

Beyond Access

Designing Adult Basic Education for Sustainable Digital Inclusion

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Abstract

Digital inclusion in adult basic education extends beyond access to devices or connectivity; it involves learners' confidence, everyday digital practices, and opportunities for meaningful engagement. While existing research has predominantly focused on structural access conditions or the acquisition of discrete digital skills, less attention has been paid to how digital inclusion unfolds as a process across different stages in concrete adult basic education contexts.

Drawing on data from the GediG project, this paper presents a qualitative secondary analysis of learner surveys, focus groups, expert interviews, round-table discussions, and course observations. The Digital Inclusion Pathway (Reder 2015) is used as an analytical lens to examine how learners' experiences, pedagogical practices, and structural conditions interact across stages of digital engagement.

The findings show that digital engagement develops unevenly and is shaped by the interplay of prior experiences, self-efficacy, and the perceived relevance of digital tasks. Structural constraints, including limited access to devices and connectivity, restrict opportunities for sustained engagement and practice, while pedagogical approaches influence learners' willingness to engage with digital tools. The analysis further reveals that learners cannot be treated as a homogeneous group, as differences in digital biographies, literacy levels, and learning needs shape their individual trajectories across the Pathway.

The paper contributes to a process-oriented understanding of digital inclusion by empirically demonstrating how engagement evolves across stages rather than emerging as a linear accumulation of skills. It shows how the Digital Inclusion Pathway can be operationalised in concrete adult basic education contexts and highlights the need for pedagogical approaches that combine meaningful tasks, sustained scaffolding, and stable structural conditions to support long-term digital participation.

Beyond Access. Medienpädagogische Gestaltung in der Grundbildung für nachhaltige digitale Teilhabe

Zusammenfassung

Digitale Teilhabe in der Grundbildung Erwachsener geht über den Zugang zu Geräten oder Internetverbindungen hinaus und umfasst das Vertrauen der Lernenden in die eigene digitale Handlungsfähigkeit, ihre alltagsbezogenen Nutzungspraxen sowie Gelegenheiten für bedeutungsvolle digitale Aktivitäten. Während bisherige Forschung vor allem strukturelle Zugangsbedingungen oder den Erwerb einzelner digitaler Kompetenzen in den Blick nimmt, bleibt weitgehend unklar, wie sich digitale Teilhabe als Prozess über verschiedene Stufen hinweg in konkreten Kontexten der Grundbildung Erwachsener entfaltet.

*Auf Grundlage von Daten aus dem GediG-Projekt präsentiert der Beitrag eine qualitative Sekundäranalyse von Befragungen, Fokusgruppen, Expert*inneninterviews, Round-Table-Diskussionen und Kursbeobachtungen. Der Digital Inclusion Pathway (Reder 2015) wird dabei als analytische Perspektive genutzt, um das Zusammenspiel von Lernerfahrungen, pädagogischen Praktiken und strukturellen Bedingungen über verschiedene Stufen digitaler Teilhabe hinweg zu untersuchen.*

Die Ergebnisse zeigen, dass digitale Teilhabe nicht linear verläuft, sondern durch das Zusammenspiel von Vorerfahrungen, Selbstwirksamkeit und wahrgenommener Relevanz digitaler Anwendungen geprägt ist. Strukturelle Einschränkungen – insbesondere im Hinblick auf den Zugang zu Geräten und Internetverbindungen – begrenzen Möglichkeiten zur kontinuierlichen Übung, während pädagogische Gestaltungen massgeblich beeinflussen, inwieweit sich Lernende auf digitale Lerngelegenheiten einlassen. Zugleich wird deutlich, dass Lernende nicht als homogene Gruppe betrachtet werden können, da sich ihre digitalen Biografien, Literalitätsniveaus und Lernvoraussetzungen deutlich unterscheiden und unterschiedliche Teilhabeverläufe hervorbringen.

Der Beitrag trägt zu einem prozessorientierten Verständnis digitaler Teilhabe bei, indem er empirisch aufzeigt, wie sich digitale Teilhabe über verschiedene Stufen hinweg entwickelt, anstatt sich als lineare Anhäufung von Kompetenzen zu vollziehen. Zugleich wird deutlich, wie sich der Digital Inclusion Pathway für die Analyse konkreter Lehr-Lern-Kontexte der Grundbildung operationalisieren lässt. Daraus ergeben sich Hinweise für eine pädagogische Gestaltung, die bedeutungsvolle Lernanlässe, kontinuierliche Unterstützung und stabile strukturelle Rahmenbedingungen miteinander verbindet, um nachhaltige digitale Teilhabe zu ermöglichen.

1. Background and Theoretical Framework: Digital Inclusion in Adult Basic Education

1.1 Digital Literacies as a Foundational Component of Adult Basic Education

In contemporary digitised societies, literacies in adult basic education extend beyond reading and writing to encompass digital literacies – understood not merely as technical skills but as socially situated practices. As Koppel and Wolf (2021) argue, engaging with the world today necessarily involves engaging with it digitally, underscoring that everyday participation increasingly depends on navigating digital environments. Digital literacies enable adults to access information, communicate across platforms, and participate in educational, professional, and civic life (Castek et al. 2023).

Yet, digital engagement remains unevenly distributed. Warschauer (2003) emphasises that meaningful access extends far beyond the mere availability of devices or connectivity, highlighting the importance of social, cultural, and educational resources in achieving digital inclusion. This perspective is echoed by Passey et al. (2024), who demonstrate that digitally marginalised adults face compounded barriers, including limited training opportunities, technological anxiety, and reduced adaptability in rapidly evolving digital contexts.

Global data further illustrate the magnitude of these disparities: UNESCO (2023) reports that only 54 % of adults in EU member states possess basic digital skills. Similar patterns are evident elsewhere, with the U. S. Department of Education (2023) noting that insufficient digital skills limit adult learners' academic participation and career mobility, while 18 % of UK adults lack essential workplace-related digital skills (Lewis et al. 2024).

Digital literacies therefore cannot be conceptualised as discrete competencies. Rather, they represent evolving forms of participation shaped by context, experience, and identity. As Beach, Kerkhoff and Langer (2026) argue, digital literacies encompass far more than the technical use of digital tools; they represent a foundation for participation in a more just and equitable society. Their view aligns with Helsper's (2021) argument that digital inequalities are rooted in social structures. Simply offering skills training is insufficient. Instead, digital literacies should be embedded within culturally responsive and learner-centred pedagogies that validate individuals' lived experiences and linguistic repertoires (McDaniel 2024).

Research confirms that adult learners engage more deeply when digital tasks resonate with their everyday realities and when instruction supports confidence, autonomy, and relatedness (Vanek et al. 2020; Langer 2025b). In short, digital literacies are both a means and an expression of participation in a digitally mediated world.

1.2 Challenges of Heterogeneous Learning Environments

Adult basic education serves highly heterogeneous learner groups whose digital biographies differ substantially (Grotlüschen et al. 2020). Some learners arrive with informal digital experience – using smartphones for communication or entertainment – while others have had little to no exposure to digital tools. Such diversity produces uneven levels of digital readiness (Reder 2025).

Beyond differences in familiarity, broader socio-economic and linguistic factors shape learners' digital opportunities. Durgunoğlu, Langer and Cantürk (2026) show that migration experiences, limited educational histories, and linguistic barriers can restrict learners' digital engagement. Recent integrative reviews similarly highlight that digital (in)equity is multidimensional, spanning infrastructural, economic, and socio-cultural barriers that intersect in adults' everyday lives (Raihan et al. 2025). These constraints amplify technology-related anxiety, prompting some learners to withdraw when unfamiliar tools are introduced. Scaffolded instruction, peer support, and accessible hands-on activities can mitigate such barriers by reinforcing confidence and familiarity (Koppel 2025).

Access inequalities persist as well. While some learners benefit from personal devices and stable internet connections, others rely entirely on institutional access. Rural broadband gaps further exacerbate inequities (Yahn 2023). The OECD (2021) notes that low digital readiness remains a major barrier to workplace training and lifelong learning, while UNESCO (2023) warns that inconsistent opportunities for independent practice lead to rapid erosion of digital confidence. Building on these findings, Langer (2025a) argues that stable and continuous access to digital devices and connectivity is a central precondition for enabling meaningful participation in adult basic education.

Taken together, these factors show that digital engagement is not simply an individual characteristic but the outcome of interacting social, economic, and infrastructural conditions. Understanding digital inclusion in adult basic education therefore requires theoretical frameworks that can capture both personal and structural dimensions of participation.

1.3 Digital Inclusion as Empowerment

A powerful conceptual lens for digital inclusion is empowerment. Ragnedda's (2018) concept of *digital capital* proposes that digital engagement reflects both access to technology and the ability to use it meaningfully. Those with higher digital capital experience greater educational and economic opportunities, while those with limited digital capital risk systemic exclusion.

Complementing this structural perspective, Bolten-Bühler (2021) introduces the concept of *digital habitus* to describe how instructors' digital biographies, dispositions, and affective orientations toward technology OR dispositions, and

confidence levels shape their pedagogical practices. While originally applied to educators, the concept can be extended to learners: digital engagement is shaped by internalised attitudes, past experiences, and one's sense of digital self-efficacy.

Motivation also plays a central role. According to *self-determination theory* (Deci and Ryan 2000), sustained engagement occurs when individuals experience autonomy, competence, and relatedness. In digital learning settings, this means learners persist when tasks feel relevant, purposeful, and connected to their daily lives (Kirkwood and Price 2014). For many adults in basic education, relevance is the catalyst for overcoming digital anxiety.

These perspectives highlight that digital inclusion cannot be understood solely in terms of access or skills, but as a dynamic process shaped by the interplay of structural conditions, individual dispositions, and pedagogical practices.

1.4 The Digital Inclusion Pathway as an Analytical Framework

Against this background, the *Digital Inclusion Pathway* (Reder 2015) offers a structured model for understanding how processes of digital engagement unfold over time. Importantly, the *Pathway* does not describe a progression of competencies; instead, it conceptualises digital inclusion as an engagement trajectory shaped by access conditions, motivational entry points, and opportunities for meaningful application.

The model distinguishes four stages:

Access: concerned with the foundational conditions that enable digital participation, including device availability, connectivity, and socio-economic constraints (Reder 2025).

Digital Taste: captures emerging curiosity and motivational entry points. As David, Langer and Koppel (2023) argue, fostering *Digital Taste* requires accessible and personally meaningful encounters with digital tools that spark curiosity and reduce intimidation.

Readiness: reflects growing confidence and familiarity with digital practices, including willingness to explore and apply digital tools beyond casual use.

Digital Literacies: involve applied and critical forms of digital engagement across diverse contexts, requiring sustained support and opportunities for practice.

This framework is particularly useful for analysing adult basic education, where learners' digital experiences often fluctuate and where structural, motivational, and contextual barriers intersect.

Despite these conceptual advances, important questions remain regarding how digital inclusion unfolds in concrete educational settings. While a growing body of research has examined digital inequalities and digital literacies in adult basic education, existing studies have predominantly focused either on structural access conditions or on the acquisition of discrete digital skills (e.g., Warschauer, 2003; Vanek et al. 2020; Passey et al. 2024). However, less attention has been paid to how digital engagement unfolds

as a process across different stages in real learning environments, and how pedagogical practices shape these trajectories.

Although the *Digital Inclusion Pathway* (Reder 2015) provides a conceptual model for understanding digital engagement as a dynamic and stage-based process, its empirical application to concrete adult basic education contexts remains limited. In particular, little is known about how the stages of the *Pathway* can be observed, interpreted, and pedagogically addressed in specific course contexts.

This paper addresses this gap by applying the *Digital Inclusion Pathway* as an analytical lens to a qualitative secondary analysis of adult basic education data. It examines how learners' experiences, pedagogical practices, and structural conditions interact across different stages of digital engagement. By bringing together learners' perspectives and instructional practices, the study provides empirically grounded insights into how the *Pathway* can be operationalised in real learning settings and contributes to a more process-oriented understanding of digital inclusion.

1.5 Aim and Research Questions

Building on this gap, the central aim of this paper is to examine how the *Digital Inclusion Pathway* can serve as an analytical framework for understanding digital inclusion processes in adult basic education. This secondary analysis explores two guiding research questions:

1. How can documented course practices and learner experiences be mapped onto the stages of the *Digital Inclusion Pathway*, and what insights does this provide into learners' digital engagement trajectories?
2. Which challenges and facilitating conditions become visible when the *Digital Inclusion Pathway* is applied as an analytical lens to existing digital learning practices in adult basic education?

In addition, the paper considers the longer-term implications for fostering sustained digital engagement and supporting learners' broader social participation. The following section outlines the methodological approach underpinning this secondary analysis.

2. Methodological Approach

The findings presented in this paper are based on data generated within the GediG¹ project, which employed a Convergent Mixed-Methods Design (Creswell 2022) to examine the integration of digital media in adult basic education (Langer and Koppel 2025). The present paper does not involve new primary data collection but instead conducts

¹ GediG (Gelingensbedingungen für den Einsatz digitaler Medien in der Grundbildung), 2019–2023, funded by the German Federal Ministry of Education and Research (BMBF), grant number 01JD1826.

a qualitative secondary analysis of the existing multi-perspective dataset. Secondary analysis is particularly suitable when previously collected data are sufficiently rich, comprehensive, and aligned with newly formulated analytical questions (Heaton 2004, 2008). As Heaton (2004, 2008) argues, reworking qualitative data allows researchers to revisit and reinterpret existing material through new conceptual lenses, thereby generating insights beyond the scope of the original study. Sherif (2018) further emphasises that secondary qualitative analysis is especially valuable when datasets permit meaningful recontextualisation and conceptual reframing.

In this paper, the GediG data are reinterpreted through the framework of the *Digital Inclusion Pathway* to analyse how digital inclusion is experienced and enacted within adult basic education. The breadth and depth of the dataset – including surveys, focus groups, interviews, round-table discussions, and course observations – provide a robust empirical foundation for this secondary analysis.

Specifically, data were collected through an online survey of course participants (N=74), instructors (N=49), and institutional leaders or curriculum developers (N=58), offering insights into experiences, attitudes, and structural conditions affecting digital media use in education (see Lindel and Langer 2025 for further information on questionnaire-based data collection).

To capture learners' subjective experiences and motivations, focus group discussions were conducted with 23 participants (13 female, 10 male) (Langer 2025c). Expert interviews were also carried out with course instructors (N=17; 13 female, 4 male) and institutional representatives (N=14; 10 female, 4 male), complemented by four round-table discussions on best practices and implementation challenges.

Additionally, course observations (N=3) were used to identify best-practice examples of digital media integration. The triangulation of these diverse data sources ensures a comprehensive foundation for the secondary analysis presented in the results section.

The dataset reflects a broad range of institutional contexts within adult basic education in Germany, including providers such as adult education centres (Volkshochschulen), non-profit organisations, private training providers, and other adult learning institutions across multiple federal states.

Participants were recruited across diverse course settings, including literacy and basic education programmes serving learners with varying levels of prior education, language proficiency, and digital experience. While detailed demographic variables such as age were not systematically collected across all data sources, the sample represents a heterogeneous group of adult learners typically associated with basic education contexts, including individuals with low literacy skills, migration backgrounds, and limited prior access to formal education.

This diversity is reflected in the qualitative data, which capture a wide range of digital biographies, learning trajectories, and engagement patterns across different learner groups.

All qualitative excerpts presented in this paper (from focus groups, expert interviews, round-table discussions, and course observations) are fully anonymised. The original statements were collected in German and have been translated into English by the author; minor linguistic adjustments were made to improve readability while preserving the substantive meaning of the participants' contributions. Quotations are labelled as follows: FG=focus group, CI=expert interview with course instructors, IR=expert interview with institutional representatives, and RT=round-table discussion. Observational data from course observations (CO) are included as descriptive analytical notes; because no verbatim quotations were produced in the observation protocols, CO references refer only to the researcher's fieldnotes rather than to spoken extracts.

3. Navigating the *Digital Inclusion Pathway*: Findings from Adult Basic Education

The findings demonstrate how learners' experiences and documented course practices can be systematically mapped onto the stages of the *Digital Inclusion Pathway* (Reder 2015; 2025), thereby providing insight into learners' trajectories of digital engagement.

As the framework outlined above suggests, each stage presents distinct challenges that influence learners' ability to engage with digital technologies effectively. The results provide insight into how adult learners progress through these stages, with implications for instructional strategies and policy development.

3.1 Access: Availability and Structural Barriers

The first stage of the *Digital Inclusion Pathway* focuses on the conditions that enable participation in digital environments, particularly access to devices and stable internet connectivity. Across the data, substantial disparities in access emerged, shaping learners' opportunities to engage with digital learning. While institutions often provide digital infrastructure for teaching purposes, access for learners remains uneven, particularly with regard to personal devices and opportunities for independent practice.

Survey data from the institutional online questionnaire indicate inconsistencies in device provision. Ten percent of institutions reported having no computers or laptops available for learners, and 25 % indicated that the number of available devices was insufficient to achieve a 1:1 learner-device ratio. Furthermore, 40 % of institutions did not provide tablets, while only 10 % ensured that each learner had access to one. These limitations were also reflected in the interviews, where instructors described working with a small number of shared devices: «*It was a regular classroom, and I had just a handful of laptops scattered around*» (CI5).

Even where infrastructure was available, access was often restricted. In some cases, computer labs could not be used due to competing institutional demands: «*There is a computer lab here, but it is currently being used for other courses, so I don't have access*

to it» (CI6). In other settings, tablets were provided for all learners but remained limited to in-class use, preventing continued practice beyond the course context. Instructors noted that although each participant received a tablet for use during lessons, these devices remained at the institution and could not be used beyond the course context (CI2; CI4). Institutional perspectives further emphasised that establishing basic infrastructure remained a central challenge. One interviewee noted that considerable effort had been required simply to ensure that learners could access functioning devices during lessons: *«We have now provided notebooks or Chromebooks for the participants so that they have them during lessons. Much of our work has focused on getting the basic infrastructure in place so that learners can actually participate»* (IR14).

Learner survey data complement these findings. While 68 % of respondents reported owning a personal computer or laptop, only 35 % had access to a tablet. Although 92 % owned a smartphone, mobile devices alone were often described as insufficient for more complex tasks such as document processing or navigating online learning platforms. The round-table discussions further highlighted the importance of access beyond the classroom. Instructors noted that learners frequently relied exclusively on smartphones at home, limiting their ability to continue practising digital tasks: *«Participants only work with smartphones at home. Here, they enjoy using tablets or laptops, but they cannot afford such devices themselves»* (RT1). Another instructor emphasised that differences in access had to be considered when planning learning activities: *«They all have a smartphone, but many do not have a tablet, laptop, or computer at home. I always need to consider who has access to what when assigning homework»* (RT2).

Internet connectivity emerged as an additional dimension of inequality. According to the learner survey, 90 % of respondents reported having Wi-Fi access in their course settings, while only 82 % had access at home. In addition, 50 % relied on limited mobile data plans, and only 37 % reported having unlimited mobile data. These constraints restricted learners' ability to use online resources outside of class. The importance of connectivity for participation was repeatedly emphasised in the round-table discussions: *«Without internet, nothing really works today. Social participation simply isn't possible. It's essential that everyone has the opportunity to access the internet and use what it enables»* (RT2).

Regional disparities further intensified these challenges. In rural areas, instructors reported that learners often lacked fixed broadband access and depended on small mobile data packages, limiting engagement with online tools outside the classroom (CI2). Attempts to compensate for these limitations, such as providing mobile routers, were not always successful due to insufficient network coverage. As one instructor explained, *«on-site courses often lack internet access ... in some areas, there was no mobile network at all»* (CI5). The same instructor stressed that these limitations are not new but stem from a long-standing infrastructural deficit: *«We have been calling for broadband expansion in rural areas for years. The infrastructure simply isn't there yet»*

(CI5). These observations were framed as part of a broader and persistent infrastructural issue, with participants referring to long-standing gaps in broadband provision.

Taken together, the findings from the *Access* stage show that learners' opportunities to engage with digital environments are shaped by a combination of institutional provision, individual resources, and infrastructural conditions. These factors influence not only participation within the classroom but also the possibility of continued engagement beyond formal learning settings.

3.2 Digital Taste: Motivation, Self-Efficacy, and Initial Engagement

The *Digital Taste* stage captures learners' initial engagement with digital tools and is shaped by their motivation, emerging self-efficacy, and perceptions of relevance. Across the data, learners' engagement with digital technologies was closely connected to everyday practices and personally meaningful applications.

Findings from the focus group discussions indicate that many learners entered basic education courses with clearly articulated personal goals, such as improving employment opportunities, gaining independence, or strengthening their ability to communicate in written form. Instructors consistently described that engagement with digital tools was more likely when learning activities connected to learners' lived experiences and individual priorities. As highlighted in the round-table discussions, learners bring diverse associations, prior experiences, and cognitive patterns into digital learning contexts, which shape how they approach new technologies: *«Learners carry different associations and experiential backgrounds with them. Understanding these individual ways of thinking and addressing them accordingly is crucial when designing digital learning environments»* (RT1).

Hands-on and creative applications of digital tools appeared frequently across the data. Instructors described activities such as digital storytelling or video production, which enabled learners to explore digital environments in ways that were perceived as meaningful and accessible. In one example, a film project provided opportunities for participants to engage with digital tools through experimentation and collaborative work. Similar observations were reported in the round-table discussions, where participants described participatory and exploratory approaches as common features of digital learning settings: *«Participatory and exploratory approaches are essential for helping learners develop a taste for digital tools. They need to have a say in what becomes part of a basic education course and the opportunity experiment with digital tools in meaningful ways»* (RT1).

Alongside motivation, self-efficacy emerged as a recurring theme in both interviews and observations. Several instructors described situations in which learners reacted with hesitation or withdrawal when confronted with unfamiliar digital devices. In one case, an instructor reported that a participant left the course immediately after

encountering computers in the classroom: «*We once had a participant who was so overwhelmed by the computers in the classroom that they left immediately and never returned*» (C13).

At the same time, the data document multiple instances in which learners gradually engaged with digital tools after initial hesitation. Instructors described how small, achievable tasks supported this process. Activities that provided immediate feedback, such as short digital quizzes, were frequently mentioned in this context: «*When participants complete a short online quiz and see a good result immediately, of course that motivates them*» (C16). «*The result is available immediately... they can try again, check if they got it right, and even make it a bit harder the next time*» (C11).

Accessible learning environments also featured prominently across the data. Instructors reported using formats that allowed learners to engage at their own pace, repeat tasks, and experiment without immediate performance pressure. Gamified elements and reward structures were mentioned as part of these approaches, alongside opportunities for repeated practice and gradual familiarisation with digital tools.

Peer interactions constituted another recurring pattern. In several interviews, instructors described deliberately pairing learners with different levels of digital experience. These constellations allowed less confident participants to observe digital practices before engaging themselves. One instructor explained that hesitant learners were sometimes initially encouraged to «*just watch and get a feel for it*» before trying tasks independently, often resulting in increased willingness to participate over time (C18). Similar dynamics were described in group settings, where learners supported one another in navigating unfamiliar tools (C12).

Across the data, a further pattern emerged concerning differences in how learners' digital engagement was perceived. In some cases, learners demonstrated forms of emerging confidence and experimentation that were not fully recognised in instructors' descriptions. This divergence was visible in contrasts between learners' accounts of their own practices and instructors' more cautious assessments.

Taken together, the findings from the *Digital Taste* stage show that initial engagement with digital tools is shaped by the interaction of personal relevance, emerging confidence, and opportunities for supported experimentation. These patterns illustrate how learners begin to engage with digital environments in ways that extend beyond prior experience and open up further possibilities for participation.

3.3 Readiness: Developing Digital Readiness and Confidence

Building on initial engagement, the *Readiness* stage captures a phase in which learners begin to use digital tools with increasing confidence and familiarity. Rather than referring to formal competencies, this stage reflects learners' emerging ability to apply digital tools in everyday and learning-related contexts. The findings presented in this section

illustrate how learners assess their own digital abilities, how they engage with common digital tasks, and which patterns characterise their progression.

Survey data indicate that many learners enter adult basic education with prior exposure to digital technologies, most commonly through smartphones. This experience, however, is largely limited to everyday applications such as messaging services or entertainment platforms. Analysis of the learner survey (N = 74) shows that such routine use does not necessarily extend to broader or more complex digital practices. When asked about their confidence in using tools such as email services, cloud storage, or document processing software, many learners reported uncertainty.

These differences are reflected in the survey results. While 75 % of respondents reported feeling confident using a smartphone, only 34 % expressed confidence in using a computer or laptop in educational or work-related contexts. Similarly, 43 % rated their skills in messaging applications as «very good», compared to 22 % who reported the same level of confidence in using email. Furthermore, 45 % of learners reported difficulties evaluating the credibility of online information, and 42 % remained uncertain about how personal data are collected and used by digital services.

Focus group data provide additional insight into how learners navigate this stage. Participants described how personal interest and perceived relevance influenced their willingness to engage with unfamiliar tools. One learner explained how using speech-to-text functions allowed them to engage with digital tools despite limited literacy skills: *«The things they usually do don't interest me personally. But to make learning interesting for myself, I dictate things into my laptop. That way I start learning – first improving my pronunciation... and then you learn how to send things»* (FG3).

At the same time, the data include accounts of hesitation and avoidance when learners encountered unfamiliar digital environments. As described in the previous section, even the presence of digital devices could lead to withdrawal in some cases (CI3). These observations reappear in this stage when learners are expected to move beyond familiar applications and engage with new tools.

Across interviews and observations, learners' engagement was closely linked to their prior experiences with digital technologies. Participants who reported informal exposure through activities such as gaming, social media use, or peer interaction often described fewer difficulties when encountering new tools. In contrast, learners with limited prior exposure more frequently expressed uncertainty and reluctance, particularly in situations requiring independent problem-solving or the transfer of skills to unfamiliar contexts.

In response to these patterns, instructors described a range of instructional approaches used in practice. In expert interviews, one instructor emphasised the role of repeated routines: *«When digital routines are introduced from the beginning and practised consistently – both in class and at home – learners gradually build confidence... it requires suitable devices, repeated practice, and guidance over weeks and months»* (CI10).

Course observations and interviews also document the role of gradual exposure and individual support. In one observed situation, a learner initially hesitated to use a tablet but engaged more readily after the instructor clarified its function and differences from previously encountered devices (CO2). Similar accounts across the data describe how learners were introduced step by step to unfamiliar tools, often with opportunities for repetition and clarification.

Taken together, the findings from the *Readiness* stage show that learners' engagement with digital tools develops unevenly and remains closely connected to prior experience, opportunities for repeated practice, and the conditions under which new tools are introduced. The data illustrate how learners begin to move beyond familiar uses of digital technologies while encountering ongoing challenges in extending and transferring these practices.

3.4 Digital Literacies: Independent and Critical Engagement

The *Digital Literacies* stage describes learners' engagement with digital tools in more independent and varied ways across everyday contexts. At this stage, digital practices extend beyond supported use in instructional settings and become increasingly embedded in learners' daily activities. The data show that these forms of engagement develop gradually and differ substantially between individuals.

Across the focus group discussions, learners reported increasing independence in handling digital tasks that had previously been perceived as challenging. These included activities such as completing job applications, navigating online forms, using e-government services, and organising travel. One participant described this development as follows: *«I used to struggle with online housing applications, but now I can navigate the portal easily and even book travel online»* (FG6).

Learners also described how incremental progress enabled them to engage with a broader range of digital practices over time. In one example, a participant reported learning how to record videos, transfer files between devices, and upload content online: *«It comes slowly, step by step... I've learned how to record videos, move them from my phone to my laptop, and upload them to Facebook. These small pieces I learn — that's good»* (FG7).

Other accounts highlighted the use of digital tools for everyday purposes such as online shopping or independent information seeking. One learner described how access to online resources expanded opportunities for self-directed learning: *«In primary school, there was no internet, and knowledge was beyond my reach. Now, through Wikipedia and other pages, I can learn so much I could never have read before»* (FG3).

At the same time, the data indicate that engagement at this stage remains uneven and context-dependent. While learners described increased independence in familiar tasks, difficulties persisted when interacting with more complex systems. In particular,

navigating online learning platforms was frequently described as challenging. Learners reported interruptions in their workflow when dealing with account creation, password management, or selecting the correct course areas: «*Entering email addresses, creating new passwords... it throws me off, and then I start losing interest*» (FG3).

Further challenges emerged in relation to evaluating online information and understanding digital risks. Instructors reported that learners were often active on digital platforms, including social media, without consistently reflecting on the credibility or implications of the content they encountered: «*They are very active on social media — even if they don't reflect on how they are using it*» (RT2).

Issues related to data protection and online safety were also described in the interviews and round-table discussions. Participants referred to uncertainties regarding the handling of personal data, image rights, and potential risks associated with online interactions: «*These are all issues course instructors need to pay close attention to... learners must understand that something could happen here [in terms of privacy or online safety risks]*» (RT4).

In addition, the data show that learners often experienced difficulties transferring familiar digital practices to new contexts. While many participants reported confidence in using applications such as WhatsApp or YouTube, this familiarity did not always extend to other environments, such as uploading documents, navigating institutional platforms, or solving technical problems independently. As described in the round-table discussions, learners frequently required support when encountering unfamiliar interfaces and were hesitant to experiment without guidance (RT2).

Across the data sources, instructors described a range of practices used in instructional settings that accompanied learners' engagement with digital tools. These included activities such as comparing online sources, discussing privacy settings, working with real-world digital scenarios, and engaging with tasks related to everyday applications such as job portals or navigation tools. Course observations further document the use of personalised projects and alternative communication formats, such as voice messages, which enabled learners with limited writing proficiency to participate in digital practices (CO).

Taken together, the findings from the *Digital Literacies* stage show that learners engage with digital tools in increasingly independent ways, while continuing to encounter challenges related to complexity, transfer, and critical evaluation. These patterns illustrate how digital engagement expands beyond initial use while remaining shaped by prior experience, available support, and the contexts in which digital practices are applied.

4. Understanding Digital Inclusion as a Process: Discussion and Implications

Building on the stage-specific findings presented above, this section brings together cross-cutting insights into how digital inclusion unfolds in adult basic education. Using the *Digital Inclusion Pathway* as an analytical lens, the discussion shifts from describing patterns of engagement to interpreting how learners' trajectories are shaped by the interaction of structural conditions, pedagogical practices, and individual experiences.

The section proceeds in four steps. First, it outlines the study's contribution to understanding digital inclusion as a process. Second, it examines pedagogical implications across stages of digital engagement. Third, it discusses structural and institutional conditions that frame learners' opportunities for participation. Finally, it reflects on limitations and directions for future research.

4.1 Digital Inclusion as a Process: Empirical Insights from Adult Basic Education

This study set out to examine how the *Digital Inclusion Pathway* (Reder 2015) can be used as an analytical lens to understand digital engagement in adult basic education. By mapping empirical data onto the stages of the *Pathway*, the findings extend existing research on digital inclusion in three key ways.

First, the results reinforce the understanding of digital inclusion as a process rather than a static condition. While previous research has often focused on access or the acquisition of discrete digital skills, the findings presented here illustrate how learners' engagement unfolds unevenly across different stages. Movement along the *Pathway* does not follow a linear progression; instead, it is characterised by interruptions, regressions, and non-linear, context-dependent shifts. For example, learners who demonstrated confidence in familiar applications such as messaging services often encountered difficulties when transferring these practices to new contexts, such as navigating online platforms or evaluating digital information. This highlights that digital engagement is not simply cumulative, but contingent on situational demands and prior experience.

Second, the study provides empirical insight into how different dimensions of digital inclusion intersect across stages. The findings show that structural conditions (e.g., access to devices and connectivity), motivational factors (e.g., perceived relevance and emerging interest), and experiential aspects (e.g., confidence and prior exposure) do not operate independently but interact dynamically. For instance, limited access to devices outside the classroom constrained opportunities for practice, which in turn affected learners' confidence and willingness to engage with unfamiliar tools. Similarly, meaningful and personally relevant tasks were associated with increased engagement at early stages, while continued participation depended on repeated opportunities for application and reinforcement. These patterns suggest that progression across stages is shaped by the interplay of structural, pedagogical, and individual factors rather than by any single factor.

Third, the analysis demonstrates how pedagogical practices are implicated in shaping learners' trajectories of digital engagement. Across the data, instructional approaches such as accessible entry points, opportunities for repetition, and peer-supported learning were consistently associated with learners' movement between stages. At the same time, the findings point to tensions in how learners' capabilities are perceived and addressed in educational settings. In several cases, learners demonstrated emerging forms of digital engagement that were not fully reflected in instructors' assessments, indicating a divergence between observed practices and pedagogical expectations. This suggests that teaching practices not only respond to learners' existing competencies but also contribute to shaping how these competencies are recognised and developed.

These findings can be further situated within broader theoretical perspectives on digital inequality. Helsper (2021) argues that digital inequalities are embedded in social structures and cannot be reduced to individual skill deficits. The present study supports this perspective by showing that access conditions, institutional arrangements, and socio-economic factors continue to shape learners' opportunities for engagement across all stages of the *Pathway*. At the same time, concepts such as digital capital (Ragnedda 2018) and self-determination theory (Deci and Ryan 2000) help to interpret how differences in resources, prior experiences, and motivation influence learners' engagement with digital practices. The findings suggest that digital inclusion emerges from the interaction of these structural and individual dimensions, rather than from isolated interventions targeting skills alone.

Taken together, the study contributes to a more process-oriented understanding of digital inclusion in adult basic education. By empirically tracing learners' movement across stages of the *Digital Inclusion Pathway*, it shows how digital engagement develops through the interaction of structural conditions, pedagogical practices, and learners' experiences. In doing so, the *Pathway* is not only confirmed as a useful conceptual model but further specified as an analytical framework that allows for the systematic interpretation of digital engagement in concrete educational contexts. While several findings align with existing research – particularly regarding the importance of relevance, scaffolding, and repeated practice – the contribution of this paper lies in showing how these elements interact across stages of digital engagement.

Rather than identifying isolated factors, the analysis demonstrates how digital inclusion unfolds as a process shaped by the dynamic interplay of structural conditions, pedagogical practices, and learners' experiences across the *Pathway*. This stage-based perspective provides a more differentiated and process-oriented understanding of digital inclusion in adult basic education contexts.

4.2 Pedagogical Implications Across Stages of Digital Engagement

The findings highlight that digital inclusion in adult basic education cannot be effectively addressed through isolated interventions targeting single aspects of digital competence. Instead, the data point to the need for pedagogical approaches that recognise digital engagement as a staged and interconnected process, in which structural conditions, motivational dynamics, and opportunities for practice are closely intertwined.

Importantly, the findings also indicate that learners cannot be treated as a homogeneous group with regard to digital engagement. Differences in prior experience, literacy levels, language backgrounds, and confidence shape how learners engage with digital tools across all stages of the *Pathway*.

For instance, learners with prior informal digital experience – such as through smartphones or social media – often require different forms of support than those with little or no exposure to digital technologies. Similarly, learners with limited literacy skills may benefit more strongly from multimodal and voice-based tools, while others engage more readily with text-based environments.

These differences suggest that pedagogical approaches to digital inclusion need to be differentiated and responsive to learners' individual starting points, rather than assuming uniform progression across groups.

A first implication concerns the importance of aligning digital learning opportunities with learners' everyday realities and personal goals. Across the data, engagement with digital tools was closely linked to perceived relevance, particularly in the early stages of digital engagement. Learners were more likely to engage when digital practices connected to concrete needs, such as communication, navigation, or administrative tasks. This suggests that pedagogical approaches should prioritise meaningful and context-sensitive entry points that allow learners to experience digital tools as useful within their own life contexts, rather than as abstract or decontextualised skills.

Closely related to this is the role of accessible and exploratory learning environments. The findings show that initial engagement is often shaped by uncertainty and, in some cases, by withdrawal when learners are confronted with unfamiliar technologies. Instructional practices that allow for gradual familiarisation, repetition, and experimentation appear to support learners in engaging with digital tools at their own pace. In particular, formats that reduce performance pressure – such as short tasks with immediate feedback, playful elements, or opportunities to observe others before participating – were frequently associated with increased willingness to engage. These observations underline the importance of designing learning environments that normalise uncertainty and enable learners to approach digital tools without the expectation of immediate proficiency.

At the same time, the findings indicate that sustained engagement depends on continuity across learning contexts. While many learners were able to engage with digital tools within instructional settings, limited access to devices and connectivity outside

the classroom constrained opportunities for independent practice. This discontinuity affected not only the consolidation of newly acquired practices but also learners' confidence in applying digital tools beyond supported environments. From a pedagogical perspective, this highlights the importance of creating conditions that enable learners to engage with digital practices across settings, thereby supporting the transition from guided participation to more independent use.

Another central implication concerns the role of scaffolding in supporting learners' progression across stages. The data show that learners differ substantially in their prior experiences and levels of confidence, resulting in uneven trajectories of digital engagement. Instructional practices that provide structured support – such as step-by-step guidance, repeated routines, and opportunities for practice over extended periods – appear to facilitate engagement with increasingly complex digital tasks. At the same time, the findings suggest that scaffolding needs to remain flexible and responsive to individual learning trajectories, rather than assuming uniform progression across learners.

In addition, peer interaction emerges as a relevant pedagogical resource. Across the data, collaborative arrangements – such as pairing learners with different levels of experience – created opportunities for observation, informal support, and gradual participation. These dynamics indicate that social learning processes can play a significant role in enabling engagement with digital tools, particularly in contexts where learners may initially hesitate to participate independently.

Finally, the findings point to the importance of addressing not only functional but also critical dimensions of digital engagement. While learners increasingly engaged with digital tools in everyday contexts, difficulties remained in areas such as evaluating information, understanding data practices, and transferring knowledge across platforms. This suggests that pedagogical approaches need to integrate opportunities for critical reflection and problem-oriented learning, enabling learners to navigate digital environments in more informed and adaptive ways.

Taken together, these implications highlight that pedagogical support for digital inclusion requires a holistic approach that spans all stages of digital engagement. Rather than focusing on discrete skills, effective approaches attend to the interplay of relevance, emotional safety, access to practice, and opportunities for sustained engagement, thereby supporting learners in navigating increasingly complex digital environments.

4.3 Structural Conditions and Institutional Constraints

While pedagogical practices play a crucial role in shaping learners' engagement with digital tools, the findings of this study also underscore the extent to which digital inclusion is conditioned by structural and institutional factors. Across all stages of the *Digital*

Inclusion Pathway, learners' opportunities to engage with digital technologies were closely linked to the availability of material resources, infrastructural conditions, and organisational arrangements within adult basic education.

In line with Helsper's (2021) argument that digital inequalities are embedded in broader social structures, the data show that disparities in access to devices and connectivity continue to frame learners' possibilities for participation. Although many institutions have made efforts to provide digital equipment, the findings reveal persistent inconsistencies in device availability, restricted access to computer labs, and limitations in extending access beyond the classroom. These conditions do not merely affect initial access but shape learners' engagement across subsequent stages, particularly where opportunities for repeated practice are constrained.

The findings further indicate that institutional arrangements play a significant role in mediating access. Policies restricting the use of devices to in-class settings, competing demands on shared infrastructure, and limited technical resources create discontinuities between supported learning environments and learners' everyday contexts. As a result, learners often encounter situations in which engagement with digital tools is possible within the classroom but cannot be sustained beyond it. This discontinuity limits the consolidation of digital practices and contributes to uneven progression across stages.

In addition, broader infrastructural conditions, particularly in rural areas, intensify these challenges. Limited broadband access and reliance on restricted mobile data packages were described as persistent barriers that cannot be addressed at the level of individual courses or institutions alone. These findings point to structural inequalities that extend beyond educational settings and reflect wider socio-economic and regional disparities.

At the same time, the data suggest that institutional responses to these constraints vary considerably. While some institutions have implemented measures to improve access — such as providing devices during lessons or attempting to expand connectivity — these efforts are often shaped by resource limitations and local conditions. This variability highlights that digital inclusion in adult basic education is not only dependent on pedagogical design but also on the institutional capacity to provide stable and continuous access to digital infrastructures.

Taken together, these findings emphasise that digital inclusion cannot be understood solely as a matter of individual competence development or pedagogical intervention. Rather, it is fundamentally shaped by structural and institutional conditions that enable or constrain learners' engagement with digital technologies across contexts. Addressing these conditions therefore remains a central challenge for advancing digital inclusion in adult basic education.

4.4 Limitations and Outlook

Several limitations of this study should be considered when interpreting the findings. First, the analysis is based on a qualitative secondary analysis of existing data, which limits the degree to which data collection could be tailored specifically to the *Digital Inclusion Pathway*. While the dataset provides rich insights into learners' experiences and instructional practices, certain aspects of digital engagement may not have been captured systematically across all cases.

Second, the study draws on a specific sample within adult basic education, which reflects particular institutional contexts and learner groups. As a result, the findings are not intended to be generalisable in a statistical sense but to provide analytically grounded insights into processes of digital engagement. Further research across different educational contexts and learner populations would be valuable to examine how the patterns identified here manifest in other settings.

Third, the analysis focuses primarily on learners' experiences and pedagogical practices within organised learning environments. Although structural conditions such as access to devices and connectivity are considered, broader socio-economic dynamics shaping digital inclusion could only be addressed indirectly. Future research could therefore further explore how these wider conditions intersect with educational practices over longer periods of time.

Building on these limitations, several directions for future research emerge. Longitudinal studies would be particularly valuable for examining how learners move across stages of digital engagement over time and how these trajectories are influenced by changing life circumstances and learning opportunities. In addition, further research could explore how emerging digital environments – such as AI-supported applications – reshape the conditions under which digital inclusion is enacted in adult basic education. Finally, comparative studies across institutional contexts could provide deeper insight into how organisational and infrastructural conditions influence learners' opportunities for sustained digital engagement.

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