Digital Connectivity and Sustainable Human Capital Development: Evidence toward Achieving Quality Education in Indonesia

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Abstract

The rapid expansion of internet penetration and Massive Open Online Courses (MOOCs) over the past decade has fundamentally reshaped knowledge acquisition, lifelong learning patterns, and cognitive engagement. Within the framework of the Sustainable Development Goals (SDGs) digital connectivity is increasingly recognized as a strategic enabler of inclusive human capital development. Nevertheless, robust empirical evidence on whether internet access contributes to cognitive performance, especially in developing country contexts, remains limited.

This study investigates the causal impact of internet access on cognitive scores among Indonesian adults using data from the fifth wave of the Indonesia Family Life Survey (IFLS-5). Employing a quasi-experimental design with Propensity Score Matching (PSM), we estimate the Average Treatment Effect on the Treated (ATT) to address selection bias in internet use. The analysis covers 11,423 respondents and compares individuals with and without internet access while controlling for demographic, socioeconomic, and regional characteristics.

The findings reveal a statistically significant cognitive advantage associated with internet access, with connected individuals scoring approximately 3.4 points higher than their non-connected counterparts. Subgroup analyses further indicate that the positive effect is more pronounced in rural areas and on the island of Java, suggesting that digital access may play a compensatory role in regions with historically uneven educational resources. These results underscore the importance of digital infrastructure in sustaining cognitive functioning and mitigating cognitive decline through continuous exposure to information and intellectual stimulation.

This study contributes to the literature by providing nationally representative, quasi-experimental evidence on the relationship between digital access and cognitive outcomes in a developing country setting. By linking digital inclusion to measurable cognitive gains, the findings underscore the urgency of policies that expand equitable internet infrastructure and strengthen digital inclusion strategies, in line with Indonesia's commitment to achieving the SDGs.

Index Terms

Internet Access; Digital Inclusion; Cognitive Performance; Digital Divide; MOOCs; Human Capital