Erasmus+

Manual of Artificial intelligence

Uses and advantages in Vocational Training

GRAIL Project

GRAIL Project

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PARTICIPATING ENTITIES:

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1. The Erasmus+ GRAIL project and this manual

This manual is presented as a practical resource designed to support vocational education and training (VET) teachers in the European Union in the gradual integration of artificial intelligence into their teaching and learning processes. Its approach is highly applicable: it combines pedagogical principles, methodological guidelines, and proposals for the real-world use of AI tools in educational contexts, with a particular focus on inclusion, personalized learning, and the development of digital skills.

The Manual originated as one of the main outcomes of the Erasmus+ GRAIL project and its primary objective is to equip teachers to use AI as an educational tool, not only from a technical perspective, but also from an ethical and pedagogical one. Throughout the document, key AI concepts are presented, along with examples of classroom applications, practical activities, and recommendations for integrating these technologies into vocational training in a responsible and meaningful way. In this way, the Manual combines concise theoretical content with practical proposals, enabling teachers to quickly move from understanding to action in the classroom.

1.1 Erasmus+ GRAIL Project (*General Resources for Artificial Intelligence Learning*)

The GRAIL Project (General Resources for Artificial Intelligence Learning) is a European initiative funded by the Erasmus+ program (KA210-VET), specifically designed to support Vocational Education and Training (VET) in the digital age. Its core mission is to provide resources, training, and strategies so that VET teachers can integrate Artificial Intelligence (AI) in a pedagogically sound and ethical manner into their educational practice.

The reason for GRAIL's existence lies in three major current educational challenges:

- The digital transformation of the labor market requires students and teachers to develop skills in AI.
- Many vocational training teachers lack practical training in AI tools.
- AI offers unique opportunities to personalize learning, promote inclusion, and modernize educational methodologies.

Therefore, the GRAIL Project seeks to train vocational training teachers in the pedagogical use of AI tools through:

- ✓ The development of accessible teaching resources (manuals, video tutorials, etc.) for classroom use.
- ✓ Promoting innovative methodologies that integrate AI into teaching and learning processes.
- ✓ Promoting international cooperation between educational and public entities in Europe.

- ✓ The contribution to inclusion and personalization of learning through technology.

With this, the GRAIL Project aims to offer vocational training teachers a practical and collaborative framework and an international educational network with shared experiences and resources so that they can acquire educational skills in AI and design more personalized and equitable learning experiences by integrating emerging technologies into the curriculum in a pedagogical way.

Furthermore, GRAIL helps vocational training centers respond to the labor and technological challenges of the 21st century, strengthening employability and educational innovation.

1.2 Collaborating entities in the GRAIL Project

GRAIL is based on an international collaboration between organizations from Spain, Portugal and Poland, with different expertise in education, digitalization and training.

1.2.1 Spain

IMAGINA, Educación y Ocio SL

Educational consultant with extensive experience in training and digital skills programs. She acts as project coordinator and is responsible for ensuring that activities are implemented with quality and pedagogical coherence.

Colegio Salesiano Nuestra Señora del Rosario, en Rota (Cádiz)

A private school in the city of Rota, in the province of Cádiz, which is part of the Salesian network founded by John Bosco. It offers a comprehensive education based on values, close support, and personal development for students, combining academic training with social and human support.

1.2.2 Portugal

Câmara Municipal de Mértola

A public entity in the municipality of Mértola (Alentejo region) that promotes digitalization and local education. It contributes expertise in digital inclusion and territorial education policies, collaborating with vocational training centers such as Escola Profissional ALSUD – Mértola to ensure that the project meets the real needs of teachers and students.

Escola Profissional ALSUD – Mértola

A vocational training center located in Mértola, managed by an educational cooperative established in 2008 to ensure the continuity of vocational education in the area. Its main mission is to offer technical training to young people and adults, tailored to the needs of the region and geared towards employment, with a strong connection to its local environment. It develops projects related to biodiversity, culture, and sustainable development, and collaborates with numerous social and educational organizations.

1.2.3 Poland

Fundacja Intelligent Technologies

A non-governmental organization specializing in digital education, digital skills development, and assistive technologies. Its contributions include the design of innovative educational tools and strategies to improve teaching in diverse contexts.

Omega Group

A business ecosystem focused on information technologies, telecommunications, and digital infrastructure (ICT), with a history closely linked to the development of the internet and networks in Poland since the 1990s. Its activity is geared towards the digital transformation of companies and spaces (offices, buildings, data centers, etc.), developing advanced network and telecommunications infrastructures for businesses and organizations. Furthermore, it participates in discussions and projects connecting technology, business, and education in the age of artificial intelligence.

1.3 Structure of this Manual

This manual is organized into progressive blocks that allow the reader to advance from a general understanding of AI to its concrete application in vocational training environments. In summary, its structure is organized into the following sections:

- **Introduction to the GRAIL project and the role of AI in education,** where the manual is contextualized and the general objectives are presented.
- **Fundamentals of Artificial Intelligence,** with an accessible approach to the basic concepts and their impact on education and the labor market.

- **AI applied to teaching practice,** focused on the educational use of specific tools (such as conversational assistants, content generators or learning support platforms).
- **Methodologies and use scenarios in VET**, including examples, activities and teaching proposals aimed at personalization, inclusion and pedagogical innovation.
- **Ethical and pedagogical considerations,** addressing aspects such as the responsible use of AI, data privacy, and students' critical thinking.
- **Supplementary resources and materials** that facilitate the direct transfer of the manual's content to the classroom.

This organization responds to a practical and modular approach, allowing teachers to use the manual in its entirety or consult only those sections that are most relevant to their educational context.

1.4 Who can use this Manual

This manual is primarily intended for:

- **Vocational Training Teachers (VET/FP)** from any professional family interested in integrating AI into their teaching practice.
- **Trainers of adults** linked to professional qualification or requalification programs.
- **Management teams and pedagogical leaders** of vocational training centers that wish to promote educational innovation processes supported by AI.
- **Technical and educational staff** involved in projects of digitization, inclusion and modernization of teaching.

Although the main focus is on vocational training, the manual has been designed with accessible language and transferable proposals, so it can also be useful for other educational levels and for professionals in the field of education and training interested in the potential of Artificial Intelligence.

The GRAIL Manual is intended to be a living and flexible document, so that it can be used both as individual self-training material and as a support guide in collective training actions, workshops or innovation processes in educational centers.

2. What is Artificial Intelligence and its importance in education

Education is going to have to change.
AI is like a calculator for words and thought.
We won't stop teaching writing or reasoning,
but the way we do it will evolve radically.
It will be an incredible tool for amplifying human potential.

Sam Altman (CEO of OpenAI)

Artificial Intelligence (AI) is an emerging technology with significant transformative potential in various sectors, including education, such as Vocational Training (VT). Its rapid development raises numerous challenges and debates within education.

AI is defined as a branch of computer science focused on the design and development of algorithms and systems that exhibit intelligent behavior and can perform tasks that normally require human intelligence, such as reasoning, learning, problem-solving, image recognition, or decision-making.

Artificial intelligence systems operate using algorithms and mathematical models that analyze large volumes of data, identify patterns, and generate responses or predictions based on that data. This data can include text, images, sounds, and more, serving as the foundation for AI to generate coherent, innovative responses tailored to the human request. Thus, unlike traditional computer programs, AI systems can improve their performance with experience, as they learn as they are used. For example, if we use an AI system to prepare a marketing module, the AI not only searches its general database but also the data we have previously uploaded (questions about similar notes, notes about our students, searches related to the topic, etc.) to adapt its response to our needs. This is what is known as "training" the AI.

Artificial intelligence is now present in many areas of daily and professional life, from virtual assistants and recommendation systems to industrial, healthcare, and educational applications. In this chapter, we will explore the types of AI systems that exist today and how they can be used in education.

2.1 Classification of AI

AI is broadly classified according to its scope or ability to solve tasks:

1. **General AI (Strong AI)**

   It is an AI that would possess the ability to understand, learn, and apply its intelligence to any problem, similar to human intelligence. Currently, this type of AI does not exist, but it is the long-term goal of much research.

2. **Weak AI (Restricted or narrow AI)**

   This is the AI currently available. Its systems are designed and trained to efficiently perform a specific task, such as translating text, recognizing speech, recommending content, or grading exercises; however, their capabilities are limited outside of that specific domain. It lacks general awareness and understanding, but can be highly effective within its area of application. Examples of weak AI include virtual assistants (such as Siri or Alexa), recommendation systems on streaming or shopping platforms, and bank fraud detection systems.

Also, according to its function, we can divide it into:

- **Rule-based systems**

  They operate based on predefined instructions and rules. They don't learn on their own, but they can be useful in highly structured contexts.

- **Machine Learning (Machine *Learning* – ML or AA)**

  It allows systems to learn and improve automatically from data and experience, enhancing their performance without being explicitly programmed for each step. It relies on mathematically based algorithms that analyze large amounts of data to identify patterns and build models that can predict future values or classify new input data. These include, among others, classification, prediction, and recommendation models.

- **Deep *Learning***

  It uses deep neural networks to process large volumes of data and generate complex predictions. It is especially effective in image, audio, and natural language recognition.

Finally, we can divide AI systems into two subtypes:

- **Classical AI**

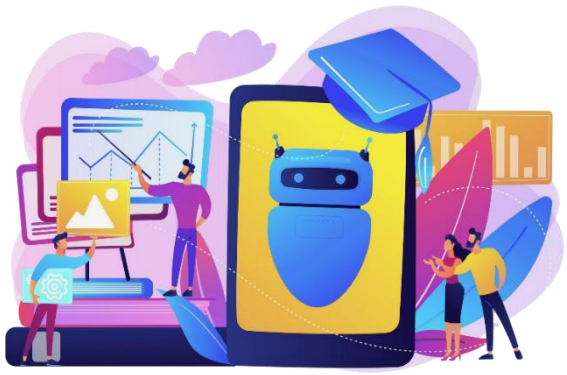
  It is characterized by the use of an expert system composed of a fixed algorithm (inference engine) that logically chains together a series of rules drawn from expert knowledge ("If... then..."). These systems are designed to analyze information, recognize patterns, and make decisions based on existing data, following pre-trained models or defined rules. In other words, they answer a

specific question or perform a specific task by working with structured data to produce predictable and bounded results. Thus, their main function is to classify, predict, recommend, or optimize, but they do not create new content; rather, they act on information that is already available. Some examples of this type of AI are recommendation systems (for movies, products, content, etc.), automatic grading of multiple-choice tests, and medical diagnostic systems.

- **Generative Artificial Intelligence (IAGen)**

  This is a more recent type of artificial intelligence capable of creating new content from the data with which it has been trained. Its main capability is generating original content (text written in natural language, images, videos, music, software code, etc.) in response to written instructions (called "prompts"), allowing for open interaction with the user. Thus, Gen AI is not limited to choosing a response from existing options, but rather produces new content, new sequences, or representations, maintaining coherence and meaning. However, its results can be inaccurate and even unreliable, since these tools do not understand the instructions or the generated result, and depend entirely on the data with which they were trained. This is the type of AI we will focus on throughout this manual.

2.2 AI in education



AI is profoundly changing the education sector by introducing technologies that optimize both the teaching and learning processes. Its impact on education systems is growing, and its integration into Vocational Training (VET) programs is essential, given the growth of this type of training in Europe and its close relationship with the world of work and technological advancements.

Numerous studies have explored the importance and impact of AI in education. One of the most significant is the "Teaching and Learning International Survey" (TALIS), an international study by the Organization for Economic Co-operation and Development (OECD) that analyzes teachers' working conditions and the management of educational institutions, comparing practices in different education systems and the opinions of professionals from various countries. According to the TALIS 2024 report, teachers believe that the use of AI in their work presents both benefits and risks. Eighty-five percent of teachers believe it is motivating, while 50% believe it is distracting. The teachers surveyed primarily use it for planning (64%) and summarizing (68%). Although 50% believe it helps diversify personalized lesson plans, 70% of teachers fear plagiarism.

This is not the only risk perceived by teachers, who also warn of algorithmic biases, lack of privacy, and excessive dependence and lack of pedagogical regulation.

The average percentage of teachers using AI in the OECD is 33%, with Singapore and the United Arab Emirates leading the way in its use in education (75%), while France and Japan have the lowest rates (approximately 20%). Thus, TALIS 2024 acknowledges the potential of AI in classrooms, but its systemic integration into educational policies and working conditions is still in its early stages.

2.3 Benefits of AI in Vocational Training

In the European context, artificial intelligence literacy is considered a strategic element for quality, inclusive and future-oriented education, in which vocational training teachers play a key role as mediators, guides and pedagogical references.

Among the main applications and advantages of using AI in education are:

- **Personalization and optimization of learning**

  AI allows for content adaptation, provides immediate feedback, automates routine tasks, and generates personalized learning resources, improving the quality and effectiveness of the educational process. AI tools such as adaptive learning platforms (e.g., Duolingo for languages or Khan Academy with integrated AI) adjust the pace and content according to the student's profile. In vocational training, this is useful for practical modules: an AI can generate personalized tutorials for a student with dyslexia, using voice-over and simplified visuals, or simulate real-life scenarios for students with reduced mobility.

- **Sensory and cognitive accessibility**

  The personalization we've discussed is fundamental to improving educational inclusion and integration for students with sensory disabilities. For example, for people with visual impairments, AI-powered screen readers (such as Google Lens or Microsoft Seeing AI) can be used to describe technical diagrams aloud, ideal for blueprint drawings in vocational training programs for mechanics, for instance. Meanwhile, for people with hearing impairments, real-time transcriptions can be generated with tools like Otter.ai or OpenAI's Whisper, which convert workshop presentations or lectures into editable text, facilitating inclusion in the noisy environments typical of education. Regarding a cognitive approach, predictive AI (e.g., systems like IBM Watson) analyzes performance patterns to identify difficulties early on, such as in a programming module where a student with ADHD receives gamified reminders.

- **Social and cultural inclusion**

  Regarding the increasing ethnic diversity in classrooms, AI can facilitate teaching by translating content in real time (e.g., Google Translate with an educational

context) for immigrant students in vocational training, or by generating inclusive virtual avatars in VR simulators to avoid gender or ethnic bias in traditionally stereotyped studies.

- **Support for teaching**

  Artificial intelligence can act as a support tool for teachers, not replacing their pedagogical role, but rather reinforcing it. Its use allows for optimized time management, improved student support, and enriched teaching and learning processes through instructional planning and design (helping to create learning activities or situations adapted to the different professional profiles present in vocational training); formative assessment and monitoring (automatic correction of objective tests, analysis of student progress, and early detection of learning difficulties, enabling more personalized tutoring and better educational support); and improved attention to diversity, as discussed in previous sections.

- **Development of digital and professional skills**

  Understanding and using AI helps students acquire key skills for their future employment in an increasingly digital market. It is a fact that AI will be a crucial tool in numerous professions in the very near future. Therefore, if the goal of vocational training is to prepare students for the workplace, teaching the use of AI is essential in this type of study. Using AI in the classroom helps students learn to interact with these systems, understand their capabilities and limitations, and use them effectively and safely. Furthermore, in certain professional sectors where AI is already used daily (healthcare, administration, technology, or creative fields, for example), teaching its use exposes students to real-world situations in the professional environment they aspire to pursue.

- **Promote autonomous learning**

  AI can support learning, allowing students to explore content, practice procedures, or resolve doubts, always under the guidance of the teacher. In this way, AI enables teachers to offer students support tailored to their level, pace, and needs, fostering greater autonomy without compromising educational quality. Furthermore, it can provide alternative explanations, additional examples, or break down complex tasks into simpler steps, and helps reinforce key concepts when frequent errors or persistent difficulties are detected. Thus, students can use AI to review their own work, identify areas for improvement, and compare different solutions to the same problem. This support helps students progress with greater security and confidence in their own learning process. On the other hand, AI can help students take a more active role in their learning, facilitating guided information searches, the exploration of alternatives, and informed decision-making.

- **Promoting critical and ethical thinking**

  Finally, integrating AI into the classroom offers an opportunity to reflect on the responsible use of technology, data protection, algorithmic biases, and the social impact of automation. A responsible and critical use of AI allows students to learn to question AI-generated results, compare sources, detect errors or biases, and avoid uncritically accepting answers. Likewise, understanding that AI is not neutral, that it depends on the data it is trained on, and that it can reproduce inequalities or stereotypes is key to responsible digital citizenship. For all of this, a well-trained and aware teaching staff is essential to guide students toward responsible use and promote values of transparency, privacy, authorship of work, and respect for European regulations and frameworks.

2.4 Practical Examples of AI Tools for Vocational Training Teachers

The following table details some AI-based tools and apps that may be useful for vocational training teachers.

Tool	Practical use	Benefit	Example
Chatbots (ChatGPT, Gemini, etc.)	- Design learning situations or adapted educational plans. - Create professional practical scenarios (real cases, incidents, challenges, etc.) - Develop assessment rubrics, criteria, and competency descriptors. - Adapting the same content to different levels of students	Time savings in planning and instructional design, allowing teachers to focus on pedagogical support and student attention.	Generate a practical customer service case study for a Commerce and Marketing cycle or a social intervention scenario for Social Integration
Evaluation and feedback (Google Forms, Gradescope, etc.)	- Correction of theoretical questionnaires. - Generating indicative feedback on written work. - Detection of common errors or unachieved competencies. - Monitoring of individual and group progress	Improvement of formative assessment, by facilitating more continuous and detailed monitoring of student progress	Analyze which learning outcomes present the most difficulties in a technical module and adjust the programming accordingly.
Personalization and accessibility	- Adapting materials for students with different learning	They facilitate attention to diversity, adapting materials	Transforming labor or technical regulations into a

(Immersive Reader, Read&Write, etc.)	paces and special needs. - Convert technical texts into more accessible explanations. - Facilitate access to content in different formats (audio, diagrams)	and explanations to different learning paces and needs.	comprehensible summary for the first year of vocational training
Image generation and visual resources (Dall-E, Nano Banana, Midjourney, etc.)	- Create visual diagrams of technical processes. - Design posters, prototypes, or project materials. - Supporting the understanding of complex concepts	They improve the understanding of complex processes and concepts, especially in technical and practical modules.	Generate an explanatory image of an industrial process, facility, or professional workspace
Support for projects and professional documentation (Notion AI, Grammarly, etc.)	- Support in the drafting of technical reports, memoranda or projects. - Structuring professional documents. - Linguistic revision and improvement of clarity.	They strengthen communicative and professional competence, helping students to structure and present work according to workplace standards.	To accompany students in the preparation of a final project report, encouraging critical review
Teaching organization and management (Notion AI, Trello, etc.)	- Project organization and schedules. - Summary of educational or technical regulations. - Preparation of teaching guides for students.	Optimization of teaching organization, facilitating task management, documentation and project planning.	Summarize occupational risk prevention regulations adapted to a specific professional family
AI simulation (Labster, PhET Interactive Simulations, etc.)	- Virtual simulations of laboratories or workshops, accessible via the web for students with physical limitations	It allows for remote practice, essential for students in rural areas or with family care.	In healthcare, an AI simulation of medical procedures that adapts to individual paces, including subtitles and voice controls

3. Teaching Competencies in AI

I believe we are on the cusp of using artificial intelligence
to achieve the greatest positive transformation education has ever seen.
AI will not replace teachers, but will be the
best teaching assistant for every teacher
and an all-knowing personal tutor for every student.

Sal Khan (Founder of Khan Academy)

The development of teaching competencies is a fundamental pillar, especially given the urgent and widespread need for AI training for both teachers and vocational training students. This training is essential for AI to reach its full potential in the educational context. Therefore, a minimum level of AI training is considered indispensable for teachers to facilitate the teaching and learning process and improve the quality of education through more personalized and interactive learning.

This training must be continuous and cover three interconnected areas:

- **Teaching about AI**: This involves understanding the fundamentals of AI, how algorithms and data work, and how models are trained.
- **Teaching for AI**: Developing the skills needed to interact confidently, critically, and securely with systems. This includes prompt engineering (descriptive instructions for AI) and fostering computational thinking; that is, understanding biases in data, using computational thinking to solve problems, and critically reflecting on data protection.
- **Teaching with AI**: Integrating AI into pedagogical practice to enhance the teaching and learning process. This involves the educational use of these tools, including understanding how algorithms work, pedagogical models, and data usage.

We will delve deeper into these concepts in this chapter, with practical examples of AI training strategies.

3.1 Global AI Competency Framework for Teachers

The AI Competency Framework for Teachers is an international guide proposed by UNESCO that defines the knowledge, skills, values, and attitudes teachers need to use artificial intelligence responsibly, effectively, and pedagogically in education. It is, therefore, a professional framework designed specifically for teachers, with the aim of guiding their development in relation to AI in education. It is not intended to establish a curriculum for teaching in-depth technical AI, but rather a structure that helps teachers integrate AI into their teaching practice and their own professional development.

In this sense, it describes 15 necessary competencies for teachers that cover five aspects and three levels.

The five interrelated aspects or dimensions:

1. ***Human*- centered mindset**

   Define the values and attitudinal orientation that teachers need to develop toward human-AI interactions. This includes being aware of the importance of human action when evaluating and using AI tools.

2. **AI Ethics**

   Describe the essential ethical principles, regulations, and institutional laws that teachers need to understand and apply for the safe and responsible use of AI, including privacy, transparency, and fairness in educational contexts.

3. **Fundamentals and applications of AI**

   It specifies the necessary conceptual knowledge and operational skills. This enables teachers to understand the definition of AI, how models are trained, the main categories of technologies, and how to creatively customize AI tools for student-centered teaching environments, thus enabling the safe and effective use of AI in the classroom.

4. **AI Pedagogy**

   It proposes competencies for the intentional and effective integration of AI into teaching. This includes the ability to validate and select appropriate AI tools and integrate them into pedagogical strategies for course design, teaching, learning, socialization, and assessment.

5. **AI for Professional Development**

   Describe the skills needed for teachers to use AI to drive their own continuous professional learning, collaborative professional development, and the transformation of teaching practice.

Furthermore, the Global Teacher Competency Framework indicates three levels of progression of teaching competencies, designed to support all teachers, from those with no knowledge to those with advanced experience:

- **Level 1. Acquire (AI Literacy)**

  It defines the essential set of skills that every teacher needs. The curricular objective is for all teachers to reach a basic level of AI competence (literacy). This involves acquiring basic knowledge about how AI works, its benefits and risks, and knowing how to identify and leverage its pedagogical advantages.

- **Level 2. Go deeper**

  It is aimed at teachers with some knowledge and experience. It seeks to help teachers skillfully integrate AI into educational practices, focusing on the design and facilitation of student-centered teaching practices, mitigating risks, and promoting empathy and critical thinking.

- **Level 3. Create**

  Aimed at educators with a strong background and extensive experience in AI, this level fosters advanced skills such as competently customizing or modifying AI tools, co-creating new AI applications to address inclusive accessibility and personalized learning needs, and exploring the ethical and transformative application of AI.

The Global Teacher Competency Framework guides the development of national AI competency frameworks, provides input for teacher training programs, and helps design assessment parameters. It also offers strategies for teachers to develop AI knowledge, apply ethical principles, and support their professional growth.

3.2 Specific pedagogical and training strategies

To ensure the successful integration of AI into vocational training, training strategies must be practical and aligned with the needs of the environment:

3.2.1 Critical prompt engineering

Teachers need experience in the engineering and critical evaluation of prompts (descriptive instructions for IAGen). This skill is vital for teachers to be able to carefully specify what the curriculum or lessons should cover and achieve. Thus, the following steps can be followed to construct an effective prompt in a vocational training cycle, for example, in Healthcare:

- Specify the educational context: Indicate the vocational training level (e.g., Intermediate or Advanced Vocational Training in Healthcare), the module or topic (e.g., "Patient Care" or "Hygiene Techniques"). Define the students' level (e.g., beginners with basic knowledge), the lesson duration (e.g., 45-60 minutes), and the format (face-to-face, online, or hybrid).

- Mention the curriculum: Align it with current regulations in your country or region, highlighting key competencies such as, for example, in a Health module, "Attending to the patient considering their cultural diversity."
- Incorporate cultural diversity: Ask for inclusive examples, including users from diverse backgrounds (migrant communities) and with diverse cultural practices (e.g., beliefs about health in Islamic or indigenous cultures).
- Focus on awareness: Address barriers such as language, traditions or stigmas (e.g., care tactics in traditional Chinese medicine vs. Western protocols).
- Avoid bias: Specify elements such as "use neutral and inclusive language, without gender or cultural stereotypes."
- Structure the lesson: In such a way that there are clear sections (learning objectives, practical activities, assessment, materials, etc.)
- It includes interactive elements: Group activities with simulation of multicultural scenarios, to promote empathy and health skills.
- Adaptations: Propose modifications for students with special educational needs (for example, pictograms for linguistic diversity).
- Sources: Ask for references to regulations (e.g., Patient Rights Act) or multicultural guidelines (e.g., WHO on cultural health).

Example of a Complete Prompt: "Create a complete 60-minute lesson for a 'Patient Care' module in the Intermediate Vocational Training Cycle in Auxiliary Nursing Care. The topic is 'Intercultural Communication in Healthcare.' Include cultural diversity: examples of patients from Latin America (e.g., Andean customs), Sub-Saharan Africa (e.g., traditional practices), and Asian communities (e.g., Ayurvedic beliefs). Structure: 1) Objectives (aligned with Royal Decree 1085/2020: competencies in empathy and communication); 2) Introduction (10 min, with a short video); 3) Development (30 min, role-playing with multicultural scenarios); 4) Conclusion (15 min, group reflection and assessment rubric); 5) Materials (accessible, neutral, and inclusive). Use neutral language, without gender or cultural bias. Emphasize adaptation to diversity (e.g., interpreters or materials in multiple languages)." Total duration: 60 min, for 20 adult students.

3.2.2 Monitoring and collaboration

Teachers are the primary users of AI in education and key mediators. Training should empower them as designers and facilitators of student learning with AI, and as guardians of safe and ethical practices.

In the design of AI-powered learning environments, monitoring and collaboration are not merely administrative tasks, but pedagogical strategies that position teachers as

ethical guardians on shared platforms, such as eTwinning. These platforms facilitate the co-creation of educational resources among schools in different countries. However, without ethical oversight, they can amplify biases (for example, Eurocentric datasets in generative AI) or violate privacy (for example, data on students with special educational needs in shared repositories). The teacher's role, in this sense, is to ensure integrity, acting as a human filter that combines professional judgment with AI tools.

Therefore, teachers must:

- **Detecting and mitigating biases**

  On platforms like eTwinning, where AI prompts for simulations are shared, teachers must review outputs to eliminate stereotypes. For example, in an Erasmus+ healthcare vocational training project, a teacher moderates a shared repository of AI-generated clinical cases, requesting inclusive reformulations (e.g., «Include perspectives of African patients with sensory disabilities»).

- **Ensuring privacy and consent**

  In collaborative environments (e.g., Moodle shared on EU networks), teachers must monitor data flows to ensure compliance with the General Data Protection Regulation (GDPR). For students with special educational needs (SEN), this means verifying that sensitive profiles are not shared without anonymization.

- **Promote inclusive collaboration**

  As guardians, teachers facilitate inter-center dialogues (e.g., Erasmus+ webinars), where AI generates drafts (e.g., multicultural rubrics), but humans provide cultural validation. For example, in an EU trade vocational training program, a teacher could lead a shared forum to audit AI-generated materials, integrating input from diverse students (e.g., North African immigrants in customer service modules). This develops skills such as intercultural empathy.

3.2.3 Continuous training and adaptation

Professional development for teachers in AI is not a one-off event, but a continuous and ongoing process that spans their entire career, from initial training to retirement, acknowledging the rapid evolution of technology (for example, the emergence of generative AI post-2022). In vocational training, where contexts are unique, for example, regarding migrant students and students with special educational needs, programs must be flexible and adaptive, allowing for customization by center, module, and student diversity. This aligns with what was discussed in the previous section on the Competency Framework for Teachers in AI, which proposes progressive levels (acquire → deepen → create) and emphasizes adaptation to volatile environments.

Some aspects to consider in this continuing education:

- **Continuity**

  Training doesn't end with the qualification; it should be year-long, with cycles of 20-40 hours (for example, EQF micro-credentials for vocational training). Various studies and surveys Studies conducted by CEDEFOP (European Centre for the Development of Vocational Training) report that almost 70% of vocational training teachers express the need for continuous updating in AI to avoid digital divides in practical modules.

- **Flexibility and Contextualization**

  Programs should be modular to allow adaptation to specific needs. For example, a rural context, where the focus should be on offline AI to avoid connectivity and coverage problems, is not the same as an urban environment with international connections that can better leverage transnational collaboration via Erasmus+. In this sense, platforms like EPALE offer numerous customizable resources, integrating cultural diversity.

- **Integration of Rights, Working Conditions and Qualifications**

  Vocational training must explicitly review legal and professional frameworks for the AI era. It must therefore stay current with GDPR updates to guarantee the rights of teachers and students, address the impact of AI on their working conditions (maintaining a human-AI balance), and update profiles with certifications. In this regard, the Cedefop working paper *Exploring the emergence of microcredentials in vocational education and training* argues that EQF microcredentials represent an "emerging tool" that can expand the potential of vocational training, orienting its training towards in-demand job skills and adapting to market needs. In a context where technologies (such as AI) are evolving rapidly, constant updating is essential. Thus, an EQF certificate ensures standardization, recognition, quality, and European comparability, which is vital for teacher mobility, the transfer of skills between countries, and market confidence in those skills.

This continuing professional development also faces a number of challenges. The first is the need for institutional support, as it would be beneficial for vocational training centers to assign mentors who dedicate, for example, 10% of their working time to AI training, with incentives such as EQF bonuses. Another challenge is the excessive workload. A recent survey (September 2025) by CEDEFOP of vocational training teachers highlights "high workloads, overcrowded classrooms, and difficult working environments" as factors affecting the quality of training.

3.2.4 Focus on self-assessment

Self-assessment is a cornerstone of teacher training, fostering critical reflection on competencies. AI elevates this from a manual process to a dynamic and personalized one, enabling teachers to analyze their practices, identify errors they may be unaware of (for example, specific guidelines for migrant students), and design tailored activities. Thus, traditional teacher reflection (for example, post-session journals) is enriched by AI acting as an "intelligent mirror," as it allows for the analysis of evidence (for example, in class recordings) to generate ethical and inclusive *insights.* For instance, by showing the content of a session to the AI, it can be questioned about its appropriateness ("Is the simulation I generated for this module appropriate for migrant students with special educational needs?").

AI-powered self-assessment can be performed with:

- **Reflective Prompts**

  Use of generative AI (e.g., ChatGPT) for guided questions. For example, "Analyze this vocational training session on multicultural healthcare: What biases do you identify in my AI prompt? Suggest adjustments to ensure inclusion."

- **Automated analysis**

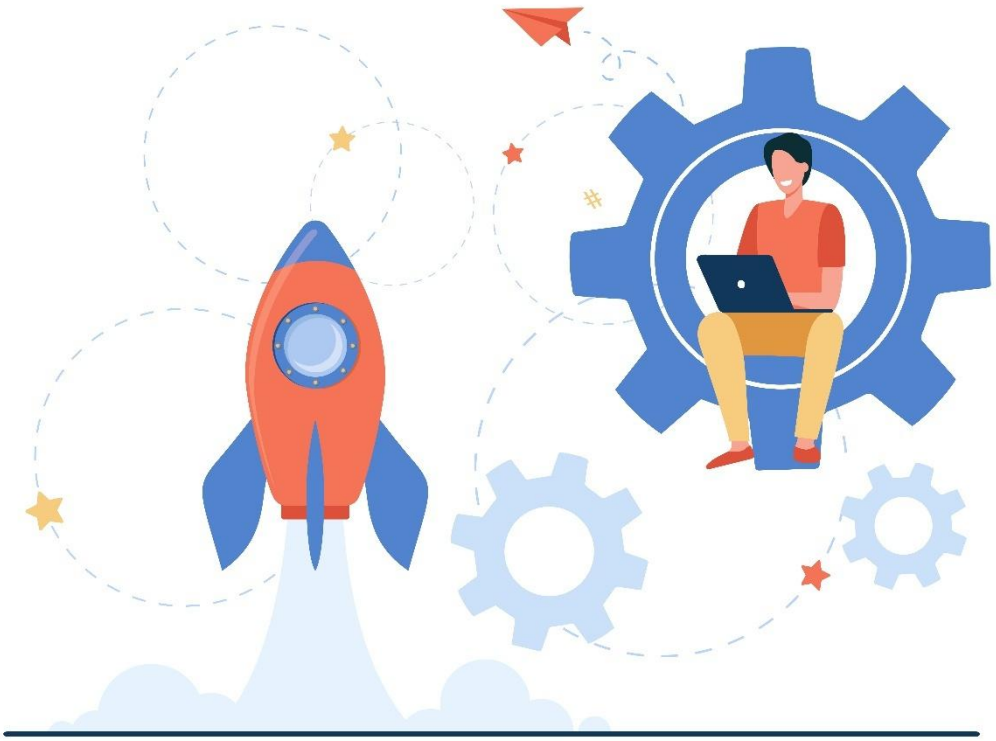
  Platforms like Microsoft Teams with AI (or Moodle plugins) process teacher/student feedback, identifying errors.

3.2.5 Institutional Leadership

It is essential that educational institutions continue to prioritize the integration of AI technologies into their training programs, ensuring that it is not *ad hoc* but rather a coherent ecosystem encompassing the entire teaching career. This counteracts inequalities in classrooms with diverse needs. This UNESCO report warns of the uneven adoption of AI in vocational training centers in Europe, pointing to infrastructure limitations, digital trust gaps among teachers, ethical concerns, and a lack of clear institutional guidance that lead to fragmented implementation. Therefore, programs must be comprehensive, with allocated budgets and annual evaluations.

Phases of a comprehensive AI training program:

- Prior preparation: Initial AI knowledge programs, for example, inclusive prompt design.
- Continuing education: Annual courses (e.g., 10-20 h Erasmus+) focused on continuous and more specific updating (e.g., generative AI for SEN personalization in vocational training).
- Support in the educational center: Local resources at the service of teachers, such as AI labs in vocational training centers, with institutional mentors for daily implementation.
- Peer tutoring: Use of horizontal networks, such as eTwinning, where other teachers can share educational practices with AI.



4. Generation of educational material with AI

The true value of AI lies not in the machine learning on its own,
but in how it helps people learn faster,
solve bigger problems, and be more creative.
In education, it will democratize access to high-level knowledge.

Satya Nadella (CEO of Microsoft)

Artificial Intelligence has become a key tool to facilitate the creation of educational material, contributing to a more up-to-date, flexible teaching aligned with the world of work, as well as representing a significant time saving for teachers, who can focus their efforts on more personalized aspects of teaching.

First, AI allows for the creation of materials contextualized to different professional sectors, adapted to the productive and social realities of European countries. This facilitates connecting content with real-world work situations, promoting practical and meaningful learning.

Furthermore, AI facilitates the adaptation of materials to different levels, paces, and student needs, promoting inclusion and equity, key principles of European education systems. The same content can be presented in various formats (simplified text, diagrams, visual resources, or audio), thus improving accessibility.

The generation of materials using AI also contributes to the constant updating of content, something fundamental in vocational training, where professional skills evolve rapidly. Teachers can review, adapt, and improve resources more efficiently, keeping them aligned with current regulations, technologies, and professional practices.

Finally, the pedagogical use of AI in the creation of materials promotes active learning and the development of transversal skills, such as digital competence, critical thinking and student autonomy, always under the supervision and guidance of the teaching staff.

During this chapter we will see and delve into different uses of AI in the generation of educational materials.

4.1 Lesson Plans

Lesson planning in vocational training requires integrating learning outcomes, professional competencies, the workplace context, and student diversity. Artificial intelligence can support teachers in this process, without replacing their pedagogical judgment, acting as a tool for design, adaptation, and improvement. Thus, through

various AI apps, teachers can automatically generate complete lesson plans. However, for this to be effective, teachers must define clear objectives and pedagogical criteria, and use AI to support the design process, not as an automatic generator without review.

In this sense, AI can help with the following tasks related to lesson plans:

- **Initial design of contextualized lesson plans**

  AI can help generate complete lesson structures based on clear instructions from teachers. It can propose learning objectives aligned with a module or unit, suggest key content related to a specific professional profile, or design a sequence of activities (beginning, development, and conclusion), incorporating active methodologies (Problem-Based Learning, case studies, simulations, etc.). For example: Creating a lesson plan on "Customer Service" for a Social Integration course, contextualized within a European social welfare service. Chatbots like ChatGPT or Gemini are particularly useful for this.

- **Alignment with European competencies and frameworks**

  AI can facilitate the pedagogical coherence of lesson plans with European frameworks by linking activities to learning outcomes and assessment criteria. It can thus connect lessons to key competences derived from national or European regulations, such as digital competence (DigComp), teaching competences (DigCompEdu), or transversal competences (teamwork, communication, autonomy, etc.). For example, it can review a lesson plan to ensure it develops both a technical competence and a basic digital competence. In addition to chatbots, other organizational apps like Notion AI can be useful for this purpose.

- **Adapting the plan to different levels and student profiles**

  As we've seen previously, one of AI's greatest strengths is adaptability. In this sense, apps like Canva or Immersive Reader can help us create variations of the same lesson plan for different educational levels, multicultural groups, or students with specific needs, adjusting the content, language, duration, and complexity of the activities.

- **Integration of practical activities and professional situations**

  AI can enrich lesson plans with activities based on real-world work scenarios by generating practical scenarios, real-life cases, or simulations. For example, it can design role-playing activities, incident resolution exercises, or decision-making exercises, such as a simulated job interview or a customer service scenario. In addition to chatbots, more specialized apps like VirtualSpeech or Mursion, which specializes in healthcare professions, can be used for this purpose.

- **Support for assessment within the lesson plan**

  AI apps can be used to integrate formative assessment from the planning phase by including assessment tools (rubrics, checklists, etc.) or self-assessment and

peer-assessment activities aligned with the plan's objectives and activities. For example, a simple rubric can be included to evaluate a professional practice activity carried out in the classroom. Assessment apps like Google Forms or Gradescope are useful for this purpose.

- **Review, improvement, and reuse of lesson plans**

  Finally, AI can also be useful in the reflection and continuous improvement phase, reviewing the coherence of the lesson plan, suggesting methodological improvements, or adapting a plan to another cycle, country, or European context. It can also facilitate the reuse and annual updating of materials. For example, updating a lesson plan to adapt it to regulatory or technological changes in the sector using apps like Notion AI.

Example of a prompt to create a lesson plan for a Vocational Training module in Mechanics:

"Role*: Acts as an expert teacher in European Vocational Training, specializing in Mechanics and active teaching-learning methodologies.*

Context: You must design a lesson plan for a vocational training module in the Transport and Vehicle Maintenance / Mechanical Manufacturing professional family (adjust if necessary), aimed at vocational training students in a European context.

Objective: To create a practical, competency-based, and workplace-oriented lesson plan that connects technical content with real workshop situations and promotes active learning.

Instructions: The lesson plan should include:

- *General information:*
  - ✓ *Lesson Title*
  - ✓ *Professional module*
  - ✓ *Level (Basic Vocational Training / Intermediate Vocational Training / Higher Vocational Training)*
  - ✓ *Estimated duration*
- *Learning outcomes and competencies:*
  - ✓ *Technical learning outcomes of the module*
  - ✓ *Professional and transversal skills (teamwork, communication, safety, basic digital competence)*
- *Professional context:*
  - ✓ *Real or simulated mechanical workshop situation (diagnosis, maintenance, repair or assembly)*
- *Sequence of activities:*
  - ✓ *Initial motivational activity (real problem situation)*
  - ✓ *Practical activities in workshops or simulated*
  - ✓ *Closing and reflection activity*
- *Methodology:*

- ✓ *Active methodologies (problem-based learning, project-based learning, or simulation)*

- *Assessment:*
  - ✓ *Assessment instruments (rubric, checklist, workshop observation)*
  - ✓ *Clear and observable criteria*
- *Attention to diversity:*
  - ✓ *Adaptations for different paces and levels of competition*
- *Safety and prevention of occupational risks:*
  - ✓ *Basic safety rules applicable to the lesson*
- *Connection with the European work environment*
  - ✓ *Relationship with FCT / Dual VET and with professional standards of the sector*

Output format: Presents the lesson plan in a clear, structured and concise manner, using sections and professional language accessible to vocational training teachers.

Ethical approach: Incorporates responsible use of technology, fostering critical thinking, safety, and student autonomy.

4.2 Worksheets

In addition to lesson plans, AI can generate worksheets that complement the content taught in class. These worksheets allow students to reinforce their learning through practical exercises, guiding their practice and connecting theory to the professional world. Artificial intelligence can support teachers in the design, adaptation, and improvement of these worksheets, ensuring they are competency-based, contextualized, and accessible, without replacing the teacher's judgment.

To improve the results that can be obtained with AI, it is important to describe the types of activities that you want to include, such as multiple-choice questions, open-ended questions, math problems, or research activities.

In this way, AI can help the teacher in the following aspects:

- **Quick worksheet design**

  Contextualized to the professional environment, with content adapted to a specific module, training cycle, and European context. Thus, the various chatbots available can propose real-world professional situations (workshop, company,

service, etc.), formulate step-by-step tasks related to professional processes, or include practical aspects as well as theoretical ones, always adjusting the language to the students' level. For example, creating a worksheet on the procedure for assisting a user.

- **Alignment with learning outcomes and competencies**

  Apps like chatbots or Notion AI can help ensure that the worksheet is aligned with learning outcomes, assessment criteria, and key competencies, linking each activity to a learning outcome, incorporating transversal skills (safety, communication, teamwork, digital competence, etc.), and formulating clear indicators of achievement. For example, a worksheet can be designed where each task indicates which professional competency is being developed, instructing the AI which competency framework to follow in its design.

- **Differentiation and attention to diversity**

  AI, through apps like Canva or Immersive Reader, facilitates the creation of adapted versions of the same worksheet, with different versions adapted to the level or special needs of the students, and with visual or auditory support.

- **Creating multimodal worksheets**

  AI allows you to enrich worksheets with visual elements and diverse formats, generating visual process diagrams, explanatory images, and integrating QR codes or digital formats with additional resources. For example, you can create a worksheet with a visual diagram of the mechanical system and associated questions using Canva or DALL-E.

- **Support for formative assessment through worksheets**

  AI can also help transform worksheets into formative assessment tools by creating them with clear marking criteria, brief associated rubrics, or self-assessment questions, facilitating immediate feedback. For example, with apps like Google Forms, a self-assessment of the procedure performed can be added at the end of the worksheet.

- **Review, improvement, and reuse of worksheets**

  Finally, AI allows for continuous improvement and updating of worksheets, checking the clarity of instructions, adapting the sheet to another cycle, country or European context, or updating the content according to technical or regulatory changes.

Example of a prompt to create a worksheet for a customer service module of a Vocational Training Intermediate Level Marketing and Commerce course:

"Role: Acts as an expert teacher in European Vocational Training, specializing in Marketing and Commerce, with experience in customer service and active methodologies.

Educational context: Design a worksheet for students of Intermediate Level Marketing and Commerce, within the Customer Service module, in a European professional context (face-to-face and digital commerce).

Objective of the worksheet: For students to practice customer service skills, professional communication and incident resolution, applying real procedures from the commercial sector.

Instructions for the worksheet: The worksheet must include:

- *Identifying information:*
  - ✓ *Title of the activity*
  - ✓ *Professional module*
  - ✓ *Level: Intermediate Level*
  - ✓ *Estimated duration*
- *Learning outcomes and competencies:*
  - ✓ *Learning outcomes related to customer service*
  - ✓ *Professional and transversal skills (communication, teamwork, digital competence, customer orientation)*
- *Simulated professional situation:*
  - ✓ *Clear description of a real-world context (physical store, e-commerce, or after-sales service)*
- *Tasks to be performed:*
  - ✓ *Step-by-step guided activities*
  - ✓ *Analysis and decision-making questions*
  - ✓ *Resolution of an incident or complaint*
- *Professional communication:*
  - ✓ *Short writing exercise or simulated response to the client (oral or written)*
- *Self-assessment and reflection:*
  - ✓ *Questions for students to evaluate their performance, language used, and professional attitude*
- *Evaluation criteria:*
  - ✓ *Clear and observable indicators (customer service, clarity of message, problem resolution)*
- *Attention to diversity*
  - ✓ *Proposal for adapting the activity to different levels of competence*

Output format: Presents the worksheet in clear, professional and accessible language, structured in sections and ready to print or use in digital format.

Ethical and professional approach: Promotes respect, empathy, protection of customer data, and the critical use of technology.

4.3 Creating exams

Another key application of AI in education is the generation of exams or assessments, whether they are multiple-choice or true/false tests, or essay questions, practical problems, and case studies. In this way, AI can help teachers design tests that measure not only theoretical knowledge but also professional skills, the ability to apply procedures, and decision-making in real-world contexts.

To achieve this, chatbots can be used to design exams aligned with the curriculum and module objectives, generating questions linked to specific learning outcomes and tailored to the course's difficulty level, thus improving coverage of the entire syllabus. These exams can be of various types, including multiple-choice questions, case study exercises, and questions involving decision-making and process justification. AI also facilitates the creation of equivalent versions of the same exam, generating several models of similar difficulty, adapting the language without changing the assessed objectives, and suggesting reinforcement or extension questions. Furthermore, exams can be tailored to students with specific needs.

When using chatbots to create exams, it is necessary to clearly define and specify a series of parameters to the AI to obtain better results:

- Question types. Whether we want them to be multiple choice, single choice, true or false, essay questions, or even a combination of all of them, being able to specify how many we want of each type.
- Topic. We can indicate the general topic on which the test should be based or, even better, attach the notes or syllabus on which we want it to be based.
- Educational level or difficulty. Determining the students' educational level directly influences the difficulty, language, and approach of the questions. Similarly, we can specify whether we want an easy or difficult test, and even create two or more versions of the same exam adapted to different difficulty levels.
- Number of questions or time allowed. It is necessary to indicate how many questions we want or even the expected exam time, in case of including open-ended questions, essay questions or practical cases.
- Expected outcome. Finally, we can specify what outcome we expect from the test (for example, in an exam on a social integration module, we want students to clearly understand the concepts of user care and family interaction). This way, the AI will better guide the questions, focusing them on that topic.

As with any use of AI, human oversight is essential when creating exams. Therefore, it's crucial to review the generated questions to ensure they are correct, consistent, and appropriate, eliminating potential errors and ambiguities. A practical tip is to request more questions from the AI than you need, allowing you to select the most suitable ones.

For example, if you want a 10-question exam, request a 15-question exam and then remove 5 questions yourself.

In addition to exam creation, AI can also be useful for grading and feedback, whether by assisting with the grading of open-ended questions, analyzing overall results, or generating guidance for students. For example, we can use apps like Gradescope or Google Forms to identify which parts of the exam have the most errors and reinforce those areas.

4.4 Interactive activities

Another interesting and useful application of AI in education is the creation of interactive activities that foster active, practical, and meaningful learning. These activities can be very diverse, ranging from debates or group exercises to simulations of real-world work situations that encourage participation, collaboration, decision-making, and the development of professional and transferable skills in a practical and even playful way.

Furthermore, the flexibility of AI allows these activities to be adapted to different teaching modalities, such as face-to-face, online, or hybrid classes. Thus, if a teacher is preparing an online class, they can ask the AI to adapt the planned activities to a virtual environment.

These are some of the activities and examples of using AI to create interactive activities:

- **Simulations of real professional situations**

  AI enables the creation of interactive, simulation-based activities where students make decisions and observe the consequences, such as customer service simulations, job interviews, technical diagnostics, or incident management.

Guided dialogues with various possible responses can be established using apps like chatbots, Virtual Speech, or AI Role Play. The Mursion app also allows for the creation of medical simulations useful for any vocational health-related degree.

- **Case studies**

  AI can generate professional scenarios with multiple courses of action, where each student decision leads to different outcomes. This is very useful for analyzing and evaluating the technical, economic, or social consequences of student decisions, applying what they have learned in class. For example, deciding how to resolve a mechanical breakdown or a logistical issue following professional procedures. Apps like Genially or H5P, which can be integrated into Moodle, can be used for this purpose.

- **Interactive questionnaires with immediate feedback**

  Beyond the creation of exams discussed in the previous section, AI also allows us to create learning assessment activities with immediate feedback—that is, interactive tests with explanations for each answer. In addition to those we can create with apps like H5P, Google Forms, or Socrative, we can include a gamified version using apps like Kahoot!, Quizizz, or Genially.

- **Guided creation and active learning activities**

  AI can support activities where students create products, not just respond, such as writing professional responses (emails, reports, quotes), designing business or technical proposals, or developing scripts or action protocols. For example, students could draft a professional response to a complaint, using AI as a draft that is then reviewed and improved. Apps like ChatGPT, Microsoft Word with Copilot, or Notion AI can be used for this purpose.

- **Educational games and gamification dynamics**

  The gamified or playful aspect of learning has been shown to influence student participation and motivation, impacting knowledge acquisition and improving critical thinking, creativity, and problem-solving skills. Beyond the interactive quizzes we discussed earlier, apps like Genially can create educational escape rooms or challenges involving professional decisions. For example, students might solve a series of challenges related to workplace safety to escape a virtual escape room.

- **Interactive multimodal activities**

  AI facilitates the creation of activities that integrate text, images, audio, and video, adapting to different learning styles. This allows for the analysis of technical images, interactive videos with embedded questions, and interpretations of diagrams or plans. For example, users can analyze an image of a technical installation and answer questions about its components and operation using apps like Canva or Genially.

- **Activities for reflection, self-assessment and critical thinking**

  AI can support interactive activities focused on professional and ethical reflection, such as guided reflective journals, critical analysis of decisions made in simulations, or competency self-assessments. For example, using ChatGPT or Notion AI to reflect on how a customer service situation was handled and what could be improved in a real-world setting.

4.5 Generate complementary resources

Supplementary resources, such as glossaries of key terms, thematic summaries, and study guides, allow students to reinforce, expand, and personalize their learning. These resources can be used by both students and teachers, offering flexible, up-to-date materials adapted to different learning paces and levels.

The complementary resources that can be created with AI to help with teaching work can be:

- **Learning reinforcement and support materials**

  AI can generate resources for students who need to consolidate basic content or review learning, such as simplified explanations of key concepts, structured summaries and visual diagrams, glossaries of technical terms, or guided practice exercises. For example, a reinforcement dossier on basic workplace safety concepts for struggling students, using apps like ChatGPT, Notion AI, or Canva.

- **Resources for expansion and in-depth study**

  Materials for students who are progressing at a faster pace or wish to delve deeper, ranging from professional case studies or more complex technical challenges to applied research activities or industry trend analysis. For example, apps like Perplexity or Notion AI allow us to create an advanced case study on multichannel customer service in European companies.

- **Step-by-step guides and professional procedures**

  For example, task checklists, action protocols, or brief procedure manuals.

- **Multimodal and accessible resources**

  AI facilitates the creation of resources in various formats, improving accessibility and inclusion. These resources can include scripted explainer videos, review audio, visual materials with icons and diagrams, or texts with different reading levels. Apps like Synthesia or HeyGen, which convert text into professional videos with realistic digital avatars, or Lumen5, which allows users to transform text (such as blog posts, scripts, or URLs) into engaging videos, can be used for this purpose.

- **Resources for autonomous and self-regulated learning**

  These types of resources are designed to help students learn independently, and can range from self-assessment quizzes and personalized study tips to customized learning paths. We will delve deeper into these latter options in Chapter 7 of this Manual.

4.6 Creation of a long-term study plan

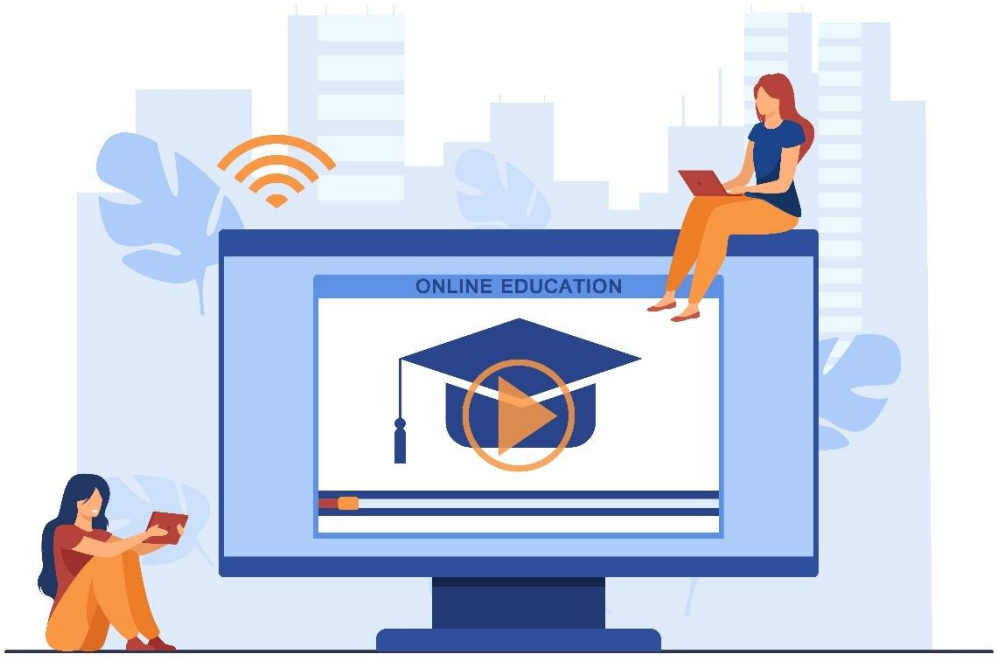
Instead of creating each lesson weekly, teachers can also use AI to generate long-term plans—for an entire term, semester, or even the whole academic year. This not only saves time but also gives teachers a clearer view of overall learning objectives and how each lesson contributes to them. This curriculum plan should ensure the progression of skills, coherence between modules, connection to the professional world, and attention to student diversity.

In this sense, AI can help to:

- **Organize and structure the official curriculum in the medium and long term,** analyzing learning outcomes and assessment criteria, identifying common transversal skills across modules, detecting redundancies or gaps in training, and proposing a logical and progressive sequencing. For example, organize the modules of a training cycle so that digital and professional skills are developed progressively over the two years.
- **Design progressive training pathways** with learning phases (initiation, consolidation, specialization) and theoretical content linked to practical experience. These pathways can be differentiated according to students' interests or level. For example, design a two-year pathway for a vocational training cycle that combines classroom, workshop, and workplace experience.
- **Better time management**, taking into account course load and learning pace, can help distribute content and activities throughout the course, adjust time according to difficulty and module type, and propose regular reviews and reinforcement sessions, generating adaptable schedules. Apps like Trello or Microsoft Planner can be useful in this regard.
- **Systematically incorporate transversal or key competences from the European framework**, linking technical skills with soft skills and including values of sustainability, equality, and professional ethics. Similarly, the curriculum can be aligned with European frameworks (EQF, DigComp, AI Competence Framework, etc.).
- **Adapting plans to the different student profiles**, with special attention to diversity. In this sense, AI can propose methodological adaptations, design reinforcement or enrichment plans, or suggest specific support, adjusting the

plans and their objectives without losing curricular coherence. For example, creating a personalized monitoring plan for students with learning difficulties.

- **Analyze the evaluation results** to detect patterns of difficulty or dropout, suggesting methodological adjustments. For example, reviewing the curriculum after the first year and adjusting content for the second.
- **To improve students' future educational and professional planning** by linking the curriculum to career paths and offering complementary certifications. This allows for the planning of pathways that connect the educational program with employment, specialization, or entrepreneurship, thus supporting informed educational decisions.



5. AI as a tool for inclusion

AI technologies can support more inclusive education systems if they are designed ethically and with a human-centered approach.

UNESCO

Students with Special Educational Needs (SEN) in Erasmus+ are those who, due to various personal or health circumstances, require specific support to access and participate equally in educational opportunities, especially in international experiences. Thus, students with SEN are considered to be those who have needs arising from physical, mental, intellectual, or sensory disabilities, or other conditions that require specific support to participate on equal terms in educational activities, including international mobility.

In this sense, AI can become a key tool for educational inclusion in Vocational Training (VT) if used with a pedagogical, ethical, and person-centered approach. VT, with its focus on practical skills and modules such as administration, IT, and hospitality, greatly benefits from AI to personalize content, reduce gaps, and foster autonomous learning that respects diversity.

Thus, Artificial Intelligence, and in particular AI applied to personalized learning, offers new opportunities to reduce barriers, adapt content, and support students in a fairer and more flexible way. When used effectively, AI can help advance towards inclusive models, aligned with Universal Design for Learning (UDL), the person-centered approach, and European principles of equity and social cohesion.

This chapter analyzes how AI can support inclusion in vocational training, exploring both its benefits and the processes necessary for responsible personalization. Through practical examples, concrete tools, and pedagogical criteria such as the Felder-Silverman model, guidance is offered to teachers who wish to integrate AI critically, ethically, and effectively, without losing sight of the irreplaceable role of human judgment and the need to protect students' rights.

5.1 Benefits of AI-powered personalization for inclusion in vocational training

Personalized learning is conceived as the adaptation of the educational experience to the individual needs of the students.

From an inclusive perspective, AI-powered personalization aims to:

- **Improving inclusive effectiveness and motivation**

  AI tailors content to preferences and abilities, but with a focus on diversity. For example, for a student with autism spectrum disorder in a welding module, AI can generate sequential and gamified visual instructions, increasing retention and confidence without stigmatizing them.

- **Comprehensive adaptation to individual characteristics**

  This involves considering not only academic performance but also inclusive factors such as sensory, cultural, or socioeconomic disabilities. In vocational training, where students are heterogeneous (young people, adults undergoing career transition), AI identifies learning styles (visual, auditory) to personalize practical assessments, such as augmented reality simulations accessible by voice for users with low vision. Thus, it can simplify technical texts without losing essential content, translate materials into different languages, convert text into audio or visual formats, or support students with reading or comprehension difficulties.

- **Role of inclusive support systems**

  Tools such as intelligent tutoring systems and adaptive learning platforms facilitate adaptation to the specific needs of students, promoting more efficient learning. These tools detect early barriers, such as reading difficulties for immigrants, offering integrated translations or simplified summaries. For example, students with attention difficulties can use AI to break down a practical task into simple steps. Furthermore, these tools provide immediate and non-judgmental feedback.

- **Supporting student well-being and confidence**

  Personalization allows you to reduce anxiety when faced with complex tasks, practice professional situations without public exposure, and boost self-esteem through positive feedback.

- **Equal opportunities and fairer, more personalized career guidance**

  Offering tailored information on career paths, supporting CV preparation and interviews, and accompanying diverse educational pathways.

This personalization fosters an inclusive classroom, aligned with the Convention on the Rights of Persons with Disabilities, by making educational content accessible and relevant to all.

5.2 Detailed AI-powered personalization process with an inclusive approach

Personalized learning with AI is based on the collection and analysis of student data. This process follows several key steps:

1. **Data collection**

   AI systems collect data on students' performance, preferences, and learning styles. In the context of inclusion, diversity should be prioritized, including accessibility metrics (time spent on tasks, interactions with adaptive tools) and inclusive profiles (SEN - Special Educational Needs - voluntarily declared). For example, in a computer science module, AI can track interactions with software to identify if a student with dyslexia prefers voice interfaces, collecting anonymized data to avoid discrimination.

2. **Data storage**

   Student performance data (grades and learning progress) and personal profiles are stored in a customized or standardized format. Specification standards include IEEE PAPI (Public and Private Information) for the Learner and IMS LIP (Learner Information Package), adapted for inclusion, meaning they integrate accessibility metadata (e.g., screen reader compatibility). One potential use is storing progress profiles on platforms like Moodle with AI plugins, ensuring that work practice data includes accommodations for diversity (e.g., flexible hours for caregivers).

3. **Analysis and modeling**

   This data is used to develop models and algorithms that identify patterns and trends, using "fair-AI" algorithms to mitigate biases (e.g., training with diverse datasets). For example, AI can analyze trends in a trade cycle to detect cultural weaknesses, modeling interventions such as automated bilingual modules.

4. **Recommendation generation**

   The resulting models generate personalized recommendations for content, activities, and assessments. For example, an AI system can suggest additional reading resources or practice exercises tailored to the student's knowledge and skill level, recommending, for instance, videos with subtitles and audio descriptions for deaf students, or simplified exercises for those with low emotional motivation.

5. **Needs identification**

   AI can help identify each student's strengths and weaknesses and offer personalized interventions to improve their learning. In this way, AI can identify hidden needs, such as stress caused by language barriers, and offer proactive support.

This iterative, student-centered process transforms vocational training into an equitable environment, where AI acts as an invisible co-teacher.

5.3 Material selection criteria: Felder-Silverman model

The selection of learning materials is based on individualized criteria for each student, a key element in promoting inclusion in Vocational Training. This becomes even more important when artificial intelligence tools are integrated, as AI not only selects materials but can also create inclusive learning pathways that respect diverse learning styles, fostering equity in professional skills such as those found in mechanical engineering, healthcare, or retail. In this regard, the Felder-Silverman model offers a very useful framework for guiding inclusive pedagogical decisions.

5.3.1 Key criteria for selecting inclusive teaching materials

- **Diversity of learning formats and styles**

  To promote inclusion, both cultural and in terms of special needs, it is important that materials be presented in diverse formats, not just written text. AI helps create materials such as outlines, diagrams, videos, and oral explanations, as well as enabling text-to-speech and speech-to-text conversion. All of this facilitates the inclusion of students with reading difficulties, language barriers, or visual preferences.

- **Balance between action and reflection**

  In other words, combining practical activities with theory and spaces for reflection. In this way, AI allows for the creation of interactive simulations and the generation of tailored reflective questions, so that all students can participate according to their learning style.

- **Professional concretion and contextualization**

  In vocational training, there are students who need concrete examples alongside those who learn best through concepts. Therefore, it's essential to create materials that combine step-by-step procedures with explanations of general principles, as well as demonstrate their application in real-world professional situations. In this regard, AI can help adapt the level of abstraction of the content and generate personalized practical examples, preventing students who need to see the real-world application of their learning from becoming disengaged.

- **Clear organization and global vision**

  The materials should facilitate both progressive learning and overall understanding, so the content should be structured in clear steps and include concept maps or overviews. In this case, AI helps create summaries, outlines, and personalized learning paths, as well as step-by-step guides or overviews as needed. This reduces anxiety and improves student comprehension by providing different ways to organize information.

- **Accessibility and adaptation without stigmatization**

  Inclusive materials must be accessible to everyone, not just those with disabilities. Therefore, they must use clear and understandable language; provide visual, auditory, and cognitive support; and be adaptable without highlighting differences. With AI, we can simplify texts and facilitate reading aloud, translation, and linguistic adaptation, ensuring equal opportunities and participation.

5.3.2 The Felder-Silverman Model: basis for inclusive recommendations in VET

The Felder-Silverman model is a learning styles model developed in 1988 by Richard M. Felder and Linda K. Silverman, specifically designed for technical and university education contexts. Its aim is to help teachers understand how students learn and to design teaching strategies that address the diversity of learning styles present in the classroom, without categorizing students.

The model describes learning through four dimensions, each with two opposing poles. Everyone falls somewhere between these two extremes. These dimensions are:

Dimensions	*Poles*	*Type of student*	*Example*
How to best receive information	*Visual*	*Learn better with outlines, charts, diagrams, images, or videos*	*Electrical schematics or flowcharts*
	Verbal	*He prefers oral explanations or written texts*	*Written explanation of the process or class discussion*
What type of information is preferred	*Sensory*	*He prefers concrete data, real examples, and step-by-step procedures.*	*Follow a detailed technical protocol*
	Intuitive	*He is comfortable with abstract concepts, theories, and global relationships.*	*Understanding the general operating principle of a machine*
How information is processed	*Asset*	*Learn best by doing, practicing, discussing, and working in groups*	*Conduct a workshop practice*
	Thoughtful	*He prefers to think, analyze, and work individually before acting.*	*Analyze the procedure and possible errors beforehand.*
How learning is organized	*Sequential*	*Learn in a linear, step-by-step way*	*Follow a procedure manual*
	Global	*You need to see the whole picture first in order to understand the details.*	*First, understand the ultimate goal of the production process.*

To implement this teaching model, the Solomon-Felder questionnaire is often used as an initial tool to profile the student. This questionnaire, also known as *the Index of Learning Styles* (ILS), is a self-assessment instrument designed by professors Richard M. Felder and Barbara A. Solomon to identify students' learning preferences according to the learning styles model that Richard M. Felder himself developed with educational psychologist Linda Silverman. It is not a strict psychological test, but rather a diagnostic questionnaire that helps identify a person's preferred learning style. The questionnaire measures the intensity of preferences for the four dimensions mentioned earlier on a scale of -11 to +11 per dimension, where 1-3 indicates moderate preference, 5-7 strong, 9-11 very strong, and values close to 0 indicate balance.

Example question (Visual/Verbal dimension):

A: "I like working with equations and formulas."

B: "I prefer to see diagrams or schematics to understand a process."

The score is automatic if taken online, but it can be calculated manually. There are no "correct" answers; the result generates a learning profile that is displayed in a graph or table.

The profile obtained through this questionnaire provides the preferred learning style. The user's learning objectives are compared with the resource metadata by calculating the Suitability Index, and the most appropriate content is then displayed based on the registered objectives.

With this profile, the Felder-Silverman model can be applied, which facilitates inclusive education by helping to design varied activities, avoiding always favoring the same type of students and improving motivation and performance. In vocational training contexts, it is especially useful because vocational training combines theory and practice, and the student body is very diverse in age and experience, allowing for a balance of practical experience, reflection, theory, and real-world application.

In this sense, AI is a very useful tool for facilitating its application, as it allows content to be offered in multiple formats (visual, verbal, practical), enabling personalized learning paths according to learning styles. For example, from the same educational content, AI can generate an explanatory video (for visual learners), a summary text (verbal), an interactive case study (active), or a step-by-step guide (sequential).

5.4 Practical examples and tools for vocational training teachers

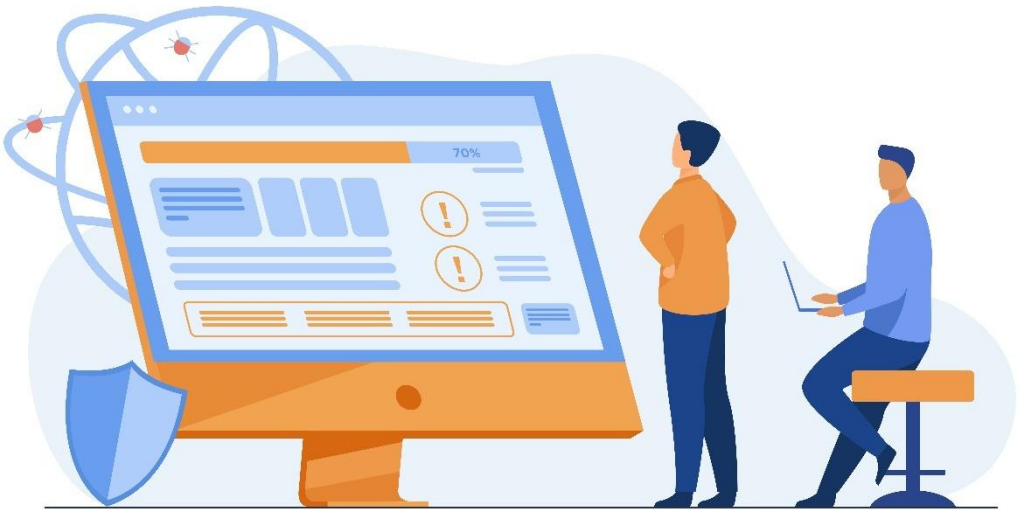
- **Adaptive Learning Platforms** (e.g., DreamBox or Adaptemy):
    - Use: Adapts lessons in real time. In vocational training for mechanics, it can, for example, generate interactive diagrams scaled to a cognitive level, with high-contrast options for visuals.

- Inclusion: Integrates voice and text for sensory diversity, facilitates autonomous and personalized learning, and reduces the gap between students with different learning paces.

- **Intelligent Tutors** (e.g. Carnegie Learning or Squirrel AI):
  - Use: It offers personalized feedback. For example, for hospitality vocational training, it suggests recipes adapted to cultural dietary restrictions or allergies.
  - Practical example: Prompt for AI: "Personalize an accounting exercise for a student with dyslexia in Vocational Training Administration: use graphics and audio."
  - Benefits: Non-judgmental and tailored feedback, reinforcement of autonomy and confidence, and specific support for difficulties such as dyslexia, ADHD or language barriers.
- **Predictive Analytics** (e.g., Century Tech):
  - Use: Predicts and personalizes based on data, identifying early inclusive needs before school failure appears.
  - Adapted plan: You can suggest specifications such as replacing textual instructions with multimedia formats (short videos with voice-over and subtitles, or interactive code diagrams instead of blocks of text); offer gamified exercises with immediate voice feedback, reducing frustration and increasing motivation; or propose additional resources, such as browser extensions with AI Code Readers.
  - Objectives: Prevention of dropout, early and personalized intervention, improvement of motivation, and equitable attention to all students.
- **Accessibility tools** (e.g. Read&Write or Immersive Reader):
  - Use: They allow you to adapt existing materials without remaking them from scratch.
  - Practical examples: Reading aloud of technical guides, simplifying complex texts, automatic translation into other languages, intelligent highlighting and automatic summaries.
  - Contribution to inclusion: Cognitive and linguistic accessibility, support for students with reading or language difficulties, and greater autonomy in studying.
- **Creating inclusive materials with generative AI** (e.g. Chatbots, Canva or Genially):
  - Use: Materials accessible from the design, such as clear and visual infographics, adapted explanatory videos, interactive activities with

different levels and worksheets with simple language and visual supports.

- Benefits: Universal Design for Learning (UDL), reduction of barriers from the start, and improved participation.



5.5 Pedagogical and ethical implications

As we have seen, the integration of AI in vocational training promotes inclusion by adapting technical simulations to individual paces, but this is not without risks such as the possible digital exclusion that threatens equity in rural or public centers; n or without ethical considerations, such as issues related to privacy and AI biases.

It's important to note that most AI applications in education are considered high-risk and require strict regulation. Specifically, AI systems are considered high-risk if:

- They determine access or distribute people among different educational and vocational training institutions.
- People are evaluated based on tests performed as a condition for accessing or within their education.

5.5.1 Pedagogical implications

Pedagogically, AI in vocational training offers educational options that accelerate practical learning in inclusive modules, but some considerations must be taken into account:

- **Personalized tutoring and individual progress**

  AI offers immediate feedback and tailored explanations, ideal for vocational training modules with varying paces. For example, in a welding course, an AI

system acting as a virtual tutor (e.g., based on chatbots) answers safety questions in real time, adapting explanations to learning styles (visual for sensory learning needs), allowing a student with ADHD to progress without waiting for the group.

- **Development of inclusive practical skills**

  In vocational training, AI personalizes simulations (for example, virtual reality for healthcare procedures), fostering autonomy in students with motor disabilities. However, this must be integrated with real-world practical assessments so that inclusion is not limited to the virtual realm.

- **Balance with human interaction**

  AI does not replace human contact, which is crucial in vocational training for socio-emotional skills (teamwork, workplace empathy, etc.). Therefore, it is essential to maintain a balance between personalization and human interaction. Education requires the development of social and emotional skills that are acquired through direct contact with educators and peers. In inclusive education, teachers should facilitate hybrid approaches, such as AI-assisted tutoring for individual practice combined with in-person workshops for collaboration, thus preventing isolation for students with social autism.

5.5.2 Ethical implications

Beyond the advantages and benefits that AI can bring to the teaching and learning process, we cannot ignore the risks it poses. These risks focus on three aspects: privacy, fairness, and discrimination.

- **Data privacy and security**

  AI collects performance data for personalization, but it must strictly comply with the European Union's General Data Protection Regulation (GDPR). In vocational training, where CVs or work experience data are handled, this is critical. For example, storing profiles of students with special educational needs (SEN) without explicit consent should be avoided, as should using anonymity in predictive analytics to protect against vulnerabilities.

- **Equity in access**

  Not all vocational training centers have the same technology. In rural or low-budget centers, AI can be exclusionary due to lack of access. To avoid this, hybrid (offline/online) models can be promoted, or grants (such as the European NEXTGenerationEU funds) can be used to ensure that students from disadvantaged backgrounds have access to AI tutoring via free mobile apps.

- **Algorithmic exclusion and discrimination**

  AI can perpetuate inequalities if it is not trained diversely. Algorithms often prioritize "standard" profiles, marginalizing people with disabilities or from minority groups. Therefore, it is important to train AI with inclusive data and even evaluate tools using inclusion checklists (such as UNESCO's) before using them.

6. Inclusive applications of AI in students with SEN

There is nothing artificial or intelligent
about artificial intelligence compared to the human mind;
it is a tool we build.
If we want it to benefit humanity,
we must ensure that it is guided by human values,
designed to enhance—not replace—human dignity.

Fei-Fei Li (Co-Director of the Stanford University Institute)

Artificial intelligence offers new opportunities to advance towards a more inclusive, equitable, and person-centered Vocational Education and Training (VET). In the European context, where student diversity is a growing reality, the pedagogical use of AI makes it possible to reduce barriers to learning, promote autonomy, and support personalized learning pathways, especially for students with special educational needs (SEN).

In this chapter, we will focus on how AI—and generative AI in particular—can be used as a support tool for teachers to adapt content, improve accessibility, create inclusive educational resources, and offer individualized support, always from an ethical perspective and under human supervision. We will also analyze mechanisms for early needs assessment, personalization strategies, and the main risks associated with the use of these technologies, highlighting the importance of professional teacher judgment as a guarantee of genuine inclusion.

The aim is to provide practical guidance to help vocational education teachers integrate AI responsibly, promoting Universal Design for Learning (UDL) and ensuring that no student is left behind in their learning process.

6.1 Content adaptation and accessibility

Artificial Intelligence, and especially Generative Artificial Intelligence (GAI), has great potential to improve the accessibility and personalization of educational content in Vocational Training. Its application makes it possible to eliminate barriers to learning and promote the active participation of students with special educational needs (SEN), contributing to more equitable and person-centered learning environments.

However, the integration of AI in education must be based on a human-centered mindset *that* prioritizes the dignity, autonomy, and well-being of students. This approach promotes inclusion, equity, and respect for linguistic and cultural diversity, in accordance with the United Nations Convention on the Rights of Persons with Disabilities and the European Union's Artificial Intelligence Regulation, which classifies numerous educational applications as «high risk» when they affect institutional assessment, guidance, or decision-making processes.

In the context of European vocational training, which is characterized by a high degree of student heterogeneity (including young people transitioning to employment, students undergoing career retraining, students from migrant backgrounds, and people with disabilities), AI acts as a key facilitator for adapting content to specific needs. Thus, its appropriate use can contribute to reducing inequalities, fostering independent learning, and strengthening solidarity within the classroom.

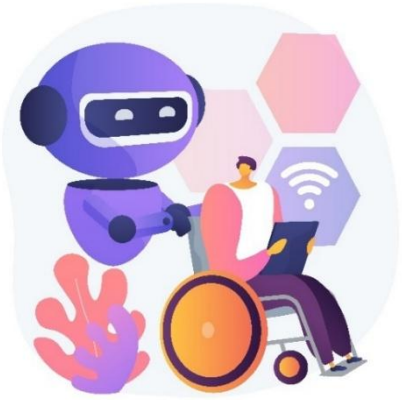
AI-based applications improve accessibility through essential support tools, including:

- Screen readers and text-to-speech and speech-to-text conversion systems.
- Machine translation systems that promote linguistic inclusion.
- Multimodal content generators that combine text, image, audio and video, allowing multiple forms of knowledge representation.

These functionalities allow teachers to offer the same content in different formats, aligning with the principles of Universal Design for Learning (UDL) and catering to diverse cognitive styles and functional abilities.

From a European educational policy perspective, it is recommended that the use of AI be geared towards inclusive access to educational programs, paying particular attention to the most vulnerable groups, such as students with sensory, motor, or cognitive disabilities, as well as those facing cultural or linguistic barriers. Within this framework, the role of teachers is essential to ensuring the pedagogical, ethical, and supervised use of these technologies, guaranteeing that AI complements—and never replaces—human guidance.

6.2 Applications of AIGen for sensory and physical disabilities



Generative Artificial Intelligence models, based on deep learning techniques, have great potential to support students with specific educational needs by generating original and adapted content in real time. In the field of Vocational Training, where theoretical, procedural, and practical learning converge, these technologies allow for the transformation of traditional formats and offer multiple pathways to knowledge, reinforcing the principles of Universal Design for Learning (UDL).

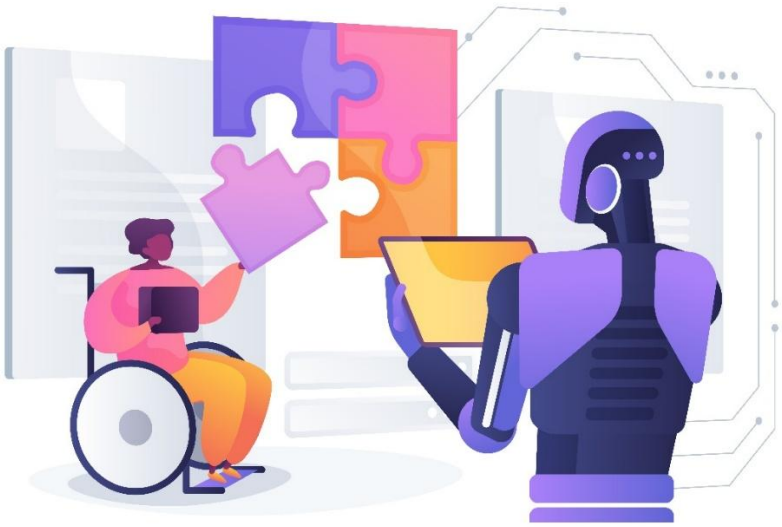
For students with hearing impairments, one of the most established applications is the automatic generation of subtitles and real-time transcripts. Tools such as Whisper (OpenAI) , Google Cloud Speech-to-Text, or Deepgram allow for the conversion of spoken explanations into text during classes or practical workshops. For example, in a hospitality vocational training course, a customer service simulation can incorporate subtitles synchronized with the dialogue, facilitating the following of instructions without relying on the auditory channel. This approach not only improves sensory accessibility but is also especially useful in the noisy environments' characteristic of many vocational training workshops, offering multiple means of representation.

For students with visual impairments or low vision, AI-powered graphics (IAGen) allows for the generation of narrated descriptions of images, diagrams, or videos using platforms such as Microsoft Azure AI or Descript . In an industrial mechanics module, for example, AI can verbally describe a technical diagram ("The *piston moves vertically inside the cylinder, with a 2 mm thick gasket"*), and is compatible with screen readers like NVDA. These descriptions can be customized using inclusive prompts (for example, "Describe *the diagram clearly and avoid technical jargon"*), expanding the functionality of tools like Google Lens and promoting a more accessible understanding of complex processes.

Language conversion and multimodal support are another fundamental aspect. Text-to-speech (TTS) and speech-to-text (STT) systems allow written instructions to be adapted to audio format and vice versa, facilitating access to learning for individuals with motor disabilities, speech impairments, or reading difficulties. Tools like ElevenLabs or Google Translate with contextual AI can transform technical content into simplified audio. In vocational training in administration, for example, a prompt such as " *Convert this financial report into an audio file with pauses and basic vocabulary* " creates an accessible resource for students with dyslexia, also connecting with the learning styles described in the Felder-Silverman model, especially sensory and verbal profiles.

Furthermore, AI allows for specific adaptations for students with cognitive disabilities or those on the autism spectrum, through the creation of structured and progressive learning pathways. In fields such as healthcare or social care, AI can generate step-by-step visual sequences for technical procedures, using tools like Canva with AI or infographic generators like Bylo AI, Infographics or Edraw, and incorporating gamified elements for students with ADHD. These strategies help reduce cognitive overload and are complemented by predictive analytics systems (for example, IBM Watson), which facilitate the early detection of needs and the personalization of learning pathways.

Despite its high potential, it is important to note that the use of AI in inclusive contexts requires carefully supervised implementation. Vocational training centers should assess aspects such as the local accessibility of the tools (especially in rural areas of the EU), their compliance with the European regulatory framework, and their validation by national or EU educational authorities. Subtitles or audio descriptions generated by non-specialized platforms may contain inaccuracies, particularly in technical terminology, which could confuse students with special educational needs. For this reason, pilot tests in inclusive classrooms are recommended before widespread adoption, as well as the application of international checklists and guidelines, such as those proposed by UNESCO for the responsible use of AI in education. In this process, teachers play a central role as guarantors of pedagogical quality, equity, and student autonomy, ensuring that technology acts as a genuine support and not as a new factor of exclusion.



6.3 Adaptation and creation of educational resources (UDL)

AI is essential for the creation and adaptation of content, enabling teachers and curriculum design teams to generate materials that meet the individual needs and preferences of students. In this way, AI enables the practical application of Universal Design for Learning (UDL) by offering multiple means of representation, expression, and

engagement, without stigmatizing students with special educational needs (SEN). In this regard, the report from the European Agency for Special Needs and Inclusive Education (EANE) emphasizes that these types of digital tools significantly improve accessibility in inclusive education contexts, especially in vocational training (VET). Furthermore, the European Commission's Digital Education Action Plan (2021–2027) explicitly promotes these adaptations as the foundation for inclusive personalized education.

From an operational perspective, IAGen allows:

1. **On-demand content generation**

   Through descriptive pedagogical prompts, AI can adapt or create educational materials in diverse formats. For example, in vocational training for IT professionals: "Generate *a Python programming tutorial for a student with low vision, including audio commentary and descriptive diagrams.*" Tools like ChatGPT or Gemini allow for the production of inclusive activity sequences, reducing the teaching load and promoting personalization based on machine learning.

2. **Variety of adapted formats**

   The same content can be transformed into activity proposals, quizzes, audio summaries, or interactive presentations. For example, in a vocational training class on international trade, AI can generate bilingual and culturally sensitive materials (e.g., " *Translate and simplify this marketing case study for immigrant students, incorporating examples of ethnic diversity* "), promoting social equity and linguistic inclusion.

3. **Cognitive adjustment and customization of the level of complexity**

   AI facilitates vocabulary adaptation, the generation of analogies, and the reformulation of complex concepts. By integrating the Felder-Silverman model, students with visual and sensory learning profiles in electrical vocational training can access interactive diagrams instead of dense text, with zoom options and high contrast for students with visual impairments. This flexibility allows for catering to different learning styles without fragmenting the class group.

4. **Inclusive recommendation systems**

   AI algorithms can suggest personalized resources and build adaptive learning pathways. Platforms like Adaptemy or Knewton analyze progress data to recommend, for example, accessible simulations or virtual environments for students with reduced mobility in vocational training in construction, fostering independent learning and peer collaboration.

In everyday practice, vocational training teachers can use ethical prompts to ensure diversity and avoid bias (for example: "*Ensure balanced representation of gender and cultural background in the examples"*). This approach transforms the classroom into an

equitable space, where AI acts as a co-creator of educational resources under human supervision.

6.4 Virtual tutoring and individualized support

Virtual tutoring and automated feedback are two of the artificial intelligence applications that have generated a significant pedagogical impact on education, transforming the way students receive support and feedback.

Following the classification, we saw in section 2.1, virtual tutoring represents a weak (or specific) AI application, operating with limited autonomy and always under teacher supervision. Its implementation in vocational training fosters inclusion by offering continuous and adaptive support, aligned with a *human-centered approach* that prioritizes equity, linguistic and cultural diversity, and respect for individual learning paces. However, its use must balance technological benefits with irreplaceable human empathy, especially for vulnerable students.

In practical vocational training modules, which require a combination of theory, independent practice, and flexible study paces, virtual assistants and chatbots based on extended language models (LLMs) act as "co-teachers." They can identify early needs, adjust interventions, and offer personalized support, reducing the workload for teachers and allowing them to dedicate more time to group interactions and inclusive strategies. This approach aligns with European educational digitalization goals, such as those outlined in the European Commission's Digital Education Action Plan 2021-2027 which promotes the use of digital technologies to improve the quality, accessibility, and personalization of teaching.

AI-powered virtual tutoring systems integrate with learning management systems (LMS) such as Moodle or Google Classroom and are also available on mobile devices, facilitating access outside of school hours. Their main features include:

- **Immediate and continuous feedback**

  AI-powered virtual assistants and chatbots provide real-time tutoring and feedback. For example, in a vocational training module on computer science, an AI-integrated chatbot can analyze and correct code as students program, suggesting step-by-step improvements and providing clear explanations. International reports, such as those from the OECD , indicate that immediate feedback from AI tools can improve knowledge retention by 20-30% in inclusive educational settings, with notable benefits for students with cognitive special educational needs through personalized adaptations.

- **24/7 Availability**

  Virtual tutoring is available 24 hours a day, which is especially valuable for students undergoing career transitions, those with irregular schedules, or those with family obligations. In a vocational training module in healthcare,

for example, an AI assistant like Carnegie Learning can offer explanations of clinical protocols even at midnight, adapting the level of complexity for students with reading difficulties and incorporating visual summaries and synthesis exercises.

- **Resolving complex doubts in natural language**

  Thanks to the use of deep learning techniques, these systems can process natural language queries and respond with detailed explanations, contextualized examples, and multimedia resources. For example, in vocational training for mechanics, a prompt in a generative model like Gemini (e.g., "*Explain the Otto cycle with an interactive diagram for a student with ADHD*") can generate a gamified animation with optional pauses and simplified text, facilitating the understanding of complex technical concepts. OECD reports also indicate that 70-75% of educators report greater *engagement* in practical tasks when using interactive AI systems that foster motivation and reduce frustration.

In addition to these capabilities, virtual tutoring can be integrated with recommendation and progress analysis systems to offer individualized support pathways, suggesting reinforcement resources, alternative activities, or study strategies based on performance data. This contributes to more proactive and personalized educational support, without replacing the guidance and professional judgment of the teaching staff.

6.4.1 Examples of specific prompts for virtual tutoring in vocational training

- Prompts for individualized support and content comprehension:
  He acts as a virtual tutor for vocational training in mechanics.
  Explain the Otto cycle using clear language, short sentences, and examples from the workshop.
  It includes a detailed outline and a final 5-point summary.
  Adapt the explanation for a student with dyslexia.

- Prompts for task breakdown (ADHD / executive difficulties):
  Break this activity down into small, numbered steps.
  Add time estimate per step.
  It includes brief reminders and a motivational message at the end.
  Adapt the explanation for students with ADHD.
  Activity: [paste activity]

- Prompts for practical tutoring in professional modules:
  Simulate a customer service situation in a restaurant.
  Act as a client and guide the student step by step.
  Correct mistakes in a positive tone.
  It offers alternatives if the student gets stuck.

It includes a simple self-assessment at the end.

- Prompts for cognitive adaptation and Felder-Silverman styles:
  Adapt this content for a visual and sensory profile.
  Replace long paragraphs with outlines.
  Include specific examples.
  Use basic technical language.
  Content: [paste text]

- Prompts for personalized reinforcement:
  Analyze these difficulties of the student: [describe or add student information].
  Propose a 1-week reinforcement plan with:
  - short daily activities
  - visual format
  - practical exercises
  - positive feedback
  Adapt the level for VET of [professional family].

- Prompts for visual accessibility:
  Convert this content into:
  - audio explanation
  - simplified text
  - detailed description of images
  Avoid technical jargon.
  Content: [paste text]

- Prompts for hearing accessibility:
  Transform this oral explanation into clear text with short sentences.
  Includes simulated subtitles and highlighted keywords.
  Content: [paste]

- Prompts for cultural and linguistic inclusion:
  Simplify this content for immigrant students.
  It includes culturally diverse examples.
  Avoid local expressions.
  Add a basic glossary.
  Content: [paste]

- Ethical prompts for online tutoring:
  Review this educational material.
  Ensure diversity of gender, cultural background and abilities.
  Eliminate stereotypes.
  It suggests inclusive improvements.
  Text: [paste or attach document]

- Tutorial follow-up prompts:
  Acts as a vocational training tutor.
  Create a brief report of the student's progress based on this data: [paste].
  Includes:
  - strengths
  - areas for improvement
  - practical recommendations
  Use motivating language.

6.5 Mechanisms for individualization and detection of needs

Individualization and needs assessment mechanisms based on artificial intelligence represent a fundamental dimension for achieving a more inclusive, personalized, and equitable education in Vocational Training. These tools use data analysis, machine learning, and predictive models to understand how each student learns and to guide pedagogical interventions tailored to their specific needs. In contrast to traditional assessments, which are usually one-off and summative, these systems continuously monitor progress and offer recommendations that enrich both the teaching work and the student support.

At the heart of these mechanisms are adaptive learning algorithms, which build a dynamic profile of each student based on their interaction with the educational platform, their response patterns, and their pace of progress. These algorithms can infer strengths, weaknesses, and learning preferences, adjusting content, activity sequences, and teaching strategies almost in real time.

Thus, these mechanisms include:

- **Performance analysis and adaptation**

  AI systems collect performance data (such as time spent on a task, error rates, response sequence, or decisions in simulations) and use *machine learning* to model individual characteristics. Based on this information, the platforms adjust the level, pace, and format of the content, offering learning paths better suited to the identified needs.

  Practical example: An adaptive platform like Squirrel AI Learning uses AI algorithms to analyze completed exercises and recommend personalized learning

paths, suggesting more visual explanations for profiles with sensory preferences or structured sequences for students with executive needs.

- **Identifying strengths and weaknesses**

  Predictive models allow for the identification of performance patterns that highlight not only areas of difficulty but also individual strengths. This dual perspective enriches tutoring and facilitates the planning of more targeted and timely support. Empirical evidence suggests that astute tutors who can identify learning difficulties early contribute to improved student persistence and reduced dropout risk. While exact figures vary depending on the study and context, educational research indicates significant reductions in risk when personalized, data-driven support is implemented.

  Practical example: Apps like Knewton or Smart Sparrow can detect when a group of students has recurring difficulties with intercultural communication skills. Based on this, they can suggest simulated situations, dialogues with contextualized translations, or specific practice activities that address this need.

- **Automated and accurate evaluation**

  Another dimension of these mechanisms is automated assessment, which not only corrects exercises or quizzes but also incorporates accessibility metrics (screen reader compatibility, multimodal formats, etc.) to ensure that feedback is accessible and meaningful for students with special educational needs (SEN). Studies by organizations such as the European Commission's Joint Research Centre have indicated that AI-based assessments can increase the accuracy of educational adaptation by 15% to 25% for students with SEN, provided that local calibration is performed and potential biases are monitored. We will discuss this type of assessment in detail in Chapter 8 of this Manual.

  Practical example: In practical modules, such as report writing or case resolution, AI tools can provide immediate and detailed feedback, freeing teachers from part of the grading burden and allowing them to dedicate more time to qualitative and human guidance.

Thus, AI-assisted tutoring offers specific applications for the most vulnerable students, such as:

- **Conversational Diagnosis**

  IAGen uses natural language to identify needs stemming from psychological, social, or emotional problems. In vocational training, a chatbot like Woebot (adapted for educational purposes) detects stress in practical modules, offering proactive support (for example, "Identifies signs of anxiety in a welding student and suggests guided breaks"). However, this needs to be complemented by professionals, as we will see in the next section.

- **Enrichment Assistance Models**

  Tools like intelligent tutors facilitate differentiated learning, empowering human capabilities. For example, for students with hearing impairments, they generate real-time conversational transcripts. The goal is intellectual development, aligned with the UN Convention, promoting autonomy in supportive environments.

6.5.1 Specific tools for predictive analytics and adaptive learning

- **Squirrel AI Learning** :

  An adaptive, intelligent tutoring platform that monitors individual progress, identifies knowledge gaps, and adjusts educational content based on student understanding. It uses advanced data analysis algorithms to personalize learning paths and support educational equity.

- **Century Tech** :

  It combines artificial intelligence with neuroscience principles to create personalized learning paths, offer recommendations and monitor progress in real time, helping teachers identify areas of support and adjust interventions.

- **Knewton** :

  Its technological engine continuously analyzes student performance in practice and assessment activities, identifying strengths and knowledge gaps, and adjusting recommendations for content, activities, and recovery practices.

- **Smart Sparrow** :

  It offers visual authoring tools with drag-and-drop components to create rich and interactive content, giving teachers pedagogical control over how learning is adapted. The system can provide tailored feedback on responses, interaction times, or solution attempts, offering videos, hints, graphics, or additional material precisely when students need it. Through dashboards and reports, teachers can see how students navigate the content, where they stop, what concepts they struggle with, and how they progress, providing valuable data for teacher intervention.

- **ALEKS :**

  An adaptive assessment and learning system based on progress through mastery of competencies. Its adaptive engine determines the next concept to practice based on the student's actual mastery. It is typically used in math, chemistry, and quantitative courses.

Tool	Advantages	Disadvantages	Typical uses
Squirrel AI Learning	Customize routes in real time. Detailed reports per student. Multilingual and cultural support.	More focused on academic content. Requires good connectivity and investment.	Detection of conceptual gaps. Targeted reinforcement of theoretical content.
Century Tech	Real-time recommendations. Clear dashboards for teachers. Encourages student engagement.	Requires initial teacher training. Dependent on internet connection.	Progress tracking. Personalized itinerary planning.
Knewton	Identifies strengths and weaknesses. Adjusts learning sequences. Good support in STEM.	It depends on external content. Evidence varies depending on the context.	Identifying knowledge gaps. Personalizing the pace of study.
Smart Sparrow	The teacher maintains total control over the content and adaptations. It offers detailed analysis. It promotes *learning by doing* through interactive activities and integrated simulations.	Difficult to operate for inexperienced staff. It requires an initial investment of time to develop quality adaptive units. High licensing costs.	Creation of adaptive digital courses, especially in conceptual content or complex procedures. Practice technical skills before physical practice.
ALEKS	Precise assessment by domain. Competency-based learning paths. Highly effective in mathematics and science.	Less multimedia. Not very focused on transversal skills.	Initial diagnosis. Monitoring of content mastery.

6.6 Risks of Genetic Engineering and the need for human supervision

Generative Artificial Intelligence offers significant opportunities to improve inclusion, personalization, and accessibility in Vocational Education and Training (VET). However, its integration into educational contexts—especially when it involves students with special educational needs—also carries risks that require responsible, critical, and continuously monitored implementation.

From the perspective of the European regulatory framework, many educational AI applications are considered high-risk, particularly those related to student assessment, the allocation of learning pathways, or automated decision-making. The European AI Regulation (AI Act) establishes the obligation to guarantee transparency, traceability, data protection, and effective human oversight, especially when these technologies affect vulnerable groups.

One of the main risks is the **lack of pedagogical judgment and human empathy.** Although AI systems can offer quick and personalized responses, they lack the deep emotional understanding that characterizes face-to-face educational interaction. The teacher-student relationship remains essential for the development of social, communicative, and socio-emotional skills, especially relevant in vocational education. Studies reviewed by the Harvard Graduate School of Education indicate that a significant proportion of AI-assisted tutoring interactions (around 40%) fail to grasp complex emotional nuances, reinforcing the recommendation to adopt hybrid models that combine virtual tutoring with human support.

Related to this, there is a **risk of misdiagnosis,** especially when using "conversational diagnostic" systems to infer cognitive, emotional, or social difficulties. Scientific evidence in this area remains limited, and an incorrect automated interpretation can lead to inappropriate support or misguided educational decisions. For this reason, any signal generated by AI should be understood as indicative, never conclusive, and always validated by education or guidance professionals.

Another critical aspect is the **reproduction or amplification of biases.** Genetic engineering models are trained on large volumes of data that can reflect social inequalities, cultural stereotypes, or historical barriers. In vocational training, this can translate into non-inclusive examples, lowered expectations for students with special educational needs, or pedagogical recommendations that are misaligned with classroom diversity. Furthermore, the tendency of some systems to generate homogeneous responses can foster an " echo chamber " effect, limiting students' exposure to diverse perspectives and hindering the development of critical and independent thinking.

In addition, there is the issue of the **reliability of the generated content.** AI can produce plausible but incorrect answers, especially in technical fields typical of vocational training (mechanics, electricity, healthcare, or IT). For students with special educational needs, these inaccuracies can have a greater impact, increasing confusion or reinforcing misconceptions. For this reason, all AI-generated material must be reviewed and validated by teachers before its use in the classroom or in online tutorials.

Privacy **and data protection** It is also a central focus. Many AI tools process sensitive information about performance, behavior, and educational needs. Strict compliance with the GDPR is essential, as is avoiding the entry of personally identifiable information on external platforms and prioritizing institutional solutions approved by educational authorities. Furthermore, students and their families must be clearly informed about what data is collected, for what purpose, and how it is protected.

There is also a risk of **over-reliance on automation.** While virtual tutoring and adaptive systems can improve access to learning, they cannot replace human support or the relational context of the classroom. In vocational training, where hands-on learning, collaborative work, and professional socialization are fundamental, overuse of AI could foster isolation, especially among students with social or communication difficulties.

Therefore, human supervision is a pedagogical and ethical imperative. Educational institutions must monitor the functioning of these tools, encourage the verification of the information generated, and promote hybrid approaches that combine AI with in-person workshops and direct tutoring. In practice, this means that teachers:

- Always retain ultimate responsibility for educational decisions.
- Review and validate AI-generated content.
- Help students to check doubtful answers.
- Avoid letting virtual tutoring replace human contact, especially in children with special educational needs.
- Use ethical prompts and active strategies to prevent bias.

7. Personalized learning

Artificial intelligence can help personalize learning and offer each student an education tailored to their needs

Andreas Schleicher (Director of Education at the OECD)

From an educational perspective, personalized learning is one of the main contributions of artificial intelligence to teaching, as we have already seen in previous chapters. Through the continuous analysis of learning data and the use of adaptive models, AI allows for the design of learning experiences better tailored to each student, promoting equity, inclusion, and the development of professional skills.

In pedagogical terms, AI-supported personalization relies on the collection and interpretation of information from multiple sources: activity results, response times, error patterns, format preferences, interactions on digital platforms, and skill development. Based on this data, AI systems build dynamic learning profiles that allow for the adaptation of content, teaching sequences, difficulty levels, and support strategies.

In vocational training, this capability is especially valuable for addressing classroom heterogeneity: young students, adults undergoing career transition, students from migrant backgrounds, or students with specific educational needs. AI can facilitate flexible learning pathways, offering support for those who need it, in-depth activities for those progressing more quickly, and accessible formats for those with sensory, cognitive, or linguistic barriers. In this way, personalization aligns with the principles of Universal Design for Learning (UDL), by offering multiple means of representation, expression, and engagement.

Traditional Teaching	Adaptive Learning
Same pace for all students	Flexible pace and content tailored to each student
Evaluation at the end of the process	Continuous and real-time evaluation
The teacher directs the entire process	The student takes an active role with AI support

In this chapter we will see what adaptive learning is and how to apply it in training thanks to AI.

7.1 What are adaptive learning pathways

Adaptive learning pathways are dynamic educational itineraries designed with the support of artificial intelligence systems that continuously adjust the content, activities, and pace of learning based on the progress, needs, interests, and individual characteristics of each student. They are part of the approach known as adaptive learning, an educational methodology that uses data and technology to personalize the learning experience for each student.

Unlike traditional approaches, they allow:

- Advance according to content mastery.
- Strengthen weak areas with specific resources.
- Offer alternative content according to learning styles, educational preferences or needs.

Essentially, these are learning paths or itineraries that don't follow a fixed, universal order, but rather adapt dynamically to the student's profile: their strengths, weaknesses, preferences, and pace of progress. Imagine a GPS for learning: instead of a single route for everyone, the system assesses your starting point (prior knowledge) and destination (learning objectives), and recalculates the route if you encounter obstacles (such as difficulties with a topic) or progress too quickly (skipping unnecessary modules). This is achieved through computer systems that analyze data in real time, such as responses to assessments, time spent on tasks, and interactions with the content.

Therefore, they are based on the principle that not everyone learns the same way or at the same time, and they use data and artificial intelligence (AI) to adapt the content, activities, and assessments.

This approach contrasts with traditional training, which is linear and "one-size-fits-all," where all participants progress at the same pace, regardless of their needs. According to experts in educational neuroscience , adaptive learning respects how the human brain works, avoiding cognitive overload and fostering neuroplasticity (the brain's ability to form new connections).

7.1.1 Benefits of adaptive learning pathways

- **Greater learning efficiency,** by optimizing training time and activating early support when difficulties arise.
- **Increased motivation and retention are achieved** by connecting content to personal relevance and visible progress, fostering deeper and more lasting

learning. In fact, studies suggest that adaptive learning systems tend to improve knowledge retention by filling information gaps, promoting active learning, and reducing cognitive load, thus facilitating better long-term learning and recall.

- **Effective attention to diversity,** by allowing different paces, formats and levels of complexity, in accordance with the principles of Universal Design for Learning (UDL).
- **Specific support for students with SEN,** through adaptations of pace, modality (visual, auditory, practical) and cognitive level.
- **Reinforcement of autonomous learning,** thanks to personalized recommendations and continuous feedback.
- **Improved teaching decision-making,** by providing structured information on the progress and needs of the group.

7.1.2 Key components of an adaptive learning path

An AI-based adaptive learning path is typically structured around the following elements:

- **Initial diagnosis**

  Assessment of prior knowledge (test, survey, or practical activity) and, where possible, learning preferences or styles (visual, practical, etc.). This is not a punitive test, but rather a diagnostic tool that establishes the starting point of the learning path.

- **Dynamic student profile**

  A model that is continuously updated with data on progress, pace, recurring errors and interactions, and that serves as a basis for adaptive decisions.

- **Main content branch**

  Basic sequence of units or modules, usually organized into micro-contents (microlearning of 5–15 minutes) that can be recombined according to the student's needs.

- **Adaptive deviations**

  Additional content or activities are activated based on performance, interest, or mastery level. Using AI and predefined rules, the system decides what to show, in what order, and at what level of detail. Factors such as quiz performance, time spent, and even the student's level of engagement guide these adjustments. If persistent difficulties are detected, reinforcement resources (videos, diagrams, practice exercises) are offered; if students demonstrate competence, they can advance or access more in-depth activities.

- **Automated and personalized feedback**

  Immediate feedback that guides students, reinforces achievements and provides additional explanations, when necessary, as well as generating useful information for teachers.

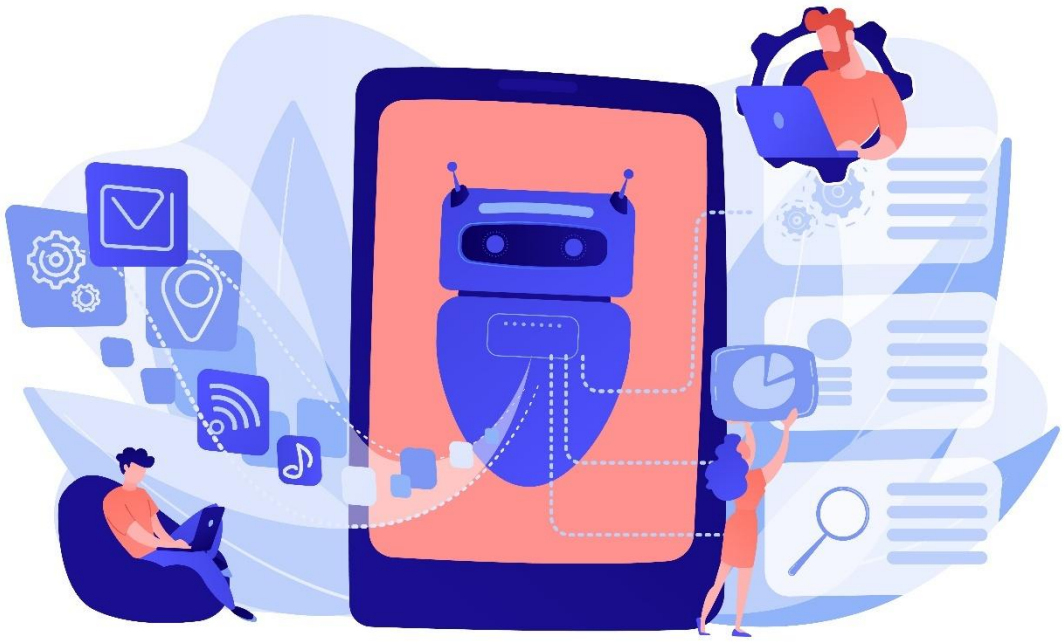
- **Personalized final assessment**

  Test, project or competency activity adjusted to the student's actual evolution along the route.

- **Human supervision and pedagogical adjustment**

  Continuous review by the teaching staff, who validate the recommendations of the AI, introduce adjustments and ensure comprehensive educational support, especially in the case of students with SEN.

Through these pathways, AI acts as a "digital tutor" that observes how the student learns and adjusts the educational experience in real time. However, it's crucial to remember that these pathways should be seen as support for teachers, never as a substitute for professional judgment. AI can suggest paths and identify needs, but it is the responsibility of teachers to guide, contextualize, and ensure that each learning path respects the rights, dignity, and potential of every student.



7.2 Role of AI in personalization

As we have seen previously, Artificial Intelligence is the main driver behind adaptive learning pathways, transforming a traditional educational approach—linear and homogeneous—into a dynamic, personalized, and student-centered one. Essentially, AI

acts as an “invisible tutor”: it not only observes and responds to student progress, but also anticipates needs, optimizes learning paths, and continuously adjusts the learning experience.

In European Vocational Education and Training (VET) contexts—characterized by a wide diversity of profiles (young people, those undergoing retraining, migrant students, and students with special educational needs) and a strong practical orientation—this capability is especially valuable. AI allows a shift from a "one-size-fits-all" model to flexible, relevant learning pathways aligned with each individual's pace, interests, and career goals.

From a technical-pedagogical point of view, these routes are built using machine learning algorithms, natural language processing (NLP) and educational data analysis, which process information in real time to create itineraries tailored to the unique profile of each student.

This AI intervention in personalized learning is carried out primarily through four major interconnected functions:

1. **Analysis of student progress**

   AI doesn't just record grades: it performs a multidimensional analysis of learning behavior to build a dynamic student profile. Among the most common variables are:

   - ✓ Successes and failures, identifying patterns that allow us to distinguish between isolated failures and persistent conceptual difficulties.
   - ✓ Time spent, detecting possible signs of cognitive overload or, on the contrary, of prior mastery of content.
   - ✓ Student participation and involvement, based on interactions with videos, practical activities, simulations or forums.

   In vocational training, this allows, for example, detecting that an electrical engineering student needs reinforcement in basic circuits before moving on to industrial automation, or that a business student can progress faster in digital marketing content.

2. **Predicting needs and preventing difficulties**

   Beyond reactive analysis, adaptive systems employ predictive models to anticipate potential future obstacles. If students show recurring difficulties with intermediate concepts, AI can predict that these will affect more advanced modules and automatically activate reinforcement pathways.

   This proactive approach helps reduce frustrations, avoid learning bottlenecks and promote continuity of training, a key aspect in European VET, where early dropout remains a structural challenge.

3. **Intelligent resource recommendation**

AI acts as an educational curator, suggesting videos, readings, simulations, or practical activities tailored to the students' level, learning style, and cultural context. Similar to recommendation systems on digital platforms, but with a pedagogical purpose, it combines:

- ✓ individual profile analysis,
- ✓ comparison with similar student trajectories,
- ✓ and evaluation of the available content.

Thus, a student with a visual learning preference in a marketing vocational training program might receive infographics or short videos, while another with a more active learning style might access simulations or practical challenges. For students with special educational needs, these recommendations incorporate accessibility criteria (subtitles, audio, simplified language, or visual aids), reinforcing Universal Design for Learning (UDL).

An IBM report indicates that these recommendations increase route completion by 50%, by making learning relevant and less overwhelming, respecting the brain's limited cognitive load.

4. **Personalized feedback and integrated tutoring**

Through chatbots and intelligent assistants, AI offers immediate feedback tailored to the student's level. It not only points out errors but also explains the reasoning step by step, proposes alternative examples, and answers questions in natural language, for example, "explain the concept of *blockchain* to me again as if I were 10 years old."

In adaptive learning paths, this feedback is often combined with gamification elements (badges, visual progress, achievements, etc.), which helps maintain motivation, especially in demanding or highly technical modules. Furthermore, some systems can detect signs of frustration or demotivation during interaction and adjust the tone of their responses accordingly.

7.3 How to adapt content with effective prompts

The foundation for Generative Artificial Intelligence to help teachers adapt educational materials quickly and flexibly lies in the use of well-designed *prompts. An effective prompt* is not simply "asking the AI for something," but rather clearly describing the educational context, the student profile, the learning objective, and the necessary adaptations. In this way, AI can act as a pedagogical assistant that generates resources aligned with the curriculum, Universal Design for Learning (UDL), and European principles of inclusion.

To adapt content in vocational training using AI, it is recommended to structure the *prompts* around five elements:

- **Specify the training context**

  Always specify the cycle, module, and level. This helps the AI adjust terminology, depth, and examples to the relevant professional field. For example: "I am teaching the Electrical Installations module in a Vocational Training Intermediate Level course."

- **Define the learning objective**

  Explain which skill or learning outcome you want to work on. This avoids generic answers and focuses the discussion on specific results. For example: "The objective is for students to understand the basic operation of a series circuit and be able to assemble it."

- **Describe the student profile**

  Include relevant information: approximate age, cultural background, special educational needs, learning styles, or prior level. This is essential for adapting content to a particular group of students. For example: "The group includes students with dyslexia and very practical learning styles; they prefer visual examples and step-by-step activities."

- **Request specific adaptations**

  indicate what type of accessibility or customization is needed, whether it be simplified language, visual support, audio, guided sequences, analogies and practical examples, contextualized examples, or multilingual versions. For example: "Adapt the content using simple language, include visual diagrams, and an audio explanation."

- **Request specific and reusable formats**

  Request practical classroom resources, such as worksheets, infographics, rubrics, interactive activities, video scripts, or simulations. For example: "Create a worksheet with 3 practical exercises, a visual summary, and a basic assessment rubric."

Complete example of a *prompt:*

"I *am a vocational training teacher in the Customer Service module of a mid-level Marketing course. I need an activity for diverse students, including students with dyslexia and a low level of Spanish."*

Objective: to practice handling claims situations.

Create a resource with:

– simple dialogues,

– easy-to-read version,

– visual support,

– audio of the dialogues,

– and a role-play activity.

Use culturally diverse examples and a professional tone."

Another consideration is **adapting the *prompt* to the students' educational level.** For more advanced students, the content should include more detailed explanations, using more technical and in-depth language appropriate to their level. In this case, AI can generate advanced versions of a topic, adding more information and exploring more complex areas. Thus, once the activity is created, we can ask the AI to include a series of more technical terms. For example, if we are working on a Customer Service module, we can ask it to include complaint management and conflict resolution techniques such as assertive communication, win-win solutions, de-escalation techniques, or empathetic reframing.

7.4 Practical examples of AI use in personalization

Below are three examples developed by Emilio Ruiz Hidalgo, a teacher at the Nuestra Señora del Rosario School in Rota (Cádiz), specializing in Artificial Intelligence applied to education. These examples use three different tools in different vocational training modules to implement adaptive learning pathways.

7.4.1 Practical Example 1: Administrative Vocational Training Module

Context

- Training cycle: Administrative Management (Intermediate or Higher Level).
- Professional Module: Business Communication and Customer Service / Processing of Accounting Documentation.
- Estimated duration: 3 hours within the "Billing" block.
- Tool: *Smart Sparrow* (platform for creating lessons with adaptive logic).

General objective

To train students to create complete and correct invoices, understanding their elements, structure and regulations, through an adaptive environment that adjusts to their level of mastery.

Specific objectives

1. Identify the mandatory elements of an invoice.
2. Calculate correctly the taxable base, VAT and personal income tax.
3. Apply discounts, surcharges and payment terms.
4. Create an electronic invoice in standard format.
5. Reflect on common errors in accounting documentation.

Adaptive structure in *Smart Sparrow*

1. Initial assessment. The student completes a short 10-question test on basic invoicing concepts (VAT, personal income tax, numbering). Quiz-type activity with automatic feedback.
2. Main branching. Based on the results, Smart Sparrow automatically redirects to one of three routes using an adaptive branching engine.
3. Learning paths.
    - Route A – Reinforcement. For students with < 50% correct answers: interactive micro-lessons on invoice elements and step-by-step guided calculations. Activities with examples, drag and drop, and immediate feedback.

- Route B – Standard. For students with a 50-80% success rate: solving practical exercises with visual support and validating results. Activity with an editable invoice simulation.
- Route C – Advanced. For students with > 80% correct answers: a complete simulation of a company that issues and receives invoices, including withholdings and credit notes. The activity here is a "Smart Office SL Company" scenario with autonomous decision-making.

4. Final assessment. All students complete a final project in which they create a complete invoice. This is done using an integrated rubric with automated criteria.
5. Personalized feedback. Smart Sparrow generates specific feedback based on detected errors. *Adaptive feedback system.*

Example of a learning flow in Smart Sparrow

1. Screen 1 – Welcome and objectives: the success criteria are explained.
2. Screen 2 – Diagnostic test: 10 questions with immediate feedback.
3. Screen 3 – Automatic decision:
   - If < 50% → ROUTE A (Reinforcement)
   - If 50–80% → ROUTE B (Standard)
   - If > 80% → ROUTE C (Advanced)
4. Screens 4-8 – Adapted content: each route offers interactive activities (videos, exercises, simulations).
5. Screen 9 – Final evaluation: simulation of invoice preparation with variable data.
6. Screen 10 – Feedback and closure: personalized recommendations and the possibility of retrying the simulation.

Content by level

- Reinforcement Level: Basic concepts (Tax ID, numbering, concept, taxable base). Activity: Identify parts of an invoice by dragging labels.
- Standard Level: Calculating taxes, discounts, and surcharges. Activity: Filling out an invoice using an editable template.
- Advanced Level: Special cases: corrective invoices, self-invoices, intra-community transactions. Activity: Decision-making simulation (choose invoice type and justify it).

Assessment

- Initial diagnosis (10%) – automated questionnaire.
- Adaptive route (40%) – progress and results in Smart Sparrow.
- Final project (40%) – complete invoice automatically corrected.
- Final reflection (10%) – brief self-assessment on learning and difficulties.

Criteria:

- Calculation accuracy (40%)
- Formal and normative correctness (30%)
- Proper use of the tool (20%)
- Reflective capacity (10%)

Role of the teacher

- Monitor progress using Smart Sparrow's analytics dashboards.
- It only intervenes at points where the system detects repeated blockages.
- It provides discussion forums to analyze common errors.

Expected result

At the end of the activity, the students:

- Master the entire invoicing process.
- Understand the usefulness of adaptive systems in your learning.
- Develops autonomy and self-management of learning.

Each student progresses at their own pace and receives automatic feedback from the system (for example, messages from a Moodle chatbot).

7.4.2 Practical Example 2: VET Electricity

Context

- Vocational Training Cycle: Electrical and Automatic Installations.
- Professional module: Interior Electrical Installations or Principles of Electricity.

- Estimated duration: 3-4 hours within the unit “Interpretation of electrical plans”.
- Tool: Knewton Alta (AI-based adaptive learning platform).

General objective

Develop the ability to interpret electrical symbols and design basic schematics using an adaptive environment that offers micro-lessons or simulations based on the errors made.

Specific objectives

1. Recognize the standardized symbols of electrical installations.
2. Correctly interpret single-line and multi-line diagrams.
3. Apply connection criteria and graphic representation in electrical plans.
4. Solve practical exercises in circuit interpretation.
5. Reinforce the misconceptions detected through dynamic micro-lessons.

Adaptive structure in *Newton*

1. Initial diagnosis: 15-item questionnaire on the identification of electrical symbols (switch, commutator, grounding, differential, etc.). The system analyzes errors and correct answers to establish the initial level.
2. Automatic level assignment. Based on the results, *Knewton* generates a personalized route with levels: Basic – Intermediate – Advanced.
3. Adaptive routes:
    - Route A (Basic). Review of concepts with interactive micro-lessons on each symbol and its function. Explanatory resources + guided self-assessment.
    - Route B (Intermediate). Exercises associating symbols with their applications in diagrams. Self-correcting activities and practical examples.
    - Route C (Advanced). Simulation of a complete lighting circuit design. Guided practice virtual lab activity.
4. Continuous feedback. After each section, *Knewton* provides tailored feedback with automatic suggestions. For example: “Review the symbols for the switching mechanisms before continuing.”

5. Final assessment. Practical test of electrical plan interpretation + brief reflection. Quantitative results + qualitative feedback.

Example of a learning flow in *Knewton*

1. Screen 1 – Introduction: brief presentation on the importance of electrical symbols in plans.
2. Screen 2 – Initial diagnosis: questionnaire with images of symbols and questions such as "select the correct function".
3. Screen 3 – Automatic adaptation:
    - If the student fails on more than 5 symbols → Route A (Basic).
    - If you get between 8 and 12 right → Route B (Intermediate).
    - If you get more than 12 right → Route C (Advanced).
4. Screen 4 – Content development: micro-lessons or simulations according to the level.
5. Screen 5 – Adapted final assessment: interpretation of an electrical plan with immediate feedback.
6. Screen 6 – Final report: summary of results, areas for improvement and suggestions for reinforcement.

Content by level

- Basics. Electrical component symbols (switches, fuses, lamps, sockets). Micro-lessons with image + text + quick questions.
- Intermediate. Applications of symbology in single-line and multi-line diagrams. Association of symbols with their location on drawings.
- Advanced. Design of a real circuit: lighting, power outlets, and protection. Interactive simulation of virtual wiring with automatic verification.

Assessment

- Symbol recognition (30%). Initial diagnosis and adaptive follow-up.
- Correct interpretation of diagrams (40%). Exercises and simulations in *Knewton.*
- Practical application (circuit design) (20%). Final guided design test.
- Self-assessment and reflection (10%). Final report generated by the student.

Role of the teacher

- Monitor the progress dashboards generated by *Knewton.*
- It provides personalized tutoring support to students with recurring difficulties.
- Integrate the results into the overall module grade.

Expected result

At the end of the activity, the students:

- It accurately recognizes electrical symbols.
- Interprets electrical plans and diagrams independently.
- Understand how adaptive systems adjust learning based on mistakes or successes.
- It improves its efficiency in the design and reading of real electrical circuits.

7.4.3 Example 3: Customer Service with ChatGPT

Context

- Training cycle: Administrative Management / Commerce and Marketing / Consumer Services.
- Professional module: Customer Service.
- Estimated duration: 2-3 hours within the unit “Communication and conflict resolution with the client”.
- Tool: ChatGPT (conversational AI model).

General objective

Train students in communication skills and handling difficult customers, through personalized conversational simulations with ChatGPT that adjust in difficulty and context according to the student's responses.

Specific objectives

1. Apply effective communication and active listening techniques.
2. Resolve customer service conflicts at different levels of complexity.

3. Develop empathy, self-control, and professional argumentation skills.
4. Analyze your own response styles and improve personalized attention.
5. Generate reflective reports on the simulations performed.

Adaptive structure with ChatGPT

1. Initial assessment. The student completes a brief test or questionnaire on communication styles. ChatGPT analyzes the communication profile (assertive, passive, aggressive).
2. Initial simulation. The student converses with a simulated "difficult customer" using ChatGPT. The AI adjusts tone, vocabulary, and level of conflict according to the student's attitude.
3. Dynamic adaptation. During the conversation, ChatGPT identifies patterns: interruptions, empathetic or reactive responses. If it detects an error, it changes the level of difficulty (more insistent, more emotional, or more technical).
4. Immediate feedback. At the end of the interaction, ChatGPT provides an automatic report. It assesses strengths and weaknesses and offers personalized advice.
5. Final report and reflection. The student analyzes their own performance and proposes improvements. The teacher evaluates using a rubric and review of the report.

Example of activity flow in ChatGPT

1. Screen 1 – Context presentation: “You are responsible for the after-sales service of a telephone company. A dissatisfied customer calls because their bill has an unexpected surcharge.”
2. Screen 2 – Simulation Start: ChatGPT represents the customer with a polite, but annoyed tone.
    - If the student responds calmly and empathetically, the client relaxes.
    - If the system responds defensively, it increases the level of tension.
3. Screen 3 – Scenario Adaptation:
    - Level 1 (basic): undecided or confused customer → needs clear information.
    - Level 2 (medium): frustrated customer → demands immediate compensation.

- Level 3 (advanced): aggressive customer → questions the professionalism of the employee.

4. Screen 4 – Automated Feedback: ChatGPT generates a structured report:
    - Positive aspects: “You have shown empathy and offered clear solutions.”
    - Areas for improvement: “Avoid making excuses before fully listening to the customer.”
    - Recommendations: “Use validating phrases like 'I understand how you feel'.”
5. Screen 5 – Student's Final Report: The student reflects on what they have learned: “I have understood the importance of remaining calm and recognizing the customer's emotion before offering a solution.”

Adaptations by performance level

- Basic level. Low difficulty. Friendly customer with a simple problem. Active listening and data verification.
- Intermediate level. Dissatisfied but reasonable customer. Conflict resolution through negotiation.
- Advanced Level. Aggressive or sarcastic client. Application of emotional de-escalation techniques.

Assessment

- Verbal communication and professional tone (30%). Simulation transcript.
- Conflict resolution (30%). Automatic ChatGPT report.
- Empathy and self-control (20%). Recording of reactions during the simulation.
- Reflection and personal improvement (20%). Student's final report.

Role of the teacher

- Design the prompts or initial scenarios adapted to the VET level.
- Monitor transcripts and analyze student progress.
- Supplement ChatGPT feedback with human observations.
- Integrate the simulations into the Moodle or web environment of the course.

Expected result

At the end of the activity, the students:

- Demonstrates proficiency in professional care and conflict resolution.
- Understand how AI can act as a communicative coach.
- Improve your confidence, empathy, and professional language.
- It has a personalized report that you can include in your skills portfolio.

8. Automation and efficiency of the evaluation

Feedback is only useful if it prompts the student to think.

Dylan William (Welsh educator)

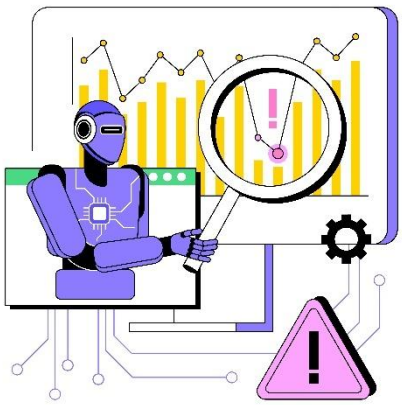
Assessment is a fundamental pillar of Vocational Training, as it not only certifies learning but also guides the development of technical and professional skills. In recent years, Artificial Intelligence has opened new possibilities for transforming this process, allowing us to move towards more agile, personalized assessment models focused on student progress.

Automating assessment through AI facilitates the grading of activities, performance analysis, and the generation of immediate feedback, reducing the administrative burden on teachers and freeing up time for pedagogical support. At the same time, these technologies enable more precise monitoring of learning, identifying early difficulties and supporting adaptive learning pathways, which are especially relevant in vocational training contexts characterized by diverse profiles and learning paces.

In this chapter, we will explore how AI can contribute to more efficient and inclusive assessment, covering everything from the fundamentals of automation to the most widely used tools, their benefits and limitations, the role of virtual feedback assistants, and intelligent progress management. Finally, we will analyze emerging trends that will shape the future of automated assessment in European vocational training, always from a *human-centered perspective*, where technology complements—but does not replace—the teacher's professional judgment.

8.1 What is assessment automation?

Assessment automation involves using digital systems and artificial intelligence to create self-grading tests, provide immediate feedback, and analyze overall student performance. This approach goes beyond traditional closed-response questionnaires: thanks to techniques such as *machine learning* and natural language processing (NLP), it is now possible to also assess open-ended responses, digital technical exercises, and simulated practical activities, integrating these processes into LMS platforms and hybrid learning environments.



In Vocational Training (VT), where some learning takes place in digital or blended environments and involves working with increasing volumes of learning evidence

(projects, exercises, simulations), automation becomes a key tool for efficiently managing these processes without sacrificing pedagogical quality. Furthermore, this approach is crucial for adapting learning to individual paces, especially benefiting students with special educational needs (SEN), such as learning disabilities or language barriers. Thus, we can say that this automation promotes equity, in addition to achieving more efficient and personalized assessment, as it adjusts the difficulty of tests in real time and detects error patterns to reinforce weak areas without stigmatizing students.

It is important to emphasize that this is not about replacing teachers, but rather freeing them from repetitive tasks (grading, classifying results, basic error detection) to strengthen pedagogical support, individualized tutoring, and the development of complex professional skills. According to an EDUTEC report on Artificial Intelligence and Education, AI reduces grading and analysis time by 47% in vocational training environments, enabling personalization for students with special needs (for example, identifying learning gaps for early intervention).

This is not the only scientific evidence of its usefulness. A recent scientific review of AI systems applied to educational assessment and feedback analyzed 77 studies and concluded that these systems significantly improve the efficiency, consistency, and personalization of assessment when used with appropriate pedagogical criteria. Furthermore, it found that automated tools correlate strongly with human assessment (for example, a high correlation between automated and human grades for structured essays), and that automated feedback demonstrates positive effects on academic performance and students' perception of learning.

In vocational training, this ability is especially relevant because it allows:

- ✓ Obtain almost immediate results after an activity.
- ✓ Apply evaluation criteria uniformly.
- ✓ Provide personalized feedback at the moment the error occurs.
- ✓ Scaling up assessment processes in large groups or in blended/online modalities.

8.1.1 Automation and equity in VET

One of the most important added values of automated assessment is its potential to promote equity. In this regard, AI-based systems can:

- ✓ Dynamically adjust the difficulty of the tests.
- ✓ Identify recurring error patterns.
- ✓ Recommend reinforcement activities without stigmatizing students.
- ✓ Activate automatic adaptations (e.g., extending time, simplifying language, or changing format).

For example, a student with ADHD may be given more time to complete a test or have questions presented in shorter blocks; a migrant student may have access to supplementary explanations in their native language; and a student with persistent difficulties in a particular area may be automatically redirected to specific resources.

8.1.2 Practical examples of assessment automation

- **Correction of objective and semi-structured tasks**

  Systems that evaluate questionnaires, multiple choice exercises, matching exercises, or short answers according to defined criteria.

- **Evaluation of open-ended responses**

  Generative models that automatically compare written responses based on semantic and contextual criteria, achieving correlation with human evaluators in detailed comprehension tasks.

- **Feedback on programming or technical procedures**

  Educational platforms that integrate AI models to analyze code or simulated procedures offer feedback on common errors and suggestions for improvement, streamlining independent practice.

For example, imagine a quiz in a Business Administration module. The system detects that a student is making repeated mistakes in financial calculations. It can automatically generate a report for the instructor, offer the student a short explanatory video on compound interest, suggest progressively more complex exercises (from basic to applied), and present the content in the student's preferred language.

This type of early intervention transforms assessment into a continuous formative process, not just a certification mechanism.

8.2 Main Tools

AI tools facilitate the creation, correction, and analysis of assessments, integrating seamlessly with platforms like Moodle or Google Classroom. Here are some accessible options for vocational training in the EU, with an emphasis on personalization:

Socrative

Formative assessment platform that allows you to create self-grading tests with real-time analysis.

Advantages:

- ✓ Immediate feedback for students.
- ✓ Detailed reports by student and by group.
- ✓ Real-time visualization that allows the teacher to adjust the explanation on the fly.
- ✓ Very lightweight and easy to use in face-to-face or hybrid classes.

Disadvantages:

- × Limited for assessing complex skills or long projects.
- × Less focused on deep customization.

Typical uses in VET:

- ★ Quick comprehension checks.
- ★ Formative assessment at the beginning or end of practical sessions.
- ★ Early detection of conceptual errors.

Google Forms with AI (Google Workspace)

Form and questionnaire creation tool with automatic correction, now supported by AI features to generate questions, summarize answers and create feedback.

Advantages:

- ✓ Direct integration with Google Sheets to create adaptive dashboards.
- ✓ Automatic correction and personalized responses.
- ✓ Very accessible for centers that already use Google Workspace.
- ✓ Easy creation of multilingual assessments.

Disadvantages:

- × Limited capacity for advanced pedagogical analysis without external add-ons.
- × It does not include deep adaptability by default.

Typical uses in VET:

- ★ Theoretical tests.
- ★ Self-assessments.

- ★ Collection of evidence of practices.
- ★ Basic progress tracking.

Classkick

Real-time formative assessment tool that allows teachers to see students' work as they do it.

Advantages:

- ✓ Immediate visual feedback from the teacher.
- ✓ It allows intervention during the activity, not just at the end.
- ✓ Very useful for students with visual needs or who require guided support.
- ✓ Automatic progress analysis.

Disadvantages:

- × Less focused on summative assessment.
- × It depends a lot on the active supervision of the teaching staff.

Typical uses in VET:

- ★ Step-by-step guided activities.
- ★ Live resolution of technical exercises.
- ★ Individual support during digital practices.

Gradescope

AI-assisted grading platform for complex tasks (essays, scanned exams, projects).

Advantages:

- ✓ Automate rubrics.
- ✓ Group similar responses.
- ✓ Detects error patterns.
- ✓ Very powerful for digitized practical assessments.

Disadvantages:

- × Detailed initial setup required.
- × Moderate learning curve.

Typical uses in VET:

- ★ Project correction.
- ★ Evaluation of technical reports.
- ★ Written or scanned exams.

Kahoot!

Gamified assessment platform with AI-powered question generation and response pattern analysis.

Advantages:

- ✓ High student motivation and participation.
- ✓ Automatic analysis of common errors.
- ✓ Highly effective for slow rhythms thanks to its playful approach.

Disadvantages:

- × Less suitable for assessing in-depth skills.
- × Risk of superficiality if used without pedagogical design.

Typical uses in VET:

- ★ Content review.
- ★ Activation of prior knowledge.
- ★ Rapid formative assessment.

MyLab (Pearson)

Continuous assessment platform by discipline (finance, mathematics, health, electricity, etc.), with integrated adaptive pathways.

Advantages:

- ✓ Personalized feedback by subject.
- ✓ Automatic level adjustment.
- ✓ Large bank of technical activities.
- ✓ It integrates detailed analytics.

Disadvantages:

- × Pearson ecosystem dependence.
- × License costs.

Typical uses in VET:

- ★ Continuous assessment by technical skills.
- ★ Automatic reinforcement in weak areas.
- ★ Preparation for professional exams.

Cognii

Tool to evaluate open-ended questions and provide personalized feedback in natural language.

Advantages:

- ✓ It generates formative feedback that guides the student to improve their response.
- ✓ Useful for reflective or reasoned evaluations.

Disadvantages:

- × It may require teacher review in complex technical contexts.
- × Less effective without well-defined evaluation criteria.

Typical uses in VET:

- ★ Evaluation of essays, critical analyses, or constructed responses.

Learnosity

Flexible suite for digital assessment that allows integration of interactive quizzes, exams, and data analysis.

Advantages:

- ✓ It allows you to design rich and varied assessments with AI.
- ✓ It includes tools for content creation and feedback.

Disadvantages:

- × It may require technical integration with LMS platforms.

Typical uses in VET:

- ★ Mixed assessments (theoretical and practical) with integrated results analysis.

Timely Grader

Automated assessment tool that helps in the quick correction of assignments and exams.

Advantages:

- ✓ Reduces teacher correction time.
- ✓ Easy to use for classic assessments.

Disadvantages:

- × More limited functionality compared to more complete tools.

Typical uses in VET:

- ★ Evaluation of short tests or structured response exams.

MagicSchool

Platform with multiple AI tools to create assessments, exams and exercises with self-correction and feedback.

Advantages:

- ✓ Automates the creation and correction of exercises and provides feedback.
- ✓ It can save teachers many hours per week.

Disadvantages:

- × It covers broad functions (beyond pure evaluation), which can create a learning curve.

Typical uses in VET:

- ★ Creating questionnaires.
- ★ Classroom activity management.
- ★ Formative assessment.

Mexty.AI

AI-powered authoring platform that allows the creation of educational content and assessments tailored to learning levels or styles.

Advantages:

- ✓ It allows you to automatically create custom activities and tests.
- ✓ It integrates with popular LMSs.

Disadvantages:

- × It is not focused exclusively on evaluation.
- × It requires adaptation for evaluative uses.

Typical uses in VET:

- ★ Generation of content and activities with integrated assessment in digital courses.

Quizgecko

AI generator of flashcards and quizzes with spaced repetition.

Advantages:

- ✓ Automatically convert texts into quizzes.
- ✓ Ideal for memory reinforcement.
- ✓ Very useful for students with retention difficulties.

Disadvantages:

- × Focused on theoretical content.
- × It does not replace competency assessment.

Typical uses in VET:

- ★ Independent study.
- ★ Exam preparation.
- ★ Conceptual reinforcement.

Megaprofe

Spanish platform for generating tests using AI, aimed at teachers and aligned with European regulations.

Advantages:

- ✓ Quick creation of customized exams and rubrics.
- ✓ GDPR compliance.
- ✓ For Spanish teachers, it has an interface in their language and is also aligned with the Spanish school curriculum.

Disadvantages:

- × Smaller ecosystem than international platforms.
- × Functionality primarily focused on test generation.

Typical uses in VET:

- ★ Creation of inclusive exams.
- ★ Initial or final assessments.
- ★ Rapid test adaptation.

Tool	**Advantages**	**Disadvantages**	**Typical uses in VET**
Socrative	Immediate feedback; reports by student/group; real-time analysis; very easy to use.	Limited for long projects; little deep adaptability.	Rapid formative assessment; detection of conceptual errors; closing sessions.
Google Forms with AI	Automatic correction; Sheets integration; quick creation; multilingual.	Limited advanced pedagogical analysis without supplements.	Theoretical tests; self-assessments; evidence collection; basic monitoring.
Classkick	Live visual feedback; guided support; helpful for visual	Less suitable for summative assessment; requires active supervision.	Guided exercises; digital practice; real-time individual support.

	SEN; automatic progress.		
Gradescope	Automates rubrics; groups responses; detects patterns; powerful for projects.	Complex initial setup; learning curve.	Project correction; technical reports; scanned exams.
Kahoot!	High motivation; gamification; analysis of common mistakes.	It can be superficial if not well designed; limited for deep competencies.	Reviews; activation of knowledge; quick assessment.
MyLab (Pearson)	Feedback by subject; adaptive routes; extensive bank of technical activities.	Pearson ecosystem dependency; licensing.	Continuous technical assessment; automatic reinforcement; professional preparation.
Cognii	Personalized feedback; useful for reasoned evaluations.	Requires expert review; ineffective without well-defined criteria.	Evaluation of essays, critical analyses, or constructed responses.
Learnosity	Varied and analytical assessments; includes content creation and feedback.	Technical integration.	Complete evaluation.
Timely Grader	Efficient correction in a short time; simple to use.	Basic functions.	Evaluation of short exams.
MagicSchool	Automate and provide feedback; save time.	Learning curve.	Creating questionnaires and classroom activities.
Mexty.AI	Integrated assessment with authoring; easy integration with other tools.	Not specialized for assessments, adaptation is necessary.	Personalized content.
Quizgecko	Generates quizzes from texts; spaced repetition; useful for memory.	Focused on theory; does not assess practical skills.	Independent study; conceptual reinforcement; exam preparation.
Megaprofe	Generates tests and rubrics; complies with GDPR; aligned with the Spanish curriculum.	Smaller ecosystem; focused on test creation.	Inclusive exams; initial/final assessments; rapid adaptation.

8.3 Advantages and challenges of automated evaluation with AI

As we have already seen, automated assessment offers a number of pedagogical benefits, including improved efficiency in the assessment process, greater consistency and transparency of criteria, the ability to provide immediate and personalized feedback and support adaptive learning pathways, and the freeing up of teachers' time for other tasks of high pedagogical value. However, these advantages should not obscure the fact that its use also presents a series of challenges that must be managed appropriately to ensure accurate and equitable results.

8.3.1 Main advantages

✓ **Immediate and continuous feedback**

AI systems allow for real-time test correction and personalized feedback after each answer. In vocational training, this is especially useful in technical modules (electricity, IT, administration, healthcare), where learning relies on repeated practice. This way, students don't have to wait days to find out their mistakes: they receive instant feedback that promotes self-regulated learning and reduces frustration, which is crucial for students with cognitive difficulties, ADHD, or language barriers.

✓ **Customizing the pace and level**

Automated assessment adjusts the difficulty of questions based on prior performance, reinforcing content when it detects recurring errors, accelerating progress when mastery is demonstrated, and offering alternative formats (visual, audio, interactive) for students with special educational needs. This directly

connects with the adaptive learning pathways we discussed in the previous chapter.

✓ **Early detection of difficulties**

Analyzing patterns (response time, error rates, and unmet concepts) allows for the identification of needs before academic failure occurs. This facilitates preventative interventions, referrals to specific support services, and rapid methodological adjustments by teachers. All of these actions are especially relevant for students at risk of dropping out or with interrupted educational trajectories.

✓ **Reduction of the administrative burden on teachers**

Automatic correction, report generation, and results visualization free up a significant portion of teaching time, which can be reinvested in other important educational tasks such as face-to-face tutoring, emotional support, or the design of inclusive practical activities.

✓ **Greater fairness and consistency in evaluation**

Automated rubrics apply consistent criteria, reducing subjective variability in objective tests. Furthermore, they allow for automatic adaptations (more time, simplified language, accessible formats, etc.) aligned with EU inclusive policies.

✓ **Scalability**

Automation allows scaling processes that would be prohibitively expensive in terms of time if done manually, for example, in courses with many students, modules with frequent tests, or hybrid vocational training cycles that combine theory and practice.

8.3.2 Main challenges

× **Limitations in assessing complex competencies**

AI performs well with closed-ended questions, structured problems, and technical exercises, but struggles to adequately assess other types of concepts such as critical thinking, creativity, professional ethics, and social skills. In many vocational training programs, such as those related to healthcare or social integration, these skills are of fundamental importance and, in most cases, are beyond the scope of artificial intelligence for evaluation.

× **Limited accuracy and hallucinations**

Beyond the limitations mentioned above, AI can also generate incorrect or inaccurate answers, as it doesn't understand information in the same way a person does. Instead, it generates responses based on statistical patterns learned from large volumes of data. Consequently, it can produce seemingly coherent

content that is objectively incorrect, incomplete, or fabricated. This phenomenon is known as hallucination. These are common when the question is ambiguous or vague, or when very specific technical data is requested, such as regulations, numerical values, or professional procedures. This is especially problematic in technical or numerical vocational training programs (electricity, healthcare, mechanics, occupational risk prevention, accounting, etc.). An incorrect answer about, for example, a clinical protocol, an electrical connection, or a financial calculation can lead to incorrect learning and even potentially dangerous situations.

- **Risk of algorithmic bias**

  If models have been trained on unrepresentative data, they can indirectly harm certain student groups (migrant students, students with special educational needs, or students with non-standard educational trajectories). We must remember that AI learns from existing data, and that if this data is not properly monitored, it can perpetuate historical biases and errors in assessments and feedback. For this reason, the European AI Regulation classifies many educational applications as "high risk," requiring transparency, traceability, and mandatory human oversight.

- **Possible dehumanization of the educational process**

  Excessive use of automated assessment can reduce pedagogical contact, which is especially problematic for vulnerable students who need adult guidance, motivation, and emotional support. AI can in no way replace the empathy or contextual understanding of teachers.

- **Technological dependence and the digital divide**

  Not all vocational training centers or students have the same access to devices or internet connectivity. Without proper planning, automated assessment can exacerbate existing inequalities. It's also important to remember that most tools are paid or severely limit their functionality in the free version, which can severely restrict their implementation in centers with insufficient funding.

- **Privacy and data protection**

  These tools handle sensitive information about performance, behavior, and educational needs. It is essential to comply with the GDPR and ensure data minimization, informed student consent, secure storage, and clear pedagogical use.

8.4 Virtual Feedback Assistants

Virtual feedback assistants are AI-based systems—typically supported by language models, data analysis, and machine learning—designed to provide automatic,

personalized, and continuous feedback on student performance. They act as ongoing support for the learning process, offering immediate guidance, tailored explanations, and suggestions for improvement, and complementing teacher support.

Unlike traditional automatic correction systems, these assistants don't just indicate whether an answer is correct or incorrect. They analyze error patterns, response style, work pace, and mastery level, and generate formative feedback: they explain the reasons for the mistakes, propose alternative strategies, and recommend specific resources.

For example, in a vocational marketing course, within the Business Communication module, a bot based on language models integrated into Moodle (or similar platforms like Coursebox AI) can analyze responses to a case study on complaint management. If a student responds, "The first step is to defend the company," the assistant can reply, "Almost! The correct approach is to start with active listening to empathize with the customer. For example: 'I understand your frustration, tell me more.' Would you like to simulate a conversation with a virtual customer to practice?" Furthermore, for students with specific needs (for example, dyslexia), the same feedback can be offered in audio format or through visual aids, enhancing accessibility.

In European VET, virtual feedback assistants provide benefits on several levels:

1. **Immediate and formative feedback**

   They allow students to receive real-time guidance during quizzes, digital activities, or simulations. For example, in a Management module, the assistant can detect a recurring error in financial calculations and explain the correct procedure step by step, offering additional examples tailored to the student's level.

2. **Answering frequently asked questions and providing ongoing support**

   Educational bots answer questions in natural language, offer automatic suggestions, and support students during assessments or independent study. This 24/7 availability is especially useful in vocational training, where many students combine their studies with work or other responsibilities.

3. **Personalized reinforcement of technical and transversal skills**

   The system identifies weak areas and suggests specific activities (micro-exercises, simulations, short videos, or visual diagrams). In the Electrical

Engineering vocational training program, for example, after several errors in wiring diagrams, the assistant might recommend an interactive diagram before allowing students to proceed. In more communication-oriented modules, such as Customer Service, it might suggest empathetic rephrasing or guided practice sessions.

4. **Support for autonomous and inclusive learning**

   These assistants can adapt the feedback format (simplified text, audio, pictograms or multilingual explanations), benefiting students with dyslexia, ADHD, language barriers or low vision, in line with the principles of Universal Design for Learning (UDL).

5. **Early detection of difficulties**

   By analyzing behavior (response time, number of attempts, type of errors), they generate alerts for teachers when they detect a risk of stagnation or dropout, facilitating early and more humane interventions.

In educational practice, various solutions appear that incorporate these functions:

- Coursebox AI: generates 24/7 conversational feedback tailored to the course content, especially useful in vocational training with flexible schedules.
- Magic School AI: offers multiple assistants focused on personalized feedback, with ethical prompts and an inclusive approach for teachers.
- Eklavvya: incorporates educational chatbots with live monitoring, similarity detection and immediate reinforcement.

As a reference for the potential impact, a university case study (University of Toronto, 2024) showed that an All Day TA type virtual assistant answered more than 12,000 queries in one semester, with an approximate 25% increase in student motivation indicators, demonstrating the ability of these systems to scale educational support.

8.5 Monitoring panels or *dashboards*

Within the support that AI offers for continuously monitoring, analyzing, and supporting the academic and skills development of each student, one of the most useful tools is the tracking panel or *dashboard.* Through the analysis of educational data in real time, these panels show us multiple indicators, such as:

- ✓ Rate of successes and errors per competency or unit.
- ✓ Time spent per question or activity.

- ✓ Group response patterns.
- ✓ Detection of poorly designed items or items with possible biases.

Using predictive analytics and machine learning techniques, this data is translated into automated recommendations for students and early warnings for teachers. These dashboards enable vocational education teachers to make evidence-based pedagogical decisions, a practice known as *data-driven teaching,* allowing them to reinforce complex concepts, redesign ineffective activities, and quickly identify struggling students, including those with special educational needs.

For example, on a platform like Brightspace, a *dashboard* for an Electricity module might show: "Group B (15% of students with special needs): 40% errors in electrical symbols; average time per activity +20%. Automatic recommendation: assign visual micro-lessons and activate personalized tutoring alert." From that same panel, the teacher can generate a PDF report with one click, including progress charts and risk predictions, supporting the planning of in-person reinforcement sessions.

This type of panel has multiple practical applications in a vocational training course:

- **Individualized follow-up and prevention of abandonment**

  AI identifies bottlenecks before they turn into dropouts, something especially relevant in technical cycles such as Mechanics, Electricity or Healthcare.

- **Dynamic adjustment of learning paths**

  In combination with adaptive itineraries, it reinforces weak areas, accelerates mastered content and proposes alternative formats (visual, practical, sequential), aligning with UDL and models such as Felder-Silverman.

- **Clear visualization of progress**

  Both students and teachers have access to clear views of their competency levels, promoting self-regulation and the setting of realistic goals.

- **Support for educational inclusion**

  For students with SEN or language barriers, intelligent management allows for discrete and continuous adaptations (pace, format, type of assessment), naturally integrated into the digital environment.

Several studies in European VET settings indicate that the systematic use of learning analytics and personalized dashboards can reduce dropout rates by around 15%, by facilitating early interventions and adaptive pathways based on aggregated data from thousands of students.

These functionalities appear integrated, totally or partially, in applications such as:

- Brightspace: predictive analytics for VET, with early gap detection and automatic recommendations.
- Blackboard Learn: *dashboards* with AI-assisted rubrics that analyze response patterns to promote fairness.
- MyLab (Pearson): presents panels by technical skills.
- EssayGrader: analysis of technical reports and essays, with summaries and personalized suggestions.

8.6 Practical examples of automated evaluation

Below, we show three examples of different Vocational Training modules that use different tools to carry out an automated assessment.

8.6.1 Example 1: Automated evaluation with Socrative

Context

- Vocational training cycle: Administration and Finance (Higher Level).
- Professional module: Business Communication and Customer Service.
- Estimated duration: 3 hours within the unit "Claims Management and Service Quality".
- Main tool: Socrative, complemented by Google Forms AI for results analysis.

Objective of the example

Design and implement an automated assessment that measures students' knowledge of customer service, providing immediate feedback and useful progress data for the teacher.

Specific objectives

1. Applying AI tools in the creation of digital assessments.
2. Offer immediate and personalized feedback based on the responses.
3. Analyze results and identify areas for improvement based on the data generated.
4. Reduce the workload of teachers by using automated processes.

Activity structure

1. Test preparation. The teacher designs a questionnaire with 15 questions (multiple choice and short answer). This can be done using Socrative Teacher or Google Forms AI.
2. Automatic setup. Correct answers and feedback messages are entered for each item. You can use Socrative's "Automatic Feedback" feature or Google Forms' "Answer Key".
3. Assessment execution. Students complete the online test from a computer or mobile device. This can be done using Socrative Student or via the direct link on the form.
4. Immediate correction. The system automatically grades and generates a global and per-student report that appears in the linked Socrative/Google Sheets results panel.
5. Results analysis. The teacher interprets the data and identifies error patterns. This is done using a results *dashboard or AI charts in Forms.*
6. Individual feedback. Each student receives personalized feedback on their successes and mistakes, with automated messages and an email summarizing their attempt.

Step-by-step application example

1. Questionnaire design in Socrative: The teacher creates a test entitled “Assessment on claims management” with 15 questions.
    - Question types: multiple choice, true/false, and short answer.
    - Customized explanations are added for each error.
    - Example:
        - Question: “What is the first step in addressing a customer complaint?”
        - Correct answer: “Listen actively and record the information.”
        - Automatic feedback: “Remember that listening without interrupting is key to identifying the problem.”
2. Test administration: Students access the system using their class code from their devices. The system calculates the results in real time and displays the individual score.
3. Feedback and analysis:

- Each student receives their grade and a summary of their mistakes with explanations.
- The teacher views the class panel, which displays:
  - Overall average.
  - Questions with the highest error rate.
  - Students with low performance for later reinforcement.

4. Automated reinforcement: Through Google Forms AI, students with less than 70% correct answers are automatically redirected to a review form with mini-lessons and three new adapted questions.

Contents assessed

- Customer service and communication techniques.
- Steps to manage complaints and claims.
- Quality criteria in service.
- Professional attitudes in conflict situations.

Evaluation of the example

- Technical design of the questionnaire. Test structure and feedback configured via Socrative / Google Forms.
- Correct application of AI. Activation of autocorrect and automatic feedback. This is done using the form's own settings.
- Data analysis. Report exported from the system with results using a Socrative / Google Sheets *dashboard.*
- Continuous improvement. Proposal of adjustments based on common errors, developed using the teacher's final report.

Role of the teacher

- Design the automated assessment and check the accuracy of the feedback.
- Analyze the results to adapt the teaching to the needs of the group.
- Provide extra support to students who need it, using the system's reports.
- It guarantees the fairness and reliability of the automated evaluation.

Expected result

At the end of the activity, the students:

- Understand your level of mastery of the content.
- Receive immediate and personalized feedback.
- Improve your learning based on the data generated.

And the teacher achieves a more efficient, analytical and formative evaluation, based on real evidence.

8.6.2 Example 2: Automated assessment with Kahoot! + Mylab

Context:

- Vocational training cycle: Electrical and Automatic Installations (Intermediate Level).
- Professional module: “Principles of Electricity”.
- Estimated duration: 4 hours.
- Main tool: Kahoot! + MyLab for virtual simulations.

Aim:

Evaluate symbology and circuit design with gamification, adapted for inclusion (for example, students with dyslexia receive interactive visual elements).

Adaptive structure (interactive: platform flow with branches):

1. Initial assessment (10 min): Kahoot! quiz with 15 items about electrical symbols (e.g., switch or circuit breaker). The AI analyzes and creates a learning path based on the number of correct answers. If the score is below 60%, the quiz follows the basic path; if it exceeds 80%, it follows the advanced path. The quiz can be adapted with large images and voice to improve accessibility.
2. Interactive development (2 hours): MyLab generates a circuit simulation (e.g., "Connect the lighting: Drag symbols"). This provides step-by-step feedback: for example, "Earth connection error: According to UNE standard, it must be connected to the differential. Do you want to see an animation?" (Gamification is possible, with *badges* for correct answers; spaced repetition is also possible for reinforcement). For slower learning paces, automatic pausing can be added.

3. Continuous feedback (30 min): Kahoot! displays an anonymous *leaderboard.* The AI may suggest: "Review switching mechanisms with an interactive micro-lesson."
4. Final assessment (45 min): Full plan simulation. The AI grades, for example: 40% accuracy, 30% application, 20% reflection, 10% ethics.
5. Analysis and closure (15 min): *Dashboard:* "Group with special needs: +15% visual improvement; recommend tutoring."

Contents by level:

- Basic: Basic symbols (switches, sockets, etc.) with drag-and-drop.
- Intermediate: Single-line diagrams with AI validation.
- Advanced: Real circuit design (lighting + protection) with autonomous decisions.

Assessment:

50% interactive simulation, 30% adaptive feedback, 20% personal report (e.g., "My area for improvement: electrical calculations").

Role of the teacher:

Monitor *dashboards;* facilitate discussions about common errors.

8.6.3 Example 3: Automated assessment with Classkick + ChatGPT

Context:

- Vocational training cycle: Intermediate level in Commerce.
- Professional module: "Customer Service".
- Estimated duration: 2.5 hours.
- Tool: Classkick + ChatGPT for *role-playing.*

Aim:

Evaluate sales communication with conversational simulations, customized for emotional or linguistic barriers.

Activity structure:

1. Initial test: Complete 10 questions about customer styles using Classkick.
2. Simulation: ChatGPT as a “difficult customer” (e.g., a complainer). The AI adjusts its tone based on responses.
3. Feedback: For example: “Good empathy, but improve the closing: Interactive suggestion.”
4. *Dashboard:* Patterns (e.g., "20% of the group needs reinforcement in negotiation").

Possible adaptations:

- Synthetic voices for non-readers.
- Multilingual results for migrant students.

Result:

Activities of this type improve students' soft skills by 25%, as highlighted by some studies.

8.7 Future trends in automated assessment with AI

Automated assessment using Artificial Intelligence is still in a rapidly evolving phase. In the coming years, its development will extend beyond simple test grading, moving towards comprehensive learning support models that combine predictive analytics, deep personalization, and multimodal interaction. Thus, the union of advanced technology with best pedagogical practices guides us towards more accurate, inclusive, and adaptive systems, improving equity, efficiency, and educational quality.

The main lines of evolution include:

- **Continuous and competency-based assessment**

  AI will gradually replace one-off exam models with continuous assessment systems that gather evidence throughout the entire learning process. Digital sensors, simulations, practical activities, and micro-assessments will feed into dynamic competency profiles, allowing for the certification of not only

theoretical knowledge but also real-world professional skills (for example, troubleshooting, customer communication, or the safe execution of technical procedures).

In vocational training, this will facilitate an assessment more aligned with European labor market standards and frameworks such as EQF, micro-credentials and modular learning.

- **Multimodal data integration**

  Future systems will combine text, voice, images, video, and even data from simulators or virtual reality. This will allow for a richer assessment of practical skills: from how a student manipulates equipment in a virtual environment to how they communicate with a simulated client. For students with special educational needs, this multimodal approach will broaden the ways in which learning is demonstrated, reinforcing Universal Design for Learning (UDL).

- **Advanced adaptive assessment**

  Technological advancements will improve AI's ability to adjust in real time to student performance, adapting not only the level of difficulty but also the assessment methodology to each student's learning style. Thus, a more visual student will receive assessments with graphs and diagrams, while a more analytical student will encounter problems based on descriptions or written reasoning.

- **Advanced predictive personalization**

  AI will evolve from reactive adaptation to more sophisticated predictive models. This will anticipate student performance, not only detecting difficulties as they arise, but also anticipating risk trajectories and proposing interventions before learning blocks occur. This includes automatic recommendations on pace, assessment formats, and specific support, strengthening dropout prevention in vocational training.

- **Conversational evaluator assistants**

  Virtual assistants will move from providing one-off feedback to maintaining ongoing pedagogical dialogues with students: they will explain assessment criteria, guide self-assessments, and help build competency portfolios. Instead of simply grading, they will act as facilitators of reflective learning.

- **Assessment of soft skills and transversal competencies**

  Currently, AI is effective at assessing theoretical and conceptual knowledge, but it falls short when evaluating other skills such as communication, critical thinking, and creativity. The development of technologies capable, for example, of analyzing argumentation and the quality of ideas in oral presentations through speech recognition will allow for a more comprehensive approach to assessment.

- **Combination with immersive technologies**

  The integration of immersive tools such as virtual reality or augmented reality will allow students to be assessed based on simulated scenarios, enabling more practical and contextualized experiences. For example, simulating an operating room procedure for healthcare professionals will provide an assessment that goes beyond theoretical knowledge, strengthening practical skills in realistic contexts tailored to their professional performance.

- **Gamified assessment**

  As we have seen in other sections, gamification is a powerful tool for motivating and engaging students. Therefore, integrating assessments into gamified environments, where students can learn and be assessed as they play, will increase their motivation and commitment by providing them with a fun and interactive learning experience.

- **Greater focus on ethics, transparency, and explainability**

  Driven by the European AI Regulation and European Commission guidelines, the demand for explainable assessment systems will grow: teachers and students will need to be able to understand why an AI assigns a score or recommends reinforcement. Mechanisms for bias auditing, data protection, and human oversight will be strengthened, especially in applications considered high-risk. This will lead to increased trust in educational technology, ensuring its responsible and equitable use.

- **Inclusive evaluation by design**

  Future platforms will incorporate accessibility as a standard: automatic time adjustments, alternative formats, simplified language, and multilingual support will be integrated from the start, benefiting students with disabilities, language barriers, or diverse educational backgrounds.

- **Less manual customization work**

  Currently, automated assessment systems require significant prior manual work to adapt the system to the educational context in which it is applied. However, the ability of generative AI to learn autonomously from student responses will facilitate process optimization. This will enable more dynamic and adaptive assessments as the AI learns.

- **Renewed role of the teaching staff**

  Far from being sidelined, vocational education teachers will assume a more strategic role: designer of learning experiences, interpreter of educational data, and guarantor of the human-centered approach. AI will handle repetitive and analytical tasks; teachers will contribute context, professional judgment, empathy, and career guidance.

9. Ethics and risks of using AI in the classroom

The creation of a successful AI will be
the greatest event in the history of our civilization.
Or the worst. We simply don't know.
That's why we must be aware of the dangers,
identify them, employ best practices
and prepare for their consequences.

Stephen Hawking (Theoretical physicist and cosmologist)

As we have seen throughout this Manual, the integration of Artificial Intelligence into Vocational Training opens up significant opportunities to personalize learning, improve inclusion, and optimize educational processes. However, it also raises ethical challenges and risks that require critical reflection and responsible action on the part of teachers and educational institutions.

Therefore, we dedicate this final chapter to addressing the main ethical challenges associated with the use of AI in vocational training classrooms, focusing on student protection, the preservation of equity, and the maintenance of human agency in increasingly automated environments. From algorithmic biases to data privacy, including system transparency and the risk of technological dependence, we analyze those issues that can directly affect educational quality and equal opportunities.

In line with the *human-centered approach* promoted by the European Union and based on documents such as the European AI Regulation, this chapter offers a practical framework to help teachers integrate AI ethically, safely, and pedagogically soundly into their classrooms. The aim is not to limit innovation, but to ensure that technology supports human development, respecting the diversity of vocational education students and reinforcing the teacher's role as a guarantor of learning, inclusion, and critical thinking.

9.1 Ethical framework and most frequent risks in Vocational Training

As Artificial Intelligence becomes increasingly prevalent in our lives, so too does the need to establish an ethical framework to guide it. In this regard, the European Union is a pioneer in establishing measures and regulations that protect a clearly human-centered approach (*Human-Centered Mindset*), prioritizing human rights, inclusion, non-

discrimination, and linguistic and cultural diversity. Examples of this include the European Digital Competence Framework for Educators (DigCompEdu), the European Commission's guidelines on trustworthy AI, and, above all, Regulation (EU) 2024/1689 on Artificial Intelligence (AI Act), which stipulates that AI must serve human well-being and not become a mechanism that perpetuates structural inequalities.

This approach is particularly relevant in vocational training, where students are highly heterogeneous (young people, adults undergoing career retraining, migrant students, students with disabilities, etc.) and where many educational decisions have a direct impact on their professional and life trajectories. Thus, AI can positively transform these environments, but it can also amplify risks if it is not designed and used ethically.

Thus, an AI system that grades simulations in mechanics could exclude students with motor disabilities by not adapting *inputs* (for example, voice controls). The AI Act requires risk management: identifying threats (Art. 9), mitigating data diversity (Art. 10), and post-deployment monitoring (Art. 61). For vocational training, this implies transparency, that is, documenting how the algorithm assesses practical skills, allowing for human appeals.

From a European perspective, responsible educational AI should be:

- ✓ Person-centered, supporting —never replacing— the teacher's professional judgment.
- ✓ Fair and inclusive, avoiding discrimination based on gender, origin, disability or socioeconomic level.
- ✓ Transparent and explainable, allowing you to understand how recommendations, evaluations or alerts are generated.
- ✓ Secure and respectful of privacy, strictly complying with the GDPR.
- ✓ Responsible, with clear mechanisms for human supervision and accountability.

9.1.1 “High-risk” AI systems in education and vocational training

The AI Act classifies AI applications that could significantly affect fundamental human rights as high-risk systems. In the educational field, high-risk systems include, among others:

- They determine access to or distribute students among different educational institutions or training pathways.
- They evaluate people through tests used as a condition for accessing or progressing within their education or professional training.

This includes, for example, algorithms that assign modules or specializations based on automated tests; recommendation systems that prioritize certain profiles for company internships; or tools that rate technical simulations (mechanics, health, electricity) without considering adaptations for students with SEN.

The European Commission notes that a significant portion of current educational applications—especially predictive and evaluative ones—fall into this high-risk category, with an estimated 50% to 70% of such tools requiring prior conformity assessments to ensure fairness and student protection.

9.1.2 Most frequent risks in vocational training practice

Alongside this regulatory framework, there are recurring risks that teachers should be aware of:

- **Over-reliance on automation**

  Delegating key pedagogical decisions to AI can weaken the role of the teacher and impoverish the human support, which is essential in vocational training.

- **Algorithmic biases and the reproduction of inequalities**

  Models learn from historical data that may reflect past discrimination. If these biases are not corrected, they can systematically disadvantage certain groups. Some European pilot projects detected biased impacts affecting 20–30% of students with disabilities.

- **Lack of transparency**

  The opacity of certain systems makes it difficult to validate results and explain them to students.

- **Risks to privacy and data security**

  The mass collection of academic and behavioral information increases exposure to misuse if strict safeguards are not in place.

- **AI Errors and Hallucinations**

  The IAGen can produce incorrect information that appears truthful, generating erroneous learning if there is no teacher supervision.

- **Reduction of student agency**

  Overly directed learning paths can limit the student's autonomy and ability to make decisions about their own learning.

In the following sections we will analyze some of these risks in more depth.

9.2 Algorithmic biases and reproduction of inequalities

One of the main ethical challenges associated with the use of Artificial Intelligence in education is the emergence of algorithmic biases. These biases do not arise because the technology is intentionally unfair, but because AI systems learn from historical data and existing patterns that, in many cases, reflect pre-existing social inequalities related to gender, cultural background, disability, socioeconomic status, or career orientation.

As a general rule, AI tends to reproduce any discriminatory treatment present in the training data. If these datasets are not representative—for example, if they are predominantly Eurocentric or ignore the cultural and migratory diversity present in the EU—the algorithms amplify these limitations, primarily reproducing historically dominant patterns.

These biases can arise at different stages of an AI system's life cycle:

- **Biases in the data**

  Underrepresented or overrepresented populations directly affect the system's estimates and classifications.

- **Design biases**

  When the criteria for "success" or performance are defined from a homogeneous perspective, ignoring diversity of learning styles or sociocultural contexts.

- **Usage biases**

  Even technically correct tools can generate inequalities if they are applied without pedagogical adaptations or human supervision.

The result can be the creation of a "self-fulfilling prophecy" effect: students labeled as low-achieving receive fewer opportunities for advanced learning, subsequently confirming the initial prediction. This phenomenon particularly affects students with special educational needs or belonging to vulnerable groups, intensifying inequalities and generating stigmatization.

In the field of vocational training, this can translate into situations such as:

- Indirect gender discrimination in traditionally male-dominated cycles (electricity, mechanics, industrial maintenance, etc.).
- Penalizing students with disabilities in assessments based exclusively on specific sensory channels.
- Training recommendations that systematically guide certain profiles towards less qualified options.
- Materials generated by IAGen reflect a homogeneous cultural vision by producing content that mirrors the most common or dominant worldview. This carries the risk of imposing majority pedagogical norms and limiting students' exposure to diverse perspectives, impoverishing critical thinking and cultural pluralism, and rendering diverse realities invisible.

For example, a virtual tutor in a hospitality vocational training program might suggest only "standard recipes" without considering cultural variations or dietary restrictions, thus marginalizing multicultural students. Similarly, a system that primarily assesses written responses may undervalue students with dyslexia or language barriers, despite their demonstrated high practical skills.

9.2.1 Strategies to prevent the reproduction of inequalities

1. **Systematic human supervision**

   No algorithmic recommendation should be applied automatically. Relevant decisions must always be validated by the teacher's professional judgment. As we have repeatedly stated throughout this Manual, AI is not meant to replace teachers but to support their work; therefore, the teacher's human role remains fundamental.

2. **Diversification of learning evidence**

   Combining AI analytics with direct observation, hands-on projects, portfolios, and mentoring helps to counteract biases stemming from a single data source, as well as reducing dependence on such systems.

3. **Critical use of predictions**

   Risk alerts should be understood as indicative signals, not as definitive diagnoses. Again, the human element of the teacher is fundamental to using AI data judiciously.

4. **Transparency and AI literacy**

   Explaining to students how these tools work fosters their autonomy and reduces technological dependence. If students (and teachers) understand how AI arrives at its results, they will be able to more easily and effectively detect its errors and prevent its risks.

5. **Inclusive activity design**

   Applying Universal Design for Learning (UDL) principles and offering multiple ways to demonstrate skills reduces the impact of biases associated with single formats.

9.3 Preservation of equity in education

Educational equity is one of the fundamental principles of Vocational Education and Training in the European Union and a central pillar in the responsible use of Artificial Intelligence in the classroom. Unlike equality—which implies offering the same to everyone—equity recognizes that students start from different backgrounds and require differentiated support to achieve common goals.

In this sense, as we have seen throughout this Manual, AI can become a powerful ally in reducing learning gaps, generating high-quality, personalized materials tailored to students' needs. However, if it is not used with clear pedagogical criteria, it can also amplify existing educational inequalities, especially in vulnerable contexts or those with limited access to technology.

Therefore, it's important to consider that not all schools or students have the same access to technological devices or internet connectivity. Consequently, the use of AI tools can negatively impact the education of people living in rural or low-income areas, without access to stable internet or devices that can take advantage of these tools. Furthermore, two other aspects must be considered: generative AI is often trained in digital environments, which can produce resources poorly adapted to specific cultural or linguistic contexts (for example, AI may generate content assuming the recipient has urban knowledge or background, resulting in materials that are difficult for students in rural areas to understand or access); and the economic cost of these tools, since, although some offer a free option, leveraging their full potential requires an investment that some schools cannot afford.

On the other hand, there is a risk of falling into what is called “apparent equity,” that is, confusing algorithmic personalization with real equity. We have already seen that, when well implemented, AI can detect hidden needs through early pattern analysis, personalize support without stigmatizing students, and facilitate learning for students with special educational needs or language barriers. However, some of these adaptive systems can systematically lower the standards for certain profiles, pigeonhole students

into limited learning pathways, or offer simplified content permanently instead of temporary support. This leads to a situation where each student receives something different, but not necessarily what they need to progress. In these cases, AI does not reduce the gap; it reinforces it.

For example, if a system continually recommends fewer complex tasks to a student with initial difficulties, it can prevent them from accessing advanced skills, directly affecting their future employability.

9.3.1 Key principles for preserving fairness with AI in VET

To avoid these risks, the educational use of AI must be based on clear principles:

1. **High expectations for all students**

   Personalization should never translate into lowered expectations. Support should be tiered, with the explicit goal of ensuring that all students achieve the curriculum's learning outcomes.

2. **Adaptations as a bridge, not as a destination**

   Adaptive measures (simplified content, more time, alternative formats, etc.) should be conceived as temporary, aimed at progressive autonomy.

3. **Important decisions always with human mediation**

   Itinerary assignments, career recommendations, and key assessments must be overseen by teachers. AI informs; teachers decide. Ultimately, no automated system can replace the teacher's professional judgment or their understanding of the students' personal context.

4. **Pedagogical transparency**

   Students have the right to know why they receive certain content or support. This strengthens their agency and prevents perceptions of unequal treatment.

5. **Inclusive design from the start**

   Apply Universal Design for Learning (UDL) principles, with multiple ways to access content, demonstrate skills, and provide motivation and participation.

6. **Compare the information**

   Preserving equity involves critically interpreting data and comparing algorithmic recommendations with the realities of the classroom and workshop. Above all, teachers must actively advocate for quality learning opportunities for all, ensuring that AI broadens horizons rather than narrows them.

9.4 Privacy, data security and transparency

The use of AI tools in Vocational Training necessarily involves processing large volumes of student data: assessment results, connection times, behavioral patterns, learning preferences, and even inferred cognitive or emotional indicators. This situation is even more critical for students with special educational needs, as this data may include particularly sensitive information. Therefore, privacy, data security, and transparency are not secondary technical aspects, but rather ethical and legal pillars of AI use in the classroom.

9.4.1 Mandatory legal framework

In the European context, these obligations are primarily supported by:

- The General Data Protection Regulation (GDPR, EU Regulation 2016/679).
- Regulation (EU) 2024/1689 (AI Act).
- The EU Charter of Fundamental Rights .

To these must be added the specific regulations of each country. In Spain, for example, this is regulated by the Organic Law on the Protection of Personal Data and Guarantee of Digital Rights (LOPDGDD).

These frameworks stipulate that students must maintain control over their personal data and understand how automated systems that influence their learning are used. Therefore, any institution implementing AI must be able to justify:

- ✓ What data is collected.
- ✓ For what specific educational purpose?
- ✓ How long are they stored?
- ✓ Who has access.
- ✓ How can students exercise their rights of access, rectification or deletion?

9.4.2 Privacy: minimizing, protecting and justifying the use of data

To protect the privacy of students, one of the basic principles is data minimization, that is, only those data strictly necessary for the educational purpose should be collected.

This involves asking oneself, for example:

- Is it essential to record every student interaction?
- Do cognitive or emotional data need to improve learning?
- How long are academic records kept?

Educational AI platforms typically collect data on test results, time spent on activities, records of interactions with virtual assistants, and written work or voice recordings, among other user information. If this data is not managed properly, serious consequences can arise, such as its misuse for commercial purposes (exacerbated if the premium version of many platforms is not available) and the exposure of sensitive information in security breaches.

Vocational training centers handle highly sensitive information: academic records, guidance reports, and in some cases, medical or psychological data related to special educational needs. Improper collection or management of this information can compromise not only immediate privacy but also the personal and professional future of students.

Furthermore, many AI system providers implicitly incentivize data sharing: the design of these platforms relies on the continuous extraction of information, often without the user being fully aware of its reuse. Recent studies indicate that up to 80% of chatbot users enter sensitive information without knowing how it will be stored or reused, increasing students' digital vulnerability.

This risk is greater when open generative AI tools are used for educational tasks, introducing student texts, diagnoses, or private conversations outside of controlled institutional environments.

9.4.3 Data security: a shared responsibility

Security depends not only on the technology provider, but also on the educational institution and its teachers. The AI Act requires that educational systems considered high-risk incorporate technical and organizational measures such as:

- Data encryption.
- Role-based access control.
- Activity log.
- Periodic audits.

In teaching practice, this translates into concrete actions:

- ✓ Do not share accounts between teachers or students.
- ✓ Do not use public networks to access sensitive educational platforms.
- ✓ Avoid downloading reports containing personal data on unprotected devices.
- ✓ Report any security incidents to the center.

The use of IAGen-based assistants deserves special attention. Entering personal data, special educational needs reports, or identifiable student work into these tools may constitute a direct violation of the GDPR.

9.4.4 Transparency: understanding and explaining how AI makes decisions

Transparency is a core principle of the AI Act. Students and teachers have the right to know when they are interacting with an AI system and how it influences relevant educational decisions, such as automated assessments, learning pathway recommendations, dropout risk alerts, or feedback generated by virtual assistants.

This implies:

- ✓ Clearly report the use of AI.
- ✓ Explain the general criteria of the system in understandable language.
- ✓ Have documentation available on how the models are trained and validated.
- ✓ Always ensure the possibility of human review.

For example, if a *dashboard* classifies a student as "at risk," the teacher should be able to understand which variables led to that conclusion (errors, time, participation, etc.) and not accept the result as a "black box." Similarly, students should be able to request explanations, correct erroneous data, and appeal automated decisions that affect their progress.

9.4.5 Key preventive measures in the vocational training classroom

For responsible use of AI, the following practices are recommended:

- ✓ Apply due diligence in the processing of personal data.
- ✓ Prioritize tools that explicitly comply with GDPR and host data in the EU.
- ✓ Use anonymity by identifying students through pseudonyms (art. 25 GDPR) and avoid entering directly or indirectly identifiable data into AI systems.
- ✓ Clearly inform students that they should not enter their own or third-party personal data into AI tools (explicit consent, art. 7 GDPR).
- ✓ Establish clear policies for data retention and deletion.
- ✓ Ensure that systems are transparent about how data is collected, used, shared, and disposed of.

Beyond legal compliance, teachers can also use transparency as an educational tool, analyzing with students how algorithms work and the purpose of different platforms collecting our data, thereby reflecting on the limits of automation. This strengthens critical digital literacy, an essential skill for employability in Europe.

9.5 Protection of human agency and autonomy

The integration of AI into Vocational Training must be based on one essential principle: technology cannot replace professional judgment or human autonomy. Its role is to support and enhance human capabilities, not replace them. Within the European framework (AI Act), this translates into the requirement of significant human oversight for all educational systems considered high-risk.

Preserving human agency means ensuring that both students and teachers maintain real control over the processes of learning, assessment, and career guidance.

9.5.1 Risk of loss of skills

Excessive automation of AI can lead to a progressive decline in key skills, not only in students but also in teachers. Students may experience a weakening of critical thinking, problem-solving, and self-regulated learning by systematically delegating decisions and

responses to AI. Teachers, meanwhile, risk becoming overly reliant on algorithmic recommendations without exercising their own pedagogical judgment.

Several studies compare this phenomenon to what happened with calculators or certain software programs: when complex cognitive processes are systematically outsourced, the practice of fundamental skills is reduced. In education, this can translate into students "consuming" answers instead of learning to construct them.

Furthermore, many IAGen tools tend to offer standardized solutions. If used without teacher guidance, they can limit personal exploration and creativity, reducing the richness of the learning experience.

9.5.2 Professional judgment versus the algorithm

One of the most sensitive issues in vocational training is educational and career guidance. As we have seen previously, delegating these decisions to automated systems carries significant risks, such as the perpetuation of social or cultural biases, oversimplification of complex life trajectories, or a potential increase in inequalities.

For this reason, there is a widely shared critical view that advises against using generative AI as the primary guidance tool. Tutoring and professional support require human connection, contextual knowledge of the student, and pedagogical experience — dimensions that no algorithm can replicate.

For example, in a vocational training cycle in Hospitality, an AI can generate personalized recipes, but only the mediation of the teaching staff can adapt them culturally (for example, respecting halal or kosher food), assess socio-emotional needs, and introduce sensory adjustments for students with hearing or cognitive disabilities.

Similarly, an algorithmic recommendation on which module to take or which itinerary to follow should always be reviewed by a professional and discussed with the student.

As discussed in previous chapters, AI-based tutoring should complement, never replace, human interaction. This is especially critical for students with special educational needs (e.g., students on the autism spectrum), for whom face-to-face socio-emotional support is irreplaceable.

9.5.3 Promoting human development as an educational goal

The use of AI in vocational training should not be limited to facilitating quick access to information. Its true value emerges when it is geared towards:

- ✓ Intellectual development.
- ✓ Student empowerment.
- ✓ Strengthening autonomy.

- ✓ Enhancement of individual capabilities.

This involves designing activities where students are creators, not just consumers, of content. For example, using AI to co-design projects, develop inclusive proposals, or solve practical challenges through critical prompts.

In the case of students with disabilities or SEN, the objective should always be empowerment, ensuring that they retain control over their learning pathways and actively participate in decision-making.

AI should enrich educational pathways, not narrow them.

9.5.4 Irreplaceable human judgment

Teachers must maintain leadership over the design, implementation, and evaluation of AI use in the classroom. This includes:

- ✓ Review the results of automated assessment systems.
- ✓ Validate adaptive recommendations.
- ✓ Detect errors, biases, or incorrect interpretations.
- ✓ Ensure integrity, fairness, and transparency.

No automated system should replace the teacher's judgment as an educator and guide in the learning process. In vocational training, where learning is closely linked to professional identity and future employment, this responsibility is even greater.

9.6 Specific recommendations for classroom practice

The ethical, inclusive, and responsible use of Artificial Intelligence in Vocational Training depends not only on European regulatory frameworks but also on concrete pedagogical decisions in the classroom and workshop. Teachers act as the primary guarantors that AI contributes to learning, equity, and human development, especially when working with students with Special Educational Needs (SEN).

The following are operational and strategic recommendations aimed at both teachers and vocational training centers.

- **Human supervision and professional judgment**

  For the responsible use of AI with diverse students, it is essential to maintain ongoing teacher supervision over any AI-assisted process. This involves analyzing the results of automated assessments before validating them, reviewing adaptive recommendations and generated *outputs,* and detecting potential biases or technical errors.

AI should always be understood as a complementary tool. It should never replace the professional judgment of teachers or human support, which is especially relevant for students with special educational needs, where the socio-emotional dimension is key.

- **Inclusion and accessibility of tools**

  Before introducing an AI tool in the classroom, it is necessary to assess whether its accessibility is real and suitable for different cognitive and sensory profiles (screen readers, subtitles, easy navigation, alternative formats, etc.), as well as its reliability and degree of inclusion.

  If a tool is not accessible to all students, the school must provide equivalent alternatives. Likewise, it is essential to establish sustainable funding mechanisms that guarantee access for students with disabilities or special needs.

  The principle is clear: no technological innovation should create new barriers.

- **Legal compliance and data protection**

  As we have seen in previous sections, the educational use of AI is subject to the European and national legal framework, especially the General Data Protection Regulation (GDPR), as well as national legislation, such as the LOPDGDD in the case of Spain. In practice, this means:

  - ✓ Use only tools authorized by the competent educational authority.
  - ✓ Avoid entering personal or identifiable data of students.
  - ✓ Apply anonymization or pseudonymization whenever possible.
  - ✓ Inform students explicitly that they should not enter their own data or that of third parties.
  - ✓ Ensure consent where appropriate and supervise use according to the age of the students.
  - ✓ Act with due diligence in the handling of any data generated.

  Teachers must ensure that the use of AI is legal, safe and supervised, and that the school has clear protocols in place.

- **Prior pedagogical evaluation of each tool**

  Before using any AI application, it is advisable to analyze its relevance to the learning objectives and assess its inclusive impact. Furthermore, it is essential to confirm that teachers possess the necessary digital skills to use it correctly and provide clear instructions to students, explaining both what is and is not permissible.

  The incorporation of AI should respond to a specific pedagogical purpose, not to technological novelty.

- **Critical use of information and promotion of critical thinking**

  Since generative AI can produce incomplete, biased, or incorrect information, it is essential to educate students on its critical use; that is, students must be taught to always compare results with reliable sources, ask for evidence, justify answers, and question *outputs.*

  To this end, it is recommended that assignments include a reflection section where students explain how they used AI, which parts were generated or assisted, what external sources they used to verify information, and what potential biases they detected. This accountability strengthens academic honesty and the development of critical thinking.

- **Human validation of the assessment**

  Any AI-assisted assessment must be reviewed by the teaching staff to ensure the integrity of the process, fairness of the results, and transparency of the criteria.

  Therefore, it is necessary to establish clear lines of responsibility and understand that the final decision always belongs to the teacher.

- **Empowering students and protecting their autonomy**

  AI-supported activities should promote active student participation and encourage creation, not just consumption. Furthermore, they should offer genuine opportunities for empowerment, especially for students with special educational needs. AI should broaden horizons, not confine learning paths.

- **Copyright and institutional integration**

  Teachers must explicitly address the proper citation of AI-generated content and the mandatory referencing of all sources used. Furthermore, they should encourage their students to reflect on the authorship of their work.

  At an institutional level, the use of AI should be included in the Center's Digital Plan, establishing clear collective criteria on permitted tools, types of tasks, rules of use and evaluation procedures.

10. Ten Commandments of Good Practices for Teachers

1. **AI supports, teachers decide**

   Use AI as a support tool, never as a substitute for professional judgment. Key decisions (assessment, guidance, pathways) must always be made by humans.

2. **Design from an inclusive perspective**

   Apply Universal Design for Learning (UDL): offer multiple ways to access, express yourself, and participate. Verify that the tools are accessible or provide alternatives.

3. **Protect your personal data**

   Do not enter personally identifiable student information. Use only authorized tools that comply with GDPR. Clearly inform students about which data should not be shared.

4. **Always monitor the results of AI**

   Review *outputs*, automated assessments, and adaptive recommendations. Detect biases, errors, or oversimplifications before validating them.

5. **It encourages critical thinking, not automatic consumption.**

   Design activities where students compare information, question results, and justify decisions. AI should be the subject of analysis, not just a source of answers.

6. **Maintain high expectations for all students**

   Personalization doesn't mean lowering goals. Use adaptive support as a bridge to independence, not as a permanent destination.

7. **It guarantees traceability and authorship.**

   Ask students to explain how they used AI and to properly cite the generated content. This reinforces academic honesty.

8. **Prioritize hybrid models**

   It combines AI with face-to-face tutoring, collaborative work, and emotional support. Especially important in vocational training and for students with special educational needs.

9. **Empower students**

   It teaches how to create good prompts, evaluate responses, and use AI as a creative and professional tool. It prioritizes agency over learning itself.

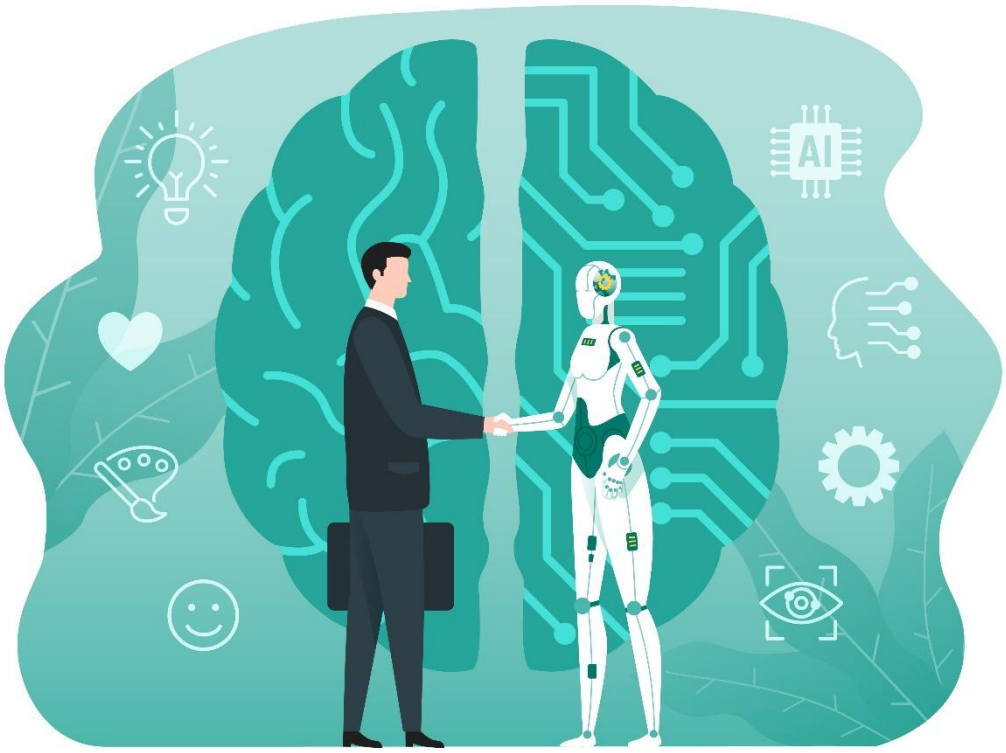
10. **Evaluate the real impact and continuously improve**

Start with pilot programs, gather feedback, analyze results, and adjust practices. Technological innovation only makes sense if it improves learning, inclusion, and well-being.

Artificial Intelligence should expand opportunities, not reduce them.

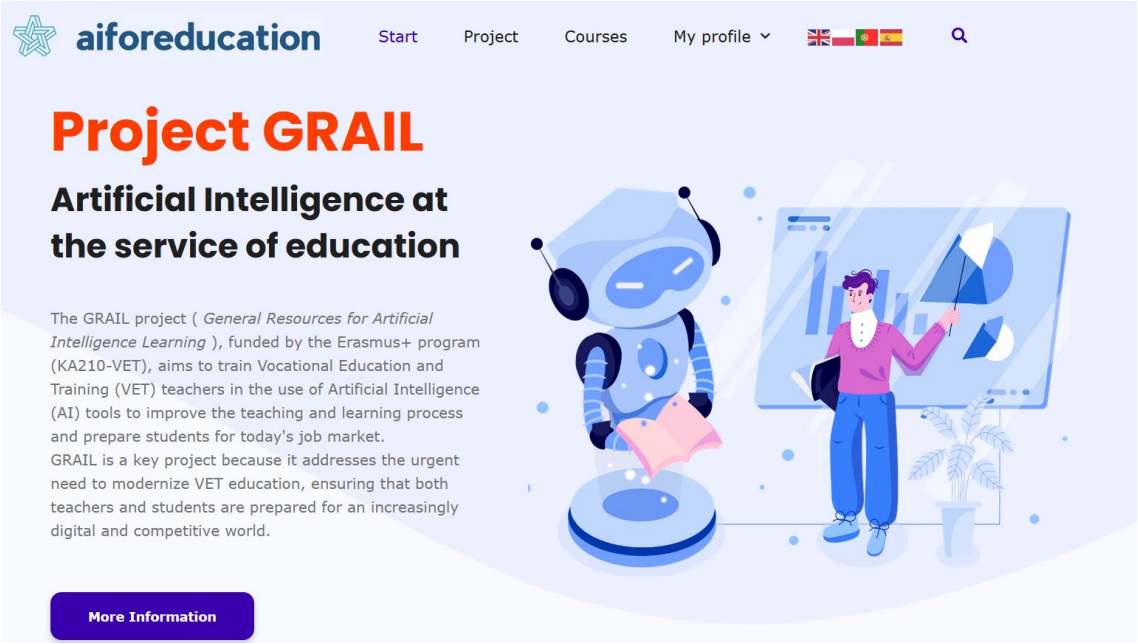
It should empower people, not replace them.

And it must serve education, never direct it.



Appendix. Links of interest

- **GRAIL Project website, with access to free training courses**
  https://aiforeducation.eu/



- **Webinar "AI in Education" (in Portuguese with subtitles)**

- **Webinar “AI in VET: Personalize learning” (in Spanish with subtitles)**

- **Webinar “AI as an educational innovation: applications and opportunities” (in Polish with subtitles)**

- **Webinar of the Multiplier Event "Integrating AI into VET: Transform Your Classroom" (in Polish with subtitles)**

- **Online course "Towards a more inclusive education with AI"**
  https://aiforeducation.eu/courses/hacia-una-educacion-mas-inclusiva-con-la-ia/

- **Online course "AI in VET: personalize learning"**
  https://aiforeducation.eu/courses/la-ia-en-vet-personaliza-el-aprendizaje/

- **Online course "AI as an educational innovation: applications and opportunities"**
  https://aiforeducation.eu/courses/sztuczna-inteligencja-jako-innowacja-edukacyjna-zastosowania-i-mozliwosci/

- **CEDEFOP manual on the use of AI and the digital transition in the workplace**
  https://www.cedefop.europa.eu/files/6228_en.pdf