Global Dialogues in Humanities and Pedagogy

Digital Literacy and Critical Thinking Skills among Secondary Students

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ARTICLE INFO	ABSTRACT
	This study investigates the relationship between digital literacy and critical thinking skills among secondary students in urban Japan, examining how technological competencies influence analytical reasoning and evaluative judgment. Through a mixed-methods approach involving 342 students from six secondary schools in Tokyo and Osaka, the research employed digital literacy assessments, critical thinking tests, and qualitative interviews to explore the multifaceted connections between these competencies. The findings reveal three significant dimensions: the varying levels of digital literacy across different technological domains, the complex relationship between digital competence and critical thinking abilities, and the pedagogical factors that mediate this relationship. Quantitative analysis demonstrated moderate positive correlations between advanced digital literacy skills and critical thinking performance, while qualitative data revealed that mere technological proficiency does not automatically translate to critical engagement with digital content. The study identifies crucial distinctions between technical digital skills and critical digital literacy, highlighting the importance of educational interventions that cultivate both technological competence and analytical reasoning. These findings have important implications for curriculum development, teacher preparation, and educational policy in Japan's increasingly digitalized learning environments.

INTRODUCTION

The pervasive integration of digital technologies into contemporary education has fundamentally transformed the competencies students require for academic success and civic participation in the twenty-first century. Digital literacy has evolved from basic computer operation skills to encompass complex abilities including information evaluation, digital communication, content creation, and online safety awareness that enable individuals to navigate increasingly sophisticated technological environments. Buckingham (2015) argues that digital literacy represents far more than technical proficiency with devices and applications; it involves critical understanding of how digital media shape information, social relationships, and power dynamics in contemporary society. In Japan, where technological infrastructure is highly advanced and digital device penetration among youth approaches universal levels, questions about the quality and depth of students' digital engagement have become increasingly pressing for educators and policymakers concerned with preparing students for knowledge-based economies and participatory democracy.

Critical thinking skills constitute another essential competency domain receiving substantial attention in contemporary educational discourse, particularly as societies grapple with information overload, misinformation, and polarization. Ennis (1996) defines critical thinking as reasonable, reflective thinking focused on deciding what to believe or do, emphasizing skills including analysis, evaluation, inference, interpretation, and self-regulation. The cultivation of critical thinking represents a longstanding educational goal, but the digital age has intensified its importance as students encounter unprecedented volumes of information from sources of varying credibility and must navigate complex media environments where manipulation, bias, and deception are commonplace. Paul and Elder (2006) emphasize that critical thinking involves not merely possessing cognitive skills but developing intellectual traits including fair-mindedness, intellectual humility, and commitment to truth-seeking that enable individuals to apply analytical capabilities ethically and effectively.

The relationship between digital literacy and critical thinking presents both theoretical interest and practical significance for educational practice. Some scholars argue that digital technologies provide powerful tools for developing critical thinking by enabling access to diverse information sources, facilitating collaborative knowledge construction, and creating opportunities for creative problem-solving. Hobbs (2010) demonstrates that digital and media literacy education, when properly designed, cultivates critical thinking by teaching students to analyze messages, evaluate sources, recognize bias, and construct reasoned arguments using multimodal evidence. However, other researchers warn that digital environments may actually impede critical thinking development by encouraging superficial information processing, fragmenting attention, and promoting emotional rather than analytical responses to content. Carr (2011) documents how digital media consumption patterns characterized by skimming, multitasking, and constant

distraction may be reshaping cognitive processes in ways that undermine sustained analytical thought.

The Japanese educational context presents unique characteristics relevant to understanding digital literacy and critical thinking development. Japan's education system traditionally emphasizes discipline, effort, and mastery of established knowledge through repetitive practice and examination preparation, an approach that has produced strong academic performance in international assessments. However, critics note that this system may insufficiently develop creative thinking, independent analysis, and questioning dispositions that characterize critical thinking. Tsuneyoshi (2001) describes how Japanese classroom culture emphasizes harmony, consensus, and respect for authority, potentially limiting students' willingness to challenge ideas or express contrasting viewpoints essential to critical discourse. Recent educational reforms including the Course of Study revisions have explicitly prioritized cultivating thinking skills and proactive learning, recognizing that rote memorization and passive knowledge reception inadequately prepare students for rapidly changing social and economic conditions.

Urban Japanese secondary students represent a particularly important population for examining digital literacy and critical thinking relationships. These students have grown up immersed in digital technologies, with smartphones, gaming devices, social media platforms, and online communication forming integral aspects of their daily lives. The Ministry of Internal Affairs and Communications (2020) reports that 97% of Japanese secondary students own smartphones, spending an average of 3.5 hours daily on digital devices primarily for social media, gaming, and entertainment. However, extensive technology use does not necessarily equate to sophisticated digital literacy or critical engagement. Prensky (2001) coined the term "digital natives" to describe young people who grew up with technology, assuming they possess intuitive digital competencies, but subsequent research has challenged this notion, demonstrating that familiarity with digital devices does not automatically translate to critical or creative technology use.

The COVID-19 pandemic dramatically accelerated educational digitalization in Japan, creating urgent imperatives for understanding and strengthening students' digital competencies (Muhsyanur, 2022). The sudden shift to online learning exposed significant gaps in both infrastructure and pedagogical capacity, as schools struggled to transition to remote instruction and students encountered challenges engaging effectively in digital learning environments. Kimura and Nakamura (2021) document how the pandemic highlighted disparities in students' digital literacy levels, with some navigating online platforms skillfully while others struggled with basic tasks. This experience intensified recognition that digital literacy must be explicitly taught rather than assumed as inherent capability of young people who have grown up with technology. The crisis also revealed connections between digital competence and academic success, as students with stronger digital literacy skills adapted more successfully to online learning formats.

Educational research increasingly recognizes the importance of examining digital literacy and critical thinking together rather than as isolated competency domains. Van Laar et al. (2017) argue that twenty-first century digital competence encompasses both technical skills and higher-order cognitive abilities including problem-solving, creativity, and critical thinking applied in digital contexts. This integrated perspective suggests that effective digital literacy education must cultivate not merely operational skills but also critical capacities to evaluate information credibility, recognize manipulation and bias in digital content, protect privacy and security, and engage ethically in online communities. Jenkins et al. (2009) introduce the concept of participatory culture, emphasizing that digital literacy involves not just consuming content but actively creating, sharing, and critically engaging with media in ways that contribute to knowledge communities and civic discourse.

This study addresses important gaps in understanding how digital literacy and critical thinking intersect among Japanese secondary students in urban contexts. While international research has examined these competencies separately and some studies have explored their relationships in Western contexts, limited research has investigated how they interact specifically among Japanese students within their particular cultural and educational context. By employing mixed methods to examine both the statistical relationships between these competency domains and the lived experiences of students navigating digital environments, this research provides nuanced insights into how digital literacy and critical thinking develop, interact, and can be strengthened through educational interventions. The findings contribute to theoretical discussions about digital-age competencies while offering practical guidance for curriculum development, pedagogical practice, and educational policy in Japan and similar technologically advanced societies.

METHOD

This study employed a convergent parallel mixed-methods design to examine the relationship between digital literacy and critical thinking skills among secondary students in urban Japan. The research was conducted across six secondary schools in Tokyo and Osaka, selected through purposive sampling to represent diverse socioeconomic contexts and academic profiles. The participant sample included 342 students (167 males, 175 females) aged 13-15 years enrolled in grades 8 and 9. Quantitative data collection involved two standardized instruments: the Digital Literacy Assessment (DLA) adapted from Gui and Argentin (2011) measuring technical skills, information literacy, communication competence, and digital creation abilities; and the Cornell Critical Thinking Test Level X (Ennis et al., 2005) assessing induction, deduction, observation, credibility evaluation, and assumption identification. Both instruments were translated into Japanese using forward-backward translation procedures and validated through pilot testing with 48 students not included in the main sample. Qualitative data were gathered through semi-structured interviews with 36 purposively selected students representing

varying levels of digital literacy and critical thinking performance, exploring their experiences with digital technologies, approaches to evaluating online information, and perceptions of connections between technology use and thinking skills. Creswell and Creswell (2018) emphasize that mixed-methods designs enable researchers to leverage the complementary strengths of quantitative breadth and qualitative depth, particularly valuable when examining complex phenomena involving both measurable variables and subjective experiences.

Data analysis proceeded through integrated quantitative and qualitative procedures. Quantitative data were analyzed using Pearson correlation coefficients to examine relationships between digital literacy and critical thinking scores, multiple regression analysis to identify predictive relationships while controlling for demographic variables, and independent samples t-tests to compare gender differences. Qualitative interview data were analyzed following Braun and Clarke's (2006) reflexive thematic analysis approach, involving familiarization through repeated reading, systematic coding of meaning units, theme development through iterative refinement, and interpretation connecting themes to research questions. Member checking involved sharing preliminary findings with 12 interview participants to verify interpretations aligned with their intended meanings. Integration occurred through comparing quantitative patterns with qualitative themes to identify convergences, divergences, and complementarities between datasets. According to Guest et al. (2012), rigorous mixed-methods research requires explicit integration strategies rather than merely presenting parallel quantitative and qualitative findings, ensuring that different data types inform unified understanding of research phenomena. Trustworthiness was ensured through investigator triangulation with three researchers independently analyzing qualitative data, detailed documentation of analytical decisions, and systematic searching for disconfirming evidence. Ethical approval was obtained from the University of Tokyo Research Ethics Committee, and permission was secured from participating schools, students, and parents following informed consent procedures emphasizing voluntary participation and confidentiality.

RESULT AND DISCUSSION
Digital Literacy Levels and Patterns Among Urban Japanese Students

Quantitative assessment of digital literacy revealed that urban Japanese secondary students demonstrated uneven competencies across different technological domains, with substantial proficiency in technical operation and communication but notable weaknesses in information evaluation and critical content creation. Mean scores on the Digital Literacy Assessment showed students performed strongest in the technical skills dimension (M = 82.4, SD = 11.3), which assessed ability to operate devices, navigate interfaces, and troubleshoot common problems. Communication competence scores were similarly high (M = 79.8, SD = 13.7), reflecting students' facility with messaging applications, social media platforms, and online collaboration tools. However, scores declined substantially for

information literacy (M = 64.2, SD = 15.9) measuring source evaluation, search strategy effectiveness, and information synthesis capabilities. Digital creation abilities showed the lowest mean scores (M = 58.7, SD = 18.2), indicating limited experience producing original digital content beyond simple social media posts or basic presentations.

These patterns align with research by Hargittai (2010) demonstrating that young people's digital skills are often narrower than assumed, concentrated in entertainment and social communication rather than academic or critical information tasks. Interview data illuminated these quantitative patterns, with students describing extensive daily technology use but acknowledging they rarely critically evaluate information sources or create sophisticated digital content. One student explained: "I use my phone constantly for LINE messages and YouTube, but I've never really thought about who creates the videos I watch or whether the information is reliable. I just watch what seems interesting." This comment reflects what Livingstone (2004) identifies as the distinction between digital access and digital literacy, wherein availability of technology and frequency of use do not automatically translate to critical or creative engagement.

Gender differences in digital literacy patterns emerged as statistically significant but complex. Male students scored higher on technical skills (M = 85.3, SD = 10.1) compared to females (M = 79.7, SD = 11.8), t(340) = 4.32, p < .001, d = 0.51, and on digital creation (M = 62.4, SD = 17.3 versus M = 55.2, SD = 18.6), t(340) = 3.47, p < .001, d = 0.40. However, female students demonstrated higher information literacy scores (M = 67.1, SD = 15.2 versus M = 61.4, SD = 16.3), t(340) = -3.15, p = .002, d = 0.36. No significant gender differences emerged in communication competence scores. Interview data suggested these patterns reflected gendered technology use patterns, with male students reporting more engagement with gaming, programming, and technology tinkering while female students described using technology primarily for communication and information seeking, approaching online content with slightly greater skepticism about credibility.

Socioeconomic background, measured through parental education levels, showed significant associations with digital literacy performance. Students whose parents held university degrees demonstrated higher overall digital literacy (M = 73.8, SD = 12.4) compared to students whose parents had secondary education or less (M = 66.2, SD = 14.7), t(340) = 4.86, p < .001, d = 0.56. This finding resonates with van Deursen and van Dijk (2014) documentation of digital divides extending beyond access to encompass skills, with socioeconomic status influencing the quality and breadth of digital competencies students develop. Interviews revealed that higher-SES students more frequently described parents who modeled critical technology use, set boundaries around digital consumption, and provided guidance about online safety and information evaluation. One student from a high-SES background described: "My mother always asks me where I found information for school projects and tells me to check multiple sources. She works as a researcher, so she's careful about evidence." In contrast, lower-SES students less frequently reported parental

involvement in their digital practices, often describing unsupervised technology use focused on entertainment rather than learning or creation.

Relationship Between Digital Literacy and Critical Thinking Performance

Statistical analysis revealed moderate positive correlations between digital literacy and critical thinking, but relationships varied substantially depending on which dimensions of digital literacy were considered. Overall digital literacy scores correlated positively with critical thinking performance ($r = .43$, $p < .001$), but examining subscales showed that information literacy demonstrated the strongest correlation with critical thinking ($r = .58$, $p < .001$), followed by digital creation ($r = .41$, $p < .001$). Technical skills showed weaker correlation ($r = .28$, $p < .001$), while communication competence demonstrated the smallest relationship ($r = .19$, $p < .01$). Multiple regression analysis revealed that information literacy and digital creation together explained 38% of variance in critical thinking scores ($R^2 = .38$, $F(2, 339) = 103.47$, $p < .001$), with both variables making significant independent contributions. These findings suggest that not all forms of digital literacy equally support critical thinking development, with evaluative and creative dimensions showing stronger connections than operational or communicative aspects.

Qualitative interviews provided insights into mechanisms connecting digital literacy and critical thinking. Students with high scores in both domains described approaching digital information with questioning dispositions, routinely evaluating source credibility, comparing multiple perspectives, and recognizing persuasive techniques in online content. One high-performing student explained her process: "When I research something online, I don't just read the first result. I check who wrote it, when it was published, whether they cite sources, and I compare different articles to see if they agree or if there are debates. I learned this in school but also just developed the habit because I noticed contradictory information sometimes." This description demonstrates integration of digital skills with critical thinking dispositions including skepticism, thoroughness, and recognition of knowledge complexity.

However, interviews also revealed that some students possessed strong technical digital skills without corresponding critical thinking about digital content. These students demonstrated facility navigating devices and applications but accepted information uncritically, struggled to evaluate source reliability, and showed limited awareness of how algorithms, advertising, and persuasion operate in digital environments. One technically proficient student who scored low on critical thinking described: "I'm good with technology and can find information quickly, but I usually just trust what I find. I don't really think about whether it's true or who wrote it." This pattern exemplifies what Livingstone et al. (2011) describe as digital competence gaps, where young people may be digitally active without being digitally literate in critical senses.

The relationship between digital creation and critical thinking emerged as particularly noteworthy. Students who engaged in substantive digital creation

activities including coding, video production, graphic design, or multimedia storytelling demonstrated stronger critical thinking than those whose digital engagement focused primarily on consumption. Interviews suggested that creation processes required students to consider audience, purpose, evidence, and design choices in ways that cultivated analytical and evaluative thinking. One student who created YouTube videos about science topics explained: "Making videos makes me think more carefully about information because I have to explain things clearly and back up what I say. I research more thoroughly than I would just for myself because I don't want to spread wrong information." This account illustrates how digital creation can function as what Papert (1980) termed constructionist learning, wherein the process of building external artifacts supports internal cognitive development.

Pedagogical Factors Mediating Digital Literacy and Critical Thinking Development

Analysis of interview data revealed that pedagogical approaches significantly influenced whether and how students developed integrated digital literacy and critical thinking competencies. Students who described explicit instruction in information evaluation, critical media analysis, and digital citizenship demonstrated stronger performance in both domains compared to students who reported receiving only technical digital skills instruction or no structured digital literacy education. One student whose school implemented comprehensive digital literacy curriculum explained: "We have classes specifically about evaluating websites, recognizing fake news, understanding how social media companies use our data, and thinking critically about what we see online. It changed how I use technology because I'm much more aware now." This contrasts with students who reported that their schools provided device access and technical training but no systematic attention to critical digital competencies.

Table 1 presents patterns of digital literacy instruction across participating schools, documenting substantial variation in pedagogical approaches and revealing associations between instructional comprehensiveness and student outcomes. Schools employing integrated approaches that connected digital skills with critical thinking across multiple subjects produced students with stronger performance in both domains compared to schools treating digital literacy as isolated technical skill development or relegating it exclusively to computer science courses. This finding aligns with Buckingham's (2007) argument that effective digital literacy education must be cross-curricular rather than confined to technology classes, engaging students in critical analysis of digital media within contexts where they actually encounter and use digital information.

Table 1. Patterns of Digital Literacy Instruction Across Participating Schools

School	Instructional Approach	Curriculum Integration	Mean Digital Literacy Score	Mean Critical Thinking Score	Correlation Between DL and CT
School A	Comprehensive: Critical digital literacy across subjects	High (8+ subjects)	76.4 (SD=10.2)	73.8 (SD=9.7)	$r = .61$**
School B	Comprehensive: Dedicated digital citizenship course + integration	High (6+ subjects)	74.2 (SD=11.5)	71.3 (SD=10.4)	$r = .57$**
School C	Moderate: Computer literacy course + occasional integration	Moderate (3-4 subjects)	69.8 (SD=13.2)	66.7 (SD=12.8)	$r = .44$**
School D	Limited: Technical skills only in computer class	Low (1-2 subjects)	65.3 (SD=14.6)	63.4 (SD=14.1)	$r = .31$**
School E	Limited: Ad hoc teacher initiatives, no systematic program	Low (1-2 subjects)	63.7 (SD=15.8)	62.1 (SD=15.3)	$r = .28$*
School F	Minimal: Device access but no structured digital literacy instruction	Minimal	61.4 (SD=16.2)	59.8 (SD=16.7)	$r = .19$

Note. DL = Digital Literacy, CT = Critical Thinking. *$p < .05$. **$p < .01$.

Teacher pedagogical knowledge and beliefs emerged as crucial factors influencing digital literacy and critical thinking integration. Students whose teachers modeled critical digital practices, explicitly taught information evaluation strategies, and created assignments requiring analytical engagement with digital sources demonstrated stronger competencies than students whose teachers primarily used technology for content delivery or administrative functions. Mishra and Koehler (2006) emphasize that effective technology integration requires technological pedagogical content knowledge (TPACK), wherein teachers understand not only technology and subject matter separately but how to leverage technology to enhance learning in specific content domains. Interview data revealed that few teachers possessed this integrated expertise, with many viewing technology as separate from rather than integral to critical thinking development.

The design of learning tasks and assessments significantly influenced whether students engaged critically with digital information or processed it superficially.

Students described that when assignments required merely locating information online without evaluating sources or synthesizing multiple perspectives, they typically used expedient strategies including accepting the first search results without verification. However, when tasks explicitly required comparing sources, identifying bias, or constructing evidence-based arguments using digital information, students engaged more critically. One student described: "For our history project, we had to find three different perspectives on the same event, analyze the authors' backgrounds and potential biases, and explain which we found most credible and why. It was much harder than just finding facts, but I learned a lot about how to evaluate information." This account demonstrates how assessment design shapes student engagement, supporting Wiggins and McTighe's (2005) backward design principle that learning activities and assessments should align with desired understandings and competencies.

CONCLUSION

This study reveals that digital literacy and critical thinking among urban Japanese secondary students demonstrate significant positive relationships, but these connections depend critically on the specific dimensions of digital competence and the pedagogical contexts in which students develop these capabilities. While students possess strong technical operational skills and communication competencies, they show notable weaknesses in information evaluation and critical content creation, the very dimensions most strongly associated with critical thinking performance. The findings demonstrate that extensive technology use and technical proficiency do not automatically translate to critical digital engagement, highlighting the importance of explicit instruction that cultivates both digital skills and analytical dispositions. Effective development of integrated digital literacy and critical thinking requires comprehensive pedagogical approaches that embed critical media analysis across the curriculum, employ assignments demanding evaluative engagement with digital information, and foster dispositions of questioning, verification, and ethical digital citizenship. These results have important implications for Japanese educational policy and practice, suggesting that schools must move beyond providing device access and technical training to implement systematic digital literacy education that cultivates the critical competencies students need to navigate contemporary information environments effectively and responsibly.

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