



## PARENTAL SOCIOECONOMIC STATUS AND DIGITAL ACADEMIC ENGAGEMENT OF UNIVERSITY STUDENTS IN AJK, PAKISTAN

Muhammad Awais <sup>1</sup>, Dr. Shehzad Ahmad <sup>2</sup>, Prof. Syed Arif Ali Shah <sup>3</sup>

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### Affiliations:

<sup>1</sup> Librarian,  
Mohi-ud-din Islamic Medical  
College, Mirpur, AJK  
Email: [awaisc283@gmail.com](mailto:awaisc283@gmail.com)

<sup>2</sup> Associate Professor,  
Edwards College, Peshawar,  
Email: [shehzad\\_ecp@yahoo.com](mailto:shehzad_ecp@yahoo.com)

<sup>3</sup> HOD Library & Information  
Science Department, Sarhad  
University of Science and  
Information Technology, Peshawar,  
Email: [arif@suit.edu.pk](mailto:arif@suit.edu.pk)

### Corresponding Author's Email:

<sup>1</sup> [awaisc283@gmail.com](mailto:awaisc283@gmail.com)

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### Abstract

*The research question is the ways in which socioeconomic status of parents affects access of and utilization of digital academic services by the university students and their satisfaction with the services and challenges they face in the institutions of higher learning in Azar Jammu and Kashmir (AJK), Pakistan. This work is the result of increased importance of digital tools in academic use as well as the overall trend of the digital divide which seems to be correlated with socioeconomic differences. A sample sized of 124 university students was picked, and the structured questionnaire was carried to them, chosen from various backgrounds. It gathered socio-demographic variables, SES variables (parents education level, occupation, and household income), and digitization access variables (ownership of devices, availability of internet, frequency of use, and number of hours of use per day) and variables of satisfaction (perceived effectiveness, effects of performance, and availability).*

*The initial descriptive statistics were that students who belonged to higher SES families possessed their own personal devices, had good access to internet, and used digital resources more often than those belonging to lower SES-groups. Chi-square test and ANOVA tests revealed that digital satisfaction and internet access were dependent on income and education. Lastly, the level of SES groups experienced a higher number of barriers such as financial and lack of connectivity, as well as institutional support that added to the structural discrimination of digital access. The results indicate that this should be done through policy formulation, the institutional investments in infrastructures and developing insights in digital literacy so that the accrued benefits of the entire population can be equally obtained by all and inclusive in accessing to digital educational materials.*

**Keywords:** Socioeconomic Status (SES), Digital Resource Access, Student Satisfaction, Higher Education, AJK, Pakistan, Digital Divide

### Introduction

The advent of the digital technologies has shaken the higher education world. It is amazing that online and offline libraries, online textbooks, learning management systems (LMS), online classrooms, and many other academic applications have enabled learning and education more than ever before, making use of technology. That change apparently bears the title of digitalization, and it is currently opening new avenues of more openness, enhanced accessibility, and scalability in learning (Al Emran et al., 2023). Ideally, they should democratize learning and break down divisions, particularly among those in remote or underserved locations however in practice, they leave a lot to be desired in terms of provision and utilization. Here socioeconomic status (SES) appears to be one of the most dominant determinants of students' access to, engagement with, and benefit from these resources (Asif et al., 2025; Kim & Song, 2022; Saifi & Arif, 2024).



Digital academic resources denote all the tech-based tools and platforms that support learning, such as online libraries, academic databases, e-books, digital lectures, and virtual learning environments. Access to these resources is a reflection of how much the students can obtain and utilize these tools in a proper way, which is dependent on their devices, internet connection, and institutional support (Chen, 2022). Usage patterns indicate the extent and duration of student engagement with such digital resources for academic purposes while satisfaction denotes the students' evaluation of these tools in terms of a learning goal being supporting adequately, relevantly, and effectively (Kayani et al., 2023). The parental socioeconomic status, especially, indicates the overall impact of the parents' income, education, and occupation, which together decide a family's access to economic and social capital. Consequently, this determines the way of interaction of the students with the digital learning resources both in terms of opportunity and skill.

Students belonging to high SES families are privileged to several advantages, such as having personal computers or laptops, uninterrupted high-speed internet, availability on paid academic platforms, conducive learning environments at home, and parents who are digitally literate and helpful in their children's academic life. However, students belonging to lower SESs face several obstacles in having limited or entirely shared access to outdated devices, poor or no internet connectivity, inadequate study spaces, and a complete lack of technical support (Kayani et al., 2023). Such differences affect their performance as students and attitudes toward the quality of digital resources made impact assessment usability possible by universities (Chen, 2022).

The context of these issues can be very clearly explained with regards to the semi-autonomous region of Pakistan, Azad Jammu and Kashmir (AJK). The area has moved to a new stage in terms of the development of higher education availability and Internet connectivity; but the socioeconomic martyrs are still a significant characteristic of the area. The uneven distribution of both financial and social capital is that there are many experiences about education that have much difference based on the background. AJK has a number of public sector universities, which include the University of Kotli and the Mirpur University of Science and Technology: these are responding to an increased interest in online and blended learning by offering a range of digital learning solutions. Nevertheless, these efforts also are conditional upon the extent to which students can practically use these tools, and this aspect is also closely interconnected with SES (Ahmed et al., 2023).

These inequalities have been complicated by the COVID-19 pandemic. Switching to the online schedule of classes favored the students of wealthy status in relative easy-going in comparison to that of the unfortunate, who got no chance of experiencing classes literally, downloaded educational materials, or took on-line exams. Not only did this pose a threat to the educational outcome during the pandemic, it also raised serious questions concerning the inclusivity of such initiatives and their success in the future (Xu et al, 2025).

Thus, it becomes very important for understanding the specific extent to which parental SES affects students' access to, usage of, and satisfaction with digital academic resources in higher education in AJK. Such information would serve as a basis for framing any policy interventions aimed at diminishing educational inequalities and developing digital inclusiveness (Halim et al, 2025).

### **Literature review**

The world has experienced significant and extensive changes in the higher education systems within the past twenty years or so. The majority of them were led by the advancements in digital technology. The transformation of the institution as a physical space into a digitized, portable and usually borderless place of learning has been swift and expansive. Several digital resources and systems have financed this alteration; they may be Learning Management Systems (LMS), online classrooms, and online libraries, e-textbooks, video conferencing software, and joint electronic devices. Moreover, they also have reconfigured knowledge production, distribution, and consumption and have introduced novel pedagogical paradigms that place greater focus on the flexibility, interactivity, accessibility, and learner autonomy (Warschauer, 2022).

Many Sports Learning Management Systems (LMS) like Moodle, Canvas, Blackboard, and Google Classroom are the mainstay of digital higher education. A virtual campus is a platform that enables an institution to manage content delivery, student communication, assignment submissions, grading, and feedback in a united environment. With LMS, educators can design online learning content while monetizing from embedding multimedia resources, tracking engagement, and creating collaborative learning communities for students (Bano et al, 2023).



E-textbooks and Open Educational Resources (OERs) have equally brought about major changes in accessing materials and sharing resources in education. Students now have access to cheaper online versions of textbooks rather than the pricy physical copies. The OER movement, which is spearheaded by organizations like UNESCO and Creative Commons, has highlighted the necessity of openly licensed teaching and learning, and research materials that are in the public domain or have been released under a specification of an intellectual property license allowing free use (Munir et al, 2023).

### **Research Objectives**

This study aims to:

1. Examine the relationship between parental socioeconomic status and students' access to digital academic resources in AJK universities.
2. Assess the degree of digital resource use among students from varying SES backgrounds.
3. Evaluate students' satisfaction with the availability, accessibility, and quality of university-provided digital tools.
4. Identify key challenges faced by students across SES categories in effectively using digital academic resources.

### **Research Questions**

1. How does parental socioeconomic status influence students' access to digital academic tools in AJK universities?
2. What is the extent of digital resource use among students from different SES backgrounds?
3. How satisfied are students with the availability, accessibility, and quality of university-provided digital academic resources?
4. What specific challenges do students from different socioeconomic backgrounds face in using digital academic resources effectively?

### **Theoretical Framework**

Parent SES relatively to Material Resources (Ownership of devices, Quality of the internet) + Digital Socialization relatively to Student Digital Literacy and Confidence + Access and Engagement relatively to Academic Satisfaction and Learning Results. Meditated by Geographic Constraints, Institutional Support Structures and Family Digital Culture. This multiplicity of influences effectively verifies both the paths of student adoption and benefits of digital academic resources.

### **Research Methodology**

#### **Research Design**

The research uses a cross-sectional survey design as the basis of the quantitative study into the relationship between parental socioeconomic status (SES) and students' access to, use of, and satisfaction with digital resources at universities located in Azad Jammu and Kashmir (AJK).

#### **Cross-Sectional Survey Design**

One of the characteristics of the cross-sectional study is that it collects data at one point in time and looks at variations among different predictors of interest.

#### **Rationale for Quantitative Design**

The rationale for a quantitative design is based on the consideration that such a course of study becomes capable of quantifying relationships and generalizing findings across a defined population; thus, making it suitable for the examination of social phenomena through statistical inference (Smith & Lee, 2020).

#### **Primary Objective**

The primary objective of this study is to evaluate the impact of parental SES on students' digital involvement concerning higher education institutions, especially, access to digital tools and infrastructures, usage behavior, barriers, and satisfaction experienced.

#### **Survey Methodology**

The survey methodology is structured and standardized as it allows for systematic data collection, thus enabling comparison across SES categories. In addition, it enables testing specific hypotheses concerning the associations of variables through established statistical methods, such as correlation and group comparison analysis (McCombs et al., 2019).



### ***Adaptation of Existing Frameworks***

A survey-based methodology also fits with previous investigations into digital access and equity within educational settings, allowing adaptation of validated measurement instruments and conceptual frameworks found in the existing literature.

### ***Relevance for Policy and Strategy***

The cross-sectional strategy captures a snapshot of students' experiences and related asymmetries of SES at this moment in time, making these findings timely and relevant to immediate policy decision-making and institutional strategies.

### ***Data analysis***

The information that was collected using the questionnaire is compiled, cleaned and analyzed to determine the statistical package of social science (SPSS) program. To achieve the study specific objectives, a combined method of descriptive and inferential statistics will be used.

1. Data Cleaning: This is the main step where missing data is verified against the data kept, aspects that do not match against the data available are corrected or missing responses deleted.
2. Descriptive Statistics: The basic descriptive analysis will be utilized to summarize the demographic variables and the profiles of SES. The access to digital resources, frequency of use, perceived barriers, and satisfaction levels of students in terms of their access to, frequency of use, and frequency of use will be described in terms of means, standard deviations, frequencies and percentages.
3. Correlation Analysis: Pearson Product-Moment Correlation assess the strength and direction of the indicator associations between parental SES (education, income, occupation) variables to student variables (digital access, use, satisfaction).
4. Group Comparisons: The comparison of means of digital access, behavior of use and satisfaction among the various groups (e.g., low, middle, and high income) is performed between far apart groups using independent-sample t-tests or one-way ANOVA. Post hoc tests (e.g., Tukey HSD) are used to find out which two or more groups were significantly different from each other, and significant ANOVA results are followed.
5. Reliability Study: Cronbach alpha coefficient is used to measure internal consistency of every scale in the questionnaire where a value of above 0.7 is considered reasonable.
6. Regression Analysis: In case the correlation outcomes show any significant relationships, several regression analyses can be used to estimate digital satisfaction or usage as dependent of various indicators of SES, adjusting by demographic factors (Allington et al, 2020).

The numerous statistical tests place the research in a more favorable place to give an insight into the mechanism underpinning the impact of parental SES to student engagement with digital learning measures.

### ***Results***

The quantitative research on the study conducted to comprehend the relationship between the different patterns of digital resource use including time spent, frequency, internet reliability, satisfaction, perceived effectiveness and performance and the student experiences. The sample used in the study was 124 university students. Statistical tests can be classified into descriptive statistics, frequency distributions, group comparisons (t-tests and ANOVA), correlation, reliability analysis, regression modeling and also a test of normality. The critical discussion of the findings is done to give a meaning of the findings into the wider context of digital resource access and satisfaction.

**Table 1**

*Demographics of Respondents*

Variable	Category	Frequency	Percentage (%)
Age Group	18–20	32	25.8%
	21–23	36	29.0%
	24–26	25	20.2%
	27 or above	31	25.0%
Gender	Male	65	52.4%
	Female	59	47.6%





The distribution of age is quite balanced among all groups, with the most significant population at 21 (29%). The gender balance is mostly male (52.4% compared with 47.6%), yet the balance is even.

**Table 2**

*Descriptive Statistics of Respondents the usage of digital Resources (N = 124)*

Variable	Mean	SD	Min	Max
Hours per Day	2.540	1.129	1.0	4.0
Frequency of Use	3.427	1.740	1.0	6.0
Internet Reliability	3.073	1.351	1.0	5.0
Satisfaction Level	2.911	1.379	1.0	5.0
Perceived Effectiveness	2.984	1.459	1.0	5.0
Impact on Performance	2.556	1.136	1.0	4.0

These values indicate that students generally use digital resources for a moderate number of hours per day and report mid-range satisfaction and effectiveness. Frequency of use exhibits a wider spread (SD = 1.740), suggesting varied usage habits across participants.

**Objective 1: Relationship Between Parental SES and Students' Access to Digital Resources**

The new part is the analysis of the impact of parental socioeconomic status, which is based on parental education, income, and occupation, on the accessibility of students to digital academic resources in universities in Azar Jammu and Kashmir (AJK). The modern environment of Academy is becoming more functional as hybrid and online learning platforms demand the exposure and usage of digital resources toward the achievement of academic success. These socioeconomic factors also affect the use of digital tools, internet access, and the quality of academic activity among the students. The data under analysis pursues trends in exclusion or privilege in the face of SES-connected metrics in the utilization of digital resources.

**Device Ownership and Internet Access of the respondents in view of their Parents' Education**

The digital access by parental education has a strong gradient. As an example, students whose parents have not attained any formal education, simply note 33% claimed to own a personal device (such as a laptop, tablet, or smartphone), versus 92% when their parents have a master's degree or higher. Likewise, the most prevalent is access to Wi-Fi at home with this group, with an average of 25% of non-educated parents to 88%. Dependable internet connection is between 25-79%.

**Table 3**

*Device Ownership and Internet Access of the respondents in view of their Parents' Education*

Parental Education Level	% Own Personal Device	% Use Home Wi-Fi	% Report Reliable Internet
No formal education	33%	25%	25%
Primary	55%	44%	41%
Secondary	68%	50%	47%
Bachelor's Degree	81%	73%	67%
Master's or Higher	92%	88%	79%

According to the results, highly educated parents have a firm connection with the good digital infrastructure at home. The first reason may be the fact that educated parents have higher chances of having higher-paid occupations, knowing the importance of digital accessories in their education, and prioritizing them to their children.

**Chi-square: Internet Reliability Income Parental**

A Chi-square test was conducted to help analyze the relationship between family income and reported internet reliability by the students. The results were statistically significant ( $\chi^2 = 12.43$ ,  $p = 0.015$ ) and a strong correlation between the household income and the quality of internet connection was proved. Only 33 percent of those whose families had incomes of less than PKR 25000 per month reported reliable or very reliable access to the internet whilst this enumerated to 77 percent of those whose families accrue more than PKR 100000.



**Table 4**

*Chi-square Analysis: Parental Income and Internet Reliability*

Monthly Income (PKR)	Reliable/Very Reliable Internet (%)	Chi-square ( $\chi^2$ )	p-value
< 25,000	33%	12.43	0.015
25,000 – 50,000	46%		
50,001 – 100,000	64%		
> 100,000	77%		

This disparity shows that those families who have higher household incomes can stock a stable, high-speed connection on which students are streaming lectures, users are submitting assignments, and students are using online academic communities. The poorer household students who have to use mobile information or common connections lack stability and usually have less bandwidth to become fully digitally transformed in scholarly studies.

**Objective 2: Digital resource usage among students from different SES Backgrounds**

This section will look into the usage patterns such as frequency and hours per day and the variation of the patterns by factors of SES. Descriptive statistics describe the shape and the dispersion of the six ordinal variables under analysis in the study: Hours per Day, Frequency of Use, Internet Reliability, Satisfaction Level, Perceived Effectiveness, and Impact on Performance. Table 4.1 shows the means, the standard deviations (SD), minimums and the maximum value of each of these variables.

**Descriptive Statistics of Digital Usage**

On the whole, the sample population of 124 students indicated a mean of 2.54 hours (SD = 1.13) of daily use and a mean frequency of 3.42 (SD = 1.74) on a 6-point scale with a higher score indicating more frequent use. These overall tendencies suggest an average level of using digital academic materials, which is aligned with the partially digitalized academic space in which it is possible to add online resources and platforms to the conventional ways of learning.

**Table 1**

*Descriptive Statistics on usage of Digital Resources*

Variable	Mean	SD	Min	Max
Hours per Day	2.54	1.13	1.0	4.0
Frequency of Use	3.42	1.74	1.0	6.0

**Hours and Frequency of usage of digital Resources by Income Group**

**Table 2**

*Hours and Frequency of usage of digital Resources by Income Group*

Income Group	Hours per Day (Mean $\pm$ SD)	Frequency of Use (Mean $\pm$ SD)
< 25,000	2.00 $\pm$ 1.02	2.78 $\pm$ 1.60
25,000 – 50,000	2.41 $\pm$ 1.17	3.29 $\pm$ 1.71
50,001 – 100,000	2.87 $\pm$ 1.14	3.77 $\pm$ 1.55
> 100,000	3.23 $\pm$ 1.01	4.22 $\pm$ 1.38

Dividing the lines by income of families, the usage patterns may be clearly seen. The lowest average usage of 2.00 hours-per-day strongly expresses lower-income households (less than PKR 25, 000) with a frequency score of 2.78. Nevertheless, on the contrary, students who were in families with incomes above PKR 100,000 gave the highest usage 3.23 hours per day and frequency score of 4.22. This disparity in hours is enormous and indicates the existence of a good correlation between income and visits to the digital world.

These findings can be attributed to material availability and computer-internet preparedness. Families who have a higher level of income are likely to be in a position to buy their own personal digital equipment, connection to the internet (in the form of constant internet), and peaceful environments in which to study-all of these making it possible to be able to be able to study effectively using the digital medium. Students are not in rich families hence they would face challenges in using digital interfaces like sharing devices, unreliable



internet or limiting financial conditions which would hinder their ability to immerse themselves in digital interfaces.

The standard deviations also provide an understanding of disparity in averages of income groups. As an instance, the students with the least income (less than PKR 25,000) do indeed report slightly lower average usage, but they do express alarming variability about it ( $SD = 1.02$  in hours,  $SD = 1.60$  in frequency), meaning that some of these students are simply out of it, but others just strive to work within all the constraints. The variability by itself here will be a schooling of possible inequities within the group which is probably due to other support systems like scholarships or university access programs.

***Objective 3: Student Satisfaction with the availability, accessibility, and quality of university provided digital Resources***

The current section deals with student satisfaction of their access and availability as well as accessibility and effectiveness of their digital academic resources offered by their universities. The outcome of the satisfaction is a critical measure of the effectiveness of digital tools and the significance of the level of institutional support in the digitized education environment in general.

To assess satisfaction, the study analyzed three interrelated metrics:

1. Satisfaction Level- overall satisfaction with digital tools.
2. Perceived Effectiveness - the degree to which the students believe that the tools support their learning.
3. Influence on educational Results - how many of the students believe that academic achievements and productivity are positively affected by the usage of digital sources.

***Descriptive Summary of Satisfaction Metrics***

**Table 3**

*Descriptive Summary of Satisfaction Metrics*

Variable	Mean	SD
Satisfaction Level	2.91	1.38
Perceived Effectiveness	2.98	1.46
Impact on Performance	2.56	1.13

Students are not completely unhappy or very happy. Their experiences are slightly on the inclination towards the aiming beam as in the scale of yes. Partially high rate of effectiveness which maybe shows that despite bad access of poor interface designs, students believe that these digital tools are helping them in their studies. Effects on performance were rated lowest among the three and therefore provide the indication between usability and quantifiable academic good. It seems obvious that good digital platforms are present in universities but hardly ever lead to positive performance improvement, maybe because of low levels of training, unreliable availability, or simple adverse attitude to the system.

***Satisfaction with the usage of Digital Resources by Gender***

**Table 4**

*Satisfaction with the usage of Digital Resources by Gender*

Gender	Mean Satisfaction	SD	t-value	p-value
Male	3.185	1.368	2.361	0.0198
Female	2.610	1.339		

The t-test was used to compare the level of satisfaction among male and female students. These findings reveal that the difference between the male students and female students is statistically significant ( $t = 2.361$ ,  $p = 0.0198$ ), and male students are more satisfied (Mean = 3.185,  $SD = 1.368$ ) than their female counterparts (Mean = 2.610,  $SD = 1.339$ ).

The result brings some crucial questions regarding gender equity in online interaction. The possible causes of this discrepancy can be the nature of:

- i. Differential access: Males may have more access to household gadgets or less control.
- ii. Training differences: Female learners might be more insecure in their online use, or they might not get the same support.



- iii. Perceived relevance: Males might view the availed digital tools to be more education need- or learning-style-appropriate.

These gender patterns are noteworthy to the university administrators. Although the technology can be neutral, depending on the sociocultural norms and institutional practices, its availability and the perceived utility may differ. Digital equity can be achieved with help of providing personalized onboarding, design of safe digital environments that are inclusive of both sexes, and assessment of the existing tools to determine the suitability of those tools towards various student populations.

***Satisfaction with the usage of Digital Resource by Age group (ANOVA)***

**Table 5**

*Satisfaction with the usage of Digital Resource by Age group (ANOVA)*

Age Group	Mean Satisfaction	SD
18–20	2.31	1.23
21–23	2.91	1.46
24–26	3.20	1.32
27+	3.29	1.32

**ANOVA Result:**  $F(3,120) = 3.335, p = 0.0218$

**Tukey HSD:** 27+ vs 18–20 difference = **0.978**,  $p = 0.0232$

The data point to the fact that there is an upward trend in satisfaction with digital materials to study based on the age category. The mean satisfaction of the individuals between 18 and 20 was just 2.31/ and the individuals of 27 and above were a little higher at 3.29. These dissimilarities were all tested statistically using ANOVA ( $F(3,120) = 3.335, p = 0.0218$ ). Additionally, the Tukey HSD post hoc test has shown that there is a significant difference between the oldest (27+) and young (18-20) age groups ( $p = 0.0232$ ). Therefore, it is possible to conclude that aged students will be better experienced, self-probed or appreciating learning through online provisions as compared to young students as they are already academically developed or are more enlightened academically.

***Objective 4: Challenges faced by students across SES categories in effectively using digital academic resources***

***Reported Challenges in the use of digital Resources by Income Groups***

**Table 6**

*Reported Challenges in the use of digital Resources by Income Groups*

Barrier	<25k	25–50k	50–100k	>100k
Financial Constraints (%)	82	60	32	18
Poor Internet (%)	76	62	45	21
Lack of Institutional Support (%)	68	52	40	24
Technical Skills Gap (%)	39	33	28	12

Statistics indicate that learners that belong to low-income families have a comparatively even harder time in gaining and utilizing digital academic materials compared to individuals in wealthy families. Eighty two percent (82) of all the respondents with monthly family income less than PKR 25,000 answered that they lack financial resources and 76 percent of them said that they lacked internet access, which was a significant barrier. The responses on such problems become, as the income increases, far lower with only 18 percent and 21 percent respectively in the top income group (>100k) experiencing such problems. The factual consideration of such information gives a foundation on which particular interventions can be designed towards minimizing digital inequities across socio-economic collectives.

***Extra Statistical Introductions***

The section also adds more statistical analysis that places even more context and support to the findings associated with the digital resource satisfaction, usage, and perceptions. These are reliability, inter variable correlation, regression and normality tests.





## Reliability Analysis

**Table 7**

*Reliability Analysis*

Scale	Cronbach's $\alpha$
Satisfaction + Effectiveness + Impact	0.8

Having a value of 0.8 in Cronbach alpha surpasses the traditional level of acceptance of 0.70 and means excellent internal consistency of the items. It implies that the three variables are trying to measure the same construct and validly can be clustered into the general domain Digital Efficacy. This internal consistency substantiates its validity to use a composite score or scale in the following analysis.

## Correlation Matrix

Pearson correlation coefficients were done to investigate the values and direction of relationships among the satisfaction-related variables.

**Table 8**

*Correlation Matrix*

Variable	Satisfaction	Effectiveness	Impact
<b>Satisfaction</b>	1.000	-0.017	0.001
<b>Effectiveness</b>	-0.017	1.000	0.216
<b>Impact</b>	0.001	0.216	1.000

All correlations are weak or negligible ( $|r| < 0.22$ ), especially between *Satisfaction* and the other two variables. Only a mild correlation exists between *Effectiveness* and *Impact* ( $r = 0.216$ ). These results reinforce that each metric functions independently, supporting the earlier reliability findings.

## Multiple Regression: Predictors of Satisfaction

A multiple linear regression model was tested to see whether Hours per Day and Frequency of Use significantly predict Satisfaction levels.

**Table 9**

*Multiple Regression*

Predictor	B	t	p
<b>Hours per Day</b>	0.052	0.469	0.640
<b>Frequency of Use</b>	-0.044	-0.610	0.543

## Model Summary:

- i.  $R^2 = 0.005$
- ii.  $F(2, 121) = 0.319, p = 0.728$

The regression model explains less than 1% of the variance in Satisfaction; further, no predictor is statistically significant ( $p > 0.05$ ). This denotes time spent and frequency of use as unimportant predictors for how students feel about their digital academic resources. Other factors possibly relating to accessibility, quality, support, or individual expectations might occupy a more prominent space.

## Normality Test

To test assumptions for parametric analysis, the Shapiro–Wilk test was applied to Satisfaction scores and regression residuals.

**Table 10**

*Normality Test*

Variable	W	p
<b>Satisfaction</b>	0.895	< .001
<b>Residuals</b>	0.926	< .001

Both variables significantly deviate from normality ( $p < .001$ ), violating the assumptions for parametric



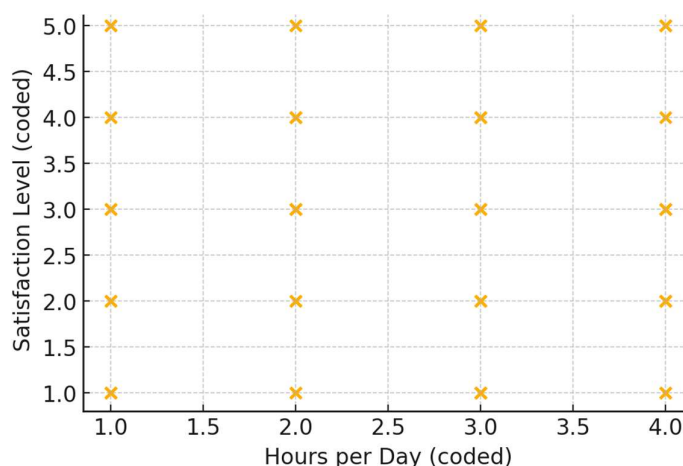
tests such as t-tests, ANOVA, and regression. Hence, interpretation of the results should be made with caution. Furthermore, these findings suggest that non-parametric alternatives, such as the Mann-Whitney U test and Kruskal-Wallis's test, may be better suited for future research in this area.

### ***Scatterplot: Hours per Day vs Satisfaction***

The relationship between Hours per Day and Satisfaction was visualized using a scatterplot (Figure 1).

**Figure 1**

*Scatterplot of hours per day vs satisfaction*



The plot reveals no discernible trend, which corresponds with the near-zero correlation ( $r = 0.047$ ) and non-significant regression result.

### **Discussion**

This study aimed to investigate the influence of parental socioeconomic status (SES) on university students' access to, use of, satisfaction with, and challenges regarding digital academic resources in Azad Jammu and Kashmir (AJK). The findings collectively present a clear and multidimensional digital divide, where SES acts as a primary determinant of digital equity in higher education.

The first objective established a strong, graded relationship between parental SES and students' access to digital infrastructure. As parental education and income increased, so did the likelihood of students owning personal devices and having reliable home internet. For instance, while 92% of students with parents holding a master's degree or higher owned a personal device, only 33% of those with parents having no formal education did. Similarly, internet reliability was reported by 77% of students from high-income households (>PKR 100,000) compared to only 33% from the lowest-income group (<PKR 25,000). These disparities underscore that financial capital and the cultural capital associated with higher education directly translate into superior digital readiness, creating an uneven starting point for academic engagement.

Regarding the second objective, these access inequities directly manifested in divergent usage patterns. Students from higher-income families engaged with digital resources for significantly more hours per day (3.23 hours) and with greater frequency than their low-income peers (2.00 hours). This gap suggests that mere theoretical access is insufficient; sustained, high-quality engagement depends on a conducive ecosystem—comprising personal devices, stable connectivity, and a supportive study environment—which is disproportionately available to students from higher SES backgrounds. This usage divide risks exacerbating existing academic achievement gaps, as digital fluency becomes increasingly integral to learning.

The third objective revealed that overall student satisfaction with digital resources was moderate at best. Interestingly, neither the hours nor the frequency of use significantly predicted satisfaction levels, indicating that other qualitative factors, such as platform usability, institutional support, and the perceived relevance of resources, are more critical to the user experience. Notably, satisfaction varied significantly across demographic lines: male students and older students (27+) reported higher satisfaction than females and younger peers (18-20). These differences point to potential gendered disparities in access, confidence, or



support, and suggest that mature students may possess better self-regulation skills or clearer academic goals that enhance their appreciation of digital tools.

Finally, the fourth objective identified a stark gradient in the challenges faced. Students from lower SES backgrounds were overwhelmingly constrained by financial limitations (82%), poor internet quality (76%), and a perceived lack of institutional support (68%). These barriers form a compound effect, where economic disadvantage is amplified by infrastructural and support deficits, effectively locking students out of the digital academic sphere. In contrast, higher-SES students reported markedly fewer such impediments.

In summary, the digital divide in AJK universities is not merely a matter of device ownership; it is a layered phenomenon encompassing access, quality of use, experiential satisfaction, and systemic barriers. These findings align with and extend the existing literature on digital equity, contextualizing it within the specific socioeconomic landscape of a semi-autonomous region in Pakistan.

### Conclusion

This research provides empirical evidence that parental socioeconomic status is a powerful, structuring force in shaping the digital academic engagement of university students in AJK, Pakistan. The study confirms that a significant digital divide exists, where students from higher-SES families enjoy superior access to technology, engage with it more intensively, and face fewer formidable barriers compared to their lower-SES counterparts.

Crucially, the findings move beyond simple access metrics to reveal more nuanced insights. The weak link between usage time and satisfaction indicates that institutional strategies must look beyond provisioning to focus on the quality, support, and pedagogical integration of digital resources. Furthermore, the identified disparities based on gender and age call for more tailored, inclusive approaches to digital education policy and practice.

Therefore, bridging this divide requires concerted, multi-stakeholder action. Policy interventions should prioritize subsidized internet and device schemes for low-income students. Universities must invest in robust digital infrastructure, comprehensive digital literacy programs, and inclusive technical support systems. Ultimately, fostering an equitable digital learning environment is essential to ensure that the transformative potential of educational technology fulfills its promise for all students, regardless of their socioeconomic background. Future research should employ longitudinal designs to track these disparities over time and explore the efficacy of specific intervention strategies aimed at promoting digital inclusion.

### Limitations of the Study

While this study provides valuable insights into the relationship between parental socioeconomic status (SES) and digital academic engagement among university students in AJK, its findings must be interpreted in light of several methodological and contextual limitations.

**Cross-Sectional Design and Causality:** The use of a cross-sectional survey design, while efficient for capturing a snapshot of prevailing conditions, inherently limits the ability to establish causal relationships. The significant associations observed between parental SES and digital access, usage, and satisfaction indicate correlation but do not prove that SES is the direct cause of these outcomes. Longitudinal or experimental designs would be required to make stronger causal inferences.

**Sample Size and Representativeness:** The sample of 124 students, though adequate for initial exploration, is relatively modest. The generalizability of the findings to the broader population of university students across AJK, or to other regions, may be limited. Furthermore, details regarding the sampling strategy (e.g., whether it was purely random, stratified, or convenience-based) are not fully elaborated, which could introduce selection bias and affect the external validity of the results.

**Self-Reported Data and Measurement:** The reliance on self-reported questionnaires for sensitive data such as household income, frequency of device use, and satisfaction levels introduces the potential for social desirability bias and recall inaccuracy. Although some scales demonstrated acceptable internal consistency (e.g., the satisfaction composite), the validity and reliability of the full SES composite index and other perceptual measures were not extensively validated within this specific cultural context.

**Statistical Assumptions and Analytical Depth:** The data for key satisfaction variables significantly deviated from a normal distribution, violating a core assumption for the parametric tests (t-tests, ANOVA,



Pearson correlation) employed in the analysis. While parametric tests can be robust to minor violations, this limitation necessitates caution in interpreting the associated p-values. Additionally, the analysis remained largely descriptive and bivariate. The regression model explained negligible variance, suggesting that future research should employ more complex multivariate models to isolate the unique effects of SES while controlling for other influential factors like gender, age, and institutional differences.

**Lack of Qualitative Context:** The exclusively quantitative methodology captures the extent and patterns of the digital divide but cannot illuminate the underlying reasons for these disparities. The lived experiences, subjective challenges, coping strategies, and nuanced perceptions of students from low-SES backgrounds remain unexplored. A mixed-methods approach incorporating interviews or focus groups would provide much-needed depth and context to the statistical patterns.

**Omission of Institutional Variables:** The study focuses primarily on individual and family-level factors (parental SES) while giving less attention to institutional-level variables. Differences in digital infrastructure, the quality of technical support, library resources, and specific university policies across the participating institutions in AJK could be significant confounding factors that were not systematically measured or controlled for in the analysis.

**Temporal Snapshot:** As a single-point-in-time study, it cannot assess trends or changes in the digital divide. It cannot determine whether the disparities are widening or narrowing, nor can it evaluate the long-term impact of digital engagement on academic outcomes for different SES groups.

**Conclusion on Limitations:** Acknowledging these limitations is not to undermine the study's contributions but to accurately frame its conclusions and guide future research. The findings should be viewed as indicative of strong associative patterns that highlight a critical area of educational inequity. Subsequent studies should aim to address these limitations through larger, longitudinal, or mixed-method designs to build a more comprehensive and actionable understanding of the digital divide in higher education.

#### Authors Contributions

All the authors participated in the ideation, development, and final approval of the manuscript, making significant contributions to the work reported.

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#### Statement of Data Availability

The corresponding author can provide the data used in this study upon request.

#### Conflicts of Interest

The authors declare no conflict of interest.

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