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Research Paper

Examining The Gaps in Digital Literacy Skills in The Urban and Semi-Urban Population

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ABSTRACT

Digital literacy has become an essential competency in contemporary education and social participation. Despite rapid technological expansion and national digital initiatives, disparities persist in digital skill development across geographical locations. This review paper examines the gap in digital literacy skills between urban and semi-urban populations, particularly among secondary school students. Drawing upon existing literature, the study synthesizes theoretical perspectives on digital literacy, the digital divide framework, and empirical findings from Indian and global contexts. Prior research indicates that urban populations generally demonstrate higher digital proficiency due to better infrastructure, institutional support, and socio-economic advantages (Adeppa, 2025; Laxminarayana, 2026). However, limited attention has been given to semi-urban populations as a distinct category. This review identifies critical gaps in literature, including insufficient comparative studies at the secondary school level and limited use of standardized measurement tools. The findings highlight the need for targeted policy interventions and structured digital literacy programs to ensure equitable access and skill development. Bridging the urban–semi-urban digital literacy gap is essential for promoting educational equity, workforce readiness, and inclusive digital participation.

Keywords: *Digital Divide, Digital Literacy, Educational Inequality, Secondary School Students, Urban–Semi-Urban Disparity*

Digital literacy is increasingly recognized as a foundational life skill in the 21st century. It extends beyond the ability to operate digital devices and includes critical thinking, information evaluation, communication, collaboration, and ethical engagement in digital environments (Hussain & Phulpoto, 2024; UNESCO, 2018). As educational systems progressively integrate technology into pedagogical practices, digital literacy has become closely linked to academic achievement, lifelong learning, and future employability. In digitally mediated societies, competence in navigating online spaces determines not only educational success but also socio-economic mobility.

Globally, scholars conceptualize digital literacy within broader discussions of the digital divide. Van Dijk (2020) argues that digital inequality is not merely about access to devices

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but also about differences in skills, usage patterns, and outcomes. This multidimensional understanding suggests that structural and location-based disparities significantly influence digital competence development. Hargittai (2010) further emphasizes that skill-based inequalities persist even when access is relatively similar, highlighting the importance of quality exposure and guided practice.

In India, digital transformation initiatives such as Digital India have expanded technological reach; however, disparities remain pronounced across geographical locations. Reports indicate that urban households demonstrate significantly higher digital literacy rates compared to non-metropolitan areas (Adeppa, 2025). While rural–urban differences are widely studied, semi-urban populations often remain underexamined despite occupying a transitional socio-economic and infrastructural position.

Given the increasing reliance on digital platforms for education, particularly in the post-pandemic context, examining the digital literacy gap between urban and semi-urban secondary school students is both timely and necessary. Understanding these disparities can contribute to evidence-based educational planning and targeted digital inclusion strategies.

Significance

First, digital literacy directly influences academic engagement. Students with higher digital competence can access online resources, participate in collaborative platforms, and develop independent learning strategies (UNESCO, 2018). Therefore, disparities in digital literacy may contribute to widening educational inequalities.

Second, digital skills are increasingly linked to socio-economic mobility. Lyons and Kass-Hanna (2021) highlight the relationship between digital competence and financial inclusion, demonstrating how digital skills enable broader participation in economic systems.

Third, semi-urban regions represent rapidly growing educational zones. However, infrastructural development in these areas often lags urban centres (Laxminarayana, 2026). Understanding skill disparities within this demographic is crucial for targeted intervention planning. Finally, examining these gaps contributes to policy discourse on digital equity and inclusive development within emerging digital economies.

Objectives

1. To examine differences in digital literacy skills between urban and semi-urban populations.
2. To analyse factors contributing to digital literacy disparities among secondary school students.
3. To identify research gaps in existing literature related to semi-urban digital competence.

Rationale

Although digital literacy has been widely studied, most research focuses on rural–urban comparisons or higher education contexts. Semi-urban populations are rarely examined as a distinct category. Given their transitional infrastructural and socio-economic characteristics, investigating digital literacy gaps within this group is essential to ensure equitable educational and technological development.

REVIEW OF LITERATURE

Digital literacy has emerged as a foundational competence in the twenty-first century, reflecting the growing integration of digital technologies into education, communication, governance, and economic participation. Initially conceptualized as the ability to operate computers and navigate the internet, digital literacy has progressively evolved into a multidimensional construct encompassing technical, cognitive, socio-emotional, and ethical competencies (Eshet-Alkalai, 2004; Hussain & Phulpoto, 2024; UNESCO, 2018). Early definitions emphasized operational proficiency, focusing on hardware manipulation and basic internet use. However, as digital environments became increasingly interactive and participatory, scholars began to recognize that effective engagement requires higher-order thinking skills, including information evaluation, content creation, problem-solving, and responsible participation in online spaces. Consequently, digital literacy is now understood not merely as technological fluency but as an integrated capacity that enables individuals to function meaningfully in digitally mediated societies.

Eshet-Alkalai (2004) provided one of the earliest multidimensional frameworks, proposing that digital literacy comprises photo-visual literacy, reproduction literacy, information literacy, and socio-emotional literacy. This model underscored the interpretive and analytical dimensions of digital engagement, emphasizing that individuals must decode visual interfaces, critically evaluate online information, and navigate social interactions responsibly. Expanding upon this perspective, Ng (2012) introduced a three-dimensional framework integrating technical, cognitive, and socio-emotional components, arguing that digital competence emerges through the interaction of these domains rather than through isolated skill acquisition. Similarly, van Deursen, Helsper, and Eynon (2016) developed and validated the Internet Skills Scale, distinguishing between operational, formal, information, and strategic skills. Their hierarchical model demonstrates that advanced digital skills build upon foundational abilities, reinforcing the need to examine multiple dimensions when assessing digital literacy gaps. These theoretical contributions collectively illustrate that digital literacy is layered and complex, requiring both technical mastery and critical engagement.

The broader discourse on digital literacy is deeply embedded within digital divide scholarship. Traditionally, the digital divide was framed as a binary distinction between those who had access to digital technologies and those who did not. However, contemporary theorists argue that this access-based framework is insufficient for understanding persistent inequalities. Van Dijk (2020) conceptualizes digital inequality as a sequential process involving motivational access, material access, skills access, and usage access. According to this model, disparities may persist even when infrastructure and devices are available, as individuals differ in motivation, competence, and capacity to derive meaningful outcomes from technology use. This layered understanding shifts the analytical focus from mere connectivity to skill acquisition and beneficial usage patterns.

Empirical research supports this multidimensional perspective. Van Deursen and van Dijk (2014) argue that contemporary digital inequality increasingly reflects differences in usage rather than access, with socio-economically advantaged individuals engaging in capital-enhancing online activities such as information seeking, professional networking, and educational enrichment. In contrast, others may use digital platforms primarily for entertainment or passive consumption, limiting potential benefits. Ragnedda and Ruiu (2017) extend this argument by linking digital skills to social capital, suggesting that digital competence mediates access to broader socio-economic opportunities. Helsper and van

Deursen (2017) further demonstrate that individuals from higher socio-economic backgrounds receive greater qualitative support for digital engagement, reinforcing cumulative advantage mechanisms. These findings indicate that digital literacy disparities are embedded within broader structural inequalities, including income, education, and institutional support systems.

Geographical context plays a crucial role in shaping digital literacy outcomes. Urban areas typically benefit from advanced technological infrastructure, stable internet connectivity, and institutional investment in digital education. In contrast, non-metropolitan regions often experience infrastructural constraints and inconsistent technological integration. In the Indian context, Adeppa (2025) reports that urban households demonstrate higher levels of digital penetration and structured ICT integration in schools compared to non-metropolitan regions. Although national initiatives have expanded connectivity, regional disparities persist in terms of quality of access, institutional support, and teacher preparedness. Livingstone and Helsper (2007) conceptualize digital inclusion as a continuum, arguing that inequalities vary in degree rather than in absolute presence or absence. This perspective is particularly relevant when examining semi-urban populations, which may have partial access to infrastructure but limited opportunities for skill development and structured digital learning.

Global data further highlight persistent regional inequalities. The International Telecommunication Union (2022) reports that while internet penetration rates have increased worldwide, disparities remain pronounced in digital skill acquisition and effective usage. Laxminarayana (2026) links digital skill disparities to unequal participation in e-governance services, demonstrating that limited competence restricts civic engagement and access to digital public services. Damásio (2024) argues that national digital inclusion policies often produce uneven outcomes due to variations in regional implementation capacity. Semi-urban regions may thus experience a “middle-gap” phenomenon, where they are neither the primary beneficiaries of rural-focused digital inclusion programs nor equipped with the advanced infrastructure characteristic of metropolitan centres. This transitional positioning warrants independent examination rather than subsumption within rural–urban dichotomies.

Within educational settings, digital literacy has become integral to academic engagement and long-term employability. UNESCO (2018) identifies digital competence as a key component of quality education under Sustainable Development Goal 4, emphasizing its role in fostering inclusive and equitable learning opportunities. Students with strong digital skills demonstrate greater autonomy in research, improved collaborative capabilities, and enhanced critical thinking (Ng, 2012). The increasing reliance on digital platforms for instruction, particularly following the COVID-19 pandemic, has amplified the centrality of digital competence in secondary education.

Empirical studies among adolescents reveal significant variability in digital literacy levels. Claro et al. (2012) developed performance-based assessments to measure ICT skills among high school students, demonstrating that objective evaluation methods can capture authentic digital competence beyond self-perceived confidence. Gui and Argentin (2011) found substantial variation in digital skills among secondary students, challenging assumptions that younger generations are inherently digitally proficient. Similarly, Hargittai (2010) reported wide differences in internet skills among members of the “net generation,” emphasizing that age alone does not guarantee competence. Hatlevik, Guðmundsdóttir, and Loi (2015) identified socio-economic status, parental education, and school-level ICT integration as significant predictors of students' digital competence, highlighting the importance of institutional and familial contexts.

Despite the growing importance of digital literacy in adolescence, much of the existing empirical literature remains concentrated in higher education contexts. Amin, Rahman, and Khatun (2021) developed and validated the Digital Literacy Scale (DLS), demonstrating strong reliability and construct validity across multiple dimensions. However, there and many similar studies primarily focus on university populations. This imbalance limits understanding of digital competence development during earlier stages of schooling, where foundational skills are consolidated. Secondary school students, particularly those in transitional geographical zones such as semi-urban areas, remain underrepresented in comparative research.

Measurement challenges further complicate the assessment of digital literacy gaps. While validated instruments such as the Digital Literacy Scale (Amin et al., 2021) and the Internet Skills Scale (van Deursen et al., 2016) provide structured frameworks for multidimensional evaluation, numerous regional studies rely on self-reported confidence measures. Hargittai (2010) cautions that self-perceived digital ability may not accurately reflect actual skill levels. Claro et al. (2012) similarly emphasize the importance of performance-based assessment for capturing authentic competence. The underutilization of standardized instruments in geographical comparative research reduces reliability and limits cross-contextual comparability.

Socio-economic and institutional determinants significantly influence digital literacy development. Lyons and Kass-Hanna (2021) demonstrate that digital competence enhances financial inclusion and economic participation, reinforcing its role in socio-economic mobility. Hatlevik et al. (2015) show that school-level ICT resources and teacher competence are strong predictors of student digital skills. Urban institutions often provide structured digital curricula, trained faculty, and updated technological infrastructure (Adeppa, 2025), whereas semi-urban schools may face inconsistent connectivity and limited professional development opportunities for educators. Helsper and van Deursen (2017) argue that qualitative support networks and guided practice play a critical role in digital skill acquisition, suggesting that mere access to devices is insufficient for competence development.

Taken together, the literature establishes that digital literacy is a multidimensional, socially embedded construct shaped by access, socio-economic context, institutional capacity, and geographical location. Urban populations consistently demonstrate stronger digital competence due to infrastructural and educational advantages, while semi-urban regions remain comparatively underexplored despite occupying a distinct transitional position. Digital divide theory (Van Dijk, 2020) provides a robust framework for understanding how motivational, material, skill-based, and usage-level inequalities intersect with structural determinants. However, empirical research specifically comparing urban and semi-urban secondary school students remains limited. A theory-driven, standardized, and developmentally sensitive approach is therefore essential to generate nuanced insights into geographical digital literacy gaps and to inform equitable educational policy interventions.

Research Gap

Despite the growing body of literature on digital literacy, significant conceptual and empirical gaps remain. First, most studies adopt a binary rural–urban framework, thereby overlooking semi-urban regions as a distinct analytical category. Semi-urban populations occupy transitional socio-economic and infrastructural positions that may produce unique digital literacy patterns. The absence of independent examination obscures nuanced disparities and limits policy relevance.

Second, digital literacy research predominantly focuses on higher education populations. Secondary school students, particularly those in early adolescence, remain underrepresented in empirical investigations. This stage is critical for consolidating cognitive and technological competencies that influence future academic and career trajectories. Without focused research at this level, educational interventions risk being misaligned with developmental needs.

Third, methodological inconsistencies persist across studies. A large proportion of research relies on self-reported measures of confidence rather than standardized assessments of actual skills. The limited use of validated instruments such as the Digital Literacy Scale (Amin et al., 2021) restricts comparability and reduces empirical precision. Objective measurement tools are essential for accurately identifying skill gaps.

Finally, there is insufficient direct comparative research between urban and semi-urban secondary school students. While urban students are generally assumed to outperform non-metropolitan peers, the magnitude and dimensions of this gap remain undocumented. A systematic comparison grounded in digital divide theory can provide clearer evidence to guide targeted educational planning

Key findings

1. Digital literacy is a multidimensional construct encompassing technical, cognitive, and socio-emotional competencies.
2. Urban populations consistently demonstrate higher digital literacy levels than non-metropolitan groups.
3. Semi-urban populations remain underrepresented in empirical digital literacy research.
4. The digital divide extends beyond access to include skills, usage, and outcome inequalities.
5. Geographical disparities significantly influence digital competence development.
6. Institutional infrastructure and teacher preparedness shape students' digital skill acquisition.
7. Socio-economic background strongly correlates with digital literacy outcomes.
8. Digital literacy predicts academic engagement and lifelong learning capacity.
9. Post-pandemic educational shifts have intensified the importance of digital competence.
10. Secondary school students are less frequently studied compared to university populations.
11. Self-reported digital competence often overestimates actual skill levels.
12. Standardized assessment tools are underutilized in regional comparative research.
13. National digital inclusion policies produce uneven regional implementation outcomes.
14. Skill-based inequalities persist even when material access is available.

15. Transitional regions such as semi-urban areas may experience a “middle-gap” phenomenon.

Future Implications

1. Targeted Educational Policy Design: Policymakers should design region-specific digital literacy interventions addressing semi-urban infrastructural and pedagogical gaps.
2. Integration of Standardized Assessment Tools: Schools should adopt validated digital literacy scales to enable reliable monitoring and cross-regional comparison.
3. Teacher Training and Institutional Strengthening: Capacity-building initiatives must prioritize semi-urban institutions to ensure equitable digital integration in curricula.
4. Developmentally Appropriate Interventions: Early adolescence-focused digital literacy programs should be introduced to strengthen foundational competencies before higher education.

CONCLUSION

The present review highlights that digital literacy is a multidimensional construct shaped by technical competence, cognitive processing, socio-emotional engagement, and ethical awareness. While access to technology has improved considerably, particularly in developing nations such as India, disparities persist at the level of skills, usage, and meaningful outcomes. The literature consistently demonstrates that urban populations tend to exhibit higher digital literacy levels due to stronger infrastructural support, institutional resources, and socio-economic advantages. However, semi-urban populations remain insufficiently examined, despite occupying a distinct transitional position that may produce unique patterns of digital engagement and constraint.

Furthermore, the review underscores critical methodological and contextual gaps in existing research. Secondary school students, particularly those in early adolescence, are underrepresented in digital literacy studies, and standardized assessment tools are not consistently employed in comparative analyses. The reliance on rural–urban dichotomies oversimplify geographical inequality and obscures the specific challenges faced by semi-urban learners. Addressing these gaps through systematic, theory-driven, and empirically rigorous research can contribute to more equitable digital education policies and targeted interventions aimed at bridging skill-based inequalities across regions.

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Conflict of Interest

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