Emerging Technologies for Holistic Literacy in Adult Education

D2.2. ETHLAE Report on methods for holistic literacy and emerging technologies in Adult Learning and Education

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List of abbreviations

Abbreviation	Description
ALE	Adult Learning and Education
CDP	Communication and Dissemination Plan
EC	European Commission
EU	European Union
GA	Grant Agreement
GDPR	General Data Protection Regulation
WP	Work Package
AI	Artificial intelligence
ET	Emerging technologies

Partners

No	Partner	Country	Acronym
P1	EUROPEAN ASSOCIATION FOR THE EDUCATION OF ADULTS	Belgium	EAEA
P2	SVEUCILISTE ALGEBRA	Croatia	AU
P3	ALL DIGITAL AISBL	Belgium	AD
P4	KANSANVALISTUSSEURA	Finland	KVS
P5	CENTRUL PENTRU PROMOVAREA INVATARII PERMANENTE TIMISOARA ASOCIATIA	Romania	CPIP
P6	VERBAND OSTERREICHISCHER VOLKSHOCHSCHULEN	Austria	VOV
P7	NATIONAL LEARNING AND WORK INSTITUTE	United Kingdom	L&W

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Executive Summary

This report presents the findings of the ETHLAE project's field research into the integration of emerging technologies (ET) and the existence of holistic literacy in adult learning and education (ALE) across diverse European contexts. Drawing on semi-structured interviews with adult educators, policy makers, education technology experts, education non-profit representatives and =adult learners from vulnerable contexts, the study spans national case studies in Austria, Croatia, Finland, Romania, Switzerland, the United Kingdom, and at the EU level.

The research addressed two primary tasks. Task 2.1 focused on institutional and stakeholder perspectives regarding the use of emerging technologies in adult education systems. Findings highlight a growing awareness of the importance of digital transformation, accelerated by the COVID-19 pandemic, yet reveal uneven levels of readiness across regions and institutions. Common obstacles include underdeveloped digital infrastructure, lack training for educators and other ALE practitioners, fragmented policy frameworks, and limited long-term funding. However, promising initiatives have emerged through European and national strategies, NGO-led projects, and public libraries as community digital hubs. Stakeholders emphasise the need for systemic, inclusive, and ethical integration of ET into adult learning ecosystems.

Task 2.2 explored how holistic literacy programmes are implemented, particularly the ones serving adults from vulnerable groups. Interviews with educators, representatives of ALE providers or non-profit organisations and learners revealed that meaningful digital inclusion requires much more than access to devices or tools. Adult learners, particularly migrants, low-income individuals, and those with lower qualifications, face intersecting barriers such as mistrust, language challenges, lack of confidence, and digital bureaucracy. Holistic approaches that build trust, foster learner agency, and embed digital skills into real-life contexts are essential. Learners value clear, slow-paced instruction delivered in safe, relational environments, and benefit greatly from peer support and co-designed learning experiences.

The report also features powerful case studies from adult learners across participating countries, offering first-hand perspectives on the complexities of navigating digital life. These testimonies underscore the importance of empathy, guidance, and contextualised learning in the design of inclusive digital education.

In conclusion, the ETHLAE field research confirms that while emerging technologies hold promise for expanding access and personalising learning in ALE, their effective use depends on a thoughtful, systemic implementation grounded in pedagogy and learner realities. The findings call for investment in educator training, co-creation with learners, inclusive digital infrastructures, and sustainable policies that support long-term innovation and equity in adult learning across Europe.

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1. Introduction

1.1. Description of the deliverable

This document is the official deliverable **D2.2 ETHLAE Report on methods for holistic literacy and emerging technologies in ALE**. Emerging Technologies for Holistic Literacy in Adult Education (ETHLAE) project funded by the European Union's Erasmus Partnership for Cooperation in the field of Education and Training - European NGOs programme (**Project: 101184061 — ERASMUS-EDU-2024-PCOOP-ENGO**).

2. Research Methodology

The research methodology developed under WP2 of the ETHLAE project was designed to explore the integration of emerging technologies within holistic literacy programs for adult learners, with particular attention to the needs of vulnerable groups. The methodology was carried out through two interconnected tasks: **T2.1 Mapping and Methodological Analysis**, and **T2.2 Contextual Analysis of Holistic Literacy Integration**. Together, these tasks provided a layered understanding of how digital transformation intersects with adult education across diverse national and institutional contexts in Europe.

A decentralised and qualitative design guided the research, in line with ETHLAE's commitment to context-sensitive outcomes. Each project partner was responsible for collecting and analysing data within their country, using shared guidelines and templates to ensure consistency and comparability. This flexible yet structured approach allowed for the collection of localised insights while also contributing to a coherent cross-national synthesis.

All partners engaged in desk research and semi-structured interviews, and while focus groups were proposed as an optional method, none were conducted in practice. Interviews were chosen for their appropriateness in capturing in-depth, personal experiences and stakeholder reflections. To reduce administrative burden and streamline ethical compliance, no full transcripts were produced; instead, data were documented directly into analysis templates designed for each task.

Research Objectives (WP2)

The research activities conducted under Work Package 2 of the ETHLAE project were designed to provide a grounded understanding of how emerging technologies are embed (or not) into holistic literacy programmes in adult education, with particular attention to vulnerable learners and under-resourced learning environments. The overall aim of the research was to generate knowledge that would inform the design of tools, training, and policies within the project and beyond.

The specific research objectives were:

1. **To explore how emerging technologies are currently used in adult learning and education across different European contexts**, particularly in literacy programs. This included identifying the types of technologies in use, target groups, pedagogical approaches, and observed outcomes.

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2. **To map and analyse best practices in embedding emerging technologies in inclusive adult education**, especially practices that show potential for transferability, innovation, and responsiveness to learner needs. The goal was to understand what makes certain approaches effective and under what conditions.
3. **To identify systemic and practical challenges that challenge the integration of emerging technologies in adult education**, such as issues related to infrastructure, educator preparedness, digital competence, institutional support, and attitudes toward technology.
4. **To understand the needs, barriers, and motivations of vulnerable adult learners in engaging with digital learning environments**, including their access to devices and connectivity, prior exposure to technology, and experiences with digital tools in both formal and informal learning settings.
5. **To investigate the support needs of adult educators and stakeholders in designing and delivering holistic literacy programs using digital and emerging technologies.** This included examining gaps in training, availability of practical resources, and institutional or policy support.
6. **To examine how holistic literacy is currently conceptualised and supported in adult education practices.** The research aimed to identify whether and how these dimensions are being addressed, particularly when ETs are involved.
7. **To gather country-specific contextual insights** through both desk research and interviews, enabling an understanding of national policies, institutional frameworks, and local practices that shape the integration of ETs in adult learning.
8. **To synthesise findings across all countries and stakeholder groups**, producing an evidence base that directly informs the ETHLAE Toolbox (WP3), educator training (WP4), and pilot design (WP5), while also contributing to the broader European dialogue on inclusion, digital transformation, and lifelong learning.

2.1. Desk Research and Stakeholder Mapping

The first step in Task 2.1 was a systematic **desk research phase**, conducted by all partners to identify existing practices, strategic documents, and policy frameworks relevant to the use of emerging technologies in education, especially adult education and learning. This phase focused on public sources such as national policy papers, institutional strategies, European initiatives, relevant legislation, and previous EU-funded projects.

The desk research aimed to map how emerging technologies—particularly AI, VR, AR, and data-driven tools—have been integrated (or not) into education systems, with a focus on adult learning. Special attention was paid to practices and tools designed for or adaptable to vulnerable groups. The outcomes of the desk research fed directly into the subsequent interview phase by identifying gaps, national priorities, or promising initiatives that could be further explored through dialogue with stakeholders.

In the second phase of T2.1, each partner conducted interviews with relevant stakeholders, including adult educators, education technology experts, non-profit organisations (NGO representatives), VET providers, and policy makers. Using a common analysis template, partners synthesised key insights around stakeholder roles, familiarity with emerging technologies, examples of successful implementation, perceived barriers (technical, cultural, financial), and suggestions for improving the uptake of digital tools in the adult learning ecosystem.

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As part of Task 2.1, a total of 21 interviews were conducted across six countries and at the EU level, complemented by a topic-focused workshop in Austria that gathered around 90 participants. The mapping aimed to capture diverse perspectives from the institutional and policy landscape of adult education. Interviewees included a wide range of professionals: adult educators, literacy and digital skills trainers, directors and department heads from ALE providers, education technology and AI experts, policy makers, NGO representatives, VET and teachers. Austria contributed significantly with seven profiles across digitalisation, literacy, and social inclusion, while Croatia offered insights from a school-based informatics educator, a seasoned adult trainer, and an e-learning manager. Finland and Romania each added a mix of policy-level actors and practitioners, and the UK brought perspectives from NGOs and Edtech experts. At the EU level, the voices included representatives of European NGOs, innovators in AI and digital education, policy makers, and practitioners from adult learning, VET, and school-based education.

The findings from both desk research and interviews were integrated into a national analysis report, which later contributed to a consolidated comparative analysis.

2.2. Contextual Analysis of Holistic Literacy Integration

While Task 2.1 emphasised institutional and policy-level mapping, Task 2.2 moved closer to the learner experience. It focused on the concept of holistic literacy, which encompasses not only basic digital and cognitive skills (literacy, numeracy, digital, science and citizenship, defined as such by the European Union), but also personal, social and learning to learn competence, and other lifelong learning competences such as financial literacy, health and environmental, entrepreneurship and cultural awareness and expression.

Two key participant groups were interviewed: (1) adult education practitioners and stakeholders involved in social inclusion and workforce development, and (2) adult learners. These interviews aimed to uncover learners' access to and comfort with digital tools, their motivations, barriers, and preferences, as well as educators' experiences in integrating technology into inclusive and personalised learning programs.

Partners used a second shared template to synthesise insights across several dimensions, including learner backgrounds, technology access, digital inclusion efforts, support systems for educators, and feedback on existing or past digital learning programs. As with Task 2.1, anonymised quotes were included where possible to illustrate findings without compromising participant confidentiality.

In Task 2.2, partners conducted 26 interviews across six countries and at the EU level, focusing on how holistic literacy is approached in real-world adult education settings, particularly those serving vulnerable groups. The sample included two main participant categories: adult education professionals working in social inclusion, workforce development, and basic skills training, and vulnerable adult learners themselves. Croatia contributed perspectives from two high-level workforce development professionals and one foreign worker. Finland provided insights from social inclusion experts and a vulnerable learner, while Romania focused primarily on professionals engaged in inclusion efforts. In Switzerland, interviewees included a basic skills expert, a government representative, and a vulnerable adult learner. The UK added voices from the charity sector, adult education, and institutional workforce development. At the EU level, a diverse range of expertise was represented, spanning adult learning, psychology, gerontology, ALE policy analysis, and one direct learner experience. This mix of stakeholders allowed for a nuanced view of access to digital tools, barriers to inclusion,

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support systems for educators, and learner engagement within the broader context of holistic literacy.

2.3. Ethical Considerations

All research activities were conducted following the **BERA Ethical Guidelines for Educational Research (2018)** and the **General Data Protection Regulation (GDPR)**. Each participant was informed of the voluntary nature of their involvement, data protection procedures, and the purpose of the study. No personal data was stored beyond anonymised summaries, and no recordings or transcripts were retained. Each partner was responsible for securing ethical compliance in their national context, supported by the project's overall ethical framework.

2.4. Reflections and Limitations

The methodological design, though intentionally flexible, presented a few limitations. The absence of focus groups meant that group-based meaning-making was not captured, which might have enriched discussions on shared barriers or institutional dynamics. Similarly, the lack of transcription limited the possibility for deep textual analysis, though this was mitigated by encouraging detailed summaries and thematic synthesis in the templates.

Desk research quality depended on national information availability and partners' familiarity with policy sources. While most countries provided substantial documentation, the level of depth varied, and the lack of evaluative data on many existing initiatives made it difficult to assess impact. Still, partners were encouraged to include contextual explanations, noting whether an initiative was too recent for evaluation or describing indirect indicators of success.

Despite these challenges, the research methodology succeeded in producing a nuanced, well-grounded understanding of how adult learning systems are (or are not) integrating emerging technologies in ways that promote inclusion, accessibility, and holistic development. The results are being used to inform the design of learning resources (WP3), capacity-building activities (WP4), and pilot implementations (WP5), ensuring that ETHLAE's tools and training are anchored in real-world needs and practice.

3. EUROPEAN UNION

3.1 Desk Research Findings

Context analysis: Obstacles & Enablers

Sustainable Development Goal 4, Quality Education, aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Among other targets for 2030, the United Nations calls for universal literacy and numeracy, ensuring that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy; and for the elimination of all discrimination in education, calling for equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations. The European Union also focuses on lifelong learning in its main guiding initiative, the European Pillar of Social Rights. The first principle, Education, training and life-long learning, dictates "Everyone has the right to quality and inclusive education,

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training and life-long learning to maintain and acquire skills that enable them to participate fully in society and manage successful transitions in the labour market". In line with the initiative proclaimed in 2017, the new European Commission's strategy, Union of Skills, also reinforces the importance of learning, skills development, upskilling and reskilling for *everyone in Europe, no matter where they are*.

Regarding Adult Learning and Education (ALE), the European Union proposes as a 2030 target that at least 60% of all adults should be participating in training every year to "improve employability, boost innovation, ensure social fairness and close the digital skills gap", and considering that one in five adults still struggle with reading and writing. Yet, participation is not on track to reach this target. By 2022, the 12-month participation in learning activities was only 39,5% in the EU, showing uneven rates across EU countries. The Education and Training Monitor 2024 shows that the participation of adults in learning is increasing, but at a slower pace than what would be necessary to fight current challenges. Participation is even lower for people in most need of skills-development, such as adults who are low qualified, people over 55 years old, unemployed, who are outside the labour force or living in rural areas. These results show that the only way to increase the overall participation rate is to focus on and increase the participation in learning of people who are in greater need of reskilling and upskilling. But what explains this lack of participation? Other data from Eurostat show that, in 2022, 42.4% of persons aged 25-64 did not participate and did not want to participate in adult learning, while another 30.4% participated but did not want to participate more. Three-quarters of the population who did not want to participate (more) said they did not feel the need to participate in adult learning. For the ones who wanted to participate (more) but did not, the main reasons were scheduling conflicts, cost and family reasons, followed by constraints of availability of suitable training and age and health reasons for the older population.

Regarding skills, the OECD's latest PIAAC (Do Adults Have the Skills They Need to Thrive in a Changing World?) results demonstrate declining literacy and numeracy proficiency, especially among the least educated segments of the population, which leads to a widening gap in skills proficiency between highly and low-educated adults in most of the participating countries and economies. The survey highlights the importance of decreasing barriers to learning related to social circumstances outside of individuals' control. Language also poses a great barrier to adult learning participation in the case of people with immigrant backgrounds. A note for the type of skills assessed in this survey: literacy, numeracy and adaptive problem solving. Besides the obvious importance of skill-development for labour market integration, these foundation skills are important in everyday life and key to having adults who are active citizens, knowledgeable and who achieve personal goals.

For the adults who are low qualified, a major obstacle identified across the EU countries is a lack of motivation, which can stem from poor experiences of initial education or due to multiple disadvantages. Different strategies are needed that include more diverse stakeholders to encourage adults to participate in educational opportunities within familiar settings or explore new learning environments. Ensuring adequate public infrastructure – venues, equipment and appropriate personnel – is essential to boost local initiatives that focus on the needs of low-skilled adults. Successful policies often take a holistic approach, bringing together multidisciplinary services and involving familiar and trusted environments such as libraries and community, cultural, sports, health and social inclusion centres.

Particularly important in this context is the development of digital competence, which, as determined by the Council of the European Union in the Council Recommendation on Key Competences for Lifelong Learning (22 May 2018), involves the confident, critical and

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responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property-related questions, problem solving and critical thinking. The European Union has prioritised digital competence in its policy agenda, creating the Digital Competence Framework for Citizens (DigComp). The current version, DigComp 2.2, encompasses five core domains: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving, comprising 21 specific competences with practical applications. In today's fast-evolving technological landscape, digital competence does not exist in isolation but is deeply interconnected with other essential skills, particularly literacy. The ability to search for, comprehend, and critically evaluate online content and its sources has become fundamental in navigating today's digital environment, where information and news are found online. As part of Europe's Digital Decade, the EU proposes the target of at least 80% of those aged 16-74 should have basic digital skills. Even though 90% of all jobs require at least basic digital skills, in 2023, the percentage was only 56%, not surprisingly, 28% for people aged 65-74 and 70% for those aged 16-24. The percentage also changed with their level of formal education, with 34% for those with no or low formal education.

The Trends Shaping Education 2025 report states that digital tools and especially emerging technologies (ET) are already changing how we work, learn and communicate, influencing education and moving towards a digital education system. Some authors argue that digital tools are already integrated into various aspects of everyday teaching and learning practices, but that the use of educational technologies with advanced automation capabilities (where educators only supervise and monitor) has limited prevalence. Others mentioned that only Artificial Intelligence (AI) text generators or chatbots are used frequently by students, with or without the approval of their educators.

Studies show potential benefits and opportunities of the use of emerging technologies in educational and learning settings. AI can function as an intelligent tutoring system and enable individualised learning experiences, incorporate immediate feedback and customise content to match individual learning styles. AI can also support accessing content or enabling interactions with users across languages, reducing the current language barriers, or allowing gesture recognition features. Besides AI teaching assistants, other practical scenarios can include Virtual Reality (VR) in vocational education and training (VET), language learning tools for migrants, and specialised social and humanoid robots for learners with special needs. Immersive technologies like VR, robotics and simulated realities are normally used to teach skills in technical fields such as medicine, welding, logistics, and healthcare, and they are also being explored for teaching and learning soft skills. For example, VR could help learners to experience life from another person's viewpoint by virtually stepping into their physical reality, showing promise in fostering empathy and enhancing attitudes toward marginalised groups. Social robots can also revolutionise the education sector. While still too expensive, social robots could provide support in adaptive tutoring using natural language communication or encourage learning by acting as peer learners. These technologies can access resources that otherwise could not be accessed, support individuals in isolated locations, or those lacking facilities for in-person learning. Robots with emotion-recognition artificial intelligence have already demonstrated effectiveness in addressing mental health issues, such as feelings of loneliness, and in improving social skills among people on the autism spectrum. Additionally, there remains the fundamental argument that increased integration of digital resources in education contributes to developing students' digital competencies.

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However, recent UNESCO data reveals significant contractions: while over two-thirds of secondary students in high-income countries use generative AI for schoolwork, only 10% of schools and university institutions have established official AI guidelines. Meanwhile, regulatory restrictions are increasing, with nearly 40% of countries now prohibiting mobile phones in schools, up substantially from 24% in 2023. There are implications in using these advanced technologies related to data privacy, ethics and potential bias. This use can enhance the current digital divide, when we think of the population that does not own appropriate hardware, where there is a lack of available devices and connectivity or of the specific advanced technologies. Data from 2019 shows that 25% of low-income households have no access to computers and broadband, so ensuring educational institutions and learners have access to reliable internet is crucial. Inequality in the digital competences of teachers and educators can also play an important role in increasing the digital divide of learners, as a 2018 study shows, on average, that less than 40% of educators felt ready to use digital technologies in teaching across the EU. Educators need support, both in training but also by establishing dialogue directly between educators and decision-makers to develop national strategies that support teacher-led AI integration and that focus on pedagogical innovation and not solely on technical use. Ethical and environmental challenges are present, as well as making sure learners become critical and responsible users of such technologies. Lack of regulation or over-regulation is also a key variable when discussing the use of digital technologies, and the future will depend on striking a balance in overcoming barriers like regulation, labour-market frictions, and workforce training costs.

The impacts of the demographic change, changing labour market needs, skills mismatch, as well as the green and digital transitions, require new approaches to facilitate the participation of adults, including those not inclined to attend learning activities and the 65+ age group, in adult learning to support their full integration and participation in society. The question is how to embed these emerging technologies in such a way that motivates and increases the participation of adults in learning opportunities, in an appropriate and relevant manner.

Policy Framework at European and International levels

There are several main initiatives regarding emerging technologies, namely Artificial Intelligence, in education. Within the framework of Europe's Digital Decade policy programme, the EU AI Act (Regulation (EU) 2024/1689 laying down harmonised rules on artificial intelligence) is the EU's comprehensive legal framework. The AI sets out a risk-based approach, defining 4 levels of risk for AI systems: unacceptable, high, limited and minimal risk. AI solutions used in educational institutions that may determine access to education and the course of someone's professional life (e.g. scoring of exams) are considered, by the AI Act, as high-risk. This regulation was based on the Ethics Guidelines for Trustworthy Artificial Intelligence published in 2019.

Digital Education Action Plan 2021-2027 is an initiative aiming to enhance digital skills and competences for the digital transformation while fostering the development of a high-performing digital education system. It integrates different types of actions, such as Council Recommendations, guidelines on the ethical aspects of AI and data for educators, and updating the European Digital Competence Framework, among others. The plan focuses on digital skills, increasing capacity, both on the educators' training and on infrastructure and resources; mentioning the need to empower educators to innovate and the need for accessibility, inclusiveness and learner-centred design.

The Digital Competence Framework for Citizens (DigComp) provides a common understanding of how to identify and describe the 5 key areas of digital competence. The

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framework is being updated, and a new version will be published in 2025, where emerging technologies play a more prominent role. The Ethical guidelines on the use of artificial intelligence and data in teaching and learning for educators were published in 2022 and target primary and secondary teachers. The guidelines aim to support educators in understanding the concepts and offer practical advice on how to integrate AI and data in the classroom. The European Commission will introduce a 2030 Roadmap on the future of digital education and skills to ensure equal access to digital education later in 2025. And in 2026, a dedicated initiative on AI in education will establish an AI literacy framework and guide the responsible use of AI in learning environments (focusing on digital well-being, safety, and tackling disinformation).

Other EU policy initiatives related to a social Europe and education also mention emerging technologies and/or digital literacy and digital skills. The European Pillar of Social Rights, proclaimed in 2017, and its action plan include, as the first principle, the right to education, training and lifelong learning. It set up ambitious targets of at least 60% of all adults should participate in training every year, and at least 80% of those aged 16-74 should have basic digital skills, a precondition for inclusion and participation in the labour market and society in a digitally transformed Europe. The Union of Skills recognises the importance and the need to increase digital skills in Europe. AI is mentioned, referring to the lack of current capacity from education systems to effectively embed AI into learning contexts and to its role in the future of the labour market. The Council Resolution on a new European agenda for adult learning 2021-2030 presents a vision of how adult learning should develop in Europe by 2030. The document asks the Member States to promote high-quality and inclusion-driven digitalisation in education. It argues that adult learners need to use digital tools more widely and effectively, while recognising the need for more training and support for adult educators and trainers on technical assistance and learning approaches. The European Digital Rights and Principles, published in 2022, promote digital rights and principles for a human-centred digital transformation, shaped by European values. It includes universal access to inclusive technology is essential, including being able to acquire the education and skills necessary to enjoy the benefits of digital technology.

International organisations also work extensively in the field of digitalisation in education. UNESCO Beijing Consensus on Artificial Intelligence and Education (2019) recommends guiding principles for the use of AI in education, promoting AI literacy and teachers' training. UNESCO Guidance for generative AI in education and research (2023) looks, among other topics, into the possibilities for creatively using GenAI in curriculum design, teaching, learning and research activities. UNESCO AI Competency Framework for Students supports educators to integrate AI learning into the curricula and AI Competency Framework for Teachers, and defines the knowledge, skills, and values teachers need when working with AI. UNESCO AI and education: Guidance for policymakers (2021) helps policymakers to better understand AI and improve decision-making and legislation, and risk assessment. The OECD "Getting Skills Right: Future-Ready Adult Learning Systems" report highlights that as digitalisation advances, globalisation deepens, and populations age, the ability of individuals, businesses, and economies to capitalise on these changes hinges crucially on preparedness of adult learning systems to facilitate the acquisition of relevant skills for this evolving job market.

Existing Programmes and Best Practices

Several existing programmes in the EU countries have been identified as examples of the best practices.

In Spain, the *'English Communicative Workshop' methodology* uses gamification in adult education for language learning (50-70 years-old people). It is divided into three

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consecutive courses corresponding with 3 different levels (beginners, intermediates, advanced learners). Each workshop includes 4 three-hour class sessions, and a group of approximately 20 students regularly meet twice or three times per week to learn English, using interactive games and materials. These methodologies enhance self-confidence in learners and digital upskilling, making the learners more aware of alternative tools to learn languages. Gamification can be a good way to motivate learners who are typically not motivated to learn or that have different types of learning styles. It is also important to consider the use of digital technologies in adult education and with vulnerable groups, such as older learners, as per this example. With time and effort, it is possible to integrate more advanced digital tools and emerging technologies.

In Greece, the *EU GAMER project* aimed at using digital games to encourage responsible citizenship, targeting students in secondary education, teachers, parents, youth workers, and adult educators. Different activities built around digital games (video games), and gamification (role-playing activities) were developed, where real-life scenarios were transformed into interactive experiences. For example, in 'The Virtual Role Play Game', players act as MEPs, join political groups, and debate, negotiate, and vote on a legislative proposal. On 'Venba', students take on roles within an immigrant family, navigating the balance between cultural heritage and integration into a new society. They are given a scenario related to managing cultural differences and must discuss and vote on the best solution through a democratic process, ensuring respect for everyone's opinions. The project pilot with more than 300 students experienced increased engagement and boosted student participation, but a need to contextualise the activities and preparation. Although the project was implemented with secondary school students, this practice of the use of digital games and gamification can be transferable to adult learners. It is interesting that, in this case, the games can be used to teach different types of competences: in the first example, the students are learning about communication and negotiation skills, and also acquiring knowledge about the function of the EU Parliament; and in the second, students are putting themselves into other people shoes and working multicultural competence and empathy.

Another example is the *GAD project*, which resulted with the GAD Game App. GAD Game App is a digital learning game based on augmented reality, where it is possible to create lessons and launch quizzes to provide an immersive and engaging educational experience. It aims to support educators with innovative pedagogical and educational approaches that consider the changes in communication and teaching/learning dynamics due to the use of new technologies and digital devices. It is an application that combines AR, education and gamification. The target group were educators who had an active role in the prototyping of the Game as an educational tool, to be later tested and used with learners. The GAD Platform is complementary to the GADGame and acts like a hub with learning sessions and 3D model examples, and what a session using the GADGame could look like, tools and helpful resources. This practice is an example of mixing gamification and digital learning. The app the lesson examples, and materials can be transferable or adapted to different target groups. No special equipment is ed. Unlike VR, augmented reality doesn't require any expensive hardware. If learners own a smartphone, AR technologies are immediately available for use for most of the target audience. The project is creating innovative digital training prototypes that educators can share between them, while improving the educational offer and support in the development of digital skills (both for learners and educators).

In Italy, the *project School of Data* allows students to come into contact with the world of Data Science and Artificial Intelligence to develop digital and professional skills, necessary to enter the world of work. The project includes a mixed format, with in-person and online training, both for teachers and for students. It starts with an open day (3h, in attendance at the school for the whole school), followed by an online training for teachers

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of about 12h. 8h workshops with students are organised online or in-person, depending on the location of the school, plus an extra 4h online. The project is based on project-based learning, which is developed individually (with help from experts), followed by presentations at a public event. The project is interesting, since it includes training and support for the practitioners before the activities with participants. It can also be transferable as a micro-learning course as a first step to include emerging technologies and discover the basics and can be replicable in different countries or contexts.

In the Netherlands, the *ViPP project* (Virtual Past Places) focuses on the development of VR applications to be used with learners in higher education, particularly enrolled in History degrees. It developed 9 openly available VR components with 3D content for existing courses. These VR rooms connected to different historical eras allow students to gain knowledge and experience (contested) perspectives on the past. They are hosted in hubs, an open-source virtual reality platform, which can be used to design your scenes and use them as virtual meeting rooms. An interesting element is the use of virtual reality to acquire new knowledge from history and the past more engagingly and visually. While the use of these technologies is more common in technical fields, there is less use in the humanities/social sciences, as per this example. These open applications can be used, if well contextualised, to learners who are not enrolled in higher education courses and/or from History courses.

Sources and practices

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European Pillar of Social Rights Action Plan

Statistics explained: Adult learning - reasons for not participating

Union of Skills

Action Plan on Basic Skills

Digital literacy in the EU

Eurostat - Skills for the digital age

Shaping Digital Education 2023

Do Adults Have the Skills They Need to Thrive in a Changing World? (PIAAC)

Council Recommendation on Key Competences for Lifelong Learning

Digital Competence Framework for Citizens (DigComp)

Europe's Digital Decade

Digital Education Outlook 2023 - Towards an Effective Digital Education Ecosystem (OCED, 2023)

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Trends Shaping Education 2025 (OCED, 2025)

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UNESCO AI Competency Framework for Teachers (2024)

UNESCO AI and education: Guidance for policymakers (2021)

Getting Skills Right: Future-Ready Adult Learning Systems (OECD, 2019)

3.2 Stakeholder Perspectives on Emerging Technologies in Adult Learning

The EU-level field research carried out for Task 2.1 offers a broad and insightful overview of how emerging technologies (ET) are being approached across the adult education landscape in Europe. Drawing from interviews with stakeholders involved in policy, research, education technology, and adult learning, the findings reveal both systemic challenges and promising developments. While levels of digital access and skills vary widely across countries and sectors, a shared set of concerns emerges regarding institutional readiness, educator training, digital inclusion, and the long-term sustainability of innovation.

A recurring theme in the interviews is the growing strategic importance of digital transformation in adult education, particularly in the wake of the COVID-19 pandemic. Institutions and policymakers increasingly view digital tools not as a supplementary tool but as a structural component of education systems. Nevertheless, participants stressed that most digitalisation efforts to date have focused on reactive adaptation rather than proactive pedagogical reform. "We saw a surge in digital adoption," one participant noted, "but much of it was driven by emergency needs, not by long-term planning or systemic change."

Stakeholders recognised the unevenness of implementation. While some adult learning centres are piloting advanced technologies, such as gamification platforms, AI-based learning tools, and immersive environments, —others still struggle with basic digital infrastructure and connectivity. These disparities are particularly visible between urban and rural regions and between formal and non-formal education providers. As one interviewee put it, "We have centres experimenting with AI and adaptive learning, but others can't even guarantee stable Wi-Fi."

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A significant barrier to systemic digital integration remains the limited capacity of adult educators to use and embed these technologies in teaching, many of whom received little or no training in digital pedagogy. Interviewees consistently pointed to a need for professional development that goes beyond tool use to include critical reflection, didactic design, and inclusion strategies. According to one educator, "Teachers need to understand not just how to use a tool, but why and for whom. Otherwise, the risk is that technology becomes noise instead of support."

Another key finding is the lack of institutional and policy coherence across the EU. Despite numerous national and European-level strategies promoting digital skills, interviewees highlighted the absence of frameworks that support the recognition and validation of digital skills acquired in adult learning. Many adult learners engage with digital tools informally or through short-term projects, yet these experiences rarely translate into formally recognised competences. This undermines both learner motivation and the perceived value of digital learning.

Several participants voiced concern over short project cycles and insufficient funding for long-term innovation. The pilot-project culture fosters experimentation, but without further support, it often results in a lack of continuity. Promising initiatives are seldom scaled or institutionalised. "We develop tools, we test them, and then the project ends," said one stakeholder. "There's no bridge between innovation and implementation." This fragmentation is particularly problematic when it comes to reaching learners from vulnerable groups, who benefit most from sustained, contextualised support, as implementation often takes longer with these groups due to trust and confidence building

Nevertheless, the research also revealed pockets of promising practice across Europe. Stakeholders described successful examples of gamified platforms designed for adults with low literacy levels virtual learning communities that support peer mentoring, and AI-driven applications that personalise learning for migrant or learners with neurodivergence. The key success factors in these cases were participatory design, cross-sector collaboration, and a strong commitment to learner-centred pedagogy. "The best tools are the ones co-created with learners," said one interviewee. "They reflect the real needs, fears, and goals of the people using them."

Interviewees also emphasised the importance of ethical and inclusive technology development. There is increasing awareness that technology can reproduce or even deepen existing exclusions if not thoughtfully implemented. Stakeholders advocated for a rights-based approach to digitalisation in adult learning, one that ensures accessibility, respects learner privacy, and prioritises pedagogical purpose over novelty. "Digital doesn't automatically mean inclusive," one expert warned. "We need to ask: who is this technology for? And who is being left behind?"

The EU-level perspective reveals a landscape where emerging technologies are recognised as essential to the future of adult learning, yet systemic integration remains hampered by fragmentation, underinvestment, and insufficient capacity building. A shift toward long-term thinking, inclusive design, and robust educator support is urgently needed. The challenge is not merely to digitise adult learning, but to do so in ways that advance equity, empowerment, and lifelong learning for all.

3.3 A Learner-Centred Perspective

The EU-level field research for Task 2.2 provides a nuanced account of how holistic literacy programmes are understood and implemented in adult education across Europe,

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especially those targeting learners in vulnerable contexts. Drawing on insights from education professionals, digital inclusion advocates, and civil society stakeholders, the research highlights how the different competences are increasingly recognised as interdependent elements in the adult learning process, but not yet systematically addressed in practice.

A recurring theme in the interviews was that digital literacy cannot be addressed in isolation. For many vulnerable adults—migrants, people with low formal qualifications, the elderly, or those facing economic hardship—digital exclusion is compounded by low self-confidence, prior negative schooling experiences, or limited language proficiency. One interviewee stressed: "If we only teach them how to use a platform, we're missing the point. We need to build trust, motivation, and a sense of belonging. That's where learning really starts."

Educators and practitioners agreed that the emotional dimension of learning is often invisible but critical. Several highlighted that adult learners who have experienced marginalisation or trauma often approach education with fear or resistance. These emotions shape not only how learners interact with technology but whether they engage at all. "Digital tools can't fix a lack of trust," one stakeholder reflected. "What learners need first is a safe space - then they can start experimenting, clicking, making mistakes."

Holistic literacy, then, begins with relational pedagogy. Practitioners described how they cultivate learner agency through informal conversation, storytelling, humour, and listening. Digital tools are introduced only when there is sufficient trust and readiness. The research confirms that while learners may own smartphones or use social media, their ability to engage critically or productively with digital content remains limited. One participant explained: "They might use WhatsApp every day, but that doesn't mean they know how to recognise a phishing link or apply for a job online."

There was also a strong emphasis on the importance of co-design and peer learning in building confidence and competence. When learners are involved in shaping their own digital learning paths—such as choosing content formats or themes—they are more likely to persist and succeed. Peer mentors from similar backgrounds were identified as effective intermediaries in helping build digital and emotional resilience, particularly among newcomers or older adults. As one expert put it, "Seeing someone like you succeed is often more powerful than any app or course."

Despite these strengths, participants consistently pointed to gaps in educator preparation. Many adult educators lack training in how to address holistic literacy, especially when it comes to using emerging technologies in inclusive ways. There is little formal guidance on how to integrate emotional intelligence, ethics, or critical digital awareness into adult education curricula. "We don't have enough pedagogical resources," one educator said. "We're good at improvising, but that's not a sustainable strategy."

Another critical insight relates to the ethical use of technology with learners from vulnerable groups. Stakeholders warned that data collection, surveillance features, or poorly designed interfaces can exacerbate exclusion or harm. There is growing concern that mainstream edtech products are not adapted to adult learning contexts, especially for users with low qualifications. "We need human-centred tech, not corporate-centred," one interviewee argued. "The tools should adjust to the learner - not the other way around."

Finally, interviewees described how access remains a barrier, but not the only one. Even where devices and connectivity are available, motivation, cultural expectations, and emotional readiness determine whether learners will engage. As one participant put it, "Just giving someone a tablet doesn't make them literate. You need to walk with them. That's where the magic happens."

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The EU-level findings reinforce that holistic literacy programmes are layered, deeply human processes, one that requires more than digital competence. Emerging technologies can support this process, but only when embedded in empathetic, inclusive, and participatory pedagogies. Building trust, ensuring ethical design, and empowering educators are all prerequisites to truly enabling vulnerable adults to thrive in a digital world.

3.4 Learner Voice: case study outside the partner countries

This case features a vulnerable adult learner living in a small town in Spain. Originally from Peru and now a mother of three, she is representative of a group often overlooked in digital education initiatives: women with caregiving responsibilities, part-time employment, and limited opportunities for formal learning. Her story reflects both the invisible labour of digital navigation and the barriers faced by low-income migrant women in accessing inclusive digital education. Her everyday use of digital technologies revolves around necessity. She uses her smartphone for WhatsApp, Facebook, email, and video calls, primarily to communicate with her family and manage routine tasks. However, more advanced or unfamiliar applications, especially those related to work or formal services, are a source of confusion and stress. "Sometimes I just ask my son to help me because I don't know if I'm doing it right," she explained, illustrating how intergenerational support often fills the gap left by institutional failures.

Her digital learning is entirely informal, driven by urgency rather than structured educational opportunities. For example, she taught herself how to fill out forms online when required by the school or public authorities but struggles when websites are poorly designed or only available in Spanish. As she noted: "I speak Spanish, but the way some of these forms are written... It's like another language." Even with native language proficiency, bureaucratic digital communication can present serious obstacles for vulnerable adults.

Financial constraints are another critical barrier. Her smartphone is outdated, and her internet connection is unstable, making even basic digital tasks difficult. While she would like to take a course to improve her digital skills – especially to help her children with schoolwork or find better job opportunities - she cannot afford to pay for one or travel to a nearby city to attend. "It's not just the cost of the course," she said, "it's the bus, the time off work, someone to watch the kids." She also expressed a deep lack of confidence in using unfamiliar platforms, particularly those involving online banking, e-government services, or job applications. Mistrust of digital systems, fear of making mistakes, and the absence of human guidance are major inhibitors to participation. "I don't want to click on something and lose money or send the wrong document. Who can help me if I get it wrong?" Her concern reflects a broader pattern identified in the EU-level research: digital exclusion often stems not from total absence of access, but from the fragility of use in high-stakes contexts. Despite these challenges, she is eager to learn and improve, particularly if courses are offered in community spaces, in small groups, and with patient, empathetic instructors. She values training that starts from the basics and relates directly to her life - understanding school portals, applying for jobs, navigating public services, and supporting her children's learning. "If someone could just sit with me and show me, not too fast, I think I could do it," she said.

This case illustrates the compounded nature of digital vulnerability: it is not only technical, but economic, gendered, and social. For emerging technologies to be inclusive, they must be introduced within frameworks that acknowledge these layered realities and provide scaffolding that respects the learner's lived experience and constraints.

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4. AUSTRIA

4.1. Desk Research Findings

Austria has taken significant strides in fostering digital competence across all levels of education through comprehensive strategies, national frameworks, and targeted initiatives. The overarching aim is to enhance digital inclusion, reduce inequalities, and integrate emerging technologies such as artificial intelligence (AI) into both learning and teaching processes.

Policy Framework and Governance

Austria's digital education strategy is anchored in the Digitale Kompetenzoffensive für Österreich (Digital Competence Offensive for Austria). Launched by the Austrian government, this strategy includes the establishment of the Digital Skills Office within the OeAD, Austria's Agency for Education and Internationalisation, on October 12, 2023. The initiative supports Austria's goal to meet the European Commission's target of ensuring that at least 80% of the population aged 16-74 possesses basic digital skills by 2030. Currently, Austria surpasses the EU average with 63% of this demographic having such skills. The initiative is operationalised through nationwide programs, such as 4,500 "Digital Everywhere" workshops designed to enhance digital literacy and facilitate public engagement with digital tools.

Competence Frameworks

Austria has adopted the Digital Competence Model for Austria (DigComp AT), which is based on the European Commission's DigComp 2.1. The most recent version, DigComp 2.3 AT, became effective in April 2023. This model outlines 27 individual competencies across six domains, integrating new focus areas such as sustainable IT practices, legal compliance in digital publishing, and critical engagement with digitality. The model serves as a foundation for curriculum design, certification, and self-assessment tools for learners.

Obstacles and Enablers of Digital Inclusion

Despite progress, Austria still faces challenges in digital inclusion. Research by institutions such as the Arbeiterkammer Wien and the FFG highlights persistent digital inequalities. The "first digital divide" concerns access to infrastructure, while the "second digital divide" relates to disparities in digital usage and skills. Marginalised groups are disproportionately affected due to limited access, lack of educational support, and high entry barriers.

The FFG's Digitale Ungleichheit Report (Digital Inequality Report) further details how technological products may inadvertently exclude users when their design fails to accommodate diverse needs. It advocates for inclusive technology development through participatory design, user feedback, and adaptive development phases.

AI in Adult Education

Austria is actively exploring the integration of AI in adult learning. A dedicated issue of the journal Magazin Erwachsenenbildung examines the potential, challenges, and ethical considerations of AI in education. It addresses critical areas such as learner-centred design, data protection, institutional transformation, and the evolving role of educators.

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A pioneering best-practice initiative is the AI-focused training programme offered by bifeb. This structured, modular course targets adult educators and includes core and elective modules on AI in teaching, consulting, and education management. Topics cover AI tools, ethics, bias, and personalised learning, empowering educators to navigate and apply AI effectively.

Community Outreach and Best Practices

Notable outreach initiatives include the Digital Village programme by the Vienna Adult Education Centers, which provides hands-on support in municipal housing areas. Residents can seek help with everyday digital challenges in a supportive, community-driven setting. This initiative aims to build foundational digital skills organically through daily needs and social interactions.

Austria presents a coherent and evolving model for integrating emerging technologies and digital skills into education. Its national frameworks, inclusive outreach, and emphasis on educator training provide valuable insights for other countries seeking to build resilient, inclusive, and future-ready education systems.

Sources and practices

Digitale Kompetenzoffensive für Österreich

DigComp AT

Policy Paper Digitale Inklusion (Arbeiterkammer Wien)

FFG Digitale Ungleichheit Report

Magazin Erwachsenenbildung

Digital Village

Bifeb AI in Adult Education Course

4.2 Stakeholder Perspectives on Emerging Technologies in Adult Learning

In Austria, Task 2.1 focused on institutional and policy-level insights into the integration of emerging technologies (ET) in adult education. The research team conducted six in-depth interviews with adult educators, education technology experts, and adult learning centre representatives, complemented by a thematic forum at a major adult education event (VHS-Tag 2025) that gathered approximately 90 participants. The participants represented a range of stakeholder roles, including trainers, digital strategy developers, literacy educators, and social inclusion experts—many operating in community-based, non-profit adult learning institutions.

All interviewed stakeholders demonstrated a high degree of familiarity with digital tools, including artificial intelligence (AI), mobile platforms, and communication apps. Several participants were early adopters or long-standing experts in the field, having worked with emerging technologies since the 1990s. Importantly, most respondents viewed technology as a pedagogical tool rather than an end, emphasising that its integration must be grounded in educational relevance and learner needs. Technologies are generally

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selected based on their accessibility and relevance to learners' everyday lives, rather than their novelty.

Digital tools are widely used in preparation and delivery, with strong emphasis on low-threshold technologies that learners already use, such as WhatsApp, YouTube, Padlet, automatic translators, and school management platforms. More advanced tools, including AI-powered applications, are typically applied in course planning rather than in live teaching, reflecting time constraints and the lack of institutional support.

The guiding pedagogical philosophy centres on participant orientation, with educators adapting technology use to learners' prior digital habits and cultural familiarity. This approach is especially prevalent in literacy and inclusion-focused programs, where tools like Zoom and smartphones are introduced not only for instruction but as a means of building learners' digital confidence in everyday contexts.

The Austrian fieldwork revealed several successful examples of ET use, rooted in flexible, resource-sensitive pedagogies. Educators reported that integrating mobile-based applications such as Google Maps or automatic translation tools into classes increased learner engagement and promoted real-world relevance. In basic education settings, tablets and visual digital tools were seen as effective for making abstract concepts more tangible and enhancing accessibility. However, success often depended on the personal initiative of educators, many of whom work in precarious or freelance positions and frequently finance or develop digital resources themselves.

Collaborative projects and training initiatives were also highlighted as important enablers. Notably, EBmooc 2025, an online training course for adult educators on AI-supported workflows, was seen as a key mechanism for building institutional digital capacity. Similarly, public engagement initiatives such as Vienna's "Digital Village"—which brings digital support services into public housing—illustrate how community-based solutions can enhance digital inclusion and visibility.

Despite promising practices, structural challenges persist. Many educators reported a lack of institutional support for hardware acquisition, software licensing, and pedagogical innovation. Digital infrastructure is often individualized, with little provision for shared devices or IT support, particularly among freelance educators in non-formal adult education. This results in a dependence on learners' own devices and a reliance on free tools, which limits pedagogical possibilities.

Furthermore, digital competence among educators varies, and many lack the time or incentives to explore new tools beyond surface-level use. The fragmented employment landscape, marked by limited paid preparation time and a lack of team-based collaboration, was identified as a key constraint on innovation. Financial and logistical barriers—such as difficulties securing quiet spaces for podcasting activities—further illustrate the everyday obstacles to meaningful technology integration.

Stakeholders emphasized the importance of cultivating an institutional culture that values experimentation, peer learning, and reflection. Educational teams that foster open dialogue and mutual support were seen as better equipped to explore new tools and respond to challenges. By contrast, institutions lacking this culture often failed to capitalize on available resources and fell short in disseminating best practices. Attitudinal barriers were also identified, both among educators and learners. While outright resistance to technology was rare, many stakeholders highlighted the need to overcome technophobia and promote balanced, reflective engagement with ET, avoiding both techno-solutionism and undue scepticism.

The findings from Austria underscore a nuanced, practice-driven integration of emerging technologies in adult learning, shaped by pedagogical pragmatism and constrained by

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structural limitations. While educators demonstrate strong commitment and ingenuity in adapting tools to learner contexts, the lack of institutional infrastructure, funding, and systemic recognition of digital practices hampers broader innovation. Moving forward, Austria's adult education sector would benefit from coordinated investment in shared infrastructure, professional development, and stable employment structures, ensuring that the integration of ET is not dependent on individual effort alone but embedded within sustainable institutional frameworks.

4.3 Learner-Centred Perspectives on Holistic Literacy and Emerging Technologies

Task 2.2 explored how holistic literacy programmes are being addressed and implemented in Austrian adult education, particularly in programs that serve vulnerable groups. Interviews focused on two key perspectives: (1) educators and stakeholders working in adult education, social inclusion, and workforce development; and (2) vulnerable adult learners themselves, many of whom participate in basic education and literacy programs delivered by community-based institutions.

The Austrian findings indicate that vulnerable adult learners often experience significant barriers to digital participation but also display resilience and openness when supported appropriately. Access to hardware and stable internet remains uneven, particularly for learners in basic education settings or those from low-income and migrant backgrounds. Many rely on smartphones as their sole digital device, which limits their ability to engage with more demanding educational platforms.

Nevertheless, learners tend to show strong motivation and curiosity, especially when digital tools are introduced in ways that align with their everyday lives. Educators reported that using familiar applications such as WhatsApp, Zoom, and Padlet can build learners' confidence and foster digital inclusion. For example, communicating via Zoom during a course not only supports learning goals but also introduces learners to a new medium they can use in other areas of life—such as keeping in touch with family or accessing services. This demonstrates that technology can become an indirect literacy tool, even when it is not the primary focus of instruction.

Educators working with vulnerable learners consistently emphasised that pedagogical intentionality is more important than technological novelty. They reported using digital tools primarily as enablers of communication, collaboration, and personalisation. Importantly, technology is often integrated into face-to-face instruction, rather than deployed in fully online formats, in recognition of learners' varying levels of digital literacy and comfort.

A key insight is that holistic literacy cannot be separated from relational pedagogy. Learners' emotional security and trust in the educator are foundational to their willingness to engage with technology. Many learners have experienced exclusion or failure in formal education systems, and educators must create spaces where experimentation is encouraged, and failure is not penalised. This underscores the importance of affective and ethical dimensions of holistic literacy, especially in tech-mediated learning.

Educators also noted that group dynamics strongly influence technology adoption. For instance, social hierarchies within learning groups - related to gender, language proficiency, or perceived digital competence - can inhibit participation. Some learners may feel reluctant to ask questions or seek help if others in the group dominate or present

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themselves as more tech-savvy. These subtle dynamics can reinforce exclusion unless proactively addressed through sensitive group facilitation and trust-building.

Despite promising practices, the integration of emerging technologies into inclusive literacy programs remains constrained by resource scarcity and institutional fragmentation. Educators frequently work under precarious conditions, with little access to preparation time, technical support, or dedicated equipment. In many cases, digital engagement depends on learners bringing their own devices, and there is minimal funding for upgrading or maintaining institutional infrastructure.

Notably, no dedicated technology-based approaches were identified that directly target the challenges adults in vulnerable contexts face. Instead, effective practice hinges on the adaptability and creativity of individual educators, who often compensate for systemic shortcomings through volunteerism and personal investment. This reality raises concerns about sustainability and equity in digital inclusion efforts.

Moreover, the prevailing assumption that digital tools inherently increase access and participation is questioned by practitioners. Without sufficient support, technology can become another layer of exclusion, particularly for learners facing multiple forms of marginalisation. Educators stressed that technology must be mediated through pedagogy, rather than imposed as a universal solution.

Learners respond most positively when digital tools are introduced incrementally and with clear, practical purposes. They appreciate tools that are intuitive, mobile-friendly, and directly relevant to their daily lives. Importantly, their preferences reflect a desire for guided experimentation, not passive consumption of digital content.

From the educator's perspective, there is a strong need for ongoing professional development, access to easy-to-use and inclusive digital resources, and institutional support structures that recognise the complex demands of working with vulnerable learners. This includes not only technical training, but also capacity-building in digital ethics, accessibility, and differentiated instruction.

Austria’s experience in Task 2.2 highlights that the integration of emerging technologies into ALE for adults in vulnerable contexts requires more than access to devices or tools. It requires a pedagogical culture grounded in empathy, trust, and contextual relevance. While learners show willingness to engage with digital tools, their participation depends on the scaffolding provided by educators who are often operating under-resourced and unsupported. To move forward, systemic investment is needed in infrastructure, educator support, and inclusive digital pedagogies. Holistic literacy in the digital age cannot be achieved through technology alone - it must be cultivated through intentional, responsive, and equitable educational practices.

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5. CROATIA

5.1. Desk Research Findings

Policy frameworks
A set of policy frameworks has been identified as significant for emerging technologies in the Croatian context. We present the most important ones.

National Development Strategy 2018–2030 (NDS2030), as Croatia's overarching development plan, emphasises the *"green and digital transition"* as a key pillar. A major focus is on boosting digital competencies for all citizens, including adults. The strategy calls for improved access to quality adult education programmes in digital skills and aims to raise both basic and advanced digital literacies across society. The goal is to reach the EU average on the Digital Economy and Society Index (DESI) by 2030 and ensure no one is left behind in the digital society.

Digital Croatia Strategy 2032 sets out Croatia's digital ambitions through 2032. One strategic objective explicitly is to *"develop citizens' digital competencies for life and work in the digital age,"* aligned with European frameworks. It includes measures for digital upskilling of the workforce and general population, with substantial investments (e.g. €93 million earmarked to increase ICT experts and STEM scholarships). The strategy also underpins Croatia's commitments to the EU Digital Decade targets, with Croatia already outperforming the EU average in basic digital skills (63% of people have at least basic digital skills vs 54% EU average).

National Plan for the Development of the Education System (2021–2027), adopted in March 2023, dedicates a specific strategic goal to the digitalisation of education. It is accompanied by an implementation plan (to 2024) and aligns with the NDS2030. The plan outlines reforms to strengthen ICT infrastructure in schools, enhance teachers' digital skills, and modernise teaching methods through technology. While focused on primary and secondary education, these policies establish a foundation that can extend to adult learning (e.g. creating online learning platforms and resources).

Strategic Framework for the Digital Maturity of Schools (2020), developed under the e-Schools pilot project, defines five levels of digital maturity for educational institutions (from "digitally unaware" to "digitally mature") across areas like leadership, teaching, digital skills development, and infrastructure. It provides a common reference for schools' progress in ICT integration and is aligned with the European DigCompOrg framework. Policy makers use it to shape initiatives for successful ICT integration, while schools use it as a self-evaluation tool. This framework, though aimed at schools, illustrates a model that adult education providers could adopt to assess and improve their own digital readiness.

Croatia updated its national qualifications law to incorporate digital competencies as part of the *Key Competences for Lifelong Learning*. This legislative inclusion means that digital literacy is formally recognized in all education levels, including adult education and

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vocational training, ensuring that qualifications and curricula integrate essential digital skills for the 21st century.

Croatia participates in the EU's **Digital Skills and Jobs Coalition** via a National Coalition that brings together government, industry and education stakeholders to promote digital skill development. In late 2020, the Croatian Digital Literacy Network was formed to foster digital citizenship and education and to drive the digital transformation of non-IT sectors. These networks serve as platforms for policy coordination and sharing best practices, and they specifically aim to include vulnerable groups in the digital agenda.

The Croatian government has introduced funding mechanisms to support digital education. For example, under the EU Recovery and Resilience Facility, a voucher scheme for adult upskilling was launched in 2022, offering adults (especially unemployed or those with low skills) vouchers to enroll in digital skills training programmes. This is part of a broader effort to improve lifelong learning participation. In addition, substantial EU funds (European Social Fund, ERDF) are directed toward improving broadband internet access even in rural areas, to ensure all learners can access online education. Together, these policies and funding incentives create an enabling framework for integrating emerging technologies into education, including adult learning.

Obstacles & Enablers for Integrating Emerging Technologies in Adult Education

Six main obstacles in the Croatian context have been identified: digital skills gaps in adult population, infrastructure and connectivity disparities, educator training and confidence, content and curriculum limitations, financial and organisation constraints, and gender and inclusion issues.

A significant portion of adults, especially older adults and the long-term unemployed, lack basic digital skills, posing a barrier to adopting advanced educational technology. While Croatia's average digital skill level is relatively high, vulnerable groups lag behind. Low digital competence among the elderly and socially disadvantaged is highlighted as a challenge that needs to be overcome. This gap means adult literacy and learning programmes must often start with basic ICT training before introducing more complex tools like AI or VR.

There exists a digital divide between urban and rural areas in Croatia. Rural regions often have poorer internet connectivity, hindering the use of online platforms and digital tools in adult education. Similarly, adult education centres may have limited ICT infrastructure (older equipment or no access to emerging tech devices). Inconsistent broadband coverage and equipment shortages can impede e-learning or virtual classroom initiatives outside major cities. The government is addressing this (e.g., investing in broadband for sparsely populated areas), but it remains an obstacle in the interim.

Many adult education instructors and tutors have not been sufficiently trained in using emerging technologies for teaching. Historically, teacher training in ICT focused on school teachers; adult educators often have fewer opportunities for professional development. A

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2014 education strategy noted that teachers and trainers need to develop the ability to introduce new approaches with ICT and digital tools, and this applies equally to adult education staff. Without confidence and pedagogical strategies to use tools like digital games or AI-based platforms, educators may resist or under-utilize them. Traditional teaching methods (e.g., rote learning, "true-false" assessment models) still prevail, indicating a cultural barrier to the innovative, trial-and-error learning approach that technology can facilitate.

Holistic adult literacy programmes in Croatia (focusing on basic literacy, numeracy, and life skills for adults) have not widely integrated digital content yet. Often, the curricula for adult basic education are outdated and do not include digital competencies or use of ed-tech. There is a lack of localised digital content tailored to adult learners (e.g. educational mobile apps in Croatian for adult literacy). Developing relevant e-learning content or gamified learning modules for low-literate adults requires investment. Until recently, most emerging tech initiatives targeted formal schooling or higher education, leaving a gap in content for adult basic education.

Adult education in Croatia is often delivered by various providers (public open universities, NGOs, private training centres) that may have limited budgets. Investing in new technologies (like AR/VR equipment or specialized software) can be costly. Without dedicated funding or incentives, these providers may not prioritize tech integration. Additionally, adult learners often attend part-time and juggle jobs or family, so logistical issues (scheduling online sessions, access to devices at home) can hamper implementation of tech-based solutions.

There is an underrepresentation of certain groups in technology-related training. For instance, women are less likely to pursue ICT training – Croatia notes the insufficient representation of women in the digital field as a challenge. Similarly, people with disabilities may face accessibility issues with mainstream e-learning platforms. If not proactively addressed (e.g. through inclusive design and targeted outreach), these issues become obstacles to truly holistic, inclusive tech-enhanced adult education.

At the same time, there are important enablers for integrating the ET into adult education. First and foremost, the policy frameworks described above are a major enabler. The clear government commitment to digital transformation (through strategies like NDS2030 and the Digital Education Action Plan) creates a supportive environment. For example, the National Digital Decade Roadmap lays out concrete measures such as *"continuous development of digital competences of citizens through targeted education"* and *"promoting non-formal education and reskilling for vulnerable groups"*. These high-level commitments ensure that resources and attention are directed toward integrating technology in education at all levels. Adult education stakeholders can align their projects with these national priorities to gain support and funding.

Secondly, dedicated funding streams greatly enable progress. The ESF-funded voucher scheme for adult learning is one such enabler, as it lowers the financial barrier for adults to enrol in digital skills courses. Similarly, EU-supported projects (Erasmus+, ESF+, and the Recovery and Resilience Plan) provide grants for innovative education projects. For

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instance, Croatia's Recovery Plan includes investments in digital infrastructure and adult training programmes. These funds have enabled pilot projects in digital upskilling of adults and the modernization of adult education centres with new equipment. Moreover, the government's provision of hardware to schools (tablets, laptops) under programmes like e-Schools indirectly benefits adult learners too – for example, when schools share digital resources with the wider community or when teachers trained in those programmes also teach in adult classes.

Thirdly, a vibrant ecosystem of NGOs and private sector partners in Croatia bolsters digital learning. A standout example is IRIM (Institute for Youth Development and Innovativeness) which, with support from donors like Google and partnerships with ministries, has executed large-scale programmes to improve digital literacy (discussed in Best Practices below). Their Digital Citizen project transforming libraries into digital hubs and the Croatian Makers robotics and coding initiatives have reached thousands, including adult community members. Such initiatives not only directly teach digital skills but also serve as proof-of-concept that emerging technologies can engage learners of all ages. The presence of a tech-savvy NGO sector in Croatia acts as an enabler by piloting new methods (like gamification and maker spaces) which can then be expanded or replicated by formal institutions.

Steady improvements in ICT infrastructure enable tech integration. Croatia's push for broadband expansion (aiming for at least 100 Mbps to all households) and equipping of public institutions with high-speed internet reduces the urban-rural gap. Many adult education centres (often municipal adult learning institutions or libraries) benefit from national IT programmes: for example, libraries got new computers and internet through various projects. The e-Citizens (e-Građani) government portal and widespread use of smartphones mean a larger portion of the adult population is now online and accustomed to digital interaction, lowering resistance to online learning. The COVID-19 experience forced many educators and adult learners to try online tools (Zoom classes, etc.), which has normalised the idea of digital learning and built a base of skills that programmes can build upon.

Croatia's integration of digital competence into formal education standards and qualifications is an enabler that creates long-term change. As digital literacy is embedded in curricula from primary school onward, future generations of adults will possess better skills. In the short term, the government and agencies run awareness campaigns and free trainings for citizens (often in collaboration with NGOs or EU initiatives). For example, the Croatian Digital Literacy Network (2020) focuses on digital education for all ages, and agencies like the Education and Teacher Training Agency (AZOO) provide courses on digital pedagogy which adult educators can also attend. All these efforts build a culture that values and understands technology in learning.

Being part of the EU's digital education agenda provides external impetus and guidance. The European Commission's Digital Education Action Plan (2021–2027) and country-specific monitoring (e.g., *Education and Training Monitor* reports) highlight areas for improvement and share good practices from other countries. Croatia benefits from this

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through knowledge exchange and policy support. For instance, OECD and EU experts collaborated with Croatia to assess and improve digital maturity in higher education institutions, which indirectly benefits all educational levels by creating frameworks and recommendations. This international support functions as an enabler by bringing in expertise, setting targets (like ensuring all citizens have basic digital skills by 2030), and sometimes funding pilot programmes that introduce emerging technologies in teaching and learning.

Croatia faces challenges such as skill gaps and uneven access, it also has significant strengths in its policy support, active stakeholder initiatives, and improving infrastructure. The obstacles are being actively addressed by the enablers, creating a cautiously optimistic outlook for integrating emerging technologies into adult education and literacy programmes.

Existing Educational Programmes and Best Practices

Croatia has implemented several noteworthy programmes that successfully integrate emerging technologies into education. These best practices span various educational levels and offer valuable lessons that could be adapted for adult literacy and learning.

"e-Schools" Programme – Digitally Mature Primary & Secondary Schools is a flagship national initiative (2015–2023) aimed at transforming all primary and secondary schools into "digitally mature" institutions. Implemented by CARNET (Croatian Academic and Research Network) with EU funding, e-Schools provided schools with ultra-fast Internet connectivity, modern ICT equipment (smartboards, projectors, laptops/tablets), and extensive teacher training in digital skills. Under this programme, the government distributed 26,755 laptops to teachers and tens of thousands of tablets to students – including providing every student in 5th and 7th grade a tablet device – to enable digital learning and digital textbooks. The curriculum was updated to allow the use of digital educational content, and by 2018 textbook regulations were changed to fund the development of e-textbooks. Crucially, e-Schools was not just about equipment: it introduced new e-learning platforms, digital content repositories, and a framework for ongoing self-evaluation of schools' digital maturity. Key outcomes: As of 2023, all state-funded schools in Croatia have been part of this transformation, ensuring more equal conditions for digital education nationwide. When the COVID-19 pandemic hit, this groundwork paid off – Croatian schools swiftly transitioned to online teaching within 2 weeks of closures, using virtual classrooms and even television broadcasts for younger pupils. The e-Schools programme stands as the best practice in systemic integration of ET in education. Its success factors (comprehensive teacher upskilling, infrastructure investment, and strong policy support) are highly relevant to adult education providers aiming to go digital.

The non-profit IRIM has spearheaded innovative tech education projects that reach youth and adults outside the formal school system. One example is Project **ProMikro** (2017–2018), a collaboration between IRIM and the Ministry of Science and Education, which introduced coding and microelectronics to primary schools. Through ProMikro, 45,000

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micro:bit microcomputers were delivered to every 6th-grade student in Croatia, with 85% of primary schools voluntarily joining the project. Alongside hardware, IRIM developed free educational materials and conducted 500+ teacher workshops, training 2,000 teachers (many new to coding) in how to integrate micro:bit lessons across subjects. This massive capacity-building effort effectively jump-started coding in the elementary curriculum. Another IRIM initiative, the **Croatian Makers Robotics League** (launched 2016 and ongoing), donated robotics kits (mBot robots) to schools, libraries and clubs and organized nationwide competitions. Over 12,000 children from 600+ schools and institutions have participated, guided by volunteer mentors trained by IRIM. Though targeted at school-age youth, these programmes often involve community centres and libraries where adults (teachers, librarians, parents) also build digital skills by mentoring or learning alongside students. Finally, the **Digital Citizen project** (2018 - present) is an outstanding example of leveraging local libraries to spread digital literacy. With support from Google.org, IRIM equipped 170 public libraries across Croatia and neighboring countries with maker-tech (micro:bits, STEM kits, 3D printers). Librarians were trained, and in the first phase alone over 1,500 free workshops on coding and digital making were held in libraries, engaging more than 13,100 participants – including children, parents, and older adults. Libraries became community innovation hubs where adults and kids experiment with technology in a friendly environment. Key outcomes: IRIM's model of donate-equipment-plus-training-mentors has sustainably increased digital and scientific literacy in Croatia, reaching over 200,000 individuals to date. These initiatives demonstrate the power of digital gamification (through robotics competitions) and accessible tech platforms (like micro:bit) in education. They are replicable in adult learning; for instance, an adult literacy programme could incorporate micro:bit workshops to teach problem-solving or use library makerspaces for adult learners to practice digital skills in a hands-on way.

Croatia's universities have also embraced emerging technologies, particularly accelerated by the pandemic and national strategy. All Croatian universities now use digital learning management systems (often the Merlin/Moodle platform provided by SRCE, the University of Zagreb's computing centre) to support blended and online learning. A recent OECD project in 2021-2023 worked with Croatian higher education institutions to assess and improve their digital maturity, guiding investment in modern e-learning infrastructure and tools. As a result, universities have been upgrading smart classrooms, adopting e-assessment tools, and even exploring technologies like virtual labs and AI-based tutoring systems. For example, some technical faculties use VR simulations in engineering and medical studies have introduced virtual anatomy applications for students. While these are early-stage implementations, the policy push for modernizing higher education is clear. The government has invested in campus networks and digital equipment (part of ~€300 million allocation for science and education digitalization by 2026), and institutions are encouraged to pilot innovative methods. Key outcomes: University professors report greater use of digital content and data analytics to personalize learning. The University of Rijeka's AI Centre and the University of Zagreb's projects on AI in education (e.g. adaptive learning systems) are examples of linking academic research with teaching practice. The lessons from higher education – such as the importance of faculty training and technical support when introducing new tech –

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provide insights that adult education providers can utilize. Moreover, as graduates enter the workforce with stronger digital skills, future adult learners will likely be more receptive to technology-enhanced lifelong learning.

While holistic adult literacy programmes with ET are still nascent in Croatia, there have been pilot efforts. Many adult learning centres shifted to online or blended delivery during COVID-19, using video conferencing and e-classrooms to continue lessons in literacy, languages, and vocational courses. The Agency for Vocational and Adult Education (ASOO) has been promoting digital tools in adult education through projects and guidelines. In 2020, ASOO published recommendations for adult educators on using virtual classrooms and conducting assessment in an online environment. Additionally, a new ESF+ project titled "BrAIn – Application of Digital Technologies Based on Artificial Intelligence in Education" was initiated in 2023 by ASOO, aiming to introduce AI-based personalized learning in vocational and adult training (e.g., AI-driven tutoring systems for adult learners to practice skills). Though detailed results of BrAIn are yet to come, it reflects the growing interest in AI to enhance learning personalization. Another noteworthy development is the adult upskilling voucher scheme mentioned earlier: adult learners using these vouchers often enrol in digital courses offered by institutions like Algebra University and local open universities, which utilise modern e-learning platforms. For instance, Algebra offers a range of online IT courses for reskilling adults, complete with interactive content and simulators. This indicates that adult education in Croatia is gradually adopting the same digital platforms commonplace in formal education. Key outcomes: Adult learners have more flexible access to learning via online platforms than before. Some adult education programmes now include modules on digital literacy and use gamified e-learning quizzes to reinforce basic skills. Although on a smaller scale, these emerging examples show that technology can be integrated into adult learning – from basic digital literacy courses held in community centres, to advanced IT certification programmes delivered fully online.

An emergency response that became a best practice model was Croatia's swift rollout of distance learning for all ages at the onset of COVID-19. The Ministry of Science and Education (MZO) coordinated a national effort called *"Škola na daljinu"*. For younger primary pupils, the public broadcaster HRT aired daily educational TV programmes so that even children without internet could continue learning. Older students used online platforms (Google Classroom, MS Teams, and CARNET's Moodle) arranged by their schools. Teachers across the country shared digital lessons and MZO issued guidelines for teaching and grading in a virtual environment. This included not just school children but also vocational students and adult education participants, many of whom joined these remote classes or had their own courses moved to Zoom. The inclusive approach (using television, radio, and online means) ensured learning continuity. Key outcomes: The success of "school at a distance" demonstrated the resilience of Croatia's digital learning infrastructure. It built confidence among educators and learners in using technology. The practices developed (like recorded video lessons and online assignments) have since been repurposed for regular use, such as in blended adult learning courses or as make-up lessons during disruptions. This case is often cited in Croatia as proof that large-scale digital education is feasible, given preparation and political will. It also underscored areas

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to improve (e.g., ensuring every student/learner has a device), which the government and donors addressed by lending equipment to disadvantaged students during the crisis.

Adapting Best Practices to Adult Literacy

Some of the above initiatives were not originally targeted at adult basic literacy learners (who might be older, out of school individuals lacking fundamental skills). However, they offer strategies that could be adapted to holistic adult literacy programme.

The gamified and project-based approach of IRIM's programmes (using simple, fun tech tools to build confidence and skills) could engage adult learners who missed out on traditional education. For example, adults learning basic numeracy might enjoy programming a micro:bit to display numbers or using a simple robot to visualize math problems, turning learning into a practical game rather than a classroom drill.

The community access model of Digital Citizen (through libraries) is directly transferable to adult literacy. Libraries in Croatia already serve adults seeking basic education; equipping them with digital resources (tablets, literacy apps, VR for immersive learning of e.g. language) and training librarians as facilitators can create a welcoming, low-threshold environment for adults to improve their literacy and digital skills simultaneously. The comprehensive training and support provided to school teachers in e-Schools is a reminder that adult educators need similar investment. If the staff of adult education centres receive robust training in digital pedagogy and ongoing support (mentorship, online communities of practice), they can effectively use emerging technologies with adult learners. The frameworks and digital content developed for schools can often be adapted for adults with some modification – indeed, the national e-Schools digital content repository includes resources (like interactive e-books and educational videos) that adult educators can reuse.

These best practices succeeded largely due to strong policy backing and funding. For adult literacy programmes to integrate ET, they should seek alignment with national strategies (e.g. frame digital literacy for adults as part of the Digital Croatia initiative) and tap into available funding (EU funds for digital inclusion, national grants). The voucher scheme and projects like BrAIn indicate that funding is available for adult-focused digital education, and successful programmes will be those that leverage such support.

Croatia's experience over the last five years provides a solid foundation of knowledge on integrating emerging technologies in education. From digitizing schools to innovative NGO-led projects and rapid digital pivots during COVID-19, the country has multiple best practice examples. The challenge and opportunity now is to transfer and tailor these successes to the adult education and literacy sector. By doing so (improving infrastructure in adult learning centres, training adult educators, creating engaging digital content for adults, and ensuring policy incentives) Croatia can significantly enhance holistic adult literacy programmes with the power of emerging technologies, ultimately improving digital inclusion and lifelong learning for all its citizens.

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Sources and practices

Strategija digialne Hrvatske za razdoblje do 2032. godine

Nacionalna razvojna strategija Republike Hrvatske do 2030. godine

Profiles Enhancing Education Reviews (PEER) - Croatia: Technology

Croatia - National Digital Decade strategic roadmap

Nacionalni plan sustava obrazovanja za razdoblje do 2027. godine

Advancing Digital Maturity in Croatia's Higher Education System

Program e-škole. Put prema digitalnoj zrelosti (CARNET, Zagreb, 2023.)

Action plan for the implementation of the distance education, Ministry of Science and Education

Promikro – Croatian Makers

5.2 Stakeholder Perspectives on Emerging Technologies in Adult Education

The Croatian field research for Task 2.1 engaged three stakeholders representing diverse segments of the educational landscape: a primary school informatics teacher also active in NGOs and teacher training (P1), an adult educator with decades of experience in non-formal education and EU projects (P2), and a university e-learning department manager overseeing large-scale digital content operations (P3). Together, these perspectives provided a multi-layered view of how emerging technologies (ET) are integrated into adult learning, the motivations behind their use, and the systemic conditions that shape their success or limitations.

All participants were highly familiar with emerging technologies such as AI, VR, gamification, and adaptive learning platforms. However, the degree and purpose of implementation varied significantly depending on institutional context and learner needs. P3, operating from a private higher education institution, had the broadest technological reach, including AI-generated multimedia content, avatar-driven instruction, and large-scale automation systems. P1, while working in a formal school setting, focused on pragmatic, ethics-oriented uses of AI and gamification to support learner engagement and critical thinking. P2 took a more reflective, learner-sensitive approach, emphasising careful, context-dependent introduction of technology to avoid screen fatigue and over-reliance on digital shortcuts.

Technology is widely used in both formal and non-formal adult learning contexts, though with different pedagogical intentions. P1 described using AI to assist with differentiated instruction, quiz creation, and critical thinking exercises. He also leverages gamification to foster engagement and provide immediate feedback—particularly important in settings with short learner attention spans. P2 experimented with comparative exercises, such as dividing groups into AI-assisted and non-AI-assisted teams to stimulate metacognition. P3

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oversees the institutional use of AI for content scaling, personalised feedback, and assessment automation, reaching over 25,000 learners.

Across all cases, the integration of ET was consistently guided by the principle of pedagogical alignment over novelty. All three stakeholders expressed scepticism toward technology for its own sake and emphasised the importance of contextual relevance, learner agency, and reflection.

Several successful practices emerged from the fieldwork:

- AI for scalability and personalisation, enabling rapid content production while maintaining alignment with pedagogical goals.
- Gamification as a motivational tool across age groups, providing structure, engagement, and a return incentive for learners.
- Ethical integration of AI, with activities that challenge learners to identify flaws in AI-generated content, thereby building critical digital literacy.
- Comparative learning scenarios, where learners directly experience the strengths and weaknesses of technology-supported versus traditional methods.
- Immersive simulations through VR to explore abstract or inaccessible environments, particularly in STEM education.

Key enablers of success included institutional investment, access to dedicated support staff, and prior exposure to hands-on training. Examples included earlier training sessions offered by tech companies, and university-supported instructional design teams. Stakeholders repeatedly stressed that successful implementation depended not just on tools, but on supportive infrastructure, including time allocations, training resources, and responsive leadership.

Despite these best practices, several cross-cutting barriers were identified. Participants reported persistent infrastructure gaps, especially in underfunded and rural institutions. Even basic digital literacy remains a challenge for some educators, particularly in contexts where training and support are unevenly distributed. A significant cultural barrier was described as a tendency to externalise responsibility, with educators often waiting for institutional leadership or government directives rather than taking initiative.

Resistance to technology was also tied to a lack of perceived relevance, with stakeholders noting that motivation to adopt ET is limited when incentives, support, or visible benefits are absent. Institutional inertia—what one participant termed the "mammoth effect"—was seen as a major impediment, particularly in public systems with rigid governance structures and limited flexibility.

The Croatian data point toward several concrete recommendations:

- Personalised and ongoing support systems for educators, such as embedded mentorship, helpdesk functions, or peer-to-peer learning models.
- Hands-on, scenario-based training, emphasising practical applications over general introductions to digital tools.

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- Institutional alignment, where leadership visibly supports digital innovation and rewards experimentation.
- Policy coherence, including centralised guidance, shared standards, and coordinated funding mechanisms to reduce fragmentation.
- Cross-sectoral partnerships, particularly between higher education and industry, to align educational programs with evolving workforce needs.

Stakeholders emphasised that successful ET integration is not merely a matter of access, but of relevance, trust, and institutional culture. The Croatian experience demonstrates that while there is strong capacity and creativity among educators and institutions, a lack of systemic coordination and support continues to constrain the full realisation of technology's potential in adult learning.

5.3 Learner-Centred Perspectives on Holistic Literacy and Emerging Technologies

Task 2.2 in Croatia explored the role of emerging technologies in supporting holistic literacy programmes for adults, particularly for vulnerable groups. Interviews were conducted with two workforce development professionals active in digital and professional training (P1 and P2), and one adult learner from a vulnerable background (P3). The sample, while small, captured both strategic and experiential dimensions of technology use in adult learning contexts.

Both professionals described robust and integrated use of digital tools in adult education, especially within professional and technical training environments. P1 detailed how digital platforms support structured onboarding and continuous professional development in the IT sector, combining internal knowledge-sharing with external partnerships. This reflects a blended, lifelong learning model already operational in the corporate domain.

P2 focused on the transformative role of AI in content creation, emphasising its potential to dramatically accelerate ideation and reduce barriers to accessing tailored educational content. Tools previously accessible only through large platforms like Udemy are now being replicated—faster and more contextually—through AI. These developments, according to P2, are not only enhancing digital literacy but also reshaping how knowledge is produced and disseminated.

The perspective of the vulnerable learner (P3) was less documented, though the inclusion is valuable for highlighting the lived experiences that institutional strategies must respond to.

Despite the progress described above, significant barriers continue to hinder access and engagement for vulnerable adults. Key challenges include:

- Language barriers: Non-native speakers face difficulties navigating content-heavy or technical platforms, even when digital access exists.

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- Cognitive load and system complexity: Many digital systems, especially high-tech or institutional platforms, are not user-centred and require substantial prior knowledge or experience.
- Motivational challenges: Learners often struggle to see the immediate relevance of digital tools, especially when prior learning experiences have been exclusionary or demotivating.
- Dual literacy demands: In certain sectors, such as IT, learners are expected to master both technical and interpersonal skills - an often unrealistic demand for those without supportive environments.

P2 aptly summarised the problem by noting that many systems are built "for experts, not for people", reinforcing the need for bridge-building technologies that reduce friction in learning and interaction. He also pointed to bureaucratic obstacles, such as overly restrictive data policies, that limit the usefulness of educational technologies for non-expert users, such as farmers or older adults.

The field research also identified a few promising approaches to mitigating these barriers:

- AI-powered translation: Participants noted that AI has significantly lowered language barriers, enabling learners to access resources that would otherwise be inaccessible.
- Assistive technologies: Tools such as eye-tracking systems are being piloted for learners with physical disabilities, showing the potential of inclusive design when properly applied.
- Blended learning models: P1 described internal training pathways that combine digital modules with face-to-face mentoring, a format that helps reduce digital fatigue and anxiety.
- Task-focused AI support: AI tools are used to assist with specific learning objectives—such as generating ideas or simplifying content—rather than replacing instruction entirely.

These examples suggest that the most effective digital interventions are targeted, supportive, and modular, allowing learners to gradually build confidence and competence.

Both professionals called for stronger institutional structures and national coordination to support the uptake of emerging technologies. P2 argued for a centralised technology transfer office at the national level, to help translate research into default tools and standards for educational institutions. He also stressed the need to align pedagogical approaches across institutions to avoid confusion and fragmentation.

P1 focused on the importance of connecting education and industry, advocating for internships, mentorships, and scholarships that expose learners to real-world applications of their training. He also underscored the need for policy frameworks that ensure accessibility and relevance, especially in digital contexts. The idea that "information serves no one if no one can access or apply it" captured the core sentiment across

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interviews: accessibility is not just a matter of availability, but of design, communication, and human support.

Several recommendations emerged for improving educator readiness to work with vulnerable adults in tech-mediated environments:

- Hands-on, experiential training, conducted in small groups and focused on practical applications.
- Voluntary adoption of tools, rather than mandated use, to reduce resistance and encourage contextual integration.
- Institutional support mechanisms, such as teaching assistants or secondary communication platforms, to help manage learner questions and needs.
- Team-building and experimentation sessions, giving educators space to explore and reflect on new technologies before integrating them into their pedagogy.

Crucially, participants emphasised that not all educators are equipped to work with learners in vulnerable contexts, especially those with special needs. Specialised training and classroom support must therefore be integral to any strategy promoting digital literacy and holistic learning.

The Croatian findings in Task 2.2 illustrate that while emerging technologies have strong potential to support holistic literacy programmes, their effectiveness depends on intentional design, strong pedagogy components, and systemic support. For adult learners from vulnerable groups, digital inclusion is not only a technical challenge but a deeply human one, requiring trust, motivation, and a sense of purpose. While AI and other technologies are already reshaping learning environments, their success will ultimately rest on whether they are introduced in ways that respect the learner's context, reduce cognitive and emotional barriers, and empower personal growth. As one participant noted, "AI can assist, but only people can inspire."

5.4 Learner Voice: Croatia

This learner-centred insight from Croatia offers a detailed view into the lived experience of an adult navigating work, language, and technology in a new country. The participant, a Filipino national who moved to Croatia in 2022 for employment in the hospitality sector, illustrates how informal digital practices can coexist with significant systemic barriers to structured learning and inclusion.

Her daily use of technology is shaped by communication needs and self-directed information seeking. Social media platforms like Facebook and Instagram are her primary digital spaces, used to maintain personal connections. She has experimented with tools like ChatGPT, which she described as useful and unintimidating: "It will translate it for you, so I don't have any difficulties using it." However, such use remains exploratory rather than educational. Formal training, especially language instruction, has not been made accessible to her through public or workplace channels.

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Though she has regular access to a smartphone and stable internet, her experience underscores a recurring theme in the research: access alone is not inclusion. The digital, tools she has tried, such as the Monday.com platform for learning Croatian—were described as costly and ineffective: "It's not really a user-friendly platform… and you have to pay for full access." Her limited exposure to structured digital learning reflects the broader lack of digital support offered to migrants in Croatia, compounded by linguistic and financial barriers.

Her journey also highlights the challenges of engaging with public digital services. While she uses mobile banking and has attempted to navigate the Croatian e-Građani system, she relies heavily on her husband and the Filipino community for guidance. "It's really hard because everything is in Croatian. Some people don't want to speak English, and others maybe don't understand it either," she explained, pointing to a lack of multilingual or user-friendly design in public systems. This linguistic exclusion is both a practical and emotional barrier to full participation in society. Importantly, her reflections also pointed to systemic gaps in employer and institutional support. She voiced concern over legal uncertainties caused by bureaucratic complexity and poor communication. "People come legally and then become illegal because they don't know about bureaucracy," she said, emphasising the urgent need for clear orientation processes and accessible information for both workers and employers.

In her own words, the solution is clear: "Better both employees and employers should have knowledge about bureaucracy - this is the biggest thing." Her appeal goes beyond access to digital tools; it touches on the fundamental right to navigate a new society with dignity, clarity, and support. This case illustrates the deep interconnection between digital inclusion, emotional security, linguistic access, and institutional responsibility. It is a reminder that emerging technologies can only empower when embedded in an ecosystem that recognises the complexity of migrant learners' realities.

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6. FINLAND

6.1. Desk Research Findings

Policy Frameworks and Report

There are several recent education policies, strategies and reports linked to literacy and digitalisation of education in Finland. In 2025, the Finnish National Agency for Education and the Ministry of Education and Culture published guidelines for the use of AI in all levels of education in Finland, including liberal adult education. The goal of the guidelines Artificial Intelligence in Education – Legislation and Recommendations is to support education providers in making use of AI as part of teaching and learning. The material consists of two parts: obligations and recommendations, as well as background materials that provide context for them.

The aim of the **Digital service package for continuous learning** is to produce a customer-oriented and flexible service package that crosses administrative boundaries and supports individuals in making education and career choices and maintaining and developing their competence throughout their careers. Goal is to accelerate the reform of the education system and employment services by building an interoperable and integrated digital operating environment and new services which meet the customer's needs optimally, the target groups are individuals, career counsellors, working life actors and education providers, companies and actors in the labour and educational administrations.

The Finnish National Agency for Education has issued a decree on **national digital badges** that focus on basic skills. These badges can be used to identify, recognise and make visible broad, generic and general competences, such as those needed in working life. The Agency has defined the learning objectives and assessment criteria for the badges based on competences. Providers of liberal adult education may act as issuers of the badges. The national basic skills digital badges are divided into six thematic areas:

- learning skills
- literacy skills
- numeracy and financial skills
- interaction and workplace wellbeing skills
- digital skills
- sustainability competence

The National Literacy Strategy 2030 describes the measures that should be taken in Finland to strengthen multiliteracy. The vision of the Literacy Strategy – Finland - the most multiliterate country in the world in 2030 – aims for a society in which the importance of literacy is acknowledged widely in all sectors and everyone's literacy skills will be supported and strengthened throughout their life. The strategy also presents a mission: A literary way of life is the basis for equality, education and well-being. The three guidelines of the National Literacy Strategy are 1) Creating and strengthening structures for literacy

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work 2) Strengthening multiliteracy competence, and 3) Encouraging reading and diversifying literacy.

The National Literacy Program (former The Literacy Movement) is an ongoing governmental program aimed at promoting the literacy of Finnish residents, especially children and young people. The Literacy Program emphasises diverse literacy, not limited to a specific text type. New types of technology are changing our everyday life, work and, inevitably, our reading habits and texts. The Programme uses the term multiliteracy, which includes interpreting and evaluating the content of the text. Multiliteracy also involves the ability to absorb and convey information, identify emotions, and understand the use of language and contexts.

The National Agency for Education and the Ministry for Education and Culture coordinate several development programs which are linked to the above-mentioned policies.

Recommendation for the Literacy Education Curriculum in Liberal Adult Education (2017), intended for immigrants, is designed to support curriculum design in liberal adult education institutions. The recommendation can also be used in other similar literacy education programmes. The National Agency for Education recommends that education providers develop their own curricula based on this recommendation.

Finnish Education Evaluation Centre (FINEEC) carried out an evaluation of literacy training for immigrants in 2022. The evaluation applied to liberal (non-formal) adult education and basic education for adults. The evaluation produced information to support the planning, implementation, assessment and development of literacy training for immigrants. **Some key conclusions were:**

- Rather than by the student's needs, access to the training is determined by the length of their residence in Finland and their labour market status.
- Competence assessment methods and criteria vary, which puts students in an unequal position
- The practices of directing students to the training as well as the ways in which information is stored and transferred are varied and partly inadequate
- The impact of literacy training is undermined by lack of interaction and language practice outside the school.

Recommendations from the evaluation: The evaluation recommends expanding access to literacy training by removing the requirement for an integration plan and extending funding to all who need it. Assessment practices should be standardised nationally to ensure fairness and better identification of learning needs. Guidance and information sharing between institutions and authorities must be improved through interoperable systems. Support structures should be strengthened for students who progress slowly or have learning difficulties, with stable funding and flexible study options. Finally, integration should be enhanced by encouraging language use outside school and developing national methods to track the broader impact of training on well-being and social inclusion.

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Funding of Emerging Technology Initiatives

There is no specific programme to fund the use of emerging technology in adult education in Finland. However, the National Agency for Education and the Ministry of Education and Culture have several programmes that fund new initiatives and projects in adult education centres, universities, NGO's, libraries etc. They also coordinate ESF-funding for education initiatives. Digitalisation and basic skills are common topics among these initiatives. They also fund the degree education of teachers in universities, as well as further education programmes. Many of the teacher education programmes nowadays include learning about the use of emerging technologies.

The National Agency for Education has also several material banks and instructions for educators on how to use emerging technology in teaching, as well as ethical guidelines. For example, this is a material bank on how use of AI in basic education.

Best Practices

With the emergence of new technologies, the practices and demands of working life will continue to change in the future. Therefore, competence in using and applying XR technologies, learning analytics, artificial intelligence, and game engines will become essential skills in future teaching. Häme University of Applied Sciences, together with the Tavastia Vocational College Consortium and the Kiipula Foundation, has launched project Curious 1.0 – Inspiring learning and teaching through new technologies. The primary target group includes teachers, guidance counsellors, and development staff in upper secondary education institutions, as well as teachers and counsellors in liberal adult education. Kiipula is a special education vocational school, so the project will also produce knowledge how new technologies work with vulnerable learners.

The PerusSetti project (2020–2022) developed digital learning solutions tailored to the needs of adult basic education. The aim was for students to begin practising the use of various devices and digital materials right from the early literacy phase. The project created a digital learning framework for the different stages of adult basic education, which can be applied on a national level. Some of the games and learning tools used are utilising AI.

Game on-Level up! Erasmus+ project focuses on enhancing and developing the teaching staff's pedagogical gamification skills through new digital technologies, especially VR and immersive technologies. With these enhanced skills, teaching staff will be able to create more engaging and motivating learning content suitable for all levels of learners, addressing the emerging needs of the modern work environment. The project has developed a course for educators. By completing this course, educators gain valuable expertise in gamified learning, helping them create engaging, immersive, and effective training experiences for their students. The project has also developed six innovative virtual educational games designed to enhance students' soft and transversal skills.

FCLab.fi (Future Classroom Lab) is a unique network of teacher training schools and universities to develop new learning environments, promote educational technology and diversify pedagogical models. The project is active in several lower and upper secondary schools. For example, in Helsinki teacher training school (Norssi), the project organised a

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workshop for 19 students. The students' task was to create a story, fairy tale, poem, backstory or other similar written piece either individually, in pairs or in small groups using AI tools, and to produce suitable illustrations for it.

The Kaikkien malli is a holistic educational model designed to support the development of basic skills. A group is formed around a shared theme. The aim may be, for example, to strengthen personal finances, a sense of inclusion and wellbeing, as well as participation in education and employment. Learners' needs are identified to ensure the activities help improve their everyday lives. Basic skills – literacy, numeracy and digital skills – are integrated into solving everyday challenges.

Furthermore, there are important examples of networks and projects related to emerging technologies in education. They mostly focus on basic or higher education. Several Finnish universities have launched **Generation AI** project. The project brings together technology developers, researchers, schools, public authorities, businesses and NGOs. It strengthens children and young people's ability to cope with the global societal impact of technology and provide teachers with pedagogical tools to address the transformation of learning. The project will produce and sharpen scientific understanding that will enable education and training solutions to meet the skills needs of the AI generation.

The Innokas Network guides schools towards creativity and innovation through technology. Today over 600 Finnish schools participate in the Network. The network encourages schools to arrange their own activity that supports the learning of 21st Century Skills and to participate in education development. "Our network forms a unique live lab that allows us to study new educational innovations in a practical school context." Network is coordinated by the Faculty of Educational Sciences at the University of Helsinki in collaboration with 10 regional coordinators.

Since 2016, **digital tutoring** has been systematically developed and organised in Finnish schools, with government grants supporting the activities. The publicly funded projects ended years ago, but the practice continues in Finnish schools as a local activity, funded by the municipalities. It is widely considered a very well-working practice. The digitutor is a teacher themselves, and they have some allocated time to help other teachers and develop their digital skills. This allows the tutor to become familiar with the school's individual teachers and better understand their specific tutoring needs. When the work is integrated into the school's everyday teaching, it becomes easier for teachers to ask for help. Having support available on-site lowers the threshold for asking for help, especially among those teachers who might otherwise find digital training burdensome.

The good practices of digital tutoring could also be extended to other forms of tutoring and peer teaching, for example, in areas such as social and emotional skills, multiliteracy, entrepreneurship education. For digital tutoring to succeed, it requires support not only from school leadership but also from the broader education and cultural services sector. When principals value the work of tutors, it is easier to find them a meaningful role and space within the school environment. Tutors also play a part in school development; by observing the key challenges related to digital skills in classrooms, they can provide valuable insights to the school leadership.

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Obstacles and Enablers

Researchers from the Universities of Tampere, Helsinki and Turku addressed a set of question on digitalisation in schools in 2020s using a range of extensive quantitative samples as well as in-depth qualitative data. The research findings are summarised into recommendations that can inform decisions about the use of future technologies during lessons. Teachers are key agents in the digitalisation of schools. Without their active and engaging use of technology, school digitalisation remains incomplete, and students' digital competence will not develop equitably. Research found both barriers and enablers of the use of digital tools.

Barriers to the pedagogical use of digital tools

- Students use digital tools at school mostly at a basic level. Advanced use (e.g. programming, automation) is virtually non-existent in schools.
- Lack of digital pedagogy. Digitalisation in schools has largely remained at the level of "digitisation"—converting analogue materials into digital form without pedagogical transformation.
- Teacher attitudes and experience. Teachers with longer careers use digital tools more frequently, but advanced use is hindered by uncertainty and feeling uncertain about benefits of technology. Male teachers use technology more than female teachers.
- Digital self-efficacy (confidence in using technology). According to research, low digital self-efficacy limits both basic and advanced use of digital tools.
- Subject-specific differences. Foreign language teachers use digital technology the least. Math teachers use it more.
- Teachers' perceptions of digital resources. Feeling that resources are insufficient can hinder use—even when resources are in fact available.
- External policy guidance exists but is ineffective. Guidance from municipalities and authorities has not yet had achieved the intended impact on everyday teaching.

Enablers for the pedagogical use of digital tools

- High digital self-efficacy. The more confident teachers feel about their digital skills, the more likely they are to use technology in teaching.
- Positive experience with digital resources. A favourable view of the quantity, quality, and reliability of devices increases basic use.
- Belief in technology's benefits for learning. Believing that technology supports learning promotes the basic use of digital tools in schools (though it does not predict advanced use).
- Certain subjects and curriculum requirements. For example, programming mentioned in the curricula for maths and crafts supports advanced use.
- Teaching experience of 5–25 years. Teachers in this group use digital tools for basic purposes the most.

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- In-service training and the pedagogical technology acceptance model. Kyllönen's (2020) model emphasises supporting teachers through training and strengthening their self-efficacy.
- Targeted training measures. Continuing education aimed especially at teachers who use less digital technology is crucial. Making this education compulsory will increase the effect. Also, including a digital technology course in the basic curriculum can increase its use in schools.

Sources and practices

Tekoäly varhaiskasvatuksessa ja koulutuksessa – lainsäädäntö ja suositukset

Vapaan sivistystyön digitalisaation tavoitetila

Varhaiskasvatuksen, esi- ja perusopetuksen sekä vapaan sivistystyön digitalisaation viitekehys

Policies for the digitalisation of education and training until 2027

Education Policy Report of the Finnish Government

Government report: Digital Compass

Digital service package for continuous learning

Vapaan sivistystyön osaamismerkit

National literacy strategy 2030

The National Literacy Program promotes the literacy and multiliteracy in Finland

Vapaan sivistystyön lukutaitokoulutuksen opetussuunnitelmasuositus 2017

Evaluation of literacy training for immigrants 2022

Tausta-aineisto: Tekoälyn mahdollisuuksia opetuksen ja opiskelun tukena | Opetushallitus

Utelias 2.0

PerusSetti

Game On Level Up!

FCLab.fi

Kaikkien-malli

Generation AI

Activity on Grass-roots Level – Innokas

Kuntaliitto: Opettajatutorit tukevat koulujen digityötä

Digitalisaatio oppimisen ja oppimistulosten selittäjänä

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6.2 Stakeholder Perspectives on Emerging Technologies in Adult Education

In Finland, Task 2.1 involved interviews with three stakeholders representing different facets of adult education: a national-level policymaker (P1), a freelance educator and higher education lecturer (P2), and a vocational education teacher specializing in adult literacy and digital skills (P3). Together, these perspectives offered insight into how Finland's educational ecosystem integrates emerging technologies (ET) into adult learning, with attention to policy frameworks, pedagogical practices, and systemic barriers.

All participants were highly familiar with emerging technologies, particularly artificial intelligence (AI), gamification, and adaptive learning tools. Participant 1 had direct involvement in shaping Finland's national AI education guidelines and contributed to the development of support packages for educators. Participants 2 and 3 were experienced practitioners, applying digital tools in daily instruction and training teachers in their use. Notably, P2 had also integrated virtual and augmented reality (VR/AR) into educator training, while P3 focused on AI-supported literacy tools in multilingual classrooms.

As P1 explained, her work "focuses on staying up to date with new technologies, how they are implemented, and the legal, pedagogical, and quality-related questions they raise [as well as] how all of this connects to the curricula." The Finnish case thus reflects both national coordination and individual innovation in ET use.

Emerging technologies are widely employed across educational levels in Finland, although their use in non-formal adult education remains limited. Educators use AI to customise materials to varying literacy levels, enhance independent learning, and support engagement through gamification platforms such as Wordwall. P3 reported using AI tools to provide equitable and objective feedback, observing that "students often accept the automated feedback more humbly than traditional feedback… [because] they perceive it as objective."

In vocational education, adaptive platforms help identify learner needs in real time. AI-powered learning analytics and virtual learning assistants—though not yet widely adopted—are emerging as promising innovations for individualizing learning and freeing up educators' time.

AR/VR technologies, while no longer novel, are still seen as effective when pedagogically integrated. P2 described their value in helping educators visualise content creation and interaction: "360 images, augmented reality, and virtual reality aren't exactly new anymore… but they still provide immersive learning opportunities."

A standout success at the policy level is Finland's national AI guidelines for education, which provide structured guidance across education levels and promote responsible, legally compliant AI adoption. These guidelines address EU and national legal frameworks, pedagogical integration, and practical recommendations for safe AI use.

At the classroom level, several best practices emerged:

- Gamification and AI integration to increase motivation and personalize feedback.
- Use of Wordwall and similar platforms for rapid, multilingual literacy material creation.
- Simplification through tool minimalism, as P3 put it, "Use fewer tools. Choose one and stick to it."

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- Teacher autonomy and trust, supported by strong pedagogical foundations and student feedback.

These successes were supported by institutional factors such as school-level leadership, access to digital tutors, and Finland's open educational resource libraries. As P1 noted, "Teachers should trust their own pedagogical expertise, which serves as the foundation."

Despite Finland's high digital readiness, several structural, financial, and cultural barriers limit the effective integration of ET in adult learning. Technical barriers include a shortage of IT support staff, limitations in software licensing, and fragmented device management systems. Institutional inconsistency in tool approval and data protection interpretation means that educators in different institutions face widely varying constraints. P2 highlighted the inefficiency of this approach: "It's a huge waste of resources that each institution conducts these evaluations separately." Financial constraints affect both tool availability and training. App costs are rising, and support staff hours are often reduced due to budget cuts.

Lack of time and training opportunities was consistently emphasised. Teachers receive few training sessions per year, often scheduled without flexibility, limiting their ability to experiment or reflect. Legal and bureaucratic complexity, especially around terms of service and compliance, creates a chilling effect on experimentation. Negative media discourse and cultural resistance further complicate adoption. Some institutions even ban the use of AI tools, reflecting fear or misunderstanding rather than pedagogical reasoning. As P3 observed, "New technologies are not utilised enough throughout the education sector. This is mainly because of the skill level of teachers and the lack of resources given for teachers to get more training."

Finland's experience reveals that the technical feasibility of integrating ET is well established, but its educational impact hinges on systemic coordination, leadership engagement, and professional support. The national AI guidelines represent a strong foundation, but their effectiveness depends on consistent institutional adoption and sufficient infrastructure for implementation.

Participants called for:

- Dedicated digital pedagogical support staff, ideally active teachers who can offer peer-to-peer mentoring.
- Curriculum updates and leadership training, to ensure decision-makers remain connected to classroom realities.
- Clear national-level coordination on tool approval and data security, reducing institutional inefficiencies.
- Flexible training formats, including short, practical sessions and long-term professional development tracks.

In the words of P1: "We have a mandatory national curriculum at all levels, and that's the instrument we use to define what schools are supposed to do." Leveraging this existing structure, while enhancing its responsiveness to emerging technologies, could ensure that Finland continues to lead in responsible and inclusive digital education.

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6.3 Learner-Centred Perspectives on Holistic Literacy and Emerging Technologies

The Finnish field research for Task 2.2 offers a multi-layered view of how holistic literacy programmes can be supported through emerging technologies in adult learning settings.. Drawing from interviews with social inclusion experts, an adult educator working in non-formal education, and an adult learner from a vulnerable background, the findings reveal both the promise and the fragility of digital inclusion strategies in practice. The integration of digital tools into adult literacy programs is increasingly shaped not only by technological availability but by the interwoven challenges of access, confidence, prior learning experiences, and social complexity.

Social inclusion experts emphasised that the role of emerging technologies has expanded rapidly with the rise of AI. Traditional assistive tools like reading rulers and overlays remain in use, but newer AI-powered applications are now beginning to bridge deeper gaps in literacy and accessibility. Tools that convert speech into text, extract text from images, or offer real-time translation are helping adult learners with limited language skills, learning difficulties, or sensory impairments to engage more equitably with educational materials. The transition from niche accessibility tools to widely normalised applications has been viewed as a positive development. As one expert explained, "Digital tools play a massive role these days - they improve accessibility and bring more equality for different types of learners."

Despite this growing potential, the use of emerging technologies in holistic literacy programs is still inconsistent, particularly in non-formal adult education. The adult educator interviewed pointed out that basic digital tools are fairly common, but advanced tools such as AI-based support systems are not yet fully integrated. Their adoption often depends on the initiative and digital competence of individual educators, rather than a systematic framework. This leads to uneven learner experiences and misses opportunities for building foundational skills through engaging, multimodal platforms.

The challenges faced by adult learners from vulnerable groups in Finland remain substantial. Many learners carry negative educational histories, with some believing they are simply incapable of further study due to past failures or unrecognised learning difficulties. Immigrant learners often face additional barriers, such as unfamiliarity with the local service infrastructure, digital interfaces, or cultural expectations around self-directed learning and disclosure of need. These factors frequently intersect in ways that make educational participation seem inaccessible or irrelevant, especially when systems are not designed to accommodate diverse experiences.

Digital skills are increasingly essential for everyday life in Finland - from accessing public services to submitting job applications. Yet, for many adults, simply applying for a course is an overwhelming task. The learner who participated in the study confirmed the importance of basic digital training, having personally benefited from structured courses that introduced them to essential tools. Their experience underscores the role of non-formal adult education institutions as crucial contact points for digital inclusion. However, as the educator noted, these institutions often operate without sufficient support structures, and there is no standardised method for identifying or responding to learner needs in this context.

Despite these barriers, there are promising examples of how technology is used to overcome exclusion. Tools like Microsoft Lens and immersive reading software have proven effective in enhancing access to text for learners with visual impairments or limited literacy. Virtual learning environments can simulate real-life contexts in which learners

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can engage without relying heavily on reading or writing, supporting both autonomy and relevance. Additionally, digital platforms can offer learning in formats that suit diverse preferences—whether through listening, watching, or reading. These multimodal approaches are particularly well-suited to learners who lack formal educational experience and may struggle with conventional instruction.

The findings also point to systemic gaps that delay sustained progress. There is a clear lack of institutional coordination around learning support in adult education, especially in non-formal contexts. Teachers and social workers operate with limited resources and fragmented mandates, making it difficult to provide long-term, individualised support. Participants highlighted the need for policies that recognise the cumulative nature of digital and cultural integration. One-off interventions or project-based initiatives are insufficient for learners who may need years to acquire the skills required for meaningful participation.

Educators working with adults from vulnerable groups face their own set of challenges. Many are unfamiliar with emerging technologies, lack access to adequate training, and feel uncertain about the pedagogical value of new tools. Even when training is available, it is often too brief, too theoretical, or ill-matched to the practical realities of diverse classrooms. Participants stressed the importance of professional development that is hands-on, reflective, and sensitive to different learning styles among educators themselves. Peer support networks, mentoring, and consistent institutional investment were identified as necessary conditions for improving educator readiness and confidence. As one participant put it, "Educators are also diverse learners, just like their students."

The ethical and cultural dimensions of technology use also emerged as critical. Some educators still perceive tools like voice dictation or AI-supported proofreading as less legitimate than traditional methods. This mindset can create unclear expectations and, at times, ableist practices that exclude or disadvantage learners who rely on digital tools for support. In contrast, participants advocated for a values-based approach, seeing technology not as a shortcut but as a form of scaffolding that enables all learners to express themselves and succeed on their terms.

Overall, the Finnish experience demonstrates that while emerging technologies can greatly enhance holistic literacy efforts, their success depends on more than digital infrastructure or tool availability. Sustainable impact requires a pedagogical culture rooted in empathy, practical support systems tailored to adult learners' needs, and policy frameworks that prioritise long-term investment over short-term innovation. When designed and delivered with intentionality, digital tools can foster not only literacy but also self-efficacy, agency, and inclusion, precisely the outcomes most needed by those at the margins of education.

6.4 Learner Voice: Finland

This interview with a woman in her early 40s, originally from Afghanistan and living in Finland for seven years, offers a powerful insight into the ways emerging technologies intersect with migration, caregiving, and digital inclusion. A mother of four and a Farsi speaker with limited Finnish proficiency, her experience illustrates the complex interplay of motivation, digital access, and systemic obstacles in the lives of many vulnerable adult learners.

Her primary digital environment is her smartphone, which she uses daily for communication, information-seeking, and essential tasks such as online banking and

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social media. She reports using tools like WhatsApp, Facebook, Google, and ChatGPT with relative ease, and finds Google Lens particularly helpful for translating Finnish content in real time—something she relied on even during the interview. Larger devices like computers or tablets remain uncomfortable for her, though she has used them occasionally in libraries and classroom settings.

Despite her active use of digital tools, she notes that she has not yet engaged with them for structured personal development—with the partial exception of searching information via ChatGPT. Her motivation to learn more is grounded in necessity: "Because everything in this life is digital," she said. From supporting her child's education to applying for unemployment benefits and managing healthcare, digital proficiency has become an unavoidable part of her daily life. Yet, the barriers she encounters are substantial. Navigating public services online, especially medical systems and school communication platforms like Wilma, is particularly difficult. "For example, at the doctor's office, I don't know how to open things, and I read afterwards what happened," she explained. These gaps in access and understanding have real-life consequences. On multiple occasions, she missed deadlines for unemployment benefits due to difficulty using digital platforms—leaving her without income for weeks.

Her main source of support is her 14-year-old son, who acts as a digital mediator. "He helps me, especially with things like Wilma (the school platform). I trust him. He's truly the best boy," she said. However, she also acknowledges the emotional burden these places on both of them: "I don't want to disturb my son… he has his own schedule and goes to sleep, so I can't always ask him to help." Other support options, such as employment counsellors or digital support at educational institutions, are often geographically inaccessible or not available at convenient times.

She has participated in a classroom-based digital skills course at an adult education institution, which she described as transformative, especially in terms of learning how to apply for jobs. "It's really important how we fill out the application. This has always been very important to me. I had problems before, but now, luckily, I know how to do it." The success of the course, she noted, was due in large part to the teacher's approach: slow, clear, and patient. By contrast, she finds many courses too fast-paced and difficult to follow due to language barriers and the speed of instruction. When asked how digital skills training could be made more relevant, her response was clear: it should focus on practical, everyday challenges: booking medical appointments, understanding health information, and communicating with schools. These are the domains where digital exclusion becomes a source of stress and disempowerment.

This case underscores how motivation alone is not enough to guarantee digital inclusion. While this learner shows resilience, adaptability, and initiative, she continues to face significant structural and linguistic barriers that inhibit her full participation in society. Emerging technologies hold promise, but without accessible, multilingual platforms and sustained, person-centred support, they risk reinforcing exclusion rather than alleviating it.

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7. ROMANIA

7.1. Desk Research Findings

Policy Framework

Romania has adopted several policies and strategies aimed at integrating digital technologies in education, but there is no clear and dedicated budget line for adult education. Important documents include:

- SMART.Edu Strategy (2021-2027) - the strategy on digitalisation of education.
- National Strategy for Adult Continuing Education (2024-2030).
- National Digital Skills Strategy (currently being updated).

National policies encourage the digitisation of education, including adult education. However, there are still implementation gaps and insufficient funding for adult education. European projects, such as Erasmus+, play an important role in stimulating the deployment of emerging technologies.

Romania has adopted strategies that promote the digitisation of education and digital literacy as essential parts of educational reform. These strategies are supported by government documents, such as the "SmartEdu" Strategy (2021-2027), which emphasises the importance of integrating emerging technologies (ET) into education, including adult education. The National Education Act also provides legislative frameworks for the integration of technologies in education systems.

Although these strategies are an important step towards the modernisation of education, their concrete implementation remains challenging due to a lack of dedicated funding and uneven implementation at the national level. Emerging technologies are still partially mainstreamed, with positive results in some European projects, but large-scale implementation in adult education remains limited. These policies are essential for promoting digital literacy, but practical implementation needs to be strengthened through continuous training for teachers, increased access to technologies and the integration of an adequate digital infrastructure in adult education institutions.

Obstacles and Enablers

Romania's efforts to integrate emerging technologies (ET) into adult education face a complex interplay of structural, social, and institutional challenges, but also benefit from a growing body of supportive strategies, initiatives, and infrastructures. The integration of digital tools into adult learning remains uneven, and its effectiveness is significantly influenced by socio-economic disparities, institutional readiness, and cultural attitudes toward lifelong learning.

A persistent barrier is the low participation of adults in online education. With only 19.1% of Romanian adults having engaged in educational activities in the last 12 months (2022), Romania falls well below the EU average of 39.5%. This gap is further exacerbated by territorial inequalities, with participation rates at 29.7% in urban areas versus 11.2% in rural regions. Vulnerable groups—including older adults, individuals in rural communities, and those with low income—are disproportionately affected, lacking both access to digital devices and the skills needed to engage with digital content.

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Another major obstacle is the absence of a national framework for validating digital competences acquired through non-formal means. Without formal recognition of online or informal learning, adult learners have little institutional incentive to pursue such opportunities. Compounding this is the limited access to technology and connectivity, particularly in remote or underserved regions, where broadband infrastructure and device ownership remain insufficient. Even when access exists, a widespread lack of digital competences, especially among marginalised populations, inhibits effective participation in technology-based education.

The adult learning landscape in Romania is also shaped by low intrinsic motivation among adults with limited or outdated educational experiences. This disengagement is amplified by a weak culture of lifelong learning, where adult education is not consistently valued or supported at a societal level. Furthermore, institutional fragmentation and the lack of coherent strategies for integrating ET into adult learning systems result in uneven implementation and underutilised opportunities for innovation.

Despite these challenges, Romania does show signs of progress and promise. National and European strategies, such as the National Education and Adult Learning Strategy (NEAAL 2030), are setting the stage for systemic improvements by explicitly encouraging the use of digital tools in lifelong learning. EU-supported programmes like Erasmus+ and various NGO-led initiatives are actively promoting digitisation in adult education, offering both resources and capacity-building efforts that target educators and learners alike.

There are also grassroots enablers that can be further harnessed. Public libraries, for instance, have strong potential to act as local hubs for digital learning, offering access to technology and guidance in developing digital competences. Similarly, training programmes such as "Teach for the Future" are beginning to fill gaps in educator preparedness, helping instructors integrate ET into their pedagogical approaches.

The increasing political recognition of the role of emerging technologies in educational inclusion is another encouraging sign. This recognition is translating into new investments and pilot initiatives that promote online and hybrid learning models, which have proven to offer greater flexibility and reach—especially critical for adult learners balancing work, family, and education.

To move forward, Romania could focus on several key priorities: establishing a national framework for online education; expanding digital literacy initiatives in disadvantaged areas; ensuring continuous professional development for educators in digital pedagogy; strengthening partnerships between educational institutions and NGOs; and supporting innovative, inclusive, and flexible learning models. These coordinated efforts are essential to closing participation gaps and enabling Romanian adults to fully benefit from the opportunities offered by emerging technologies.

Existing Best Practices

Romania does not yet have a broad national system for integrating ET in adult literacy, but there are pilot projects - and local or sectoral initiatives that can be scaled up.

"Ion Neculce" Theoretical High School in Târgu Frumos has implemented, in the period 1 September 2023 - 31 August 2024, the Erasmus+ project entitled "Education for VALoarE+: a 3D puzzle: DIGITALIZATION, SUSTAINABLE DEVELOPMENT, DIVERSITY for INCLUDING! Through this project, ten secondary school teachers participated in three

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international mobilities in Belgium, Italy and Malta. These mobilities aimed at training teachers in key areas such as digitisation of learning, conflict management, bullying prevention and education for sustainable development. The courses enabled the teachers to acquire advanced skills in the use of digital platforms, to develop effective strategies for managing conflict situations at school and to integrate environmental issues into the educational process, thus contributing to a positive and inclusive educational climate.

The CRED project ("Relevant Curriculum, Open Education for All"), implemented by the Romanian Ministry of Education, has been highlighted in the European strategy "Europe's Digital Decade: Digital Agenda 2030" as an example of good practice in developing teachers' digital competences. In the context of the COVID-19 pandemic, CRED offered training modules focusing on digital competences, attended by 56,615 teachers, representing almost half of all primary and secondary school teachers. At the same time, the course dedicated to digital educational resources has been completed by around 3,900 teachers, with more than 8,700 open educational resources created and made available. The CRED platform has recorded over 90 million page views since its launch. The report also mentions Romania's involvement in EU Code Week 2022, with 2,297 activities organized mainly in schools, attracting almost 80,000 participants, 45% of them girls, ranking Romania 5th in Europe.

Initiated by the Association of Assistance and Programs for Sustainable Development - Agenda 21, **Digital education for a sustainable future project** aims to introduce ICT technology in the educational process in the village of Cîndeşti, Buzău County, a disadvantaged rural community with high unemployment and high risk of social exclusion. The aim of the project is to reduce educational inequalities and increase opportunities for young people from vulnerable backgrounds by equipping with digital tools (tablets) and conducting ICT training workshops for 30 students and 10 teachers from the Secondary School "Sat Cîndeşti". The initiative also supports volunteering by involving 6 young people in updating the software on the devices provided. The project contributes locally to the Sustainable Development Goals of the 2030 Agenda (quality education, reduced inequality, innovation and infrastructure) and responds to an urgent need for digital equipment in rural areas where access to internet and technology is low. The project promotes digital education as an essential pillar of sustainable development and aims to create a model of good practice that is sustainable and adaptable to other disadvantaged communities.

"TEACH FOR THE FUTURE" - training for librarians and trainers in technology and innovation is a project supporting educational transformation in Romania, providing training for educators and promoting the integration of emerging technologies in adult education. The project includes modules that help educators to adopt digital educational methods and apply innovative active learning approaches such as gamification and augmented reality learning. The project "Teach for the Future - Adult Educational Transformation through Innovation, Technology and Entrepreneurship" is a strategic initiative launched in November 2019 by the National Association of Librarians and Public Libraries in Romania (ANBPR), in partnership with organizations from Bulgaria and Greece, and funded by the Erasmus+ Programme (Key Action 2 - Strategic Partnerships). The project aims to modernise and widen access of low-skilled adults to innovative educational opportunities tailored to today's labour market needs by promoting digital skills, entrepreneurship and leadership. The initiative aims to create a transnational network of trainers in the fields of IT, innovation management, networking and entrepreneurship, who will disseminate knowledge to diverse adult communities in Romania, Bulgaria and Greece. The project proposes an integrated and multi-sectoral approach, involving public libraries as hubs of innovation and lifelong learning in an inclusive, adaptive and technology-driven educational approach.

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Back to School project - a platform with AI resources, gamification and storytelling for students combines artificial intelligence (AI) technologies with innovative learning methods, such as gamification and flipped learning, to support digital adult education. The platform is an excellent example of using emerging technologies to enhance adult education, providing a flexible and accessible framework for lifelong learning. At the beginning of the new school year, teachers in several European countries are benefiting from an innovative online educational platform, developed in the framework of the *Back to School Open Resources* project, coordinated by the Romanian "Once upon a time" team in collaboration with institutions in Greece and Spain. The platform offers freely accessible open educational resources that can be easily integrated into teaching activities, whether for homework, classroom lessons or homework. The platform proposes activities structured on two modern pedagogical methods - flipped learning and gamification - and is based on a set of 20 international stories. Each story is transformed into ten different types of activities, including educational games, debates, environmental activities, quizzes or critical thinking exercises, all illustrated with artificial intelligence to make them as appealing as possible to children of the digital generation. An important aspect of the project is the inclusion component: all materials are also available in Romanian sign language as well as in international sign language, to be accessible to hearing-impaired children. Developed under the Erasmus+ program, the project demonstrates how technology - through AI, gamification and learner-centred pedagogical methods - can transform education into an interactive, adaptive and inclusive process. The platform encourages not only the accumulation of knowledge, but also the development of key skills for the future: autonomous learning, collaboration and critical thinking. According to coordinator Măriuca Mihăilescu, this type of initiative could redefine the way education is conceived and delivered globally in the future.

The course **Designing and Implementing Learning with Digital Support** is intended for pre-university teachers and is offered free of charge on the iTeach platform. It is self-paced, with an estimated learning time of 30 hours. The course is organised under the aegis of the Faculty of Psychology and Education Sciences, University of Bucharest. The aim of the course is to help teachers to integrate online tools and digital resources into classroom activities, thus supporting their continuing professional development. The course provides examples and suggestions for lesson design, making lessons more dynamic, and increasing student motivation, encouraging their participation and interest in learning.

Sources and practices

Educație inovatoare prin Erasmus+: un viitor digital, verde și incluziv la Liceul Teoretic „Ion Neculce" din Târgu Frumos

CRED-Curriculum relevant, educație deschisă pentru toți"

Educatie digitala pentru un viitorul durabil

"PREDĂ PENTRU VIITOR" – proiect strategic privind transformarea educațională a adulților din România, Bulgaria și Grecia

Noua platforma „Back to School" îmbină tehnologii AI cu metode de învățare europene precum Gamification și Flipped Learning

Proiectarea și desfășurarea activităților de învățare cu suport digital

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7.2 Stakeholder Perspectives on Emerging Technologies in Adult Education

The Romanian field research for Task 2.1 included interviews with stakeholders involved in adult learning from both the public and private sectors, including NGO staff, vocational training providers, and actors within educational projects targeting marginalised groups. Their perspectives paint a picture of an adult education landscape where emerging technologies are gaining recognition but remain unevenly adopted due to structural, cultural, and policy-level constraints.

A consistent message across interviews is that digital transformation is increasingly seen as a priority, but its implementation in the adult learning sector lacks coherence. Although some actors have begun integrating digital tools, particularly in response to the pandemic, this uptake has been largely reactive, fragmented, and heavily dependent on project-based funding. National-level strategies do exist, and Romania participates in European frameworks promoting digital skills and inclusion. Yet, according to participants, there is a visible disconnect between policy documents and day-to-day practice in adult education institutions.

Stakeholders emphasised that emerging technologies such as AI, gamification, and digital collaborative platforms are not systematically embedded in adult learning structures. Rather, they are explored in isolated pilots or non-formal projects, often supported by EU or donor funding. The more common digital tools in actual use are relatively basic: Zoom, Google Meet, and messaging platforms for communication. More advanced forms of digital pedagogy, such as interactive simulations, virtual or augmented reality, or personalized AI-driven learning environments, are rarely applied, especially outside urban centres or among learners from marginalised backgrounds.

Several interviewees pointed to infrastructural disparities as a major barrier. While urban institutions often have adequate internet access and equipment, many rural or under-resourced adult learning centres still struggle with outdated hardware, unreliable connectivity, and limited technical support. In such settings, introducing advanced educational technologies is not only difficult but, in many cases, seen as unrealistic. One stakeholder noted that even ensuring stable access to a digital classroom was an ongoing challenge for many learners.

Another critical obstacle is the lack of educator readiness and digital pedagogical training. Most adult educators in Romania have not received structured training on how to integrate digital tools meaningfully into their teaching. Even when they are open to experimentation, they lack time, support, and incentives to redesign curricula around digital platforms. One participant described this situation as a "double gap": learners lack digital skills, and educators lack the strategies to support them effectively through technology.

Furthermore, institutional leadership does not always prioritise innovation. In many centres, the introduction of emerging technologies is left to individual initiative rather than embedded in strategic planning. Some NGOs have managed to incorporate digital tools successfully in working with disadvantaged groups, especially young adults or migrants. However, these efforts remain isolated, with little systemic follow-up or knowledge transfer into public education structures. There is a lack of national coordination to ensure that effective practices can be scaled or sustained.

Despite these challenges, stakeholders also pointed to enabling factors. Romania has a growing base of civil society actors engaged in digital education, often using co-design

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methodologies and learner-centred approaches. Several projects have explored the use of gamified learning, blended models, and accessible online platforms tailored to adult learners' needs. Moreover, the pandemic has had a long-term effect in pushing both institutions and learners to become more comfortable with digital tools, even if at a basic level.

Importantly, participants stressed the need to redefine the value of adult education in the public discourse. Without elevating the status of adult learning - and integrating it meaningfully into national development goals - innovation will continue to be limited to pockets of experimentation. One interviewee noted that there is a need for "new narratives" that frame adult education not merely as a remedial service but as a strategic space for economic resilience, social inclusion, and democratic participation, especially in a digital age.

The Romanian context reflects a complex interplay of policy ambition and operational constraint. Emerging technologies are viewed as relevant and increasingly necessary, yet the conditions for their meaningful integration into adult education remain fragile. Achieving systemic impact will require a coordinated effort to improve digital infrastructure, build educator capacity, support institutional leadership, and recognise adult learning as a central pillar of Romania's digital transformation agenda.

7.3 Learner-Centred Perspectives on Holistic Literacy and Emerging Technologies

The Romanian field research for Task 2.2 explores how holistic literacy programmes are implemented for adult learners, especially those in vulnerable situations, drawing on insights from both educators and learners themselves. The findings reflect a learning ecosystem in which emerging technologies hold significant potential but are confronted by structural inequities, cultural hesitations, and pedagogical limitations. In this context, holistic literacy is unevenly fostered, with access and success often determined by geographic location, socioeconomic status, and institutional context.

The adult education providers interviewed frequently work with learners from disadvantaged backgrounds: those experiencing long-term unemployment, limited formal education, and rural or peri-urban exclusion. For many of these learners, digital literacy remains at the level of basic functionality, such as using smartphones for communication or navigating simple apps. Yet even these minimal skills are unequally distributed. One educator described learners who "couldn't tell the difference between a browser and an app," while others were more confident but lacked understanding of digital risks, critical thinking, or online communication norms.

The emotional dimensions of learning emerged as especially critical. Many learners carry the weight of educational failure, economic stress, or familial responsibilities that shape how they engage with learning. Educators noted that motivation is often fragile, and learners can easily become discouraged by setbacks, particularly when digital tools introduce feelings of incompetence or shame. The abrupt shift to online learning during the COVID-19 pandemic exacerbated these issues: some learners disengaged entirely, while others continued only with substantial external support.

Despite these challenges, there are signs of resilience and adaptability. Educators emphasised that trust-building and relational teaching are key to re-engaging learners who have had negative experiences with formal education. Digital tools can assist in this process when they are introduced in a learner-centred way. For instance, some educators

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use messaging apps like WhatsApp or Telegram to maintain informal communication, check in on learners' well-being, and provide micro-learning resources. Others rely on blended learning models, mixing in-person sessions with carefully guided digital exploration.

At the same time, there is a notable absence of structured pedagogical approaches to emerging technologies. Tools such as gamified learning environments, AI-supported writing aids, or immersive simulations are rarely used in adult education for vulnerable groups. Educators cited a lack of training, limited resources, and institutional risk aversion as major obstacles. Even in cases where learners were enthusiastic, teachers felt ill-equipped to select, adapt, or evaluate such tools meaningfully.

The learner voices in the research echoed many of these challenges. Adults who had previously dropped out of education described returning to learning as emotionally taxing, particularly in environments where the emphasis was placed on "catching up" rather than valuing their lived experiences. One learner described feeling "outside of everything digital," even though they used a smartphone daily. This paradox highlights a key issue in digital inclusion work: access does not equate to literacy. Without guided, contextualised, and supportive pathways, learners may remain passive consumers of technology rather than active participants in digital culture.

Some educators expressed a critical stance toward mainstream digitalisation narratives, warning that technology can deepen inequality if implemented without care. They pointed out that many platforms are not designed for adults with low levels of literacy or who face cognitive barriers. For these learners, slow-paced, highly personalized instruction is necessary, conditions often at odds with platform-driven models of efficiency and scale. In this sense, the ethical dimension of holistic literacy becomes clear: inclusion requires not only access to devices and networks but also technologies and pedagogies designed with equity in mind.

Importantly, the research also identified strategies that educators found effective in promoting holistic literacy. These include narrative-based learning, peer mentoring, and creating safe spaces where learners can make mistakes without judgment. Although not technologically advanced, these approaches help build the confidence and self-awareness needed to approach digital learning meaningfully. In some cases, technology was used to document learners' progress and reflections, reinforcing a sense of ownership and agency over the learning process.

The institutional context, however, does not always support such work. Educators reported that adult learning programs are often underfunded, time-limited, and oriented toward rapid outcomes rather than long-term development. This creates tension between the need for slow, relational work and the pressure to meet administrative or funding requirements. As a result, many promising practices remain confined to individual educators or projects, with limited opportunities for replication or scaling.

The Romanian field research underscores that building holistic literacy among vulnerable adults requires more than introducing digital tools. It demands a pedagogical and institutional shift toward empathy, contextual relevance, and long-term commitment. Emerging technologies can support this transformation, but only if their use is grounded in the realities of learners' lives and the capacities of those who support them. Without such alignment, technology risks reinforcing the very exclusions it seeks to overcome.

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8. SWITZERLAND

8.1. Desk Research Findings

Policy Framework and Governance

Switzerland has adopted a decentralised yet increasingly coordinated approach to integrating digital competence and emerging technologies into its educational landscape, including adult education. Although there is no single, overarching strategy for adult digital literacy, various federal and cantonal policies, strategic initiatives, and innovative programmes support the lifelong development of digital skills.

The cornerstone of Switzerland's digital transformation efforts is the Swiss Digital Strategy 2025, led by the Federal Department of Economic Affairs, Education and Research (EAER). This strategy prioritises inclusive digital transformation, promotes lifelong learning in digital skills, and underscores responsible use of artificial intelligence, open-source technologies, and robust cybersecurity. It actively involves federal, cantonal, and communal levels, as well as civil society and private actors, fostering a broad participatory model.

Complementing this is the work of Educa, the Swiss agency supporting digital transformation in education. Educa offers expert guidance and creates foundational tools and frameworks that promote responsible data use and technology integration within the digital education ecosystem.

Although adult education lacks a unified digital strategy, specific support exists, including SEFRI's federal programme to promote basic skills in companies, which may include digital elements. However, cantonal responsibility leads to diverse levels of implementation and resource allocation.

The Swiss context presents both structural and social obstacles to digital inclusion in adult education. Fragmented governance between cantons can result in uneven access and opportunities. Older adults, migrants, and individuals with disabilities face a persistent digital divide due to access barriers, a lack of tailored support, and motivational challenges. Despite these obstacles, Switzerland benefits from a robust digital infrastructure, political support for digital inclusion, and a strong ecosystem of partnerships. The promotion of open-source tools and responsible AI use is seen to improve both efficiency and inclusion.

Several initiatives offer promising models for digital transformation and adult learning. The University of Geneva supports digital skills development across its academic community, addressing both general and tailored needs. The SVEB report on digital transformation in adult learning institutions introduces a self-assessment tool based on the European DigCompOrg model. The 123digit platform offers free resources, courses, and tools for digital training and inclusion. It also provides monitoring tools, forums, and collaborative spaces for service providers. The DORA project, led by crfba.ch, supports trainers and institutions with pedagogical tools (e.g., photo cards, assessment instruments) and educational design principles for basic digital skills training. Educa's Navigator tool helps stakeholders evaluate and choose digital tools for education based on standardised criteria.

Switzerland's digital education landscape reflects a multi-actor, decentralised approach, balancing national priorities with cantonal autonomy. While challenges remain, particularly regarding inclusion, Switzerland is building a flexible and innovative

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ecosystem that other countries may look to for adaptive, context-sensitive models of digital competence development.

Sources and practices

Swiss Digital Strategy

Educa

University of Geneva

SVEB Report

123digit

DORA Project

Educa Navigator

8.2 Learner-Centred Perspectives on Holistic Literacy and Emerging Technologies

The Swiss field research for Task 2.2 offers insight into how holistic literacy programmes are implemented in adult education contexts, with particular attention to learners from vulnerable groups. The findings capture key tensions between pedagogical intent and institutional practice, especially in the use of digital technologies to support adult learners' autonomy, engagement, and inclusion. Drawing from the perspective of an experienced adult educator, the research illustrates how digital tools are being integrated (or, in some cases, avoided) not due to lack of availability but because of deeper ethical, cultural, and emotional considerations.

A central theme in the Swiss data is the need to "de-mechanise" adult education. The interviewee emphasised that current digital systems often reflect rigid institutional logics rather than learner-centred principles. Adult learners, particularly those with complex life experiences, frequently encounter education not as a space for growth but as a system of control: timed assessments, predefined outcomes, and bureaucratic constraints. This environment, the educator argued, undermines key dimensions of holistic literacy: it narrows reflection, suppresses agency, and overlooks the emotional labour involved in returning to learning as an adult.

In contrast, the educator's own practice privileges slowness, reflection, and relationship-building. Learners are seen not as passive recipients of skills, but as individuals with histories, fears, and creative potential. This approach, though resource-intensive, fosters trust and engagement - two conditions the interviewee identified as indispensable for adult learning to become meaningful and transformative. While emerging technologies can support such environments, they often require deliberate adaptation. The educator described using digital tools selectively and cautiously, emphasising that the priority must always remain with pedagogy rather than innovation.

The interviewee challenged the assumption that all digitalisation equates to progress. For many learners in disadvantaged contexts, digital tools are more likely to trigger stress and self-doubt than empowerment. Some adult learners in their programs experienced "a sense of being surveilled" when asked to log in to online portals or interact with standardised learning management systems. Others struggled with basic navigation or

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feared making irreversible mistakes in digital environments. In these cases, the introduction of technology, particularly when unaccompanied by appropriate scaffolding, served to intensify existing inequalities, not alleviate them.

Holistic literacy, in this context, was defined not only as the development of digital or cognitive skills, but also as emotional resilience, ethical reflection, and the capacity for critical dialogue. The educator described using analog methods, such as drawing, dialogue circles, and storytelling, as entry points into digital learning, allowing learners to first express themselves on their own terms. These practices are not technophobic; rather, they reflect a pedagogical belief that technology should follow the learner, not the reverse.

An important insight from the Swiss data is the critique of one-size-fits-all digital tools. The educator noted that many platforms currently promoted for adult education are designed for efficiency, not personalisation. They often fail to accommodate learners with neurodiverse profiles, trauma backgrounds, or low confidence. As a result, even when these tools are introduced with good intentions, they risk alienating the very learners they aim to support.

Institutional barriers further complicate the situation. The educator reported that while some staff are deeply committed to learner-centred approaches, they face time constraints, administrative pressures, and a lack of systemic recognition for their pedagogical labour. Funding structures reward quantifiable outputs rather than slow, relationship-driven processes. In such contexts, emerging technologies are more often used to meet reporting requirements than to enhance learning.

Despite these challenges, the interviewee expressed a cautious optimism about the future of adult education in Switzerland. There is growing dialogue among educators about how to re-humanise digital learning, integrate trauma-informed practices, and co-design tools with learners rather than for them. However, for these efforts to take root, systemic change is needed: investment in long-term educator training, flexibility in institutional structures, and a willingness to treat adult learners as co-constructors of knowledge rather than data points.

The Swiss field research underscores that the integration of emerging technologies into adult education is not merely a technical or logistical issue, it is deeply pedagogical, ethical, and relational. For adults from vulnerable contexts, learning is not a set of competences to be acquired, but a process of reclaiming voice, agency, and belonging. Any technological innovation that seeks to support this process must begin with an understanding of the learner as a whole person. Without that, even the most sophisticated tools will fall short of meaningful inclusion.

8.3 Learner Voice: Switzerland

This case study from Switzerland sheds light on the experience of an adult learner participating in the Simply Better at Work programme. Having migrated to Switzerland a decade ago and employed in an industrial company, the learner's motivation to improve digital skills is strongly professional. He had completed only compulsory schooling in his country of origin, making this adult learning experience his first structured engagement with digital literacy.

In daily life, he primarily uses a smartphone, which is more accessible and familiar than a computer. While he has encountered emerging technologies, such as AI-based chat systems or even virtual reality during museum visits, his interaction with such tools

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remains cautious and limited. Installing and using new applications is particularly difficult. The complexity of interfaces, often lacking in localisation or language support, amplifies the sense of exclusion: “If I don’t understand what it says, I’m not going to risk clicking something wrong.” This hesitation is compounded by mistrust and insecurity, especially when digital environments are perceived as unsafe or confusing. He noted concern about not knowing what is trustworthy online, reflecting a broader fear among people with limited educational backgrounds of "doing something wrong" or inadvertently compromising their privacy.

Access itself remains an issue. While the learner has a smartphone, he lacks consistent access to a computer or reliable internet. He therefore relies heavily on support from family members, particularly children or grandchildren, to navigate more complex digital tasks. Occasionally, he turns to teachers or staff in local libraries, who offer critical guidance in trusted, face-to-face settings. When asked about digital learning programmes, he expressed appreciation for those that offer clear, paced, and supportive instruction. The best learning environments were those that involved small groups or paired training, ideally hosted in familiar community settings like libraries or adult education centres. However, programmes that moved too quickly or used overly complex language were discouraging. “When the words are too difficult, or things move too fast, I just stop following,” he explained. For digital learning to be meaningful, he emphasised the need for step-by-step guidance, repetition, and human presence. Apps with simple navigation, voice narration, and no advertising were considered much more usable. Above all, he stressed the importance of access to a person

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9. UNITED KINGDOM

9.1. Desk Research Findings

Policy Framework and Governance

The United Kingdom has taken a multi-faceted approach to digital inclusion and the adoption of emerging technologies (ET), particularly artificial intelligence (AI), in education. Recent initiatives focus on equipping both learners and educators with tools, training, and access to technologies that support inclusive, flexible, and personalised learning across all levels, including adult education.

Key policy documents such as the Digital Inclusion Action Plan: First Steps (UK Government, 2025) and the DfE Policy Paper on Generative AI in Education (2025) underline the UK's strategic focus on enhancing digital access and skills. The UK Government plans to launch a Digital Inclusion Innovation Fund, supporting community-led initiatives, including a pilot scheme with the Digital Poverty Alliance that provides repurposed laptops to those in need.

The Department for Education (DfE) recognises the potential of generative AI tools like ChatGPT and Microsoft Copilot in providing tailored learning experiences and easing teacher workloads. Updated guidelines stress ethical implementation, data protection, intellectual property, and the need for educator training.

Obstacles and Enablers

The Adult Participation in Learning Survey 2024 (L&W) reveals that 95% of adult learners use technology in learning, with increasing adoption of AI (18% in 2024 vs. 14% in 2023). Benefits include convenience, engagement, and confidence-building. However, obstacles such as digital poverty—affecting 13–19 million people aged 16+—persist due to socioeconomic inequalities, limited digital infrastructure, and lack of access to learning opportunities.

Motivational challenges also hinder adult learning, especially among individuals with past negative educational experiences. Emerging technologies, such as generative AI, virtual reality (VR), augmented reality (AR), and gamification, offer opportunities for more engaging and personalised learning, potentially overcoming these barriers. Still, implementation is hampered by limited funding and the cost of technological upgrades. Open-access tools like OpenAI offer some relief by enabling educators to automate administrative tasks.

Teacher perceptions of AI are mixed. According to the National Literacy Trust, AI adoption among teachers rose to nearly 48% in 2024, yet 38% remain concerned about learners' use of AI. While AI is viewed as potentially beneficial, significant concerns include data privacy, educational validity, bias, and its effect on core skills. Stakeholders, including the UK Parliament and British Council, advocate for more evidence, training, and clearer legal frameworks to support responsible AI use.

Educational Programmes and Best Practices

Several innovative programmes demonstrate the UK's leadership in integrating ET into adult education.

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- Citizen Literacy App uses voice-driven AI, handwriting recognition, and gamified features to support low-literacy learners across diverse contexts, including ESOL and dyslexia support.
- Learn English Now (Klik2learn) offers a multimedia-based, gamified platform with personalised learning paths for English proficiency.
- Readable provides AI-powered graded news and stories with real-time translations, audio, and text simplification.
- Audactive (Pembrokeshire College) transforms static content into interactive, voice-controlled learning materials, enhancing flexibility and engagement.

The UK's approach to digital inclusion in adult education reflects a balance between innovation and caution. While emerging technologies provide opportunities to enhance learning access and quality, their responsible integration requires sustained investment, inclusive policies, and robust ethical guidance.

Sources and practices

Digital Inclusion Action Plan

DfE Generative AI in Education

Digital Poverty Alliance

Adult Participation in Learning Survey

National Literacy Trust Reports

British Council on AI and ELT

Citizen Literacy

Learn English Now (Klik2learn)

Readable

Audactive

9.2 Stakeholder Perspectives on Emerging Technologies in Adult Education

In the United Kingdom, the use of emerging technologies (ET) in adult education is being shaped by a complex interplay of innovation, inclusivity goals, and systemic constraints. The participants interviewed for this study, including an education technology expert, an adult educator, and a representative from an education-focused NGO, collectively represent the interface between digital innovation and adult learning provision. Their experiences reflect a maturing but cautious ecosystem, one that is increasingly aware of both the potential and the limitations of ET in educational contexts.

All participants reported familiarity with key emerging technologies such as artificial intelligence (AI), virtual and augmented reality (VR/AR), and gamified learning tools. These technologies are already embedded, to varying degrees, in their educational practices. For example, AI is used in adult language education, where tools assess freeform text and spoken responses, providing personalised feedback on grammar, tone, pronunciation, and structure. One interviewee explained that "AI chatbots are used to

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scaffold learning by rephrasing questions and offering hints," providing an adaptive learning environment that caters to individual learners' progress and needs.

Similarly, VR and AR technologies are used to simulate real-world environments that would otherwise be inaccessible. In vocational education, VR enables learners to participate in high-risk simulations, such as job interviews or medical appointments, without real-world consequences. Facial mapping and behavioural feedback tools are then used to help learners build soft skills, such as confidence and communication. This is especially effective for ESOL learners and neurodiverse individuals. As one participant described, "We place ESOL learners in work-based simulations... and use facial mapping to analyse expressions during speaking tasks." These innovations make learning more engaging and accessible for those who traditionally face barriers in education.

Gamification is another central strategy used across adult learning. Through web-based applications that mimic native apps, learners engage with quizzes, games, and reward systems that increase motivation and reduce cognitive and emotional barriers. One participant emphasised the importance of this approach for inclusivity: "It brings a comfort for the learners... 'Oh, it's a game. I know how to do a game.' But they're learning at the same time." Notably, one of the success factors in this space has been the use of "frugal innovation" - employing established, open technologies (e.g., JavaScript) to ensure full control over code, low maintenance costs, and improved accessibility.

The UK's implementation of ET is heavily oriented towards inclusion and flexibility. Adult learners targeted by these technologies include individuals with low literacy, ESOL learners, and those from socio-economically disadvantaged backgrounds. Technologies are selected based on their ability to accommodate diverse needs and learning contexts, with special attention paid to mobile compatibility, ease of use, and the capacity to function in low-resource environments. Accessibility, both technical and cultural, is a key priority, with many tools designed to circumvent the digital exclusion that affects large portions of the adult learner population.

The observed benefits of ET in these contexts are considerable. Participants reported improved learner engagement, higher retention rates, better personalisation of content, and enhanced learner autonomy. Technologies like AI enable efficient feedback loops, while immersive environments make abstract or inaccessible content tangible. Crucially, the ability to learn flexibly (on mobile devices, at irregular hours, and at a self-determined pace) has significantly expanded educational access for adults with caring responsibilities, shift work, or other structural constraints. One interviewee concluded: "Technology gives them that opportunity to take half an hour at lunchtime, or an hour when the kids have gone to bed, to engage in learning."

Overall, the UK landscape reveals a nuanced and practical approach to ET in adult education: one grounded in accessibility, personalisation, and equity. While challenges remain (explored further in Task 2.2), these interviews suggest a strong foundation of experience and commitment among providers to integrating emerging technologies in a meaningful and learner-centred way.

9.3 Learner-Centred Perspectives on Holistic Literacy and Emerging Technologies

The UK field research for Task 2.2 presents a rich picture of how adult education providers are addressing holistic literacy in their programmes, particularly in work with learners from vulnerable contexts. Interviews with experienced adult educators and education

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technologists reveal a practice landscape where emerging technologies are being adopted not as an end in themselves, but as tools to foster agency, engagement, and inclusivity among adult learners with complex life situations.

A defining feature of the UK approach is the integration of emotional and ethical dimensions into digital pedagogy. Adult learners served by these programs often face multiple disadvantages: low literacy levels, migration-related stress, caregiving responsibilities, or socio-economic precarity. As one educator explained, "We work with learners who arrive with very low confidence. They've failed in education before, or they've been failed by the system." In this context, technology is valuable not just for delivering content, but for helping learners rebuild self-trust and emotional resilience.

Practitioners place strong emphasis on reducing learner anxiety, particularly through tools that are intuitive, mobile-friendly, and emotionally safe. Gamification, for example, is used not only to motivate but to reassure: "When something looks like a game, there's less fear. They're not going to be judged or tested; they're just going to have a go." This psychological safety is essential for learners who may otherwise disengage at the first sign of difficulty.

The use of AI and adaptive learning systems was noted as particularly effective in supporting differentiated learning pathways, enabling each learner to progress at their own pace and according to their own needs. For instance, AI-enabled language tools provide real-time, non-judgmental feedback to ESOL learners, allowing them to experiment and improve without fear of embarrassment. These tools also help identify when learners may be stuck and offer tailored hints or questions to keep them moving forward. This kind of personalisation aligns well with the ethical dimension, supporting learner autonomy while preserving dignity.

Importantly, educators interviewed in the UK are acutely aware that not all learners arrive with equal levels of digital access or familiarity. While smartphone ownership is high, digital literacy is uneven. Some learners are adept with apps but struggle with basic tasks like logging into a platform or interpreting written instructions. This has led to a pedagogy of "scaffolding from what they know"—starting with familiar tools such as WhatsApp or voice notes and gradually introducing more structured platforms as learners build confidence. As one educator put it, "We meet them where they're at. If that's WhatsApp, that's where we begin."

The emotional component of adult education was also a recurring theme. Many learners are juggling family, employment, or legal challenges alongside their studies. Flexibility, empathy, and persistence are essential to sustain engagement. Educators emphasised the importance of trust and continuity in building relationships, especially when learning moves into digital spaces. "They need to know we're still there," one educator said, describing how regular check-ins via phone or text serve as emotional anchors for learners navigating online environments.

In terms of challenges, institutional constraints remain. Funding cycles are short, and there is limited support for ongoing staff training in digital pedagogy. While the appetite for innovation exists, practitioners are often left to "hack the system" using free or open-source tools and peer-shared activities. This can lead to inconsistency across institutions and geographic regions. Furthermore, some learners remain reluctant to engage online, due to past experiences of surveillance, language barriers, or simply a preference for in-person interaction. One practitioner reflected, "We can't assume that just because a tool works well for one learner, it'll work for everyone. That's where the human element comes in."

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Nevertheless, the research highlights many instances where emerging technologies have deepened rather than diluted the learning experience. For example, AI speech analysis has helped learners monitor their own progress and develop metacognitive awareness. Digital storytelling projects have enabled learners to reflect on their personal journeys, building both literacy and self-expression. In each case, technology was embedded in a wider pedagogy of care, grounded in responsiveness, relationality, and respect for learner agency.

The UK case study illustrates how holistic literacy in adult education is not simply about acquiring skills and how using technology can support human development in its fullest sense. The most successful practices are those that honour learners' emotional realities, recognise their diverse literacy levels, and position them not as passive recipients but as active participants in their own learning journeys. Emerging technologies, when used critically and compassionately, can play a transformative role in this process.

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