



## AI Cookbook

# Work Package 2: Analysis of different potential uses of AI tools and applications in Migrant classes

## 2.2 Analysis of the capabilities of AI across the four pedagogical areas of DigCompEdu: Resources, Teaching and Learning, Assessment, and Empowering Learners: Part 1 - Literature

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AI Enhanced Learning Cookbook for Empowering Migrants



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# Introduction

## The AI Cookbook Project

The AI Cookbook project enhances digital transformation in adult education for migrant learners by empowering educators in AI integration. Focusing on professional development, it provides practical training in AI tools and pedagogy to create personalised, culturally responsive learning experiences while addressing digital readiness challenges.

Aligned with DigCompEdu standards, the initiative combines hands-on skill development with ethical considerations, helping educators overcome skepticism and build resilience in diverse classrooms. Using an innovative 'recipe' approach, the project transforms theoretical knowledge into actionable strategies for effective digital pedagogy.

# Methodology

The study employed a mixed-methods approach to examine AI's current role in migrant education through six key research questions, addressing resource development, teaching applications, assessment improvements, learner empowerment, educator competencies, and teacher engagement strategies. The methodology combines a literature review with field research to bridge theoretical insights with practical implementation. The literature review synthesizes global perspectives from academic publications, case studies, policy frameworks, and technical documentation, initially collated and reviewed by the project team and then analysed thematically using Google Notebook LM to identify trends, challenges, and best practices. Complementing this, field research, through interviews, surveys, and focus groups with educators, migrants, and experts, captures real-world experiences of AI tools in diverse learning environments. Primary participants include adult educators and migrant learners, with secondary insights from AI specialists and community intermediaries, ensuring a holistic understanding of needs and opportunities. Together, these methods inform actionable recommendations for the AI Cookbook, grounding AI integration recommendations in both evidence and lived realities.

## Research Questions

- How can AI enhance resource development and delivery for migrant education?
- What AI applications are most effective for teaching and learning in migrant contexts?
- How can AI improve assessment processes for migrant learners?
- What AI tools best empower migrant learners to take control of their learning journey?
- What are the competences for teachers and trainers using AI for digital education?
- How can we engage teachers and trainers in using AI for teaching migrants

## Literature Review

The literature review explores AI applications in migrant education. It synthesizes academic and grey literature, case studies, policy frameworks, and technical documentation to provide a comprehensive understanding of how AI can enhance learning experiences for adult migrants.

Each project partner contributed sources to the review, in multiple languages, ensuring a diverse and global perspective.

The literature review aims to:

- Identify trends in AI applications for migrant education
- Highlight best practices and key challenges
- Inform the development of AI-based teaching methodologies in the *AI Cookbook*

The literature was then further analysed using Google Notebook LM using the research questions to interrogate the sources provided.



# Results

## AI in Education and Migration Contexts

Artificial Intelligence (AI) is increasingly being integrated into educational settings, including those serving vulnerable populations such as migrants, refugees, and internally displaced persons (IDPs). The rise in AI tools and public interest in AI education is mirrored by its growing application in this field (Son et al., 2023).

The increasing integration of artificial intelligence (AI) into education represents a significant shift in pedagogical approaches. This is particularly relevant in contexts involving migrant learners, who often face unique challenges related to language acquisition, cultural adaptation, and diverse educational backgrounds. Leveraging AI technologies offers potential opportunities to address these needs and enhance educational outcomes for this vulnerable population. This review synthesizes findings from the selected literature to explore the application of AI within migrant education across four key pedagogical areas, aligning with the European Framework for the Digital Competence of Educators (DigCompEdu) areas: Resources, Teaching and Learning, Assessment, and Empowering Learners.

Research indicates a growing interest in the use of AI in English language teaching and learning (ELT/L) and foreign language learning (FLL), areas highly pertinent to migrant education. AI technologies such as Natural Language Processing (NLP), Data-Driven Learning (DDL), Automated Writing Evaluation (AWE), Intelligent Tutoring Systems (ITS), Automatic Speech Recognition (ASR), and chatbots are being explored for their potential in language education. While the majority of published research on AI in ELT/L originates from Asia and focuses heavily on higher education, there is a recognized need for more studies in diverse geographies and adult learning contexts relevant to migrants.

### Resources

AI can be specifically applied in the creation, evaluation, and adaptation of digital educational resources for migrant learners. AI technologies enable the creation of highly adaptive and personalised learning materials that can adjust content based on individual learning patterns and preferences, including adaptive textbooks and interactive modules. AI can assist in developing educational materials that are culturally responsive and address language differences, fostering a more inclusive learning environment. AI supports educators in curating and organising educational content through search and recommendation systems. Furthermore, AI can be used to evaluate the quality and effectiveness of resources by analysing student interaction data, providing insights for continuous improvement. Responsible resource management, such as automating copyright detection and managing digital rights, can also be supported by AI. Teachers report using AI tools, including large language models (LLMs), for preparing teaching materials and updating course content. Challenges in this area include ensuring the quality and relevance of AI-generated content, addressing technical limitations, data privacy, ethical considerations (such as bias), cost, and the digital divide. The limited availability of quality teaching

materials specifically designed for adult migrants with low literacy or limited language competence in the host country is a notable challenge that AI could potentially help address.

## **Teaching and Learning**

Integrating AI into teaching strategies and learning activities can lead to more personalised, efficient, and engaging learning experiences for migrant students. Adaptive learning systems can tailor content to meet the unique needs and abilities of each student, providing support and challenges based on their performance and patterns. Intelligent tutoring systems (ITS) can offer individualised support, feedback, explanations, guidance, and practice exercises. AI-powered tools, such as language translation tools and conversational AI (chatbots), are particularly valuable for migrant learners, facilitating language acquisition by providing real-time translations and opportunities for non-judgmental practice, especially for speaking skills. Studies show that chatbots can be used to scaffold writing and support argumentative writing skills. Automatic Speech Recognition (ASR) technology can support pronunciation practice. AI tools can assist teachers in planning and implementing lessons, potentially automating routine tasks to free up time for tailored instructional strategies. AI can enhance classroom engagement through interactive simulations and potentially augmented and virtual reality applications. AI can help address the specific challenges faced by migrant children by providing learning experiences suited to their varied needs. However, challenges include adapting AI to diverse learning environments, ensuring the quality and relevance of AI-driven content, teacher preparedness, data privacy, ethical concerns, technical infrastructure, and balancing AI with necessary human interaction.

## **Assessment**

AI tools offer opportunities to enhance the efficiency and effectiveness of student evaluation for migrant learners. Automated grading for various assignments, such as essays (AWE), can provide consistent and potentially unbiased evaluation and offer valuable information on errors. AI-driven analytics can provide educators with insights into student performance and learning trends, enabling targeted interventions. AI can deliver immediate and personalised feedback on student work. Adaptive testing, which adjusts question difficulty based on real-time performance, is another potential application. AI can also be used for novel assessment methods like game-based assessments. Despite these possibilities, there is a notable lack of research on the use of AI for assessment in English language teaching and learning. Concerns exist that traditional assessment design may not adequately account for the diversity of student backgrounds and primary languages, potentially exacerbating inequities. AI tools are also used in non-educational contexts for assessing migrants, such as language biometrics for identity verification in asylum procedures. The use of AI in such sensitive assessment contexts raises significant questions about fairness, transparency, and potential bias. AI tools like plagiarism detectors are also relevant for academic integrity in assessment. Challenges include technical requirements, the need for teacher professional development in AI assessment methods, and the risk of over-reliance on technology.

## **Empowering Learners**

AI can cater to diverse learning needs and styles, promoting inclusivity and accessibility for migrant learners. The capacity of AI to tailor educational content to individual needs and abilities facilitates a more personalised learning journey, ensuring learners receive

appropriate attention and resources. AI tools, such as speech recognition and language translation, can support learners with special educational needs and contribute to inclusive education by breaking down barriers. AI can empower learners by fostering independence and critical thinking, allowing students to control their learning pace and engage in problem-solving through interactive tasks. Importantly, integrating AI prepares migrant students for a future increasingly shaped by technology, providing them with essential digital literacy skills, including AI literacy, which is vital for working and living in destination countries like Australia. AI literacy involves not only using AI technologies but also evaluating their trustworthiness and considering their ethical implications. Adult migrant and refugee learners often show enthusiasm for learning about generative AI despite limited prior understanding. Gaining AI literacy is identified as a potential learning objective for this population to help them navigate daily activities and enhance learning. Challenges include ensuring equitable access and addressing the digital divide, managing data privacy and ethical concerns, developing learners' AI literacy and understanding, and balancing technology use with necessary human interaction.

## Best Practices and Key Challenges

Effectively integrating AI into migrant education requires addressing both its potential benefits and significant hurdles, particularly for teachers and trainers.

### Best Practices

Comprehensive Professional Development is crucial for equipping teachers with the necessary skills. Training should cover technical competencies, pedagogical strategies for AI integration, data literacy, critical evaluation of AI tools, and ethical considerations (Pokrivčáková, 2019; Son et al., 2023). Given the rapid evolution of technology, continuous professional development is essential (Crompton et al., 2024). Additionally, educators working with migrant populations benefit from specialised training in socio-emotional and trauma-informed support (Shapiro et al., 2018, as cited in Maahs et al., 2025).

A Focus on Practical and Pedagogical Applications ensures AI tools are effectively utilised. Demonstrating how AI can assist with concrete tasks—such as preparing materials, grading, and providing feedback—enhances teaching efficiency (Zhou et al., 2024). Pedagogical frameworks like AI-TPACK can guide meaningful integration (Yan et al., 2020, as cited in Zhou et al., 2024).

Developing AI and Digital Literacy is vital for both educators and learners. AI literacy, encompassing an understanding of AI's strengths, weaknesses, trustworthiness, and ethical implications, should be explicitly incorporated into learning programs (Creely et al., 2025). Students also need guidance to navigate AI tools responsibly (The Immigrant Learning Center, 2024).

Fostering a Positive Mindset among teachers is pivotal for adoption. Addressing skepticism and reluctance involves cultivating confidence in AI's value and usability (Koltovskaia, 2023; Wang et al., 2023, as cited in Zhou et al., 2024).

User-Centric Design and Involvement of teachers and migrant learners in AI program development ensures relevance and effectiveness (Ongarbay, 2023). Participatory design



approaches can enhance engagement (Abou-Khalil et al., 2019, as cited in Refugees, Migrants and IDPs Report, 2024).

Adapting Content and Methods to the linguistic, cultural, and educational backgrounds of migrant learners is essential. Low-threshold technologies and mobile accessibility can improve inclusivity (Maahs et al., 2025; Refugees, Migrants and IDPs Report, 2024).

Strategic Partnerships among educational institutions, NGOs, private companies, and policymakers support sustainable implementation (Refugees, Migrants and IDPs Report, 2024).

## **Key Challenges**

Lack of Teacher Training and Readiness remains a barrier, with many educators feeling unprepared to integrate AI effectively (Zhou et al., 2024). Existing professional development programs often overlook digital literacies and AI-specific skills (Crompton et al., 2024).

Infrastructure and Access Disparities exacerbate inequities, as unequal access to devices and internet connectivity widens the digital divide for vulnerable populations (Spulber, 2024; Crompton et al., 2024).

Ethical Considerations and Risks include concerns about data privacy, algorithmic bias, lack of transparency, and surveillance (Nizzolino, 2024). AI may also reinforce linguistic or ideological biases (Crompton et al., 2024), and its misuse could lead to academic integrity issues, such as plagiarism (Zhou et al., 2024).

Limitations of AI Capabilities pose challenges, including factual inaccuracies, poor translation quality, lack of nuanced understanding, and technical failures (Tekin, 2024; Crompton et al., 2024). AI-generated content may also lack originality or raise copyright concerns (Marcin Opacki, as cited in Crompton et al., 2024).

Teacher skepticism and fear stems from concerns about job displacement, student misuse of AI, and low confidence in using the technology (Alshumaimeri & Alshememry, 2023). Some educators oppose AI use altogether with beginner learners (Creely et al., 2025).

Lack of Empirical Evidence hinders progress, as rigorous research on AI's effectiveness in migrant education remains scarce (Nizzolino, 2024). Gaps persist in understanding AI's impact on specific language skills and long-term outcomes (Crompton et al., 2024).

Complexity of Integration arises from adapting AI to diverse learning contexts and ensuring seamless teacher-AI collaboration (Zhou et al., 2024). Critiques also highlight that AI design may rely on outdated pedagogical theories (Crompton et al., 2024), and evaluating AI's cultural appropriateness is challenging (Mohammed Mahmoud, as cited in Crompton et al., 2024).

## **Research Gaps, and Future Directions**

Across all the areas explored above, several overarching challenges and research gaps are identified. There is a significant digital divide affecting migrant populations, limiting access to technology and connectivity, which can exacerbate educational inequalities. Ethical considerations, including bias in AI systems and data privacy, are paramount and require careful attention, especially in vulnerable populations. Teacher preparedness and lack of training in effectively integrating AI into their practice is a significant barrier to widespread and effective adoption. Ensuring the quality and relevance of AI-generated content and addressing issues like "hallucinations" is necessary. Concerns about over-reliance on AI and maintaining academic integrity (e.g., preventing plagiarism) are also present.

The literature calls for more rigorous research, particularly focusing on the specific needs of migrant learners across all age groups and different levels of literacy. There is a need to explore different pedagogical approaches, AI tools for specific language subskills, and the long-term impacts of AI use. Developing effective professional development programs for educators is crucial. There is also a call for clearer definitions of AI in education and the development of specific ethical frameworks and regulations for its use in educational settings, particularly concerning vulnerable populations. Further research should investigate human-AI interaction and collaboration, how migrants utilise their plurilingual repertoires with digital tools, and how to ensure that AI implementation reduces rather than exacerbates existing inequalities.

## How can AI tools enhance teaching and learning

Artificial Intelligence (AI) offers a range of tools and applications that enhance various aspects of digital education, particularly for migrant learners. For Resource development and delivery, AI tools are used to create and adapt digital educational materials, such as generating lesson plans, developing customised learning content tailored to individual needs or cultural backgrounds, creating text and images for classroom use, curating educational content, and translating materials. In Teaching and Learning, AI facilitates personalised learning experiences by adjusting content and pace, provides instant feedback, and supports the development of various language skills. Key tools in this area include Intelligent Tutoring Systems (ITSs), chatbots for conversation practice and support, Automated Writing Evaluation (AWE) tools for feedback on written assignments, and Machine Translation (MT) tools that provide language support and can be used for learning. AI also supports pronunciation through Automatic Speech Recognition (ASR). For Assessment, AI tools enable efficient and effective evaluation through automated grading of various assignments, using AI-driven analytics to monitor student progress, and providing personalised feedback on performance. AWE also serves as a crucial assessment tool. In Empowering Learners, particularly migrants, AI is highly beneficial for catering to diverse learning needs and styles, promoting inclusivity and accessibility for all, including those with special needs or facing digital divides, and facilitating self-regulated learning. AI tools help migrants overcome language barriers through translation and language support, offer self-paced integration programmes, and provide real-time guidance on local customs, contributing to their overall social and financial integration in a new society. AI systems designed for these purposes can enhance accessibility by allowing interaction via speech and promoting inclusion by assisting those less confident with language.

Further information on the specific tools and use-cases can be found in report 2.4 which provides an inventory of tools and best practices.

## What are the competences for teachers and trainers using AI for digital education?

Integrating artificial intelligence (AI) into digital education requires teachers and trainers to develop a diverse set of competencies. These competencies extend beyond basic digital literacy to encompass specific knowledge and skills related to understanding, evaluating, integrating, and utilising AI technologies effectively and responsibly in educational settings.

Several frameworks and studies highlight the necessary areas of competence for educators using AI:

<b>AI Literacy</b>	Proficiency in using digital tools, including <b>AI technologies</b> . Understanding the <b>fundamental concepts and principles of AI</b> , how AI systems <b>operate</b> , their <b>capabilities, limitations, strengths</b> , and <b>weaknesses</b> . Understanding the <b>ethical</b> implications of AI use. Knowing how to use specific AI tools and platforms effectively. Developing essential abilities to <b>live, learn, and work with AI technologies</b> . AI is described as software or technological artefacts.
<b>Professional Engagement (DigCompEdu AI)</b>	Using AI tools for <b>professional development</b> , communication, and collaboration. Staying updated with AI advancements and engaging in professional learning communities focused on AI.
<b>Digital Resources (DigCompEdu AI)</b>	<b>Creating, evaluating</b> , and adapting <b>AI-enhanced digital educational resources</b> . Assessing the <b>quality of AI-generated content</b> (e.g., text, images, lesson plans, questions, translations) for factual accuracy ("hallucination"), bias, relevance, and appropriateness. Managing resources responsibly.
<b>Teaching and Learning (DigCompEdu AI)</b>	Pedagogical knowledge and understanding such as how to <b>integrate AI tools into teaching and learning strategies</b> and curriculum design effectively. Using AI to <b>support students as "cognitive partners"</b> . Exploring new pedagogical possibilities afforded by AI. Supporting <b>personalised and interactive learning</b> in diverse settings. Utilising AI for tasks like generating ideas, texts, lesson plans, exercises, and exams. Transforming text (summarising, simplifying, translating, changing style/format). Using AI for brainstorming and material creation tailored to student interests.

<b>Assessment (DigCompEdu AI)</b>	Utilising AI tools for <b>efficient and effective student evaluation</b> . This includes automated grading, analysing student progress with AI analytics, providing personalised feedback, and using AI for test/exam generation. Assessing student writing with automated writing evaluation (AWE). Critically evaluating AI-generated assessments.
<b>Empowering Learners (DigCompEdu AI)</b>	Using AI to cater to diverse learning needs, promote inclusivity and accessibility, facilitate <b>self-regulated learning</b> , and encourage critical thinking about AI and its impact. This involves supporting special and additional educational needs with AI tools. Using AI for translation and language support for migrants. Guiding students in using AI <b>responsibly</b> .
<b>Facilitating Learners' Digital Competence (DigCompEdu AI)</b>	Helping students develop their own digital competence, including <b>AI literacy</b> , ethical AI usage, data literacy, and critically assessing AI-generated information. Teaching students how to use AI tools effectively, such as prompt engineering.
<b>Data Literacy</b>	Ability to <b>interpret and utilise data generated by AI tools</b> to understand student learning patterns, identify areas of difficulty, make data-informed decisions, and tailor instructional approaches. Understanding AI-based data analysis and evaluation tools like MAXQDA. Awareness of data privacy and security concerns.
<b>Ethical Awareness and Critical Thinking</b>	Understanding the <b>ethical implications</b> of using AI. Awareness of <b>data privacy and security, algorithmic bias</b> , equity, fairness, and transparency. Critically assessing AI-generated content for quality, accuracy, and potential bias. Understanding issues like copyright.
<b>Transversal Skills</b>	Communication, collaboration, problem-solving, <b>creativity</b> , emotional intelligence, adaptability, and <b>lifelong learning</b> . Balancing technology with human interaction. The teacher's role is evolving towards a learning coach, facilitator, mentor, and ethical guide.

Despite the growing importance of AI in education, many sources indicate that there is a significant skills gap among teachers. Educators often report a lack of knowledge, adequate technical support, and specific training on how to effectively incorporate AI into their teaching practices. Existing teacher education and continuous professional development (CPD) provisions are often seen as insufficient in developing teachers' digital literacies, including AI literacy. Therefore, focused studies and investment in teacher training are considered crucial

for building supportive classrooms where AI can be used effectively and ethically to enhance learning experiences for all students. Policies must also be developed to support this training.

## How can we engage teachers and trainers in using AI for teaching migrants

Engaging teachers and trainers in using Artificial Intelligence for teaching migrants requires a multifaceted and strategic approach that directly addresses their current skills, concerns, and needs, while highlighting the potential benefits for both educators and learners.

### **Provide Comprehensive Professional Development and Training:**

It is important to acknowledge the significant skills gap reported by teachers regarding AI integration. Many teachers feel they have not received enough specific training. Training should go beyond basic technical skills to include pedagogical approaches to using AI, data literacy, and critical evaluation of AI tools and content. In order for this to happen, policymakers and institutions need to first establish relevant policies and provide financial support for teacher training and professional growth.

### **Build Specific AI and Digital Literacy Skills:**

There needs to be a focus on developing AI literacy in educators and trainers, recognising that while migrant learners need to develop AI literacy themselves, educators need to be equipped to teach this. Prior digital literacy levels vary among both teachers and migrant learners, and training needs to account for this. Teachers may be more familiar with basic digital tools than AI, and migrants may be more familiar with social media on mobile devices than with computers or complex online systems.

### **Focus on Practical Pedagogical Applications:**

Educators need to see how AI can support teachers in concrete tasks such as preparing teaching materials, distributing and grading assignments, providing feedback, and facilitating classroom discussions or interactions. Examples of how AI can help design and deliver personalised and adaptive learning experiences should also be provided.

### **Address Challenges, Build Confidence, and Foster a Positive Mindset:**

Guidance on navigating the ethical issues associated with AI, such as data privacy, algorithmic bias, and ensuring fair use should be provided. Transparency about data usage and AI limitations is crucial.

### **Foster Communities of Practice:**

Facilitate collaboration among teachers to share experiences, challenges, and best practices in using AI. Spontaneous discussions are common, but structured opportunities are also needed.

Build a community of practice around AI use in migrant education.

### **Involve Teachers (and Learners) in the Design and Selection Process:**

Include educators and other personnel in the design of technology-supported programs to ensure instructional effectiveness.

Consult with and involve migrants and refugees in the design of ICT/AI-supported programs. A user-centric approach is crucial.

## **Conclusion**

The integration of Artificial Intelligence (AI) into migrant education presents transformative opportunities to address unique challenges such as language acquisition, cultural adaptation, and diverse learning needs.

However, successful implementation requires overcoming significant hurdles, including infrastructure disparities, ethical concerns, and a lack of teacher preparedness. Comprehensive professional development, fostering AI literacy, and adopting user-centric design principles are critical to building educator confidence and ensuring equitable access.

Future efforts must prioritise rigorous research on AI's long-term impact, develop ethical guidelines, and strengthen partnerships among educators, policymakers, and technology providers. By balancing innovation with inclusivity, AI can serve as a powerful tool to bridge educational gaps and empower migrant learners in their integration journeys.

The AI Cookbook project aims to exemplify this potential, translating theoretical insights into actionable strategies. As AI evolves, continuous collaboration and adaptive practices will be essential to harness its full potential while safeguarding the values of equity and human-centered education.

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