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Digital Divide and Online Learning under NEP 2020- Evidences from Large Indian States with Special Reference to Bihar

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Abstract— The National Education Policy (NEP) 2020 places technology-enabled learning at the centre of educational transformation in India. However, the effectiveness of online and blended learning depends upon the level of digital readiness among learners, households and educational institutions. This paper examines the status of digital literacy and digital inclusion across large Indian states and evaluates the implications for online learning with special reference to Bihar. The study is mainly based on secondary data compiled from the NSS 78th Round Multiple Indicator Survey (MIS) 2020–21, the State of India's Digital Economy (SIDE) Report 2024 and other related reports. Large states with population exceeding one crore have been selected for comparison. Findings reveal that Bihar ranks at the bottom of almost all indicators related to connectivity, digital adoption and innovation. The state records lower ICT skills, lower internet usage, weak school digital infrastructure and significant gender disparities in digital access. These constraints pose serious challenges for the state in the implementation of the digital vision of NEP 2020. The paper concludes that reducing educational inequality requires simultaneous investments in connectivity, affordability, digital literacy, institutional infrastructure and gender-inclusive access.

Keywords

Digital literacy; Digital divide; Digital inclusion, ICT skills; Online learning; NEP 2020; Bihar;

1. Introduction

The twenty-first century has witnessed rapid technological advancement and increasing digitalization. The advent of globalization and amplified role of knowledge economy has resulted in rapid transformation in the structure and delivery of education. Digital technologies have now become integral part of teaching, learning, assessment, and educational administration across the globe. In India, the importance of digital education increased substantially during the COVID-19 pandemic. Due to imposition of country-wide lockdown, educational institutions were bound to shift from traditional classroom teaching to online teaching. This transition in the mode of teaching has further enhanced the adoption and practice of digital tools, virtual platforms, and online learning resources by educational institutions in India and abroad.

Considering the growing importance of digital education and online learning, Government of India has introduced the National Education Policy in 2020. The policy assigns highest priority for integrating technology into teaching-learning processes, curriculum delivery, vocational training, and educational governance. The policy recognizes the importance of digital literacy among students and teachers for creating a technologically empowered society and ensuring equitable access to digital learning. It therefore strongly supports the use of digital platforms such as DIKSHA, SWAYAM, NPTEL e-Pg Pathshala, and virtual laboratories to improve educational accessibility and quality.

Despite the ambitious vision of the NEP 2020, the implementation of online learning in India faces serious challenges. The unequal distribution of digital infrastructure, internet connectivity, access to technological devices, and ICT skills has created a deep digital divide between States, gender,

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geographical location and across different socio-economic groups. States with higher income levels, stronger educational systems, and better infrastructure have adopted these digital tools more effectively, whereas economically backward states continue to struggle (SIDE, 2024).

Bihar represents one of the most significant examples of these challenges. The state possesses one of the largest youth populations (15-29 years) in India (Census, 2011). But, unfortunately the state is at the bottom in terms of major educational and skill indicators. Although, significant progress has been made in educational enrolment and student participation in recent years, the state continues to experience severe limitations in digital infrastructure, internet penetration, and affordability as well as accessibility of technology. (SIDE, 2024). These challenges have serious implications for the implementation of online learning and the achievement of educational equity under the National Education Policy. Understanding Bihar's position is therefore essential for evaluating the feasibility of digital education under NEP 2020. In this background, present study aims to analyze the status of digital literacy and ICT skills among large population states in India and to examine Bihar's position in terms of digital readiness and connectivity.

2. Major Objectives and research methodology of the Study

Considering the importance of online learning particularly after implementation of NEP 2020, the present study aims to examine the status of digital literacy and ICT skills across major states in India. The current research paper endeavors to delve deeper to inspect Bihar's position in comparison to other large population states in terms of different digital literacy indicators. The study also seeks to assess the implications of digital inequality for online learning under NEP 2020 and suggest policy measures for improving digital inclusion and educational equity.

The study is descriptive and analytical in nature and is based entirely on secondary data sources. Data have been collected from various sources like NSS 78th Round Multiple Indicator Survey (MIS), 2020–21, State of India's Digital Economy (SIDE) Report 2024, National Education Policy 2020, various Ministry of Education reports, Government digital education initiatives and policy documents, and Research articles, journals, books, and reports related to digital literacy and online learning. The analysis is limited to 19 large states having population greater than one crore. Comparative tables, rankings and descriptive analysis have been used to examine gaps and inequalities among states. The study focuses on ICT skills, internet usage, connectivity, gender inclusion, affordability and school digital infrastructure as major determinants of online learning readiness

3. Review of Literature

The relationship between digital literacy, online education, and socio-economic inequalities in India have been examined in several studies. Prensky (2001) introduced the concept of "digital natives" and argued that younger generations are relatively more dependent on technology for their education, learning and communication. However, the accessibility to digital resources is uneven in developing countries. Selwyn (2004) highlighted that digital inclusion is not merely about access to technology but also about meaningful usage, digital competence, and socio-economic capability. The study further examined that educational outcomes depend on both technological availability and user skills. UNESCO (2020) reported that the COVID-19 pandemic exposed the wide inequalities in accessibility of digital educational resources across countries, regions, social and income groups. Students from low-income families and rural regions faced severe disadvantages in accessing online learning. Jena (2020) investigated the impact of the COVID-19 pandemic on education in India and observed that online learning became a

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necessity rather than a choice. However, this transition from conventional teaching to online teaching revealed major infrastructural gaps, especially in rural areas. Dhawan (2020) also examined the status of online learning during the pandemic and identified that lack of internet access, digital illiteracy, and technological affordability are the major barriers in effective online education. Kumar and Singh (2021) contended that NEP 2020 has significant potential for transforming Indian education through technology integration. The successful implementation of NEP however requires substantial investment in digital infrastructure and extensive training of teachers. NITI Aayog (2021) observed that the digital divide in India is majorly due to poverty, educational inequality, and shortage of digital infrastructure across states. Financially weaker states require targeted policy support for effective digital inclusion. Existing literature has extensively discussed digital learning and online education during the COVID-19 period. Studies have also highlighted major challenges in implementation of NEP 2020 and inter-state disparity in terms of digital infrastructure. However, there are limited research focusing specifically on the implementation challenges of online learning in economically weaker states like Bihar. Furthermore, limited studies uses different ICT skill indicators to compare Bihar's digital literacy performance with major Indian states. There is also insufficient focus on the relationship between financial poverty, digital exclusion, and educational inequality in the context of NEP implementation. The present study attempts to fill this gap by providing a comparative state-wise analysis of digital literacy indicators with special reference to Bihar.

4. Theoretical Background

The present study is theoretically grounded on the concepts of human capital formation, technology acceptance, digital divide, and digital inclusion. These perceptions collectively explain the impact of unequal access to educational opportunities and digital technologies on the accessibility as well as effectiveness of online learning.

The Human Capital Theory (Schultz, 1961; Becker, 1964), serves the mainstay of this study. According to the theory education and skill development are the investments that enhance productivity, socio-economic advancement and well-being of an individual. In the contemporary knowledge economy, digital learning constitutes an important component of education and skill development. Therefore, unequal access to digital education may contribute to unequal human capital formation across states, gender and social groups.

The Technology Acceptance Model (TAM**)** developed by Fred Davis in 1989 suggests that the adoption of any technology depends upon two important factors, one is perceived usefulness and the other is ease of use of that technology. Reliable and affordable internet connectivity, easily available digital learning tools, and institutional support greatly influence the willingness and ability of students and teachers to adopt online learning platforms.

When we look at online learning, the digital divide is no longer just about who owns a computer or smart phone. It is about how technology can quietly push disadvantaged students further behind, even when everyone seems to have the same access. The concept of the digital divide emerged in the 1990s to describe disparities in access to Information and Communication Technologies (ICTs). Using the ideas of researchers Van Dijk (2005) and Van Deursen and Helsper (2015), digital divide can be understood through three levels. The first-level of digital divide refers to inequalities in access to digital infrastructure such as internet connectivity, smartphones, computers, and broadband services. It starts with the basics. A wealthy student might have a quiet bedroom and fast, reliable Wi-Fi. One the other hand, a struggling student might be trying to type an essay on a cracked smartphone or in noisy cyber-café with poor internet connectivity. The second-

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level digital divide relates to disparities in digital literacy, ICT skills, and the ability to use technology effectively. Students from better socio-economic background often find it easier to navigate complex online classrooms, fix technical glitches, and give assessment mor confidently as compared to those from socio-economically less privileged section. Therefore, access alone does not guarantee meaningful participation in digital learning. The third-level digital divide concerns inequalities in educational, social, and economic outcomes arising from technology use. Even when access and skills exist, students may derive unequal benefits due to differences in socio-economic background, institutional support, and learning environments. This three-level framework clearly demonstrates that online learning often amplifies existing socioeconomic disparities. It gives an extra boost to those who are already better off in terms of their socioeconomic background.

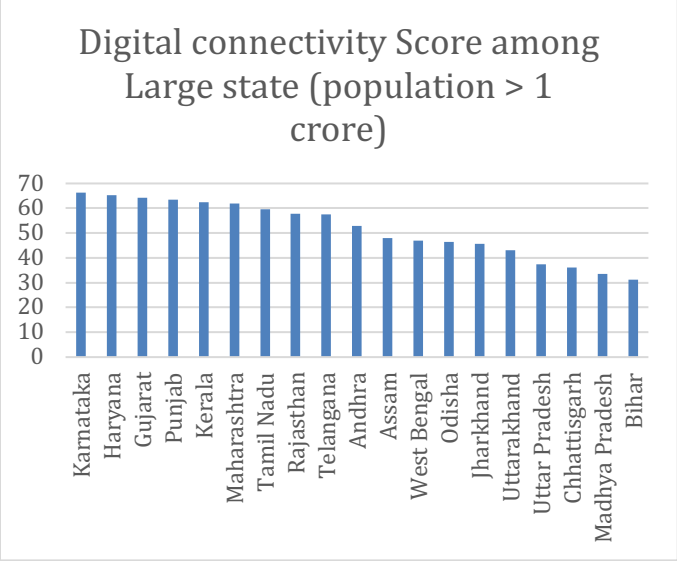
Now, comes the concept of digital inclusion which is the corrective framework of digital divide. Digital inclusion emphasizes equitable access to affordable connectivity, digital devices, digital skills, and equal opportunities of participation for all (Selwyn, 2004; UNESCO, 2023). Digital inclusion is particularly important for achieving educational equity because unequal access to technology can further aggravate the problem socio-economic and regional disparities. In poorer or low-income regions, people from rural areas, economically disadvantaged background and women, face greater barriers to digital participation. Digital inclusion is therefore a prerequisite for successful implementation of technology-enabled education.

Together, these theories provide a comprehensive framework for analysing digital readiness and assess online learning challenges in the implementation of NEP 2020.

5. Comparative Analysis of status of Digitalization among Large States

The rapid advancement of technology and digitalization has transformed the structure and functioning of key economic sectors, including education, healthcare, governance, and social interactions. Digitalization, or digital readiness, is a multidimensional process that depends on economic, infrastructural, and social factors. While digitalization is inherently dynamic, it has also produced negative externalities, resulting in regional disparities across Indian states. The performance of major Indian states in terms of connectivity is illustrated in Figure 1. Connectivity is assessed using indicators such as internet access, broadband penetration, and telecommunications infrastructure (SIDE, 2024). Comparative analysis of these scores reveals the uneven distribution of digital resources and underscores the challenges faced by states that lag in digital transformation.

Figure 1 Status of digital Connectivity of Large States



Source: State of India's Digital Economy (SIDE) Report 2024

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The data indicate significant disparities in digital connectivity amongst India's large states. Karnataka leads with a score of 66.2, followed by Haryana (65.3), Gujarat (64.2), Punjab (63.4), and Kerala (62.5). These states benefit from stronger economic growth, advanced telecommunications infrastructure, higher levels of urbanization, and increased private and public investment in digital technologies. The existence of major information technology hubs, elevated digital literacy rates, and robust institutional capacity further enhance their digital connectivity performance.

In contrast, Bihar ranks last among the 19 large-population states, with a score of 31.2, which is less than half that of Karnataka. Other low-performing states are Madhya Pradesh (33.6), Chhattisgarh (36.2), and Uttar Pradesh (37.4). Bihar's low ranking across major connectivity indicators highlights persistent challenges in digital infrastructure development, including limited internet and broadband penetration, insufficient network coverage in rural areas, and restricted digital access among households. The state's predominantly rural population, lower per capita income, and weaker infrastructure base have further slowed digital adoption. These structural barriers continue to impede access to online education, digital financial services, e-governance, and other technology-enabled opportunities.

5.1 ICT Skills and Digital Literacy

The NSS 78th Round Multiple Indicator Survey provides important insights into digital literacy and ICT skills across Indian states. The survey measures different levels of digital capability, including basic ICT skills, internet usage, and advanced digital competencies. The comparative analysis reveals substantial inter-state disparities in digital literacy.

Across India’s 19 large states, clear regional patterns emerge in digital adoption. Southern states such as Kerala, Tamil Nadu, Karnataka, and Telangana consistently demonstrate high ICT proficiency among youth, with more than 60% of individuals aged 15–24 reporting basic digital skills like file handling, email use, and spreadsheets. In contrast, northern and eastern states including Bihar, Uttar Pradesh, and Madhya Pradesh lag significantly, with Bihar at the bottom—less than one in four young people reporting even basic ICT skills. This stark divide underscores the structural barriers Bihar faces in preparing its workforce for participation in the digital economy.

Mobile penetration is broadly strong across India, with most states exceeding 75% adult usage. Urbanized regions like Delhi and Kerala surpass 85–90%, reflecting widespread exclusive SIM ownership. Bihar, however, sits at the lower end, with around 68% of adults using mobile phones, and a higher proportion relying on shared SIM cards. This suggests affordability constraints and weaker personal digital ownership, limiting the ability of individuals to access personalized digital services.

Broadband access further highlights the divide. Delhi and Kerala lead with household penetration above 65–70%, while Gujarat, Punjab, and Haryana hover around 55–58%. Bihar again ranks among the lowest, with only about 40% of households connected to broadband. This limited infrastructure restricts access to online education, e-governance, and digital commerce, reinforcing the rural-urban gap.

Mass media access shows similar disparities. More than 90 % household in relatively developed States like Kerala and Karnataka have access to television, radio, or newspapers, ensuring broad information dissemination. Bihar, however, remains at the bottom with only about 72% of households connected to mass media. This reduced exposure limits awareness of digital opportunities and government schemes, compounding the challenges of digital inclusion.

Taken together, Bihar consistently underperforms across all four indicators—ICT skills, mobile use, broadband access, and mass media—highlighting a multi-dimensional digital divide.

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While mobile penetration provides a partial foundation, the lack of ICT skills and broadband infrastructure severely constrains Bihar's ability to harness the digital economy compared to leading states like Kerala, Karnataka, and Tamilnadu.

5.2 Issues related to Connectivity, Access and Inclusion

The SIDE Report identifies connectivity as a foundational requirement for digital development. Bihar ranks last among nineteen large states in terms of digital connectivity. The report further notes that Bihar performs poorly in access (individual), inclusion (geography), inclusion (gender) and affordability. Although subscriber density has improved over time, growth has largely occurred from a low base. Consequently, digital access remains significantly below the level observed in leading states such as Karnataka, Haryana and Gujarat. Low connectivity has important educational implications. Students who experience unstable internet connections face difficulties in attending live classes, accessing digital content and participating in assessments. Educational institutions also face challenges in adopting blended learning models when connectivity remains inadequate.

Gender inequality remains one of the most significant barriers to digital inclusion. Women in Bihar face greater barriers to digital access due to economic dependency, social restrictions, and educational disadvantages. Only 24 per cent of rural women in Bihar have internet access. This restricts the ability of female students to participate in online learning and reduces opportunities for digital skill acquisition. Since gender equity is a major objective of NEP 2020, addressing digital exclusion among women should be a policy priority.

Institutional infrastructure is critical for implementing digital education. The SIDE Report indicates that less than 10 per cent of schools in Bihar have broadband connectivity and fewer than 20 per cent possess computer facilities. This limits the ability of schools to implement blended learning, digital content delivery and technology-enabled pedagogy.

6. Digital Divide and Online Learning under NEP 2020: A discussion

The National Education Policy (NEP) 2020 places technology as a medium to improve access, flexibility, and quality in education. However, evidences presented above shows that existing disparities in digital preparedness across states may undermine the realization of this vision. Effective online learning depends on access to digital devices, reliable internet connectivity, digital competencies, and supportive infrastructure. Bihar shows significant deficiencies across all these parameters. Connectivity gaps obstruct access to online educational content particularly in rural areas. Economic barriers restrict device ownership among low-income households. Gender-based disparities prevent women and girls from participating in digital learning. Inadequate school infrastructure and limited ICT skills among trainers further affect the learning process. Collectively, these factors generate cumulative disadvantages that perpetuate educational inequality. Unequal digital access further aggravates the problem of educational inequality across geographical regions and socio-economic groups. Students from socio-economically advantaged backgrounds or those residing in metro cities or urban areas are gaining greater educational benefits than those from disadvantaged community or rural areas. Digital exclusion also compromises the effectiveness of educational reforms introduced by the National Education Policy. Inadequate digital skills further diminish employability and limit economic participation in an increasingly technology-driven economy. Digital inequality thus impedes long-term human capital development and socio-economic mobility in states such as Bihar.

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7. Conclusion and Policy Suggestions

Digital literacy has become essential for participation in modern education and the digital economy. The National Education Policy (NEP) 2020 highlights the importance of technology and online learning for improving access and quality in education. However, the benefits of digitalisation are not evenly distributed across Indian states. The findings of this study show that Bihar continues to lag behind many large states in terms of digital readiness. Evidence from the NSS Multiple Indicator Survey (MIS) 2020–21 and the State of India's Digital Economy (SIDE) Report 2024 indicate lower levels of internet usage, ICT skills, digital infrastructure, and connectivity in Bihar. The state also faces significant gender disparities in access to digital technologies. Compared with states such as Kerala, Karnataka, Maharashtra, and Tamil Nadu, Bihar remains less prepared to utilise the opportunities offered by online learning and digital education. The study further reveals that weak infrastructure, limited digital literacy, and unequal access to technology remain major barriers. These challenges are more severe in rural areas and among disadvantaged groups. As a result, many students are unable to fully participate in technology-enabled learning.

Several policy measures can help improve digital inclusion in Bihar and other financially weaker states. Investment in broadband connectivity, reliable electricity, and digital infrastructure should be increased, especially in rural areas. Affordable smartphones, tablets, laptops, and subsidised internet services should be provided to economically weaker students. Digital literacy should be introduced from the school level and integrated into the curriculum. Teachers should receive regular training in digital pedagogy, online assessment, and the use of educational technologies. Targeted programmes should be launched to improve digital access among girls and women. Government schools should be equipped with computers, internet facilities, smart classrooms, and digital learning resources. Language should never be a barrier for learners. So, educational content should be developed in regional languages to improve accessibility. Village-level digital learning centres can provide shared access to computers and internet facilities for students who lack devices at home. Regular monitoring and evaluation should be undertaken to assess the effectiveness of digital education programmes and identify implementation gaps.

In conclusion, bridging the digital divide is essential for the successful implementation of NEP 2020. Improving digital infrastructure, affordability, and access can help can create a more inclusive education system in India. For Bihar, strengthening digital infrastructure is not only an educational priority but also a prerequisite for broader social and economic development. Technology must become a tool for inclusion and empowerment rather than a source of further inequality.

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