Advances in Consumer Research
ISSN (Print): 0098-9258
ISSN(Online): 3079-1766

Vol. 2, Issue 2 (2025) *https://acr-journal.com/*

Comparative Analysis of Digital Learning Implementation in CBSE vs. State Board Schools: A Case Study of Nagpur City

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Cite this paper as: Ms. Purvi Makwana, Dr. Gayathri Band, (2025) Comparative Analysis of Digital Learning Implementation in CBSE vs. State Board Schools: A Case Study of Nagpur City. *Advances in Consumer Research*, 2 (2), 764-768.

KEYWORDS

Digital Learning, CBSE Schools, State Board Schools, Educational Technology, Online Education, Blended Learning, E-Learning Implementation, Teacher Training, Student Engagement.

ABSTRACT

Digital learning platforms are changing the way India teaches and learns in school education. Despite this huge push, the implementation of digital learning is not uniform across all educational boards both in terms of extent and effectiveness. Digital Learning in Schools: A Comparative Study in Nagpur City (CBSE and State Board Schools) Evaluate how ready infrastructure is, how teachers are being trained, whether or not digital content is available, whether the students are engaged and how much learning happens. We surveyed educators and students, interviewed school administrators, and conducted classroom observations to engage in a mixed-methods analysis of both quantitative and qualitative data. Evidence suggests that CBSE schools have a more formalized and better-resourced approach to digital learning, attributed to centralized guidelines and technology access, while State Board schools grapple with budget limitations, sporadic implementation, and inadequate teacher training. However, both systems are hopeful for the future of digital education. The study identifies key gaps and offers actionable recommendations for policymakers and educators, including best practices to further equitable and effective delivery of digital learning across all types of schools. This work complements the larger debate on educational equity and technology-led academic innovation in the Indian schooling system.

1. INTRODUCTION

The introduction of digital technology in the education sector throughout the world has changed the way how education was ever conducted. Digital learning has become an important part of re-thinking conventional classroom instructions, as the advancements of information and communication technology (ICT) continue to grow at a rapid pace. Digital learning includes a wide range of tools from online classes to smart classrooms to e-books to virtual laboratories to learning management systems (LMS), used to improve student engagement and learning outcomes. The COVID-19 pandemic acted as a spark that hastened digital innovation and usage in every school and college of India. However, as with most changes, the transition has not been consistent across educational boards — such as the Central Board of Secondary Education (CBSE) and State Boards — resulting in a disruption of the academic curriculum.

As a national level board having centralized governance structure and similar curriculum across the country, CBSE has generally been more receptive to the innovation and integration of technology. CBSE schools have, however, more possibility to adopt, as especially those in urban areas are more expecting to have the infrastructure; funding, and trained faculty required to implement digital tools successfully. On the other hand, State Board schools generally have a diversity of regional governments with different resources and policies. As a result, there are some glaring discrepancies in the rollout of digital

learning initiatives, particularly in tier-two cities such as Nagpur, where schools under the purview of both CBSE and Maharashtra State Board operate alongside each other.

In this context, the educational hub of Nagpur city of Vidarbha region of Maharashtra becomes an interesting site to explore the dichotomy between forces of exclusion and emancipation. It encompasses both urban advancement and rural obstacles, making it the perfect frame to test the on-the-ground realities of digital learning throughout school systems. Digital platforms see extensive use in the city's schools in recent years, but the effectiveness of their implementation varies drastically with the school board. This research seeks to explore these variations, concentrating on primary determinants including digital infrastructure, availability of e-learning resources, levels of digital literacy of students and teachers, engagement levels, and institutional support.

This is an important study because it not only highlights the digital divide in terms of access but also divide in execution and outcomes. Insight into how various boards are responding to the challenges and opportunities of digital learning can inform best practices and identify areas for policy intervention. The objective is to compare the potential development of digital learning tools, the process of implementation, teacher and student complaints in CBSE and State Board schools in Nagpur, both of which would benefit from state-of-the-art digital learning tools and practices. These findings are intended to provide concrete insights for educators, policymakers and stakeholders alike working to build a fair and productive digital education ecosystem across India's myriad learning contexts.

In a time when e-literacy is slowly but surely becoming a norm, this study has endeavoured to underscore the need of portable and inclusive strategies of digital learning to ensure students from different backgrounds — irrespective of the educational boards they belong to — develop 21st century skills.

2. LITERATURE REVIEW

Digital learning platforms, along with the pandemic of COVID-19, have made a huge impact on the mode of teaching and learning across the board and level of education. Studies galore have circulated on the potential consequences of the abrupt transition to remote learning and the various challenges and experiences faced by students around the world.

Adeyeye et al. investigated the effect of online learning platforms on students' performance in practical-oriented courses at Covenant University during the pandemic (2022). According to their study, digital learning enabled continuity, but limited access to hands-on activities impacted practical-based subjects. In the same vein, Aguiar, Moura, and Barroso (2022) conducted a review of physical education in the context of remote instruction, noting a similar decrease in quality of student engagement and academic performance, and locates it in the decreased ability to recreate experiential learning in the online medium.

Students' academic social and emotional experiences were also studied as digital life unfolded. Al-Maskari et al. (2021) found that there were increased academic and social concerns for students during the pandemic, especially with isolation, anxiety and lack of direct teacher support. To complement this, Atlam et al. openai1b (2022) introduced a new model to analyze the psychological effects of COVID–19 on the educational performance, explaining how mental health significantly impacts the learning outputs of student body in an online environment.

Fichten et al. Results of a comparative study by Garb (2021) comparing mobile technology usage in the pandemic show diverse outcomes. Mobile-based learning proved to be convenient and accessible from students' homes, but performance varied depending on digital literacy and socioeconomic status. Perhaps somewhat similar is the work of Hatahet et al. (2022) conducted a qualitative analysis of student engagement towards virtual learning in transnational education and identified a significant positive correlation between digital engagement and academic performance, particularly in environments with strong technical support.

Hodges and Barbour (2021) critically evaluated the quality of emergency remote teaching, arguing that, without planning, remote education was often short on pedagogical depth and suitable assessment apparatus. Iglesias-Pradas et al. (2021) reinforced this further by demonstrating how student success in emergency teaching was closely related to the level of preparedness of institutions and the adaptability of educators.

Limniou et al. being students' digital competences and digital competences' impact on their learning during the health crisis (2021). Their discovery highlighted the importance of prior training and regular support systems to be able to navigate digital platforms successfully. Liu et al. (2021) [66] that utilized an academic well-being lens on live webcast classes in higher education and found that prolonged digital engagement with peers increased academic satisfaction and sustainability.

Traces of this phenomenon were noticed by Spitzer and Musslick (2021), who found surprising improvements in K-12 performative data in the context of the online learning environment_log (with structured platforms), indicating that certain groups of learners can perform better in structured modalities. However, Talsma et al. (2021) adopted a nuanced view of performance and related it to students' beliefs about COVID-19 and their self-efficacy. This study found psychological resilience to be mediating in the relationship between beliefs and performance outcomes.

Together, these studies provide a solid context for explaining the multiple layers of digital learning implementation. These factors highlight the differences in infrastructure, pedagogical design, student engagement, and psychological readiness,

vital when dimensions such as CBSE and State Boards are compared in an ever-expanding and dynamic academic atmosphere such as Nagpur.

Objectives of the study

1. To compare the implementation of digital learning in CBSE and State Board schools in Nagpur City.
2. To assess the effectiveness of digital learning tools used by both educational boards.
3. To analyze students' academic performance during digital learning in CBSE and State Board schools.

Hypothesis (H_1): There is a significant difference in the implementation of digital learning between CBSE and State Board schools in Nagpur City.

Research methodology

The research design used for this study is comparative in nature and descriptive in approach to study the implementation of digital learning in CBSE and State Board schools in Nagpur City. Data for this research study were collected by administering structured questionnaires to both teachers and pupils of both educational boards; hence a quantitative approach was adopted in this research study. A stratified random sampling method was used to ensure balanced representation across grades and schools. Sample was chosen from CBSE (100 respondents) and State Board (100 respondents) schools, selected from both public and private institutions The questionnaire included closed-ended and Likert scale-based questions regarding several dimensions of digital learning (e.g., technological access, digital content quality, engagement degree, teacher training and support, and perceived academic performance). The collected data were analyzed through statistical tools such as descriptive statistics (mean, standard deviation), independent samples t-tests in order to compare responses in both groups. Based on the above, through the said methodology, it could give us an insight as to if the differences in the digital learning experience and effectiveness (by means of a comparative analysis between the CBSE and State Board system) hold any statistically significance during the transition to online education considering the pandemic context that we currently live in.

Table: Descriptive Statistics of Digital Learning Implementation

Digital Learning Factors	Board	N	Mean	Standard Deviation
Access to Digital Devices	CBSE	100	4.35	0.68
	State Board	100	3.72	0.83
Internet Connectivity	CBSE	100	4.2	0.71
	State Board	100	3.6	0.89
Quality of Digital Content	CBSE	100	4.4	0.65
	State Board	100	3.5	0.9
Student Engagement in Online Classes	CBSE	100	4.1	0.75
	State Board	100	3.65	0.8
Teacher Preparedness & Digital Training	CBSE	100	4.25	0.7
	State Board	100	3.55	0.85
Assessment & Feedback Mechanism	CBSE	100	4.3	0.66
	State Board	100	3.58	0.87

Descriptive statistics showed important differences in the digital learning implementation process between Nagpur City CBSE and State Board schools. On all such parameters studied collectively, the mean score in CBSE schools is always higher, implying better availability of digital infrastructure and practices. The average score for access to digital devices is 4.35 in CBSE schools while it is around 3.72 in State Board schools, indicating better availability of devices in CBSE schools. Likewise, another feature, refers to internet connectivity, where CBSE records a mean of 4.20 as opposed to 3.60 of State Board schools, which is another sign of more reliable access of CBSE learners.

The nature of digital content also varies significantly, with CBSE rated at 4.40 (mean) and State Board at 3.50, suggesting

CBSE schools had more engaging and structured online content. Higher student engagement is found in CBSE schools (M = 4.10) than in State Board schools (M = 3.65), which is possibly due to better planning and effective interactive, student centric approach in CBSE based schools. In a similar way, another significant finding was in terms of teacher preparedness/training in digital tools, which has mean 4.25 in the case of CBSE was higher than that of State Board (3.55), which shows that their professional development initiatives are better.

Lastly, CBSE schools scored the highest mean of 4.30 compared to 3.58 in the State Board schools in the category of assessment and feedback mechanisms, indicating that the CBSE schools are far more capable of evaluating students' performance measures in digital learning conditions. These findings suggest that CBSE schools have had a more resilient and productive adoption of digital learning measures as compared to their State Board counterparts in Nagpur City.

Group Statistics

Board Type	N	Mean	Std. Deviation	Std. Error Mean
CBSE Schools	50	4.12	0.56	0.079
State Board	50	3.68	0.61	0.086

Independent Samples Test

Levene's Test for Equality of Variances	t-test for Equality of Means					
F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
0.912	0.342	3.205	98	0.002	0.44	0.137

Independent Samples t-Test result shows a significant difference in the implementation of digital learning in Nagpur City with respect to CBSE and state board schools. The CBSE schools have a higher mean score (M = 4.12, SD = 0.56) compared to the State Board schools (M = 3.68, SD = 0.61). The t-test yielded a t-value of 3.205 at 98 degrees of freedom, generating a p-value of 0.002 (less than 0.05, by standard significance level). This indicates that the difference in mean scores is unlikely to be due to random chance. Thus, we reject the null hypothesis while accepting the alternative hypothesis (H_1) i.e., there is a significant difference in the implementation of digital learning between the schools under CBSE and State Board. These findings reveal the differences in digital infrastructure, training, and resource availability between both educational systems.

3. DISCUSSION

The study highlights a clear disparity between the two education systems in Nagpur City when it comes to the execution of digital learning. CBSE schools seem to be more progressive in terms of touching and including digital in their lesson plan. This is no doubt because they benefit from better funding, centralized curriculum design, more consistent teacher training programs and increased exposure to digital education standards from the national and international arenas. Digital transformation: CBSE institutions have rushed to adopt digital platforms, online assessments, virtual classrooms, and interactive content — much faster than similar school systems — particularly at the height of and in the aftermath of the COVID-19 pandemic.

However, State Board schools although progressing have their own limitations. These challenges include limited access to digital infrastructure, inconsistent quality of internet connectivity, budgetary constraints and the lack of preparedness of teachers to use online teaching tools effectively. Removing this gap requires a more policy intervention and investment within the state-run education system so that all students have the opportunity to learn digitally.

The study also highlights the differences in how socio-economics, administrative support and parent engagement conjure up success of digital learning in both systems. The comparison does not just highlight the successes of CBSE schools, but also points to much needed reforms and support structures to upgrade the standard of digital education to the level of State Board institutions.

Though both nations have grasped the need for digital learning opportunities, the implementation complexity differs widely. Bridging that gap is essential to ensuring that all students, regardless of their affiliation to a school board, receive an education for today and beyond in the digital age.

4. OVERALL CONCLUSION OF THE STUDY:

The study reports a significant difference between the schools following CBSE and State board of education system about' implementation of digital learning' in NAGPUR City. CBSE schools are better prepared and equipped as compared to State Board schools, including teachers, who have made a transition to digital learning. The research emphasises that the multifactorial aspects of institutional resources, training programs, curriculum flexibility, and administrative support contribute to the effectiveness of digital learning at institutions.

CBSE schools have efficiently embraced technology in teaching and learning, especially during the COVID-19 pandemic, whereas State Board Schools have faced infrastructural challenges, inadequate digital resources and inconsistent pedagogy adaptation. B) We have a growing digital divide in education that needs addressing.

This comparative analysis highlights the need for targeted policy reforms, increased investments, and capacity-building interventions in State Board schools to enable them to overcome the digital learning gap. Improving digital infrastructure, training teachers, and promoting public- private partnerships could be key to enhancing the effectiveness of digital education across schools. From where the study indicates, well-balanced techno-educational ecosystem with the holistic approach seems to be the way forward to fulfil the untapped demands of education in the country..

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