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DIGITAL LITERACY AS A MEDIATOR OF EDUCATIONAL OPPORTUNITIES IN LATER LIFE

DIGITÁLNÍ GRAMOTNOST JAKO PROSTŘEDNÍK VZDĚLÁVACÍCH PŘÍLEŽITOSTÍ V POZDĚJŠÍM VĚKU

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Abstract

The accelerating digitalization of society presents a dual challenge and opportunity for older adults, fundamentally reshaping their access to and participation in lifelong learning. This theoretical and literature review article, grounded in a synthesis of recent empirical studies from the Web of Science database, critically examines the mediating role of digital literacy between an older adult's social determinants and their engagement in educational activities. The central objective is to develop a conceptual model that explains how digital literacy acts as a crucial filter, either facilitating or blocking access to diverse educational opportunities, including Universities of the Third Age, community courses, and online platforms. The review addresses three guiding questions: 1) Which social determinants most significantly influence older adults' digital literacy? 2) How does digital literacy mediate their access to educational opportunities? 3) In what ways does digital literacy contribute to the reproduction or reduction of educational inequalities in later life? By integrating findings on the grey digital divide and the mechanism of cumulative advantage/double disadvantage, the article argues that digital literacy is a key determinant of educational equity. The resulting implications call for a paradigm shift in policy and practice, advocating for the seamless integration of digital skills support into all later-life learning programs to ensure genuine inclusion.

Keywords: older adults; digital literacy; lifelong learning; educational inequalities; grey digital divide

Abstrakt

Zrychlující se digitalizace společnosti představuje pro starší dospělé dvojí výzvu a příležitost, zásadně přetvářející jejich přístup k celoživotnímu učení a účast na něm. Tento teoretický a přehledový článek, opírající se o syntézu nedávných empirických studií z databáze Web of Science, kriticky zkoumá mediační roli digitální gramotnosti mezi sociálními determinanty

starších dospělých a jejich zapojením do vzdělávacích aktivit. Hlavním cílem je vyvinout koncepční model, který vysvětluje, jak digitální gramotnost funguje jako klíčový filtr, který buď usnadňuje, nebo blokuje přístup k různým vzdělávacím příležitostem, včetně Univerzit třetího věku, komunitních kurzů a online platforem. Přehled se zabývá třemi vodicími otázkami: 1) Které sociální determinanty nejvýznamněji ovlivňují digitální gramotnost starších dospělých? 2) Jak digitální gramotnost zprostředkovává jejich přístup ke vzdělávacím příležitostem? 3) Jakými způsoby digitální gramotnost přispívá k reprodukci nebo redukci vzdělávacích nerovností ve vyšším věku? Integrací zjištění o šedé digitální propasti a mechanismu kumulativní výhody/dvojité nevýhody článek tvrdí, že digitální gramotnost je klíčovým determinantem vzdělávací rovnosti. Z toho vyplývající implikace volají po změně paradigmatu v politice a praxi, prosazující bezproblémovou integraci podpory digitálních dovedností do všech programů celoživotního učení pro seniory, aby byla zajištěna skutečná inkluze.

Klíčová slova: starší dospělí; digitální gramotnost; celoživotní učení; vzdělávací nerovnosti; šedá digitální propast

1. Introduction

The confluence of global demographic aging and pervasive technological advancement defines the socio-educational landscape of the 21st century (World Economic Forum, 2012; European Commission, 2008; World Health Organization [WHO], 2015). As life expectancy increases, the concept of later life has shifted from a period of retirement and withdrawal to one of active aging, social engagement, and continuous personal development through lifelong learning (LL) (Sibai & Hachem, 2021; WHO, 2015). Lifelong learning is widely recognized as a vital mechanism for maintaining cognitive health, fostering social inclusion, and enhancing the overall quality of life for older adults (UNESCO Institute for Lifelong Learning, 2023; Zhang et al., 2022).

However, the increasing reliance on digital platforms for accessing information, services, and, critically, educational opportunities has introduced a new, complex layer of inequality. The ability of older adults to successfully navigate this digital environment, their digital literacy, is rapidly becoming a non-negotiable prerequisite for participation in contemporary society (Cui et al., 2024; Melchior, 2023). This article posits that digital literacy acts as a crucial mediator in the relationship between an older adult‘s social background and their educational engagement.

This study contributes directly to the academic discourse on social determinants of educational reality by examining how pre-existing social factors influence educational outcomes in the specific context of later-life learning. While traditional research on educational inequality

often focuses on early life stages, this article highlights that the influence of social factors, such as prior education, income, and health, does not cease in retirement. Instead, these factors are now channeled through the lens of digital competence. The core argument is that digital literacy is a newly emerged, yet powerful, social determinant that shapes access to lifelong learning, thereby either mitigating or reinforcing existing educational inequalities among seniors.

The shift of educational provision to digital spaces, dramatically accelerated by the COVID-19 pandemic, has fundamentally altered the landscape of later-life learning (Boeren et al., 2020; Di Pietro & Karpiński, 2021). Even traditionally in-person institutions, such as the Universities of the Third Age (UTA), now rely heavily on digital tools for registration, material distribution, and hybrid course delivery (Janouchová & Obršálová, 2024; Kamanová & Pevná, 2022). This reliance has brought the issue of the grey digital divide, the gap in digital access and skills among older adults, to the forefront of educational policy (European Union Agency for Fundamental Rights, 2023; UNESCO Institute for Lifelong Learning, 2025).

The grey digital divide is often conceptualized in two levels (van Deursen & van Dijk, 2014): the first-level divide concerns access to hardware and internet connectivity, while the second-level divide relates to the skills, confidence, and ability to use digital tools meaningfully (Büchi et al., 2016). For older adults, the second-level divide, rooted in varying levels of digital literacy, is the more significant barrier to educational participation (Melchior, 2023).

The primary goal of this article is to theoretically and empirically analyze, based on a review of recent literature from the Web of Science database, how digital literacy acts as a mediator between social determinants and participation in later-life learning.

To achieve this goal, the review is guided by three specific research questions:

What are the main social determinants influencing the digital literacy of older adults?

How does digital literacy mediate (facilitate or block) older adults‘ access to formal, non-formal, and informal educational opportunities?

How does digital literacy contribute to the reproduction or reduction of educational inequalities in later life?

The following sections will first define the diverse landscape of later-life educational opportunities, then theoretically anchor the concept of digital literacy as a mediator, synthesize recent empirical evidence, and finally discuss the implications for practice and policy.

2. Access to Educational Opportunities in Later Life

Lifelong learning (LL) for older adults is characterized by its heterogeneity, encompassing formal, non-formal, and informal educational activities (Villar & Celdrán, 2013). The digitalization of these opportunities means that digital literacy is now a prerequisite for engagement across the entire spectrum.

Types of Educational Opportunities and Digital Requirements

Formal opportunities typically involve accredited university programs or vocational training, which often require sophisticated use of Learning Management Systems (LMS), academic databases, and digital submission platforms (Lu et al., 2022).

Non-formal settings, such as U3A, community colleges, and public libraries, are crucial providers of education for older adults. While traditionally focused on in-person delivery, these institutions increasingly rely on digital tools for administrative functions (online registration, payment) and communication (email, video conferencing for hybrid models) (Xie & Bugg, 2009). Informal learning, self-directed activities like watching educational videos, using MOOCs (Massive Open Online Courses), or participating in online interest groups, is entirely dependent on the individual‘s digital competence (Liyanagunawardena & Williams, 2016).

The shift to digital delivery has created a digital gatekeeper effect, whereby access to services and learning opportunities is effectively limited by older adults’ digital skills. The ability to find course information, complete the registration process, access course materials, and communicate with instructors are all now mediated by digital skills. For example, a senior with low digital literacy may be unaware of a local UTA course simply because they cannot navigate the institution‘s website or use the online registration form (Wilson-Menzfeld et al., 2023). Table 1 summarizes the digital demands and associated barriers across key educational settings, highlighting the pervasive nature of digital requirements.

Table 1 Digital Demands and Barriers to Participation in Later-Life Learning Across Educational Settings

Type of Course	Typical Digital Requirements	Barriers for Low Digitally Literate Seniors
Universities of the Third Age (UTA)	Online registration, email communication, accessing materials via website/LMS, occasional video lectures (e.g., Zoom).	Difficulty with initial online sign-up, fear of technology, lack of confidence in using institutional platforms, inability to troubleshoot basic technical issues.
Community Courses/ Libraries	Online search for local offerings, pre-registration via web form, use of library digital resources (e-books, databases, online archives).	Inability to effectively search for local, non-standardized information; reliance on staff for basic digital tasks; lack of awareness of digital resources.
Online Courses (MOOCs) / Informal Learning	High level of self-directed learning, managing multiple platforms, technical troubleshooting, active participation in online forums, critical evaluation of online content.	Lack of advanced digital skills (information, communication, content creation), high dropout rates due to technical frustration, lack of social support and self-efficacy.

Source: Author's synthesis

3. Digital Literacy as a Mediator of Educational Participation

Drawing on Hayes' (2018) mediation framework and empirical evidence that social background shapes digital inequality among older adults (Hu & Xu, 2024) and that digital skills mediate the effect of education on participation (Lybeck et al., 2024), this article posits that digital literacy is a crucial mediator.

Digital literacy is a multi-dimensional concept that extends far beyond mere technical proficiency. For older adults, digital literacy can be conceptualized as a dynamic capability encompassing four key dimensions – basic technology, communication, problem-solving, and security literacy (Yu, Wu, & Yang, 2025):

Functional Skills: The ability to operate hardware (e.g., tablet, smartphone) and software (e.g., browser, apps).

Information Skills: The ability to search, evaluate the credibility of, and manage digital content (e.g., distinguishing reliable educational sources from misinformation).

Communication Skills: The ability to interact and collaborate effectively online, including using email, social media, and video conferencing for learning purposes.

Strategic Skills: The ability to use digital tools to achieve specific life goals, such as accessing educational resources, managing health information, or engaging in civic life (Chen & Li, 2024).

A deficit in any of these areas can create a barrier to educational participation. For instance, a senior may possess functional skills but lack the information skills to critically evaluate the quality of a free online course, leading to disengagement or frustration (Pihlainen et al., 2022).

Social Determinants of Digital Literacy

The distribution of digital literacy among older adults is not random; it is systematically patterned by pre-existing social inequalities (Hunsaker & Hargittai, 2018). Research consistently identifies several key social determinants that significantly predict digital competence:

Prior Education: This is arguably the strongest predictor. Higher levels of formal education correlate with greater cognitive flexibility, a higher capacity for abstract learning, and a positive disposition towards new knowledge acquisition, all of which facilitate the development of digital skills (Hargittai & Dobransky, 2017).

Socioeconomic Status (SES) and Income: Higher income mitigates the first-level digital divide by enabling the purchase of quality devices, reliable high-speed internet, and private training (König et al., 2018). Low SES often means reliance on outdated technology or limited data plans, which hinders the consistent practice necessary for skill development.

Health Status: Cognitive and physical health limitations (e.g., poor eyesight, reduced dexterity, cognitive decline) can directly impede the use of digital devices, creating a health-related digital divide (Wilson et al., 2021).

Social Networks and Support: The presence of a supportive network (family, friends, community groups) who can provide technical assistance and encouragement is a critical factor in overcoming initial barriers and building digital confidence (Thalhammer, 2024).

Retirement Status: The transition to retirement can either free up time for learning or lead to a loss of work-related digital practice, making the effect complex (Morrison et al., 2020).

These determinants shape the initial level of digital literacy, which then acts as the mechanism through which social background influences educational outcomes.

4. Digital Literacy as a Mediating Mechanism in the Production of Educational Inequalities

The conceptual model Social determinants → Digital literacy → Participation in later-life learning provides a framework for understanding how digital literacy either facilitates or blocks access to education, thereby reproducing or reducing educational inequalities.

The analysis of educational inequalities in later life is strongly informed by the sociological theory of Cumulative Advantage/Disadvantage (CAD), originally formulated by Robert K. Merton (1968) to explain stratification in scientific careers (the „Matthew effect"). The core tenet of CAD is that initial advantages (or disadvantages) tend to multiply over time, leading to increasingly unequal outcomes. In the context of later-life learning, the theory suggests that those who enter retirement with high levels of educational attainment and socioeconomic status (initial advantage) are better positioned to acquire digital literacy, which then provides a further advantage in accessing LL opportunities (Dannefer, 2003).

The interaction between social determinants and digital literacy results in distinct profiles of older learners, often explained by the theory of cumulative advantage/disadvantage (Jenkins, 2024; Kalenda & Kočvarová; 2022).

Cumulative Advantage (The Digitally Empowered)

This profile includes older adults with high prior education, high SES, and strong social support. Their existing social advantages are compounded by high digital literacy, which acts as a powerful **facilitator**. They can easily access, evaluate, and engage with the most advanced and diverse educational opportunities, including international MOOCs or specialized online university courses. This mechanism ensures that those who were already privileged in their earlier life continue to accumulate educational capital in later life, thereby reproducing existing social inequalities (Vilhena et al., 2019).

Double Disadvantage (The Digitally Excluded)

This profile represents the most vulnerable group, characterized by low prior education, low income, and often poor health or limited social support. They face a **double disadvantage**: a lack of traditional educational capital combined with low digital literacy (Ueno et al., 2023). For this group, digital literacy acts as a significant **blocker.** The digital requirement for participation effectively excludes them from a growing number of LL opportunities, deepening the grey digital divide and **e**xacerbating educational inequalities (Lu et al., 2022; Tomczyk et al., 2023).

Compensated Disadvantage (The Supported Learners)

This intermediate profile is crucial for policy intervention. It includes individuals who may have lower SES or prior education but benefit from strong external support, such as community-based digital training programs or intergenerational mentoring (Lu et al., 2024; Miller et al., 2024). In this case, the lack of intrinsic digital capital is compensated by external social capital. Digital literacy is acquired through supported learning pathways, allowing these individuals to overcome the initial barrier and access LL opportunities. This profile demonstrates a pathway for reducing educational inequalities through targeted, non-digital interventions that build digital skills.

The mediation is evident in how social determinants influence the *type* and *quality* of digital engagement, which then affects educational outcomes. For example, a high-income senior (Social Determinant) can afford a tablet and private tutoring, leading to high functional and strategic digital skills (Digital Literacy), enabling them to enroll in a high-quality online course (Participation). Conversely, a low-income senior (Social Determinant) may rely on a shared, outdated device and lack social support, resulting in low digital literacy, which prevents them from even completing the online registration for a free community course (Non-Participation).

5. Conclusion, Limitations and Future Research

This review confirms the central thesis that digital literacy functions as a critical mediator of educational opportunities in later life. The level of digital competence an older adult possesses is not a matter of chance but is systematically determined by their social background, leading to the reproduction of educational inequalities through the mechanism of cumulative advantage and double disadvantage.

The central theoretical contribution of this review is the conceptual model illustrating the pathway: Social determinants → Digital literacy → Participation in later-life learning. This model underscores the necessity of addressing the digital skills gap not in isolation, but as an integral part of any strategy aimed at promoting equitable lifelong learning. These findings collectively support the conceptual model: social determinants shape digital literacy, and digital literacy, in turn, acts as the primary filter for accessing later-life educational opportunities. The empirical evidence strongly suggests that without targeted, supportive, and context-specific interventions to boost digital literacy, the digital transformation of education will continue to reinforce the double-disadvantage profile. Digital literacy among older adults acts as a key mediator between social conditions and participation in continuing education, so support cannot be based solely on „computer courses“ but must be integrated

directly into teaching, administration, and program funding. It is essential to provide targeted support to the most vulnerable groups facing a „double disadvantage“ (low education, low income, weak social support) – while removing both barriers to access to technology and barriers to skills. Community and intergenerational forms of support have great potential, as they strengthen social networks and confidence in using technology, thereby providing a real opportunity for lifelong learning.

This review is subject to several limitations. First, the literature search, while focused on the Web of Science, was limited by the search terms and the English language, potentially excluding relevant studies from non-English speaking contexts. Second, the concept of digital literacy itself is complex and often operationalized differently across studies, making direct comparison challenging. Finally, the rapid pace of technological change means that the definition of „necessary“ digital skills is constantly evolving, requiring continuous updating of the research base.

Future research should focus on: investigating the long-term impact of digital skills interventions on actual educational participation and life outcomes.

Deepening the understanding of the psychological and emotional barriers (e.g., fear, lack of motivation) that mediate the relationship between social determinants and digital literacy.

Systematically evaluating the effectiveness of integrated digital skills support models within lifelong learning institutions to identify best practices for mitigating the double disadvantage policy evaluation.

By continuing to explore the complex interplay between social context, digital competence, and educational engagement, researchers can provide the evidence base needed to ensure that the promise of lifelong learning is realized for all older adults.

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