH project is an exemplary initiative for Turkey’s effort to activate education by using modern technology.

As a significant component of FATİH, the distance education Informatics Network (EBA) system has become the most widely used distance education tool in Turkey, which started the distance education process on March 23, 2020, as a pandemic measure. Distance education in the EBA environment was planned according to the school levels of the students. Turkish Radio and Television Corporation (TRT) – EBA channels were broadcast on television at different times specifically designated for primary, secondary, and high school students; in addition, students met with their peers at certain times and held synchronous lessons with their teachers (MoNE, 2020; Emin & Altunel, 2021).

The education losses experienced by the world are extremely large, and their effects are expected to last for a long time. According to research by UNESCO, UNICEF, and the World Bank, 50% of the children in one-third of low-income countries could not access distance education (World Bank Group Education, 2021). The data show that there are serious barriers to the achievement of the Sustainable Development Goal, which commits nations to “all children completing free, equitable, and quality primary education” (Sachs et al., 2019).

In the context of interregional inequality within a country, the “digital divide” arises as an issue affecting the entire country (İra et al., 2021). This research will also be helpful to determine the digital divide and its effects on Turkish education.

1. Importance of the study

Researching primary school students access to ICT is crucial for understanding the current landscape of access to ICT, identifying areas for improvement, and developing effective strategies to ensure that all students could benefit from information and communication technologies in the 21st century. Understanding access to ICT and identifying areas needing development are crucial for enhancing educational environments and advancing society at large by assessing the impact on people’s digital competencies. Research indicates that using information and communication technologies (ICTs) in the classroom might result in enhanced academic performance, greater participation, and a more profound comprehension of subjects (Baht, 2023). Interactive simulations and multimedia tools can increase learning in subjects such as science, math, and languages. Furthermore, with the economy shifting toward digitalization, it is crucial for all individuals to possess the necessary skills and knowledge to engage effectively. Disparities in ICT access may exacerbate current social and economic inequities (Utah Valley University, 2024). This study aims to pinpoint areas where students lack access and create ways to close the gap, ensuring that all students have equal opportunities to utilize technology. It is crucial to instruct pupils on the safe and responsible use of technology. This study’s results could help in creating efficient digital programs that provide students with the necessary abilities to navigate the online environment safely and ethically.

2. Aim of the study

The study aims to investigate the accessibility of information technologies for Turkish students aged 6–10 years and to propose viable policies drawing on the obtained results that can be applied to the education system. To do so, the levels of students’ access to ICT were determined from an interregional and international viewpoint by reviewing the relevant literature.

3. Method

In this study, the document analysis method, one of the qualitative research methods, was used in accordance with the purpose of determining the existing situation of access to and usage of ICT. In the document review method, the existing printed or electronic written sources are examined in detail, and the information obtained is analyzed by the researcher (Yıldırım & Şimşek, 2011). According to Bowen (2009), the document review method is the collection and systematic examination, questioning and reviewing of printed or electronic sources that constitute the data of research. This method includes the processes of finding, reading, taking notes, and evaluating resources for a certain purpose (Karasar, 2005). This study follows the document analysis method in the following steps (Merriam, 2009): (1) finding the relevant documents; (2) controlling the originality of the documents; (3) systematizing coding and categorization; and (4) analyzing data (content analysis). The findings are presented as descriptive statistics (rates). In this study, interregional and international data derived from the official documents of the Organization for Economic Co-operation and Development [OECD], the Turkish Statistical Institute [TUIK], and the Ministry of National Education [MoNE], research articles, news in the media, and other literature sources were reviewed. The details of the data collection tools included for the review are presented in Table 1.

Table 1. The details of data collection tools included for the review

No#	Data Type	Sources	Year	Citations	Title
1	National data	Official document	2021	ERG	Education monitoring report 2021
2	National data	Official document	2021	ERG	Education in Turkey under the impact of COVID-19
3	National data	Official document	2020	MoNE	Turkey has pushed the lists of the digital world with its distance education statistics
4	National data	Official document	2020	MoNE YEĞİTEK	Safe schooling and distance education project: Environmental and social management framework
5	National data	Official document	2021	MoNE	Distance education in numbers
6	National data	Official document	2021	MoNE	Yiğitek-meb National education statistics formal education 2020/2021. Report for the Department of Education, Turkey
7	National data	Official document	2013	TUIK	06-15 yaş grubu çocuklarda bilişim teknolojileri kullanımı ve medya [Use of information technologies and media in children aged 6–15]
8	National data	Official document	2021	TUIK	İstatistiklerle çocuk, 2021 [Children in statistics, 2021]
9	National data	Official document	2020	TUIK	Çocuklarda bilişim teknolojileri kullanım araştırması [Research on children's use of information technologies]
10	National data	Research article	2013	Ekici & Yılmaz	An evaluation on the FATİH Project
11	National data	Research article	2021	Emin & Altunel	Turkey's distance education experience during the coronavirus period
12	National data	Research article	2021	İra et al.	Access to information technology of households and secondary school students in Turkey.
13	National data	Research article	2021	Bildircin	"Project of the century" Fatih turned into a black hole
14	National data	Research article	2008	Hussain & Safdar	Role of information technology in teaching learning process: Perception of the faculty
15	International data	Official document	2020	European Parliament and Council	EU Data Governance Act. In EUR-Lex (No. 52020PC0767)
16	International data	Official document	2021	Johns Hopkins University, World Bank & UNICEF	COVID-19 global education recovery tracker
17	International data	Official document	2005	OECD	Are students ready for a technology-rich world? What PISA studies tell us
18	International data	Official document	2015	OECD	PISA the OECD program for international student assessment

19	International data	Official document	2019	OECD	Pisa, 2021 ICT framework
20	International data	Official document	2021	OECD	Education at a glance 2021
21	International data	Official document	2022	OECD	ICT access and usage by households and individuals
22	International data	Official document	2020	UN	Human development report
23	International data	Official document	2018	World Bank	World development report 2018: Learning to realize education's promise
24	International data	Official document	2021	World Bank Group Education	Education finance watch 2021 report
25	International data	Research article	2018	Badasyan & Silva	The impact of internet access at home and/or school on students' academic performance in urban areas in Brazil
26	International data	Research article	2019	Malamud et al.	Home internet access and child development: Evidence from Peru
27	International data	Research article	2021	Ng	Timely change and timeless constants: COVID-19 and educational change in Singapore
28	International data	Research article	2014	Norberg & Jahnke	Blowing backwards into the future of ICT in education
29	International data	News	2022	We Are Social	Digital 2022: another year of bumper growth
30	International data	News	2022	OECD	PISA 2025 learning in the digital world
31	International data	News	2021	World Bank	Digital technologies in education

4. Results and discussion

In this part of the study, documents listed in the methods are reviewed, and the rates of access to information technologies and the internet are comparatively analyzed in the light of the obtained statistical data, which are presented as sorted by region, household, and students' educational tiers. According to the report published by We Are Social in early 2022, worldwide internet use increased by 4% to reach 62.5%. The data in the same report show that the mobile device use increased by 1.2% compared to 2021 and reached 67.1% (We Are Social, 2022). The global COVID-19 pandemic forced the world to adapt, and at the heart of this adaptation lay a potent duo: smartphones and internet connectivity. These ubiquitous technologies became more than just communication tools; they transformed into lifelines, ensuring business continuity, online education, and access to essential goods and services (ITU/UN tech agency, 2021). Business meetings shifted seamlessly online, thanks to video conferencing apps, allowing companies to collaborate and operate remotely. The rise of e-commerce platforms kept essential goods and services within reach even as physical stores shut down. Education continued, albeit virtually, with classrooms migrating to online platforms, ensuring that students did not miss vital learning opportunities. But the impact went beyond mere functionality. The connectivity fostered by smartphones and the internet provided a crucial sense of community and normalcy during a time of isolation and uncertainty. Social media platforms became virtual gathering places, video calls allowed friends and families to stay connected, and online entertainment offered solace and escape. The affordability of smartphones and increased penetration, particularly in developing regions, have made internet access more convenient and accessible (Bahia & Delaporte, 2021). Internet use rates at the household and regional level for 2020–2021 in Turkey are given in Table 2.

Table 2. 2020–2021 household and regional internet usage rates in Turkey

Statistical Regions (SR) Level 1	2020	2021
Turkey	90.7	92.0
İstanbul	96.4	97.1
Western Marmara	86.0	86.3
Aegean	90.7	89.9
Eastern Marmara	92.5	93.7
Western Anatolia	92.8	94.2
Mediterranean	90.7	91.3
Central Anatolia	87.5	89.6

Western Black Sea	81.3	84.5
Eastern Black Sea	86.9	88.3
Northeastern Anatolia	87.2	86.6
Central Eastern Anatolia	89.8	90.4
Southeastern Anatolia	87.5	93.8

The analysis of the internet access of households in Turkey by regions reveals that the region with the highest internet access rate is Western Anatolia (94.2%). The region with the lowest internet access rate is the Western Black Sea, with an access rate of 84.5%. There has been an overall increase of approximately 2% in access rates from 2020 to 2021. As the rate of household access to the Internet decreases in some regions of Turkey, such as Northeastern Anatolia and the Aegean, an increase of 5.3% is observed in the Southeastern Anatolia region. The table shows that the interregional digital divide does not exceed 10%. However, this difference is thought to be a source of inequality in opportunity. The distribution of internet access rates of individuals in Turkey by regions is given in Table 3.

Table 3. The distribution of internet access rates of individuals in Turkey by regions

SR Level 1	Total										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Turkey	36.2	37.8	39.5	44.9	48.3	55.4	60.7	69.1	72.7	76.5	80.5
İstanbul	48.6	50.3	52.3	56.1	61.0	67.3	73.9	80.4	85.2	87.0	89.6
Western Marmara	35.0	34.2	43.3	43.6	51.3	52.8	58.3	66.5	69.6	75.9	76.2
Aegean	37.6	41.2	39.5	47.3	50.6	54.3	60.1	69.8	73.7	78.1	80.4
Eastern Marmara	40.8	43.8	45.5	49.5	52.4	58.3	62.5	72.8	75.9	81.0	83.3
Western Anatolia	42.3	47.3	49.9	48.8	53.3	62.1	70.1	76.8	80.7	83.0	86.0
Mediterranean	32.9	32.2	33.9	44.3	44.5	54.6	61.0	68.4	71.3	75.3	78.3
Central Anatolia	32.5	32.0	35.6	40.0	44.2	53.2	59.7	65.7	74.0	75.8	78.3
Western Black Sea	28.8	29.3	31.1	37.1	41.0	49.4	54.7	62.1	66.5	68.0	74.3
Eastern Black Sea	33.5	24.6	31.6	41.7	45.8	47.7	55.9	64.9	63.6	69.7	78.4
North Eastern Anatolia	26.2	22.9	24.2	29.0	22.6	42.3	41.6	46.5	58.5	62.6	63.7
Central Eastern Anatolia	22.9	25.1	22.6	29.3	32.7	38.6	43.8	53.8	59.3	63.2	69.6
South Eastern Anatolia	20.5	24.1	25.1	30.3	34.6	42.6	40.3	53.5	53.1	59.5	73.2

Table 3 offers a region-based distribution of internet access rates of individuals in Turkey. Considering the TUIK data on regular use of the internet, it can be inferred that there is a proportional difference between the rates of internet access and regular use. Although the internet access rate in Turkey is 92% (Table 1), it is observed that the regular use rate remains at 80.5%. In the previous year, this number was 76.5%. Even though there seems to be an increase, it is still lower than the internet access rate. This may translate negatively to the internet use rates of individuals between 6 and 10 years old in the household in terms of being a role model, which may cause a decrease in these individuals' access to information and use of communication technologies in this age group. The Turkish government heavily invested in expanding fiber optic infrastructure across the country, reaching more rural areas, and improving overall internet speeds (BTK, 2021). Subsidies and tax breaks, new internet service providers (ISPs) entering the market, mobile data infrastructure improvements, the COVID-19 pandemic accelerating the shift toward online activities, and smartphone affordability are the leading reasons that can be listed as the reasons why internet access in Turkey improved.

The distance education applications transformed homes into educational environments and increased the impact of household opportunities on education, which changes according to social and economic conditions. During the distance education period in Turkey, 7,383,213 students actively used the EBA platform (MoNE, 2020). In the same academic year, there were a total of 18,242,881 students in primary, secondary, and high school education under the Ministry of National Education (MoNE, 2021b). Therefore, around 11 million students did not have a full access to the EBA system.

According to the EBA use data, 31% of the students accessed distance education via computer, 9% via tablet, and 60% via other mobile devices (ERG, 2021a). Table 4 shows the rates of internet, computer, and mobile phone/smartphone use among children aged 6–10 years in Turkey.

Table 4. Internet, computer, and mobile/smartphone use (6–10 years old)

6-10 Ages	2013 (%)	2021 (%)
Internet	36.9	76.7
Laptop	39.2	41.3
Tablet	8.2	66.0
Desktop	71.2	23.8
Mobile/smartphone	11.0	53.9

According to Table 4, while the rate of children using the internet was 36.9% in 2013, it became 76.7% in 2021. The rate of children using laptop computers was 39.2% in 2013, which rose to 41.3% in 2021. Children using desktop computers accounted for 71.2% in 2013 and 23.8% in 2021, respectively. Tablet devices accounted for just 8.2% of the total in 2013 but grew rapidly and became the most used device among students aged 6–10 by 2021 with 66%. Lastly, the rate of children using mobile phones/smartphones was 11% in 2013 but increased to 53.9% in 2021. According to the report published by The Economist Intelligence Unit (2021), an increase of 10% in the rate of schools with network connections increases the gross national product of countries by 1% as students' access to internet connections in and out of school promotes their academic success (Badasyan & Silva, 2018). While the rate of internet access remained at 39% in poor households with school-age children during the epidemic in Turkey, this rate remained at even lower levels in households with three or more school-age children (MoNE YEĞİTEK, 2020). Those most affected by the pandemic were vulnerable groups who had difficulties accessing education even before the epidemic (ERG, 2021b). Participating in online classes, doing homework, learning, playing games, watching videos from sharing sites, making audio and video calls over the internet, listening to music, and messaging are among the first seven activities for which children aged 6–10 use the internet. The ratios for these purposes are presented in Table 5.

Table 5. Internet usage purposes (6–10 years old)

Internet usage purpose	%
Attendance in online classes	85.6
Homework/learning	79.3
Playing games/downloading games	66.3
Watching videos from sharing sites	55.5
Voice/video calling over the Internet	42.7
Messaging	35.2
Listening to music	37.7

According to Table 5, participation in online classes is in the first place (85.6%), and recourse to the Internet for homework/learning is in the second place (79.3%) in the list of activities performed by children in the age group of 6–10 years using the Internet regularly. These are followed by playing games/downloading games (66.3%), watching videos from sharing sites (55.5%), voice/video calling over the Internet (42.7%), messaging (35.2%), and listening to music (37.7%). It can be concluded that 85.6% of children aged 6–10 years could attend online classes, whereas 14.4% do not even if they can. The reasons why children aged 6–10 years who regularly use mobile phones/smartphones vary according to years. While talking took first place among the purposes of mobile phone use in 2013, participation in online courses the second place in 2021. Cell phone/smartphone usage rates are given in Table 6.

Table 6. Cell phone/smart phone usage purposes (6–10 years old).

Years	Speaking	Online course attendance
2013 (%)	83.8	11.8 (the internet usage only, there are no data about online course attendance)
2021 (%)	56.4	75.6

According to Table 6, children in the age group of 6–10 years who regularly use mobile phones/smartphones used phones for talking at a rate of 83.8% in 2013, but that rate dropped to 56.4% in 2021. In 2021, talking became of second importance, and participation in online classes took priority with 75.6%. In Turkey, there were a total of 16,859,962 students in the 2020–2021 academic year (MoNE, 2021a). The ministry attempted to provide free tablets and internet for disadvantaged students and established the EBA support points to ensure equality in access to education for primary and secondary education students, who account for about 20% of Turkey's population, which is 84,680,273 people (TUIK, 2021). However, despite these improvement efforts, the opportunities for students in distance education remained insufficient to eliminate the inequalities in their access to education. Students' access to necessary devices and the internet was the determinants of their participation in education (ERG, 2021a). The data of the ministry concerning the EBA success rates of the Directorates of National Education according to the average duration of use of EBA in the provinces are presented in Table 7.

Table 7. EBA success rates of the Directorates of National Education according to the average duration of use of EBA in provinces

City	Student Without EBA Access	EBA Support Point	EBA Support Point Mobile	Total EBA Support Point	EBA Success %
Burdur	1.142	74	1	75	131.35
Kastamonu	5.001	240	1	241	96.38
Ankara	46.168	437	2	439	19.02
İzmir	68.547	512	21	533	15.55
İstanbul	143.953	631	3	634	8.81
Şırnak	50.142	25	0	25	1

According to Table 7, the province with the lowest number of students with no access to EBA is Burdur, which is in the Mediterranean Region with 1,142 students. The province with the highest number of students without access to EBA is Şırnak in the Southeastern Anatolia Region with 50,142 students. While the EBA success of the Burdur Directorate of National Education is 131.35%, that of the Şırnak Directorate of National Education is 1%. The success rates of the Directorates of National Education in Ankara (the capital city of Turkey), İstanbul, and İzmir – three major metropolitan cities – were 19.02%, 15.55%, and 8.81%, respectively. Although the highest numbers of EBA support points were established in İstanbul (634 points), 143.953 students could not access EBA. The province with the lowest number of EBA support points is Şırnak.

5. Conclusion

Worldwide internet use increased by 4% to 62.5% (We Are Social, 2022) due to COVID-19 and the increasing need for IT tools in education. However, this increase is not solely attributed to the pandemic. With people expected to interact with simulated realities and use digital tools for problem-solving (OECD, 2022a), the demand for digital literacy skills will continue to increase. Additionally, advancements in technology also contribute to the increase in ICT usage. It is predicted that ICT-supported education will become more prevalent in the future, and teachers' roles will evolve to guide students in navigating the digital information world (Unwin et al., 2017).

The pandemic has caused differences in the use of IT tools and the priority order of purposes. For example, while phones in Turkey were primarily used for talking (83.8%) by students aged 6–10 in 2013, they were used for participation in online courses (75.6%) in 2021 (TUIK, 2021). Smartphones have become one of the most important IT tools for accessing distance education. 60% of students have access to distance education via mobile devices (ERG, 2021a). This can be explained by the fact that mobile devices are found in almost every household since they are a fundamental part of our lives, and mobile devices have much more use cases than computers and tablets; except for being computers and making calls, they are also camcorders and gaming devices. Another reason for the increase in the use of mobile devices is that they are effortless to set up; often, with a few clicks, you are ready to go, not requiring a long process of installation or time-consuming help from the service.

According to the findings of Johns Hopkins University, World Bank, and UNICEF (2021), in low-income countries, methods involving a combination of two or more distance education methods were preferred because of unstable infrastructure. This can be explained by the fact that households with school-age children in low-income countries may not be able to access digital communication tools and regular internet subscriptions. According to the findings, the desktop computer uses rate of school-age children aged 6–10 years decreased by 47.4% from 2013 to 2021, but the laptop use rate increased by 2.1% (TUIK, 2013; 2021). Since they are portable, laptop computers are more comfortable to use than desktop computers, which explains this.

Laptops, tablets, and mobile phones are hardware-friendly devices. Mobile devices like them do not need multiple elements like desktop computers, and their power consumption is also low. For this reason, the Ministry of National Education distributed 664,157 tablet computers to students in the 2020–2021 academic years and provided 25 GB of monthly wireless internet support with these devices (MoNE, 2021a). Throughout this process, 7,383,213 students actively used the EBA system in the 2019–2020 academic year. In the same academic year, there were a total of 18,242,881 students in primary, secondary, and high school education levels of the Ministry of National Education (MoNE, 2021b). 5,328,391 of these students are at the primary school level. Looking at the numbers, it is evident that many students do not have regular access to the EBA system. As a result, 11 million students could not access the EBA system. This shows that 6–10 age group students have problems accessing the EBA system. The finding is crucial as it indicates that over half of the students aged 6–10 lack access to ICT. The finding strongly implicates disparities in information access and the growing learning gap among students. In addition, it can be concluded from the EBA success rates and regular internet use rates that there are differences between regions in Turkey. This indicates that ICT is affected by social and economic differences and the distinctions between rural and urban areas. Germany, as a developed country, can serve as an example in this regard. They were unable to implement distance education tools during COVID-19 due to EU data protection laws (Özenç-İra et al., 2021). This law states that data created within the borders of EU territory may not be exported (European Parliament and Council, 2020). This situation exacerbates the digital divide and exacerbates educational opportunity disparities. To prevent this, ICT opportunities should be offered to a wider population, especially in rural areas, and telecommunication infrastructure based on new technologies should be established. In addition, every student should be provided with opportunities to develop their ICT skills. When we examine the types of internet use among students aged 6 to 10, we can conclude that they require knowledge and skills to use the internet more productively.

6. Implications for Distance Education

To make distance education accessible to a wider student audience, platforms should be transformed into user-friendly learning environments. Lessons can be recorded and streamed with data-saving options to enable families with limited devices to follow their children's progress at different levels. Attention spans vary by age and can be improved by developing a new online priority program that is more engaging and less complex than traditional course content. This will encourage student participation and make distance education more successful.

In instances involving students hailing from socio-economically disadvantaged backgrounds or those unable to access the internet due to infrastructure deficiencies, the government may consider implementing offline and low-tech alternatives. These may include physical distributions such as printed booklets, USB drives, CDs containing pre-recorded lessons, educational content, or assignments, or materials accessed via radio, television, or pre-recorded lessons and materials. Alternately, one might consider investigating endeavors that offer subsidized or inexpensive tablets and laptops preloaded with educational materials, as well as developing offline-capable educational applications and platforms that enable students to engage in learning and accomplish assignments even in the absence of internet connectivity. Certain complimentary public Wi-Fi locations enable students or their guardians to download and utilize these materials without requiring an internet connection. To ensure that all pupils have equal access, the government may collaborate with non-governmental organizations to establish hardware and financial assistance programs. The digital divide can thus be avoided.

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