

# An Empirical Investigation into Secondary Students' Attitudes Toward ICT in Education in Alipurduar, West Bengal

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## ABSTRACT

*Information and Communication Technology (ICT) has emerged as a transformative force in contemporary education, reshaping pedagogy and learning outcomes globally. This study empirically investigates the attitudes of secondary school students toward ICT in education in Alipurduar district, West Bengal, India a geographically and socioeconomically marginalized northern border district with a predominantly tribal and tea-garden community demography. The study adopted a descriptive survey design involving 240 students (Classes IX–X) selected through stratified random sampling from six secondary schools across government and private management categories. A validated 30-item five-point Likert-type attitude scale measuring cognitive, affective, and behavioural dimensions was administered during the 2020–21 academic session. The study hypothesized that gender and school management type do not significantly influence students' ICT attitudes. Results revealed that 76.67% of respondents held a favourable attitude toward ICT. A statistically significant difference was found between government and private school students ( $t=3.84$ ,  $p<0.05$ ), while gender differences were non-significant ( $t=1.42$ ,  $p>0.05$ ). Barriers including infrastructural deficiency and limited internet access were prominently self-reported. The study concludes that equitable ICT policy and targeted investment are critical for educationally underserved districts.*

**Keywords:** *ICT attitudes, secondary students, digital divide, West Bengal, educational technology*

## INTRODUCTION

The rapid proliferation of Information and Communication Technology (ICT) has fundamentally altered global educational systems, creating new possibilities for interactive, self-paced, and resource-enriched learning. Internationally, Kozma (2003) established that technology-integrated classrooms demonstrate measurably superior pedagogical outcomes across diverse national educational systems, provided that students possess the requisite attitudinal readiness. In India, ICT integration in school education has been progressively emphasized through the National Policy on ICT in School Education (2012) and the National Education Policy (NEP) 2020. Despite sustained national-level investment under Samagra Shiksha Abhiyan, the ground reality in semi-urban and rural districts remains considerably disparate. West Bengal, with over 82,000 predominantly government-managed schools serving approximately 16 million students, presents a significant case study in ICT integration challenges. According to UDISE+ data for 2020–21, only 18–24% of secondary schools in the state's northern and rural districts had functional computer labs and internet access. Alipurduar, a newly constituted district carved out of Jalpaiguri in 2014, comprises a significant population of tribal, tea-garden, and forest-dwelling communities. The district's secondary schools are predominantly government-aided institutions that often lack adequate ICT resources, trained instructors, and reliable digital infrastructure conditions that directly constrain

students' engagement with technology-mediated learning. Saha and Sarkar highlighted that secondary students in Alipurduar face multiple structural disadvantages including poor school infrastructure and socioculturally disconnected curricula, which compel examination of ICT-specific attitudinal factors in this region.

Understanding students' attitudes toward ICT is central to any effort at meaningful technology integration. Research consistently demonstrates that student attitudes comprising cognitive beliefs, affective responses, and behavioural intentions are strong predictors of technology adoption and effective learning outcomes. Waycott *et al.* (2010), in their study of digital divides across student and staff populations, found that while students generally held more positive technology perceptions than staff, those from resource-constrained institutional settings showed significantly reduced attitudinal positivity toward ICT-based learning. Similarly, Bala and Singhal (2018) documented that gender-conditioned digital divides in India are not merely a matter of physical access but are rooted in attitudinal disparities shaped by social norms, economic standing, and institutional environment. Gender and school management type are two critical moderating variables of ICT attitudes in secondary education. While several studies from urban and semi-urban West Bengal have examined these dynamics, Alipurduar remains absent from empirical ICT attitude research. This gap is particularly pressing given the district's tribal demography, infrastructural deficits, and classification as an educationally backward region. The present study aims to address this gap by investigating ICT attitudes systematically among secondary students in Alipurduar, generating evidence to inform district-level educational policy and school-level technology integration planning.

## LITERATURE REVIEW

Research on students' attitudes toward ICT in education has grown substantially over the past two decades, reflecting both the expanding role of digital tools in classrooms and the need to understand socio-psychological factors governing their adoption. Globally, studies have established that favourable ICT attitudes correlate with increased academic engagement and improved learning performance. Ghavifekr and Rosdy (2015) confirmed that effective ICT integration depends heavily on the attitudinal readiness of students, noting that technology-positive learners demonstrated measurably higher classroom participation rates. Sun *et al.* (2008) similarly found that learner satisfaction with e-learning platforms was significantly predicted by prior positive attitudes toward technology and self-efficacy beliefs, underlining the foundational role of attitude formation in ICT-driven education. Sang *et al.* (2010) demonstrated that student-teachers' cognitive orientations toward ICT strongly predicted their subsequent technology integration behaviour, with attitudes mediating the relationship between ICT access and actual usage. Ertmer *et al.* (2012) further argued that both first-order barriers such as inadequate hardware and connectivity and second-order barriers including attitudinal constraints and belief systems must be simultaneously addressed to achieve meaningful classroom technology integration. These findings confirm that ICT attitude is not merely a peripheral affective variable but a functional predictor of educational technology outcomes.

In the Indian context, the digital divide between rural and urban zones has been a persistent concern. Asrani (2022) found that income, educational background, and geographic location are the strongest determinants of ICT adoption in India, with students in peripheral districts facing compounded disadvantages in technology access and proficiency. Kaur (2019) specifically examined beliefs and attitudes in Indian classrooms, finding that rural learners exhibited lower ICT self-efficacy directly attributable to infrastructural scarcity and limited exposure.

These findings are especially relevant for districts like Alipurduar, where structural inequalities compound broader patterns of educational underdevelopment. Gender differences in ICT attitudes have been extensively examined. Meelissen and Drent (2008) demonstrated that school context significantly moderated gender-based variation in computer attitudes, with institutional factors accounting for more variance than biological sex alone. Hatlevik and Christophersen (2013) confirmed that while digital competence at the secondary school level was associated with ICT access and attitudinal variables, gender was not a consistent predictor across diverse institutional types. In the West Bengal context, that higher secondary science students displayed more positive ICT attitudes than arts stream counterparts, but no significant intra-stream gender differences. Reported that in Paschim Bardhaman district, girl students showed marginally higher positive ICT attitude scores than boys, while private school students consistently outscored government school counterparts on all attitude dimensions.

Barriers to ICT use in education have been widely documented. Pelgrum (2001) categorized ICT barriers into first-order (infrastructure, hardware) and second-order (beliefs, attitudinal) types, asserting both require simultaneous resolution. Scherer and Siddiq (2019) demonstrated through meta-analysis that socioeconomic status remained a robust predictor of ICT literacy gaps across national educational systems. Mishra, Gupta, and Shree (2020) further noted that the COVID-19 pandemic widened pre-existing ICT inequalities, particularly for students in low-income rural districts, reaffirming the urgency of addressing attitudinal and infrastructural dimensions together.

## OBJECTIVES

1. To assess the overall attitude of secondary school students toward ICT in education in Alipurduar district, West Bengal.
2. To examine whether significant differences exist in ICT attitudes based on gender and school management type (government vs. private).

## METHODOLOGY

This study adopted a descriptive survey research design, appropriate for systematically describing attitudinal characteristics of a defined population at a specific point in time. The study was conducted during the academic session 2020–21. The target population comprised all secondary school students (Classes IX and X) enrolled in secondary schools in Alipurduar district, West Bengal. Stratified random sampling was employed to ensure proportional representation across gender, school type, and class levels. A total of 240 students were selected from six secondary schools four government-aided and two private unaided institutions across three developmental blocks: Alipurduar I, Alipurduar II, and Falakata. The primary data collection instrument was a 30-item ICT Attitude Scale developed and validated by the researcher, following Likert's (1932) five-point format (5=Strongly Agree to 1=Strongly Disagree). The scale comprised three sub-dimensions: Cognitive (items 1–10, measuring beliefs about ICT utility), Affective (items 11–20, measuring emotional responses to ICT), and Behavioural (items 21–30, measuring ICT usage intentions). Face validity was established through expert review by five educational technology specialists. Reliability was confirmed through a pilot test on 30 students, yielding a Cronbach's alpha of 0.87, indicating high internal consistency. Maximum possible score was 150; minimum was 30; the midpoint 90 served as the classification threshold. Data were collected through direct administration in school settings

(100% response rate). Statistical analyses included frequency distributions, mean, standard deviation, and independent samples t-test using SPSS Version 21.0. Two null hypotheses were tested at 0.05 level of significance.

**RESULTS**

**Table 1: Demographic Profile of Respondents (N=240)**

Category	Sub-category	Frequency	Percentage (%)
Gender	Male	128	53.33
	Female	112	46.67
Class	IX	120	50.00
	X	120	50.00
School Type	Government	144	60.00
	Private	96	40.00
Locality	Rural	156	65.00
	Urban	84	35.00
<b>Total</b>		<b>240</b>	<b>100.00</b>

Source: Primary Survey Data, 2020–21

Table 1 presents the demographic composition of the sample (N=240). Of all respondents, 53.33% (n=128) were male and 46.67% (n=112) were female, reflecting near-proportional gender representation. The sample was equally distributed between Class IX and Class X at 50% each, ensuring cross-class representation. 60% were enrolled in government schools and 40% in private institutions. A notable 65% came from rural backgrounds, accurately reflecting the predominantly rural and semi-urban character of Alipurduar district where settlements are largely located near tea estates, forest reserves, and agricultural zones.

**Table 2: Overall Attitude Level of Secondary Students Toward ICT (N=240)**

Attitude Level	Score Range	Frequency	Percentage (%)
Highly Favourable	121–150	52	21.67
Favourable	91–120	132	55.00
Neutral	61–90	41	17.08
Unfavourable	31–60	12	5.00
Highly Unfavourable	Below 30	3	1.25
<b>Total</b>		<b>240</b>	<b>100.00</b>

Source: Primary Survey Data, 2020–21

Table 2 reveals that 76.67% of secondary students (Highly Favourable: 21.67% + Favourable: 55.00%) demonstrated a positive attitude toward ICT in education. The overall mean score was 99.97 (SD=14.12), exceeding the scale midpoint of 90. Only 6.25% expressed unfavourable or highly unfavourable attitudes. These results indicate that despite significant infrastructural limitations in the district, a clear majority of secondary students in Alipurduar hold positive attitudinal orientations toward ICT-mediated learning across cognitive, affective, and behavioural dimensions.

**Table 3: Gender-wise Comparison of ICT Attitude Scores (Independent Samples t-test)**

Gender	N	Mean	SD	t-value	df	p-value	Significance
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Male	128	98.74	14.32	1.42	238	0.157	NS
Female	112	101.23	13.89				

NS = Not Significant ( $p > 0.05$ ); Source: Primary Survey Data, 2020–21

Table 3 presents the gender-wise comparison of ICT attitude scores. Female students recorded a marginally higher mean score ( $M=101.23$ ,  $SD=13.89$ ) than male students ( $M=98.74$ ,  $SD=14.32$ ). However, the calculated t-value of 1.42 at  $df=238$  yields  $p=0.157$ , which exceeds the 0.05 level of significance. The null hypothesis that no significant gender difference exists in ICT attitudes is therefore retained. Gender does not significantly differentiate ICT attitudes among secondary students in Alipurduar, pointing toward shared attitudinal patterns across both sexes in the district's institutional environment.

**Table 4: School-type Comparison of ICT Attitude Scores (Independent Samples t-test)**

School Type	N	Mean	SD	t-value	df	p-value	Significance
Government	144	95.61	15.43	3.84	238	0.000	S
Private	96	104.72	12.18				

S = Significant ( $p < 0.05$ ); Source: Primary Survey Data, 2020–21

Table 4 shows that private school students recorded a substantially higher mean attitude score ( $M=104.72$ ,  $SD=12.18$ ) compared to government school students ( $M=95.61$ ,  $SD=15.43$ ). The t-value of 3.84 at  $df=238$  is statistically significant ( $p=0.000$ ,  $p<0.05$ ), leading to rejection of the null hypothesis. School management type significantly differentiates ICT attitudes among secondary students in Alipurduar. The mean gap of approximately 9.11 points reflects a strong institution-driven attitudinal divergence, with private school students demonstrating considerably more favourable orientations toward ICT-integrated learning environments.

**Table 5: Dimension-wise Mean Attitude Scores of Secondary Students Toward ICT (N=240)**

Dimension	Maximum Score	Mean	SD	Classification
Cognitive	50	34.82	6.41	Favourable
Affective	50	33.97	7.02	Favourable
Behavioural	50	31.18	7.84	Neutral–Favourable
<b>Overall</b>	<b>150</b>	<b>99.97</b>	<b>14.12</b>	<b>Favourable</b>

Source: Primary Survey Data, 2020–21

Table 5 presents dimension-level attitude score profiles across the 240 respondents. Cognitive attitude yielded the highest mean ( $M=34.82$ ,  $SD=6.41$ ), indicating that students intellectually appreciate the value of ICT in education. Affective attitude remained in the favourable range ( $M=33.97$ ,  $SD=7.02$ ), reflecting generally positive emotional responses to digital learning tools. The behavioural dimension recorded the lowest mean ( $M=31.18$ ,  $SD=7.84$ ), suggesting a notable gap between students' cognitive belief in ICT's utility and their actual capacity or inclination to behaviorally engage with it attributable to limited physical access to devices and internet in Alipurduar schools.

**Table 6: Self-reported Barriers to ICT Use in Education (N=240)**

Barrier	Agree / Strongly Agree (%)	Neutral (%)	Disagree / SD (%)
Lack of ICT infrastructure at school	68.33	18.75	12.92
Insufficient internet connectivity	72.92	14.58	12.50
Limited teacher ICT competency	59.58	22.08	18.33

Absence of ICT-specific curriculum	54.17	24.58	21.25
Non-availability of devices at home	61.67	19.17	19.17

Source: Primary Survey Data, 2020–21; aligned with UDISE+ 2020–21

Table 6 presents the self-reported barriers profile. Insufficient internet connectivity (72.92%) and lack of school ICT infrastructure (68.33%) were identified as the two most critical barriers, followed by non-availability of home devices (61.67%) and limited teacher ICT competency (59.58%). Over half of respondents (54.17%) noted the absence of a structured ICT curriculum as a constraint. These percentages closely align with UDISE+ 2020–21 data, which documented that fewer than 24% of government secondary schools in West Bengal's northern districts had functional internet access, confirming the structural basis of students' self-reported barriers.

**DISCUSSION**

The findings of this study offer significant empirical insights into ICT attitudes of secondary students in Alipurduar, West Bengal, directly addressing both stated objectives. Concerning Objective 1 assessing the overall ICT attitude the results reveal that 76.67% of students demonstrated favourable or highly favourable attitudes, with an overall mean score of 99.97 (SD=14.12). This finding aligns strongly with Ghavifekr and Rosdy (2015), who demonstrated that even limited exposure to ICT resources typically generates positive attitudinal responses among secondary learners, as technology produces curiosity and perceived utility regardless of access constraints. Similarly found that a majority of secondary students across diverse Indian school settings reported positive orientations toward ICT, particularly in relation to accessing educational content. The dimension-wise analysis provides additional nuance. The cognitive attitude dimension recorded the highest mean (M=34.82), confirming that students intellectually acknowledge ICT's role in improving learning quality. However, the behavioural dimension recorded the lowest mean (M=31.18), reflecting a gap between cognitive appreciation and actual behavioural engagement. This divergence between belief and practice mirrors findings by Siddiq, Scherer, and Tondeur (2016), who established that structural and institutional barriers mediate the conversion of positive ICT beliefs into consistent usage behaviour, a pattern particularly evident in under-resourced districts where belief outpaces access.

Concerning Objective 2 examining gender and school-type differences the finding of non-significant gender differences ( $t=1.42$ ,  $p=0.157$ ) is consistent with prior regional research. Similarly reported no statistically significant gender differences in ICT attitudes among higher secondary students in West Bengal, while Meelissen and Drent (2008) found that institutional context accounted for a substantially greater portion of attitude variance than gender. The marginal female advantage (M=101.23 vs. 98.74) without statistical significance, who noted that girls in Paschim Bardhaman showed slightly higher ICT attitude scores than boys, potentially reflecting girls' proactive engagement with digital communication tools for learning. In sharp contrast, school management type proved a highly significant differentiator ( $t=3.84$ ,  $p<0.05$ ), with private school students scoring markedly higher (M=104.72) than government school counterparts (M=95.61). This disparity is directly attributable to the infrastructure gap between private and government institutions in Alipurduar. As Asrani (2022) demonstrated, physical access to digital tools and quality connectivity are fundamental prerequisites for positive ICT attitude formation. Government schools in Alipurduar predominantly serve tribal and economically disadvantaged communities and are severely under-resourced, a reality confirmed by UDISE+ 2020–21, which documented only 18–24% internet connectivity among government secondary schools in northern West Bengal districts. Scherer

and Siddiq (2019) established through large-scale meta-analysis that socioeconomic status closely tied to school type is among the most robust predictors of ICT-related attitudes and competencies globally. The barrier profile in Table 6 reinforces this reading, with over 72% of students identifying internet connectivity deficits and 68% identifying school infrastructure inadequacy as primary hindrances to ICT engagement. Tondeur et al. (2017) argued that first-order barriers such as infrastructure must be resolved before attitudinal and pedagogical ICT interventions can achieve their intended impact a proposition squarely supported by Alipurduar's district data.

## CONCLUSION

This study empirically established that secondary school students in Alipurduar district, West Bengal maintain predominantly favourable attitudes toward ICT in education, with cognitive dimensions being the most robust and behavioural dimensions the most constrained by institutional barriers. School management type proved a statistically significant differentiator of ICT attitudes, with private school students demonstrating markedly higher scores than government school counterparts. Gender was not a significant differentiating variable. These findings underscore that institutional infrastructure is the primary driver of ICT attitude formation in this context. Policy interventions under Samagra Shiksha Abhiyan must prioritize equitable ICT infrastructure provisioning, systematic teacher training in digital pedagogy, and contextually relevant ICT curriculum integration specifically in geographically marginalized districts like Alipurduar to bridge both the attitudinal and infrastructural digital divide at the secondary education level.

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