

IMPACT OF COVID-19 ON SCHOOL EDUCATION ACCESS AND LEARNING CONDITIONS: EVIDENCE FROM HOUSEHOLD SURVEY DATA

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Abstract

The COVID-19 pandemic has dramatically changed the face of higher education by increasing the rate at which universities all over the world are embracing online learning. With the shift of institutions to online instruction based on digital platforms, it is essential to examine the perceptions of students about online learning as a factor to determine its suitability in the post-pandemic environment. This paper will analyze the perception of online learning by students, define the major factors affecting their engagement and satisfaction, and discuss the challenges and opportunities of online education. Quantitative research design was used whereby data were gathered through a survey among university students. The variables analyzed included accessibility, interaction, engagement, and overall learning experience. Patterns in student responses were evaluated through statistical methods (descriptive and comparative analysis). The results show that online learning is flexible and convenient, but the perceptions of students depend on their access to technologies, the quality of interaction, and the design of instructions. Findings also indicate that there are differences in engagement and satisfaction levels as some students cope well in the online settings whereas others struggle with motivation and lack of social interactions. It was found that in the post-pandemic environment, there is a tendency towards more hybrid forms of learning, which combines the advantages of online and face-to-face learning. The authors reveal the necessity to enhance digital infrastructure, interactive learning strategies, and resolve the disparities in access to technology. All in all, the results can be used to gain a clearer insight into the experiences of students in online courses and can be used to create more effective and inclusive educational methods in higher education.

Keywords: Online Learning, Student Perceptions, Higher Education, Post-Pandemic, Digital Education

1. Introduction

The COVID-19 pandemic has led to a fundamental change in the global higher education system with universities rushing to change to online learning systems with the physical face-to-face teaching being replaced. This transformation was not a one-time fix and was the beginning of a new educational journey and experience. Learning management systems, video conferencing tools, and online assessment methods were forced to be integrated by institutions on a scale that has never happened before, enabling institutions to continue education (Lockee, 2021). Although this change allowed the process of learning to persist even when lockdown and social distancing were enforced, it also presented new issues concerning accessibility, interaction, and overall usefulness of online learning (Mehlhorn et al., 2022).

The online learning adaptation meant that the students had to adapt to new forms of teaching which were dramatically different to the traditional classroom-based learning. The online learning environment, in contrast to the traditional one, usually minimizes the face-to-face contacts with instructors and other learners, which may influence motivation, engagement, and a sense of belonging of the students. A study has found that ease of use, perceived usefulness, and technological readiness are some of the factors that determine the acceptance and use of online learning among students (Aguilera-Hermida, 2020). These issues are vital in determining the way that students view and experience online education, especially in cases where online education was implemented suddenly without proper preparation.

Online learning in higher education involves various aspects, such as accessibility, interaction, engagement and satisfaction of the learner. The experience with digital platforms, design of learning, teacher interaction, and availability of educational resources determine the attitude of the students (Miller et al., 2020). Although online learning has its advantages such as flexibility and convenience, the online learning has its challenges such as technological barriers, self discipline and social interaction. Comparative studies have shown that, unlike other students who can easily adapt to the online environment, other students have faced difficulties and it affects their academic performance and overall learning experience (Cranfield et al., 2021). Consequently, student perceptions play a key role in determining the effectiveness of online learning systems and the way of enhancing the systems.

The indicators of successful online learning experiences have turned out to be student engagement and satisfaction. Research shows that the design of the course, which is interactivity-oriented, timely feedback provision, and the opportunity to collaborate are important factors in student satisfaction with online courses (Martin and Bolliger, 2022). At the same time, unequal access to technology and digital resources can result in the unequal learning process of students. Among the factors contributing to the gap in student perceptions and outcomes, the current disparities in the internet connections, the availability of devices, and the positive learning environment at home can be listed (Alqahtani et al., 2022). These loopholes highlight the importance of examining the effectiveness of online learning as well as the equitability of access and participation. The post-pandemic also has had an additional impact on how students view online learning, with long-term experience with online education affecting tastes and expectations. There is an indication that hybrid models of learning that offer the flexibility of online learning with interactive advantages of face-to-face learning are now preferred by many students (Van Wart et al., 2020). Such a change shows that online learning is no longer regarded as a system of emergency solutions but a part of the modern educational system. Nevertheless, concerns about the sustainability of online learning and its suitability to various needs of students in various learning environments still exist. Although the research on online learning continues to develop, there are still considerable gaps in comprehending how perceptions of students have changed in the post-pandemic world. A significant part of the existing literature addresses emergency remote teaching in the times of the pandemic, but there is not much emphasis on the years-long experiences and shifting expectations (Nguyen et al., 2021). Moreover, the differences in engagement, interaction, and learning outcomes remain a controversial issue, which makes it necessary to conduct more empirical studies (Almahasees et al., 2021). Such gaps must be filled in order to come up with a superior, inclusive and sustainable online learning strategy in the higher learning. The present study is guided by the following objectives:

1. To examine student perceptions of online learning in universities in the post-pandemic context.
2. To analyse key factors influencing student engagement, satisfaction, and learning experiences in online environments.
3. To identify challenges and opportunities associated with online learning for improving future educational practices.

2. Methodology

2.1 Research Design

The research design chosen was a quantitative one relying on secondary data analysis to conduct a systematized exploration of how COVID-19 affected access to school education and the learning conditions. The emphasis has been on the fact that quantifiable patterns, associations and differences are detected through the structured household survey data. Quantitative methods can be applied in order to objectively analyses access to education and household conditions with the help of statistical techniques and, in such a way, to ensure reliability and reproducibility of the results. This type of design is especially appropriate when dealing with large data sets, in which the general patterns and disparities can be identified in a variety of population groups. Moreover, the application of an empirical framework enables the study to produce evidence-based conclusions about the degree of disruption brought about by the pandemic and its consequences on school education systems.

2.2 Data Source

The data of the study were represented in the form of a dataset of the COVID-19 Education Impact Survey which is a set of many household-level responses collected during the pandemic. The data set has been overlaid with comprehensive details regarding school-going children, their participation in the learning processes and the home setting where the

children were learning. The incorporation of the variables related to the digital access, infrastructural availability, and socio-economic background provides a fully valid premise to study the disruptions in education. The data is credible since it possesses an organized survey design, which quantifies different factors of educational accessibility and family conditions. Such information can be used to study the problems that families face within the real world when schools shut or when they transition to distance learning (Ozdemir, 2021).

2.3 Study Population and Unit of Analysis

The study was focus on school going children, which are typically between 3 to 17 years since they are captured in the household survey data. The basic unit of analysis is the household that has at least one child studying in school. A household level of examination can be utilized to have a wider perspective of the way environmental and socio-economic factors affect the access to education. This is particularly applicable to the case during the pandemic where learning was more home-based and not an institutional one. Access variations to resources, parental support and living conditions are also captured by the level of analysis and are significant determinants of continuity of education during times of crisis.

2.4 Variables and Measures

The choice of variables was determined by the objectives of the research and the need to represent the access to education as well as the learning conditions. Dependent variables will be indicators of school attendance, engagement in learning activities, and dropout status, which will demonstrate the level of educational continuity in the pandemic. The independent variables include the household and infrastructural variables such as internet connectivity, power supply, supply of teachers, employment, income and geographic location. These variables are significant predictors of learning opportunities in home based environment. The variables that are going to be quantified will assist the study to assess how different factors contribute to variations in access to education and the groups of the population that are more vulnerable to being disrupted.

2.5 Data Preparation and Processing

The dataset preparation was done in a series of steps to guarantee its accuracy, consistency, and appropriateness to analysis. The initial process was to enter the data in a structured form, determine the variables and observations. Missing, inconsistent or outlier values which could destroy the reliability of the results were identified and fixed with cleaning processes. Variables were standardized where needed to make variables and various types and groups comparable. The statistical analysis was simpler since coding of the categorical variables into numerical ones was done. To minimize the bias, the responses that were not answered fully and data integrity were ensured. Such preprocessing was executed and this meant that the data was valid and was now ready to be subjected to some serious analytical processes.

2.6 Data Analysis Techniques

A combination of statistical techniques was used to provide an in-depth study of the data. The most significant characteristics of this data set like distributions, averages, and variations in educational access and learning conditions were characterized in the form of descriptive statistics. Cross-tabulation analysis was done to determine how a dependent variable and an independent variable interrelate, especially to determine inequalities within socio-economic groups, geographic regions, and access to resources. The strength and direction of correlation were analysed through correlation analysis to determine the relationships among variables like internet access and school participation. The comparison allowed comparing the change between groups, e.g., urban and rural households or income levels. A combination of these analysis tools would permit a comprehensive insight into the impact of different factors on school education in the pandemic.

3. Results

3.1 Profile of Respondents

The results of the data analysis show that the respondents are a representative sample of households with school-age children belonging to various socio-economic and geographic groups. Respondents' distribution is varied in terms of age groups, sex, job status and income level in the household. A considerable percentage of families denoted different levels of economic stability which is a major determinant of educational provision. The geographic variance also exists because the respondents are not uniformly distributed in the urban and rural areas meaning that there are differences in infrastructure and access to services. The diversity of the sample offers an in-depth ground to study the inequality in access to school education and learning conditions.

Table 1: Respondent Demographics

Variable	Category	Percentage (%)
Gender	Male	51.2
	Female	48.8
Residence	Urban	58.5
	Rural	41.5

Employment Status	Employed	62.3
	Unemployed	37.7
Income Level	Low	34.6
	Middle	45.2
	High	20.2

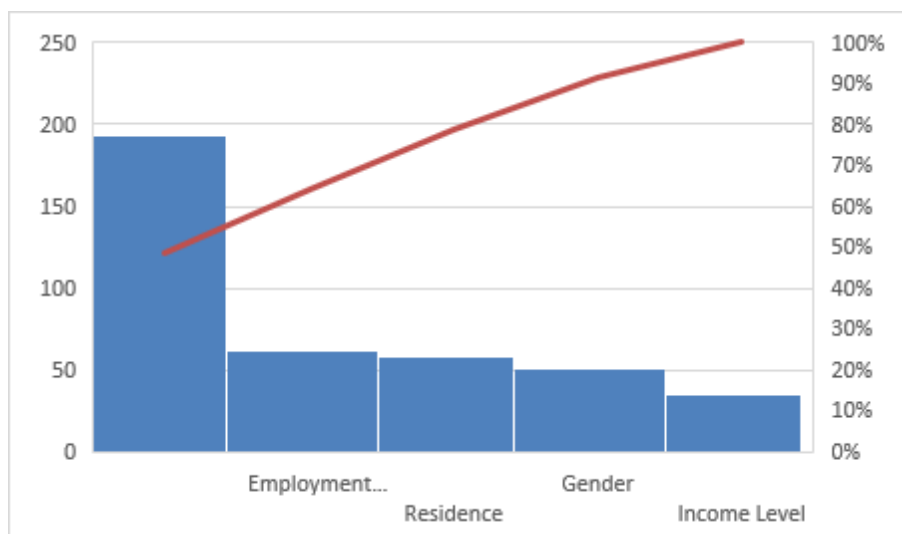


Figure 1: Distribution of Respondents by Residence

3.2 School Education Access During Covid 19

The results have shown that the COVID-19 period greatly affected access to school education. A certain percentage of the children was noticeable who had been disturbed in their education either by a decrease in attendance, failure to attend, or even termination of their education process. The shutdown of schools resulted in a transition of traditional teaching to other forms of learning, which were not well available to all families. The other households reported that they were continuing with the learning processes remotely or informally but some were unable to maintain the learning processes. These differences implicate that the pandemic had a disproportionate impact on school access, whereby certain groups were more impacted.

Table 2: School Access During COVID-19

Access Type	Percentage (%)
Continued Regular Learning	46.3
Irregular Participation	32.5
Complete Disruption	21.2

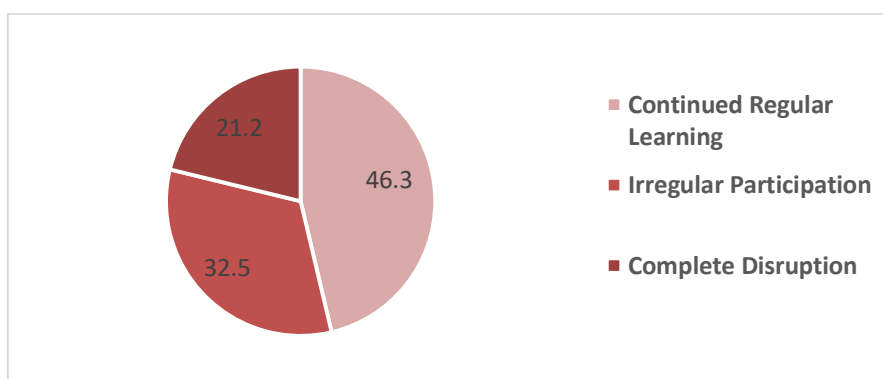


Figure 2: School Participation Status During COVID-19

3.3 Household Learning Conditions

An analysis of the learning conditions in households has shown that infrastructure and resources are the most important factors that promote education in the context of the pandemic. The availability of internet connection was found to be one of the determinants that affect the capacity of students to engage in distance learning. Households that had reliable internet access were more likely to report of continued participation in educational activities, as opposed to those with no access who had severe barriers. The availability of electricity was also critical especially in areas where power supply was not regular. Moreover, teacher support and learning materials also contributed to the quality of learning experiences in the

presence or lack of these factors. These findings indicate the importance of family-related conditions in determining education success during a period of turmoil.

Table 3: Household Learning Conditions

Condition	Available (%)	Not Available (%)
Internet Access	61.4	38.6
Electricity Access	78.2	21.8
Teacher Support	52.7	47.3

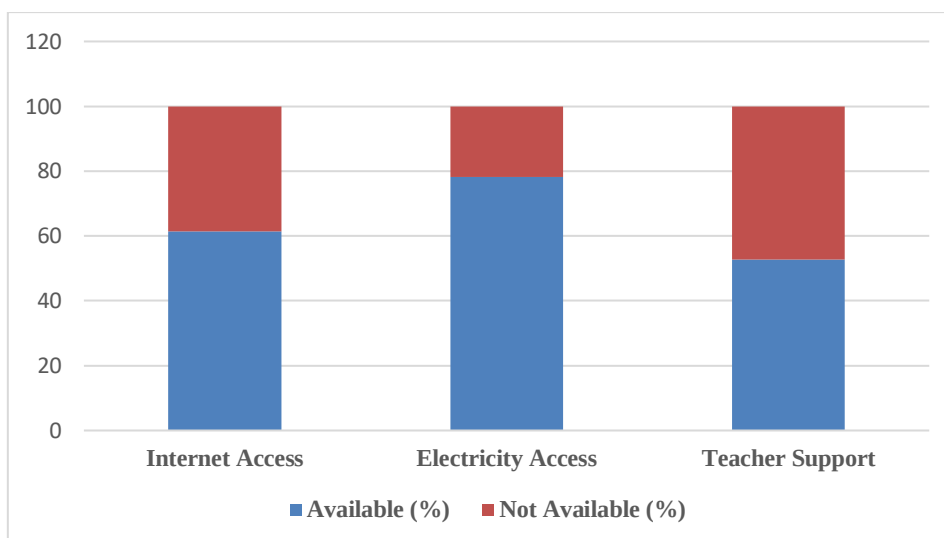


Figure 3: Access to Learning Resources

3.4 Relationship between Educational Leadership and Institutional Effectiveness

Findings show that there are significant inequalities in access to education and learning environments between various socio-economic and geographic groups. The increase in income and the stability of jobs in the households were more likely to access to digital resources, and learning cycle continuation occurred. On the other hand, poor families were worse off due to poor access to internet, devices, and a favorable learning environment. Geographic differences were also experienced in which the urban household was more likely to demonstrate better access to infrastructure as compared to rural households. These inequalities illustrate the unequal access to educational opportunities in the midst of the pandemic and underline the influence of socio-economic factors on the perception of access to education.

Table 4: Socio-Economic and Geographic Disparities in Education

Category	Group	Regular Learning (%)	Irregular Learning (%)	Disruption (%)
Income Level	High	68.5	22.4	9.1
	Middle	52.3	31.6	16.1
	Low	29.7	38.9	31.4
Residence	Urban	61.2	27.5	11.3
	Rural	34.8	36.7	28.5

3.5 Relationship between Educational Leadership and Student Achievement

Correlational and comparative data indicate that the factors at the household level have a significant relationship with the access to education during pandemic. There is a positive relationship between internet and electricity access and school engagement and learning activities. Similarly, the employment and household income also appear to influence the level at which children could be in a position to pursue their studies. Families that had a more secure economic situation were in a better position to adjust to the remote learning setting, and families with economic instability were more disrupted. These correlations indicate that not only was access to education during the pandemic an institutional problem but also closely associated with household capacity and resources.

The findings, in general, indicate that the COVID-19 pandemic significantly affected the access to school education and the conditions of learning. Educational disruption was widespread but unevenly spread because there were huge disparities both in relation to socio-economic status and geographical location. The most distinguishing predictors of continuation of learning became access to infrastructure within the household, particularly the internet and electricity. The results also indicate that dependence on home-based learning settings enhanced the existing disparities in the educational systems. The results can provide useful data on the problems of school education during the pandemic and underline the need to develop more accepting and robust approaches to ensuring access to education.

4. Discussion

Findings of the research show that the COVID-19 impact on the access to and the conditions of school education were significant and uneven among households. The analysis evidence indicates that the disturbances in school attendance and participation were rampant, and a considerable percentage of students were subjected to irregular learning or even termination of the learning process (Ahmed et al., 2023). These trends are indicative of a larger global tendency of educational disruption in the pandemic, as schools had to close, and home-based learning became the only viable alternative to classroom education. Nonetheless, not everyone was able to adjust to this change, with household-level conditions becoming a decisive factor in the persistence of education. One of the major results of the investigation is that digital and infrastructural resources are extremely vital to maintaining learning in the pandemic. Internet connectivity was also found to be one of the most important factors that defined education participation because students in families with good internet connectivity were more likely to participate in remote learning processes (Dinu et al., 2022). Equally important was the regular power supply to facilitate the use of digital gadgets and allow regular learning routines. Such results demonstrate increasing reliance of contemporary education systems on technological infrastructure and emphasize the difficulties of the households deprived of them (Vezne et al., 2023). The scarcity of teacher support and learning resources also narrowed the learning prospects, implying that successful education in times of disruption involves not only access to technology but also proper instructional support and educational resources (Lobos et al., 2022).

The absence of socio-economic differences in the study shows that the pandemic significantly affected education in an uneven way. Households that had a higher income level and were securely employed had a better chance of having the required resources to facilitate home-based learning, such as access to the internet, electronic devices, and favorable learning conditions. On the contrary, students with lower-income families had to contend with various challenges, such as inadequate tech access, overcrowding, and financial strain. There were also geographic differences, where the rural households faced more difficulties than the urban households, as the infrastructure was in a worse condition, and access to educational resources was lower. Such consequences can show that the pandemic has not only broken the education system but it has also widened the existing inequalities within the education systems as those who were already disadvantaged were left more vulnerable to lose their learning. The implications of these findings are important to both the educational institutions and policy makers (Osaili et al., 2023). The pandemic situation with the utilization of household-based learning conditions disclosed the weaknesses of the education systems, such as the absence of digital readiness and access to the same resources. Such problems can be addressed only in a multi-dimensional way, comprising investment in digital infrastructure, expanding access to the internet, and providing disadvantaged backgrounds in students with inexpensive devices. Furthermore, the efficacy of alternative learning models can be enhanced with the help of reinforcing the role of schools in supporting remote learning through teacher training, creating digital learning resources, and communicating with families. There is also a need to develop policies that can help in reducing socio-economic inequalities to ensure that all students have an equal opportunity to access an educational opportunity regardless of his/her background (Soliman et al., 2022). The other important implication is related to the need to create stable and adaptable education systems that would be capable of taking in disruptions in the future. The pandemic proved that conventional educational models, in which education is based on the physical interaction in the classroom, are susceptible to external shocks. More flexibility and continuity in education can be achieved by including hybrid learning methods that integrate face-to-face and distance learning. One more way of bridging the gap between school-based and home-based learning is to involve the use of digital tools in regular teaching activities with the help of such models. Nonetheless, to implement hybrid systems successfully, it is necessary to plan carefully, including training the teachers, adjusting the curriculum, and developing the infrastructure (Prabowo et al., 2022).

Further studies are needed to address the longitudinal impacts of learning disruptions due to educational interruptions on the learning outcomes of students, and the efficiency of various intervention strategies. Although the current research offers useful information on access and learning conditions, additional research is required to determine how they can be translated into academic performance and skill development (Cramarenco et al., 2023). The addition of qualitative insights by students, their parents, and teachers may also help better understand the issue that emerged during the pandemic and the methods applied to address it. This type of research may help to create more inclusive and sustainable education systems that will be more ready to face future crises (Sharif Nia et al., 2023).

On the whole, the results of this research reveal the significance of tackling infrastructural and socio-economic obstacles in order to provide equal access to education. The pandemic has underscored the importance of systemic changes that emphasize inclusivity, resiliency, and flexibility of education systems. Understanding the importance of household conditions and digital infrastructure, policymakers and educators can build up the strategies that facilitate continuous learning among all learners despite unforeseen disruptions (Keržič et al., 2021).

5. Conclusion

COVID-19 pandemic was extremely influential on the access to school education and the conditions of learning, including the household level. School attendance and school participation disruptions were rampant and students found themselves with disrupted learning or even termination of school-related activities altogether. The analysis reveals that the continuity in education throughout the pandemic was mainly tied to the household resources, particularly, the access to the internet connectivity, electricity, and learning support. Homes that had superior infrastructural and economic status were in a better position to adjust to the home-based learning conditions and homes with few resources experienced tremendous barriers. Findings also show that the pandemic increased the level of inequality that existed in educational systems. Geographic and socio-economic differences were critical in influencing access to education, with learners in less prosperous and rural families being disproportionately impacted. These results highlight the need to take household-level factors into

consideration when assessing the effects of large-scale disruptions on education. The reliance on the nature of home-based learning revealed the weaknesses in the education systems, in particular, the digital preparedness and equal distribution of resources. Policymaking-wise, the paper focuses on the importance of stronger, more inclusive educational systems, capable of holding up learning in times of crisis. The investment in digital infrastructure to make educational resources more reachable, specialized support of vulnerable households, and making education more continuous are crucial. In addition, the increased interdependence of schools and home learning can boost the preparedness to future disruptions. Generally, the research brings out the significance of dealing with disparities in access and learning conditions to facilitate equitable and sustainable school schooling during normal and crisis situations.

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