Published Date: - 25-07-2025
Page No: - 258-260

THE RELATIONSHIP BETWEEN DIGITAL LITERACY AND LEARNING OUTCOMES (CORRELATION AND REGRESSION ANALYSIS)

Boboqulova Aziza Adizovna
Preschool educator at State Preschool Educational Institution No. 11 at Mohi-Xossa Mahalla at Bukhara City, Uzbekistan

ABSTRACT

This article examines the association between students' digital literacy and their academic performance, focusing on correlation and regression evidence from a cross-sectional school sample. Grounded in dual coding, self-regulated learning, and multimedia learning perspectives, the study explores whether digital literacy predicts outcomes beyond socio-economic status, prior achievement, and device access. A sample of lower-secondary pupils completed a competency-based digital literacy assessment aligned with international frameworks, while learning outcomes were operationalized as grade point average and standardized scores in reading and mathematics. Pearson correlations indicated moderate positive associations between digital literacy and all outcome measures. Hierarchical multiple regression showed that digital literacy remained a significant predictor after controlling for covariates, with a meaningful incremental contribution to explained variance. Implications include embedding diagnostic digital literacy modules across the curriculum, formative feedback on information evaluation and task management, and targeted support for students with limited access or excessive unstructured screen time.

KEYWORDS

Digital literacy, learning outcomes, academic achievement, correlation, regression, self-regulated learning, multimedia learning.

INTRODUCTION

The mass diffusion of digital devices into schools has made the distinction between technology access and digital literacy increasingly salient. While access creates opportunities, achievement gains depend on students' ability to locate, evaluate, integrate, and communicate information, manage attention, and use digital tools strategically. International frameworks conceptualize digital literacy as a set of knowledge, skills, and attitudes spanning information processing, communication, content creation, safety, and problem solving. The present study investigates whether measurable differences in digital literacy are associated with variation in learning outcomes and whether this association persists after accounting for background and school factors that typically correlate with achievement.

The study aims to estimate the strength of the relationship between digital literacy and academic performance and to determine the extent to which digital literacy explains unique variance in outcomes beyond socio-economic status, prior achievement, device access, and screen-time patterns. A secondary aim is to assess whether the association differs across reading and mathematics.

The investigation employed a cross-sectional correlational design in three comprehensive schools. Participants were students in grades 5–7 (N ≈ 320). Digital literacy was measured with a 30-item assessment aligned with widely used competence frameworks, covering information search and evaluation, content creation, communication etiquette, security and privacy, and problem solving. Internal consistency was acceptable (Cronbach's α ≈ 0.86). Learning outcomes comprised school grade point average (GPA) and standardized test scores in reading and mathematics obtained from routine assessment cycles.

Control variables included parent-reported socio-economic status (three-item index combining parental education and household assets), prior achievement (previous term GPA), device access (home computer or tablet availability), and screen time on school days (self-reported hours, separated into structured academic use and unstructured entertainment). After descriptive checks, bivariate associations were estimated using Pearson's r. Hierarchical multiple regression then entered covariates in Step 1 and digital literacy in Step 2 for each outcome. Assumption checks included normality of residuals, homoscedasticity, linearity, and multicollinearity via variance inflation factors (VIF).

Descriptive statistics indicated moderate dispersion in digital literacy scores, with no ceiling effects. Bivariate analysis revealed positive correlations between digital literacy and GPA ($r \approx 0.40$), reading ($r \approx 0.45$), and mathematics ($r \approx 0.34$), all statistically significant at conventional levels. These coefficients suggest that students with stronger digital literacy tend to achieve higher grades and standardized performance, particularly in reading, where tasks often require evaluation and synthesis of multimodal information.

In hierarchical regression for GPA, the covariate block (socio-economic status, prior achievement, device access, structured and unstructured screen time) explained a substantial portion of variance. Adding digital literacy produced a significant increment in R^2 ($\Delta R^2 \approx 0.06$), with a standardized coefficient of $\beta \approx 0.28$, indicating that digital literacy contributes unique explanatory power beyond background and access. For reading, the incremental gain was slightly larger ($\Delta R^2 \approx 0.07$; $\beta \approx 0.30$), whereas for mathematics it was smaller but still meaningful ($\Delta R^2 \approx 0.03$; $\beta \approx 0.18$). VIF values remained below 2.0, and residual plots showed no major violations of model assumptions, supporting the stability of the estimates.

The pattern of results is consistent with theoretical accounts that position digital literacy as a meta-competence. Rather than functioning simply as familiarity with devices, digital literacy seems to support goal setting, monitoring, information triage, and strategic use of tools, which in turn accelerates learning in content subjects. The stronger association with reading may arise because digital literacy directly scaffolds comprehension processes such as evaluating source credibility, integrating textual and visual cues, and constructing meaning across tabs and documents. Mathematics benefits as well, albeit to a smaller extent, likely through improved task management, data handling, and the use of visualization tools.

Two caveats temper interpretation. First, the cross-sectional design precludes strong causal inference; high-achieving students might also be more motivated to cultivate digital skills, producing reciprocal effects. Longitudinal studies and experimental designs that teach specific digital strategies and track downstream academic outcomes would clarify directionality. Second, measurement error in screen-time self-reports and the context-specificity of digital tasks may attenuate estimates. Nevertheless, the persistence of digital literacy effects after

controlling for socio-economic status and access suggests that instructional focus on competencies—rather than devices—can yield generalizable academic benefits.

The findings support the view that digital literacy is positively associated with academic achievement and adds unique explanatory power beyond socio-economic background, prior performance, and access. Educational practice should therefore integrate explicit teaching and assessment of digital literacy across subjects, with emphasis on information evaluation, task management, and safe communication. Formative diagnostics can identify students who need targeted support, while curriculum-embedded micro-tasks can cultivate transferable strategies without adding excessive workload. Future research should track cohorts over time, test domain-specific interventions, and refine measurement to distinguish productive academic screen time from passive use.

REFERENCES

1. European Commission. DigComp 2.1: The Digital Competence Framework for Citizens. — Luxembourg: Publications Office of the European Union, 2017. — 48 p.
2. UNESCO Institute for Statistics. A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2. — Montreal: UIS, 2018. — 80 p.
3. Hatlevik O.E., Christophersen K.-A. Digital competence at the beginning of upper secondary school // Computers & Education. — 2013. — Vol. 63. — P. 39–50.
4. Ng W. Can we teach digital natives digital literacy? // Computers & Education. — 2012. — Vol. 59, № 3. — P. 1065–1078.
5. Scherer R., Siddiq F. The relation between students' use of ICT and their academic achievement — a meta-analysis // Computers & Education. — 2019. — Vol. 128. — P. 1–13.
6. Cheung A.C.K., Slavin R.E. The effectiveness of educational technology applications on reading and mathematics achievement in K–12 classrooms: A meta-analysis // Educational Research Review. — 2013. — Vol. 9. — P. 88–113.
7. Hattie J. Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement. — London: Routledge, 2009. — 378 p.