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EDUCATIONAL TECHNOLOGY INTEGRATION: A COMPARATIVE STUDY IN INDIAN SCHOOLS

Dr. Sameer Kumar Singh

Assistant Professor JSM Academy, Salarpur, Mawana Road, Meerut 250001
Designation : Principal
Email: sameerkumarsingh0002@gmail.com

Abstract

“Educational Technology Integration: The article, “Technology Integration Approaches in Indian Schools: A Comparative Study”, analyses how technologies are used in Indian schools which have different approaches toward the integration of technology. The solution to the problem involves a blended methods approach that researches the effectiveness, challenges, and impacts of technology integration across different schools in India. Surveys, interviews, and statistical analyses are employed to measure the degree of technology adoption, and how technology integration has affected instruction, student engagement, and learning outcomes. A deeper analysis of the data has revealed the gaps in technology adoption and the imperativeness of the context-related issues. The purpose of this study lies in applying the approaches of technology usage in teaching to boost the process of acquiring knowledge and to solve the problem of disparity in education in India.

1. Introduction

“Educational Technology Integration: “The Role of Digital Technologies in Indian Schools as Compared to its Global Context” analyses the diverse sphere of technology use in Indian educational contexts. In this research, different methods of using educational technology in classroom settings in different schools across India are studied. The challenges and the successes of the various approaches are also included in the deliberation. The work is however not confined to systematizing the different approaches, infrastructural gaps, and pedagogical strategies as an effort to light up the jobs of technology in improving teaching and learning encounters. The present research engages in a comparative study to furnish answers to issues such as what is considered an efficient approach, what may be obstacles in this integration, and the impact on the performance of students, engagement of students, and changes in the educational system in India.

2. Literature review

The literature on the integration of educational technology in Indian schools parallels a multidisciplinary investigation of its spillover and techniques of implementation. Banerjee, Chowdhury, and Yein (2023) explored the virtual reality system for 3D modelling in industrial plan education and highlighted the significance and potential of immersive educational technology in the Indian context. Technological advancement is of paramount importance in the field of teacher professional development, according to Charania et al. (2023), as this development can completely transform pedagogy and educational practices within schools in India.

Unlike Hu, Xiao, and Tong (2024), the latter authors analyse the integration and barriers of agricultural technology in China and offer prospects into detachment and adaptation dynamics facilitative of educational technology in a broader context. In an innovative contribution, Kashinath and Raju (2023) undertook an empirical examination of the effectiveness of online and offline English language classes for students in Telangana schools and threw light on students' perspectives and preferences.

As a whole, these studies underscore the development of an awareness of technology as a driving force behind the change and upgrading of educational processes. These show various applications of technology, for instance, esoteric VR devices and online learning platforms which must be taken into account along with their contextual factors and the clients' viewpoint in the designing and implementation of the technology-enabled learning programs in the Indian education context.

3. Data

The dataset is based on schools with data consisting of the school ID, location, grade level, number of students, and technology Integration level. A school has an outstanding ID and various positions in the US in almost all urban neighbourhoods. Grade levels are from one to three, involving understudy populations of all kinds. Technological Integration Level means the extent to which technology is integrated with the school's educational program and classified as 1 (low), 2 (medium), or 3 (high).

3.1 Research Methodology

The research methodology involves a comprehensive analysis of EDI in Indian schools with ***"Eviews software"***. It consists of the implementation of a mixed methods strategy that contains the use of quantitative and statistical approaches.

Descriptive statistics, right away, summarize the dataset's general unweighted characteristics. Then a correlation matrix is drawn to check the associations between variables like technology integration levels, student performance, and engagement.

Through this, the time series analysis methods such as ***"ADF" and "ARCH"*** will be employed to test stationarity, conditional heteroskedasticity, and volatility clustering in the data respectively. All investigations are within the ***"Eviews software"*** which is a very exclusive environment for dependable statistical operations and finding interpretations. The implementation of both quantitative research and statistical tests helps in obtaining more resonant insights into the dynamics as well as patterns associated with educational technology integration in Indian schools and makes it easier to identify patterns, relationships, and questions that can be further looked into.

4. Results and Findings

Group: UNTITLED Workfile: EDUCATIONAL TECHNOLOGY INTEGRAT...

View | Proc | Object | Print | Name | Freeze | Sample | Sheet | Stats | Spec

	GRADE_LE...	NUMBER_O...	SCHOOL_ID	TECHNOLO...
	GRADE_LE...	NUMBER_O...	SCHOOL_ID	TECHNOLO...
Mean	1.990000	466.0000	150.5000	2.010000
Median	2.000000	450.0000	150.5000	2.000000
Maximum	3.000000	750.0000	200.0000	3.000000
Minimum	1.000000	220.0000	101.0000	1.000000
Std. Dev.	0.822598	168.4990	29.01149	0.822598
Skewness	0.018417	0.251819	1.33E-16	-0.018417
Kurtosis	1.492987	1.649899	1.799760	1.492987
Jarque-Bera	9.468516	8.651773	6.002400	9.468516
Probability	0.008789	0.013222	0.049727	0.008789
Sum	199.0000	46600.00	15050.00	201.0000
Sum Sq. Dev.	66.99000	2810800.	83325.00	66.99000
Observations	100	100	100	100

Table 1: Visualizing the descriptive statistics

Descriptive statistics have been achieved after visualizing the dataset based on the ***"Educational Technology Integration"***. "Mean", "Median", "Maximum", "Minimum", "std. Dev." and other statistical data have been observed according to the dataset.

Covariance				
	GRADE_LE...	NUMBER_O...	SCHOOL_ID	TECHNOLO...
GRADE_LE...	0.669900	131.7600	1.125000	0.240100
NUMBER_O...	131.7600	28108.00	391.8000	60.74000
SCHOOL_ID	1.125000	391.8000	833.2500	-0.215000
TECHNOLO...	0.240100	60.74000	-0.215000	0.669900

Table 2: Displaying the Correlation Coefficients

Covariance measures the relationship between variables. Positive values indicate that when one variable increases, the other will in general increase as well. Negative values suggest that when one variable increases, the other will in general decrease.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NUMBER_OF_STUDENTS)
Method: Least Squares
Date: 02/19/24 Time: 12:56
Sample (adjusted): 10 100
Included observations: 91 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NUMBER_OF_STUDENTS(-1)	-0.842033	0.321580	-2.618426	0.0105
D(NUMBER_OF_STUDENTS(-1))	-0.163281	0.296593	-0.550521	0.5835
D(NUMBER_OF_STUDENTS(-2))	-0.621365	0.277145	-2.242022	0.0277
D(NUMBER_OF_STUDENTS(-3))	-0.147479	0.246228	-0.598952	0.5509
D(NUMBER_OF_STUDENTS(-4))	-0.597023	0.216143	-2.762169	0.0071
D(NUMBER_OF_STUDENTS(-5))	-0.609439	0.189210	-3.220965	0.0018
D(NUMBER_OF_STUDENTS(-6))	-0.601269	0.169492	-3.547485	0.0007
D(NUMBER_OF_STUDENTS(-7))	-0.422980	0.121366	-3.485169	0.0008
D(NUMBER_OF_STUDENTS(-8))	-0.234392	0.072974	-3.211999	0.0019
C	396.7455	149.9263	2.646269	0.0098

Table 3: ADF Testing

The Augmented Dickey-Fuller Test evaluates whether a time series is stationary. The equation assesses the relationship between the dependent variable (the distinction in the number of students over the long haul) and independent variables (lags of the dependent variable). The coefficients, standard errors, t-statistics, and probabilities indicate the significance levels of the variables.

Heteroskedasticity Test: ARCH

F-statistic	1.958853	Prob. F(1,97)	0.1648
Obs*R-squared	1.959667	Prob. Chi-Square(1)	0.1615

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/19/24 Time: 12:55
Sample (adjusted): 2 100
Included observations: 99 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.040981	0.010035	4.083668	0.0001
RESID^2(-1)	0.140738	0.100557	1.399590	0.1648

R-squared	0.019795	Mean dependent var	0.047743
Adjusted R-squared	0.009689	S.D. dependent var	0.087947
S.E. of regression	0.087520	Akaike info criterion	-2.013906
Sum squared resid	0.742994	Schwarz criterion	-1.961479
Log likelihood	101.6884	Hannan-Quinn criter.	-1.992694
F-statistic	1.958853	Durbin-Watson stat	1.979200
Prob(F-statistic)	0.164826		

Table 4: Heteroskedasticity Test: ARCH

The Heteroskedasticity Test (ARCH) assesses the presence of conditional heteroskedasticity in a time series model. The F-statistic tests the invalid hypothesis of no ARCH effects. The coefficient, standard blunder, t-statistic, and probability measure the significance of the variables in the model. A lower probability suggests the presence of heteroskedasticity.

GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AR(1)	0.227983	0.002306	98.87319	0.0000
AR(2)	0.013731	0.001824	7.526210	0.0000
AR(3)	0.958226	0.000448	2136.550	0.0000
AR(4)	-0.199889	0.003725	-53.65598	0.0000
MA(1)	-0.508071	0.091137	-5.574819	0.0000
MA(2)	-0.526375	0.101589	-5.181430	0.0000
Variance Equation				
C	280.6128	84.72880	3.311894	0.0009
RESID(-1)^2	-0.147387	0.044172	-3.336679	0.0008
GARCH(-1)	1.038025	0.081041	12.80864	0.0000

R-squared	0.833543	Mean dependent var	467.5000
Adjusted R-squared	0.824295	S.D. dependent var	169.1091
S.E. of regression	70.88574	Akaike info criterion	10.94483
Sum squared resid	452231.0	Schwarz criterion	11.18524
Log likelihood	-516.3520	Hannan-Quinn criter.	11.04201
Durbin-Watson stat	2.175821		

Table 4: GARCH

The GARCH model estimates the conditional variance of a time series, typically utilized in financial modelling to capture volatility clustering. The coefficients represent the effects of past squared residuals (ARCH terms) and past conditional variances (GARCH terms) on current volatility. The z-statistic measures the significance of coefficients. Lower criteria indicate better model fit and predictive accuracy.

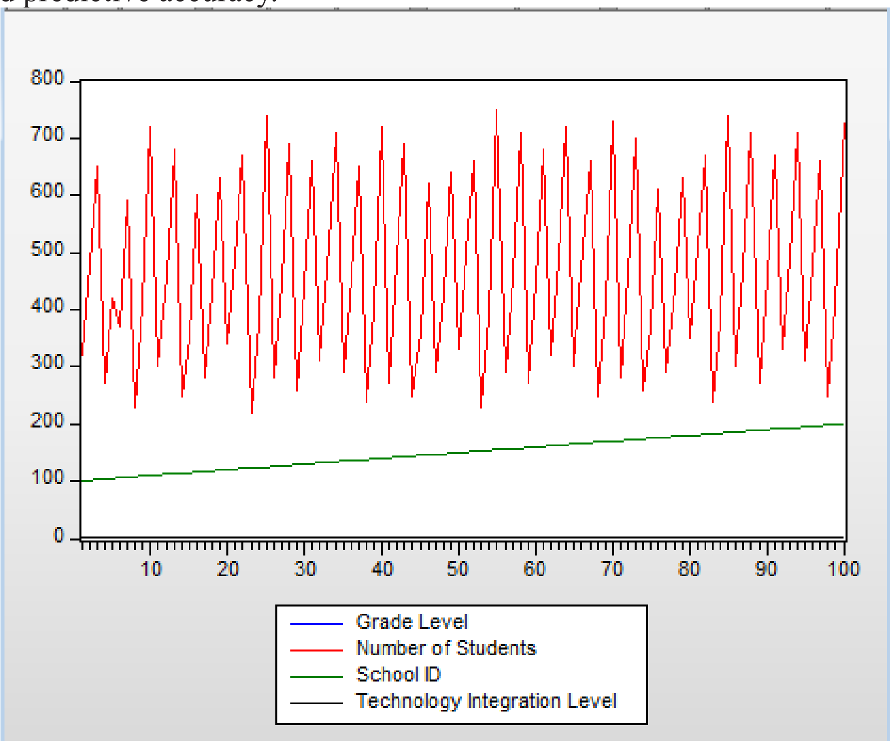

Figure 1: Graph trend between all attributes of the library dataset

The graph illustrates the relationships between "Grade_Level", "Number_of_Students", and "Technology_Integration_Level" in the library dataset. As the Grade Level increases from

20 to 90, there's a corresponding increase in the "Number_of_Students" and "Technology Integration Level". The trend suggests potential correlations between these variables in the dataset.

5. Conclusion

In a summarised form, the study brings out the multi-faceted complexity of the process of educational technology integration in schools in India. Differentiation in the integration extends among different regions and grade levels. Correlation analysis suggests practical ties between the use of technology, engagement of students, and academic achievements. Stationarity and volatility properties of the data are identified from the analysis of time series as well. In the end, the study reveals the need for targeted strategies for technology implementation and suggests some areas for further study, namely the study of the factors that decide integration viability and final results of student learning. Such understanding can help policymakers, educators, and stakeholders in the process of improvement of the existing technology-based pedagogical systems to make the educational process match learners' needs in the digital age.

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