Digital Divide and Learning Outcomes: Post-Pandemic Evidence from Uttarakhand

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Introduction

- ▶ The digital divide widens educational inequalities, impacting rural and economically disadvantaged students.
- ▶ Government initiatives aim to enhance digital access in rural areas, but challenges persist.
- ▶ Ongoing efforts to improve online education face obstacles, including the digital divide.
- ▶ This paper explores the impact of the digital divide on learning abilities, with a focus on **Bloom's Taxonomy**.

Research Questions

- ▶ To what extent has the digital divide significantly impacted the learning abilities of students?
- ▶ What are the dependencies and independencies of various components of overall learning within Bloom's Taxonomy concerning the digital divide?
- ▶ How do demographic factors, including gender, social group, and geographical area, influence the academic performance of students in the context of the digital divide?
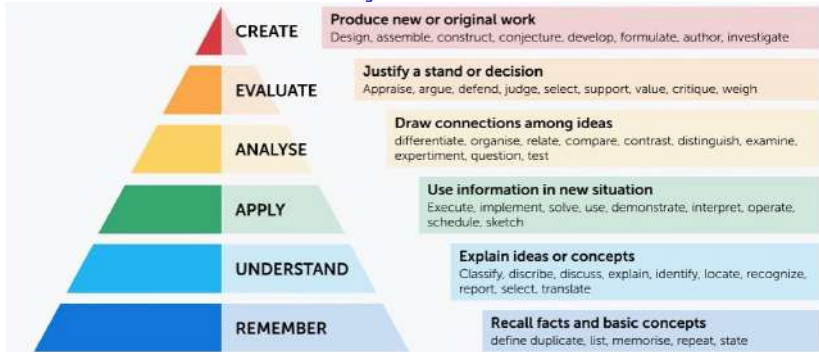
Research Design

Figure: Map of the study area.

Research Design - Contd.

- ▶ A total of **560** people including headmasters, teachers, students were surveyed across three districts of **Uttarakhand**.
- ▶ Uttarakhand was chosen for its diverse geography, having clear distinction beteeen **Accessible** and **less accesible** areas**(defined as Sugam and Durgam in govt. documents)**.
- ▶ Students were randomly chosen wihtout taking any help of teachers/admin, and the survey was conducted after restrictions lifted for all classes and before board exams.
- ▶ Classes 8 and 9 were selected as class 9 was online when they were in 8.

Revised Bloom's Taxonomy

CREATE	**Produce new or original work**	Design, assemble, construct, conjecture, develop, formulate, author, investigate
EVALUATE	**Justify a stand or decision**	Appraise, argue, defend, judge, select, support, value, critique, weigh
ANALYSE	**Draw connections among ideas**	differentiate, organise, relate, compare, contrast, distinguish, examine, expertiment, question, test
APPLY	**Use information in new situation**	Execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch
UNDERSTAND	**Explain ideas or concepts**	Classify, discribe, discuss, explain, identify, locate, recognize, report, select, translate
REMEMBER	**Recall facts and basic concepts**	define duplicate, list, memorise, repeat, state

▶ Moving up the pyramid we find higher order thinking skills.

Source: Bloom's Taxonomy.

Questionnaire

- ▶ School's location and facilities.
- ▶ Information about the participants' environment during and after COVID-19.
- ▶ Types of problems encountered by students and teachers during the COVID-19 period.
- ▶ Insights into the perception of online education during and after the COVID-19 pandemic.
- ▶ Subject Based questions for Students of class 8 and class 9.

Methodology

- ▶ Extrapolating Student's Marks:
  - ▶ Weights: 2.7 (create), 2.3 (evaluate), 2 (analyze), 1.5 (apply), 1 (understand), 0.5 (remember).
- ▶ Regression Model:

$$\begin{aligned}
\text{Total Bloom} =& \beta_0 + \beta_1 \cdot \text{cat} + \beta_2 \cdot \text{Gender} \\
& + \beta_3 \cdot \text{religion} + \beta_4 \cdot \text{caste} + \beta_5 \cdot \text{network} \quad (1) \\
& + \beta_6 \cdot \text{problem} + \beta_7 \cdot \text{device} + \varepsilon
\end{aligned}$$

Results

Variables	Bloom score
Accessibility of School (Category)	0.951
	(1.773)
Gender	**-5.648*****
	(1.222)
Prior Knowledge	**-2.557****
	(1.177)
Observations	450
R-squared	0.088

▶ For a one-unit increase in the Accessibility of School, the Bloom score is expected to increase by approximately 0.951 units.

▶ For a one-unit increase in the Gender variable, the Bloom score is expected to decrease by approximately **5.648 units**.

▶ For a one-unit decrease in the Prior Knowledge variable, the Bloom score is expected to decrease by approximately **2.557 units**.

*** indicate significance at 1%.

Discussion and Conclusion

- ▶ The study shows that digital devices significantly improve educational outcomes in rural India, highlighting the importance of providing effective training and support.
- ▶ There is a notable gender gap, with girls scoring lower than boys across Bloom's taxonomy.
- ▶ Students remote areas face particular challenges. The study calls for targeted policies aimed at rural school development to address these issues.

Appendix

Variables	Bloom score	Remember	Understand	Apply	Analyze	Evaluate	Create
Category	0.951	-0.248*	0.564**	-1.030**	1.601***	-0.486	0.550
	(1.773)	(0.148)	(0.267)	(0.460)	(0.473)	(0.519)	(0.665)
Smart class	**0.104**	-0.195*	0.0949	-0.0570	-0.0569	-0.311	0.629
	(1.239)	(0.104)	(0.187)	(0.321)	(0.331)	(0.363)	(0.464)
Gender	**-5.648***	-0.403***	-0.543***	-0.828***	-0.655**	-1.250***	-1.970***
	(1.222)	(0.102)	(0.184)	(0.317)	(0.326)	(0.358)	(0.458)
Access to Device	**2.432****	0.236**	0.198	0.482	0.358	0.615*	0.543
	(1.168)	(0.0978)	(0.176)	(0.303)	(0.312)	(0.342)	(0.438)
Caste	1.478	0.0567	0.501**	0.155	0.536	0.687	-0.458
	(1.678)	(0.140)	(0.253)	(0.435)	(0.448)	(0.492)	(0.629)
Technical issues(device)	-1.596	-0.188	-0.170	-0.675	-0.158	-0.349	-0.0562
	(1.924)	(0.161)	(0.290)	(0.499)	(0.514)	(0.564)	(0.721)
Network or Electricity	6.424***	0.418**	0.988***	1.556***	0.811	1.645***	1.006
	(1.947)	(0.163)	(0.293)	(0.505)	(0.520)	(0.571)	(0.730)
Prior knowledge	-2.557**	-0.245**	-0.578***	-0.530*	-0.460	-0.521	-0.224
	(1.177)	(0.0986)	(0.177)	(0.305)	(0.314)	(0.345)	(0.441)
Religion	-0.459	-0.0569	-0.211	-0.356	0.181	0.224	-0.241
	(1.859)	(0.156)	(0.280)	(0.482)	(0.496)	(0.545)	(0.697)
Constant	48.37***	2.819***	4.101***	8.745***	8.025***	9.662***	15.01***
	(3.593)	(0.301)	(0.541)	(0.932)	(0.959)	(1.053)	(1.347)
Observations	450	450	450	450	450	450	450
R-squared	0.088	0.079	0.101	0.057	0.090	0.073	0.056

*, ** and *** indicate significance at 10%, 5% and 1% respectively.

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