DIGITAL LITERACY AND EDUCATIONAL INEQUALITY IN KAZAKHSTAN: OPPORTUNITIES AND CHALLENGES IN HIGHER EDUCATION

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ABSTRACT

This paper examines the relationship between digital literacy and educational inequality in Kazakhstan's higher education through a conceptual, document-based approach. It is a narrative literature review and does not report newly collected surveys, interviews, or experimental data. OECD country notes on Kazakhstan from PISA 2022 and UNESCO's 2023 Global Education Monitoring Report provide the main evidence for discussing access, skills, instructional support, and inclusion. Because PISA assesses 15-year-old students, its findings are used as contextual evidence rather than direct measurements of university students. The analysis argues that access to digital devices alone does not ensure equal learning opportunities. Reliable connectivity, academic digital competencies, lecturer support, accessible course design, and critical evaluation of information are also essential. Practical implications include low-bandwidth teaching materials, diagnostic digital-literacy support, and routine equity monitoring in universities. The conclusions are interpretive and should not be read as causal findings or as nationally representative evidence about Kazakhstan's higher education students.

Keywords: Kazakhstan, digital literacy, higher education, educational inequality, digital inclusion.

INTRODUCTION

Digital technology has become a routine part of university learning. Learning management systems, electronic libraries, video conferencing, online assessment, and increasingly artificial-intelligence applications shape how students locate information, communicate with lecturers, and demonstrate knowledge. Yet the presence of technology does not automatically produce better or fairer education. UNESCO (2023) stresses that the educational value of technology depends on context, governance, teacher preparation, and evidence of learning benefit. This distinction is particularly important when institutions expand digital services faster than students can develop the skills needed to use them effectively.

Kazakhstan provides a meaningful national context for this discussion. Universities serve students with varied educational backgrounds, languages, places of residence, and economic resources. It is reasonable to investigate whether these differences influence digital participation, although this paper does not claim to measure their prevalence among university students. OECD (2023) documents differences in learning outcomes and experiences among Kazakhstan's school-age learners. Such findings motivate questions about preparedness for later educational transitions, but they cannot establish conditions inside higher education.

Digital literacy is understood here as more than the ability to operate a device. It includes finding and assessing credible information, producing academic work responsibly, communicating safely, protecting personal data, and selecting digital tools for a learning purpose. Educational inequality refers to systematic differences in opportunities to participate, obtain support, and benefit from instruction. These concepts overlap because students with the same online course access may have very different abilities to use that access.

The guiding question is: How can Kazakhstan's higher education institutions understand and reduce digital-literacy-related barriers to equitable learning? Three subsidiary questions organize the paper: What dimensions of the digital divide are relevant to university learning? What can reliable international evidence illuminate, and what remains unknown? Which institutional responses are feasible without assuming that technology itself is a solution?

The contribution of this review is a cautious, policy-oriented framework rather than a new statistical finding. It separates established source statements from interpretations, avoids invented respondents or datasets, and identifies questions that future research in Kazakhstan should test directly.

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CONCEPTUAL BACKGROUND

The digital divide can be considered at several connected levels. The first concerns material access: devices, affordable connectivity, stable electricity, and appropriate places to study. The second concerns capabilities: whether students can use digital resources for meaningful educational tasks. The third concerns outcomes: whether digital participation results in stronger learning, persistence, and academic opportunity. Treating these levels separately prevents a common mistake—equating internet availability with educational inclusion.

In university settings, a student may own a smartphone yet lack a laptop suitable for long writing assignments or specialized software. Another student may have reliable equipment but limited experience distinguishing peer-reviewed research from unverified online material. A third may have strong technical skills but encounter inaccessible course documents or insufficient feedback. These are illustrative possibilities, not observed cases from a Kazakhstan student sample.

Digital literacy also has a social dimension. Academic norms about citation, collaboration, privacy, and integrity are learned through interaction and teaching. Students who have already practiced these norms may benefit more quickly from online environments. Institutions therefore need to explain expectations explicitly rather than assume equal prior preparation. Digital tools can support flexible learning, but poorly designed systems may shift costs and responsibility onto learners.

UNESCO (2023) warns against evaluating educational technology primarily through its novelty or distribution. Decisions should consider the specific learning problem, the evidence of effectiveness, the costs of implementation, and possible unintended effects. This is relevant to Kazakhstan because institutional strategies may emphasize visible infrastructure while less visible requirements—accessible materials, lecturer development, and student support—remain difficult to measure.

A useful equity framework asks five questions of any digital learning initiative: Who can reach the service? Who can use it competently? Who receives assistance when difficulties arise? Who can participate without unreasonable financial or accessibility burdens? And who achieves the intended educational outcome? These questions are analytical criteria proposed in this paper, not a validated measurement scale.

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MATERIAL AND METHODS

This study uses a narrative literature-review and document-analysis design. It does not claim to be a systematic review, meta-analysis, field study, or representative survey. The central documents were selected because they are identifiable publications issued by established international organizations and directly address educational technology, equity, or the Kazakhstan context. The principal sources are UNESCO's 2023 Global Education Monitoring Report on technology in education and OECD's PISA 2022 Kazakhstan country note and related creative-thinking country note.

The documents were read for recurring ideas relating to (1) access and infrastructure, (2) digital competencies, (3) instructional and institutional support, (4) unequal participation, and (5) responsible use of technology. These categories were chosen as a transparent interpretive framework; no formal coding reliability test was conducted. Where the documents report numerical observations, the population and year are identified. The analysis distinguishes statements directly supported by the documents from recommendations inferred by the author.

An important methodological boundary concerns population. OECD PISA 2022 reports on 15-year-old students, not university students. Therefore, school-level observations are used only to describe the broader educational environment and to generate research questions about transitions into higher education. They are not presented as estimates of digital literacy, internet access, or academic achievement among Kazakhstan's university population.

The review does not include unpublished institutional statistics, interviews, university administrative records, or a comprehensive search of Kazakh-, Russian-, and English-language scholarly databases. This limitation means that the conclusions should be interpreted as a structured overview rather than an exhaustive account of the national research literature.

No human participants were recruited, no personal data were processed, and no ethics approval is represented as having been obtained. The work relies on publicly available institutional publications. Bibliographic entries are restricted to identifiable sources with publisher pages or persistent links; no DOI is assigned to this manuscript.

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RESULTS: THEMATIC FINDINGS

Theme 1: Access is necessary but insufficient. UNESCO (2023) describes the uneven educational effects of technology and the importance of conditions under which it is deployed. Applied to higher education, this implies that institutions should assess more than the number of accounts created on a learning platform. Device suitability, connectivity costs, accessible formats, and availability of offline alternatives may affect whether participation is realistic.

Theme 2: Digital participation requires academic skills. Online learning tasks often demand source evaluation, file management, academic communication, and independent study. These requirements are not identical to everyday social-media use. A university-level digital-literacy program should therefore teach students to search scholarly databases, check authorship and publication status, protect credentials, and document the use of digital assistance in assessed work.

Theme 3: The wider education system reveals reasons for caution. In Kazakhstan, OECD (2023) reports that 75% of participating 15-year-olds felt confident or very confident using a video communication program and 76% felt confident motivating themselves to do schoolwork. These are self-reported PISA measures from school pupils during the 2022 assessment context; they are not measurements of university students. They suggest useful dimensions for future university surveys, rather than proving university-level readiness.

Theme 4: Learning conditions and support matter. The OECD (2023) Kazakhstan country note indicates that 30% of assessed students experienced difficulty understanding school assignments at least weekly during remote learning and 22% experienced difficulty finding help with schoolwork. Again, these observations concern school students recalling remote learning, not current university populations. Their analytical significance is to highlight why timely support and comprehensible instructions deserve attention in digital-course design.

Theme 5: Digital tools can both enable and distract. The OECD (2024) creative-thinking country note reports digital learning and leisure patterns among 15-year-olds in Kazakhstan. Such findings caution against treating all screen time as educational engagement. In university settings, the quality and purpose of digital activity should be assessed separately from frequency of use.

Together, the reviewed documents support a multidimensional understanding of digital inclusion. They do not establish a measured causal relationship between digital literacy and university grades in Kazakhstan, and no such relationship is asserted here.

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DISCUSSION

The review suggests that a narrow infrastructure-based understanding of digital transformation is inadequate. When universities measure success mainly through the number of online courses, connected classrooms, or platform users, they risk overlooking the educational conditions that make those services valuable. UNESCO (2023) provides a general basis for this concern, while the OECD country materials offer contextual observations about the skills and experiences of younger learners in Kazakhstan.

One implication is that student support should be integrated into course design. Clear instructions, consistent file formats, predictable feedback schedules, and accessible alternatives can reduce avoidable barriers. Digital-literacy instruction is most useful when connected to authentic academic tasks such as finding research articles, evaluating claims, preparing presentations, and citing sources. This approach treats literacy as a learnable academic practice rather than a fixed personal trait.

A second implication concerns institutional evidence. Universities should not assume that students from particular regions, language backgrounds, or income groups have the same needs. Such assumptions require direct, ethically collected data. A brief voluntary diagnostic at entry, followed by targeted support, may be more responsible than applying a uniform intervention based on stereotypes. Results should be disaggregated only when privacy safeguards and sample sizes permit meaningful interpretation.

A third implication is the need to distinguish pedagogical innovation from technological replacement. Lecturers remain essential for explaining complex ideas, modeling scholarly judgment, and responding to confusion. Automated tools may help with feedback or accessibility, but their accuracy, bias, data protection, and influence on assessment require institutional oversight. The UNESCO (2023) report supports evaluating technologies according to educational purpose rather than novelty.

Kazakhstan-specific research remains necessary. This review cannot determine whether urban and rural university students differ in connectivity, whether multilingual course resources affect digital confidence, or whether particular support programs improve retention. Each question could be investigated through a mixed-methods study using a clearly defined sampling strategy, validated measures, consent procedures, and transparent statistical reporting.

The value of the present article is therefore primarily conceptual. It organizes plausible pathways through which digital literacy may influence educational opportunity and proposes institutional actions that can be evaluated. It does not substitute for empirical research on university students.

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PRACTICAL RECOMMENDATIONS

First, universities can conduct a voluntary needs assessment at the beginning of study. Rather than asking only whether a student owns a device, the assessment could ask about reliable access to course materials, confidence with academic search, document preparation, online communication, and accessible formats. Questions should be piloted and accompanied by clear data-protection information.

Second, introductory digital-literacy modules can be embedded in first-year courses. Short exercises may cover finding peer-reviewed publications, recognizing unreliable information, applying citation rules, and responsibly using generative AI. Successful completion should be evaluated through practical tasks rather than simple attendance.

Third, course materials should be designed for varying connectivity conditions. Downloadable readings, compressed recordings, transcripts, mobile-friendly documents, and flexible access windows can make learning more resilient. Accessibility should be considered at the design stage rather than addressed only after a student encounters difficulty.

Fourth, universities should offer lecturer development and responsive help channels. Teaching staff need opportunities to practice inclusive online assessment, meaningful feedback, and clear communication. Student-facing support should specify where to obtain technical and academic help.

Fifth, institutional evaluation should focus on outcomes as well as usage. Appropriate indicators might include completion of digital-literacy tasks, student-reported accessibility, timely resolution of support requests, and course participation. Any comparison between groups should control for relevant confounders and avoid overstating causality.

CONCLUSION

Digital literacy is an important dimension of equitable higher education, but it should not be reduced to device ownership or familiarity with applications. The literature reviewed here points toward an integrated approach combining access, academic skills, instructional support, and careful institutional evaluation. For Kazakhstan, international reports provide useful context but not a substitute for direct evidence about university students. Future studies should collect transparent, ethically managed data from defined university populations and test whether targeted support improves participation and learning. Until such evidence is available, recommendations should be treated as practical proposals rather than proven national solutions.

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