

ARTIFICIAL INTELLIGENCE IN VOCATIONAL TRAINING

Opportunities and risks

Executive summary





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Introduction

In the fast-paced world of AI, and especially since ChatGPT hit the scene in late 2022, education is facing a bunch of challenges and discussions. Alongside the enthusiasm that comes with AI, it also inevitably brings multiple risks and challenges. In recent years, these types of technologies have received considerable attention from social and humanistic studies, and various international and national organizations have emphasized the need to develop specific policies to ensure that AI is developed to serve the common good. In the field of education, organizations such as UNESCO are calling for a human-centered approach to AI, including in the political agenda and among developers the role of AI in addressing current inequalities in access to knowledge, research, and diversity of cultural expressions, to ensure that AI does not widen existing social gaps and inequalities.

In this case, this research represents an important advance in knowledge about the **impact of AI on vocational training, how it is currently being introduced in schools, how it is used by teachers and students, what the main concerns are for the educational community, what risks have been identified, and what opportunities it offers** to improve the experience, educational trajectory, and professional integration of vocational training students.

The approach used in this research addresses AI from the perspective of Science and Technology

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Studies. From this perspective, it is understood that the effects and consequences of AI cannot be isolated from the social context, educational values, and the priorities and functioning of vocational training itself. The problems and challenges of AI are intertwined with the structural tensions of the education system, pedagogical discussions, and existing social inequalities. However, they are not simply introduced; they do not merely reproduce what already existed. They can intensify biases and forms of inequality or soften them, add new pedagogical practices, and transform the dynamics of school organization, but only based on existing conditions of possibility.

Objectives

For this reason, this study has focused on **understanding how AI, and especially GAI (Generative Artificial Intelligence), participates in existing educational practices and pathways in vocational training**. Beyond the strictly technological and short-term assessment of specific applications, any educational policy or program related to AI must integrate a medium- to long-term perspective. This necessary forward-looking perspective comes at a time of uncertainty about the role of AI in contemporary societies, an uncertainty that goes beyond the field of education and requires caution, evidence, and citizen participation, known as **'the precautionary principle and measured action'**. Measured action integrates in-depth knowledge of what is happening in educational institutions, discussion of educational priorities, and the needs and concerns of the main stakeholders, namely teachers and students. This is the approach that has guided the preparation of this study and underlies the methodological design and analysis of the results.

Based on this general objective of understanding the effects and uses of AI in vocational training (basic vocational training, CFGM, CFGS), four specific objectives have been defined:

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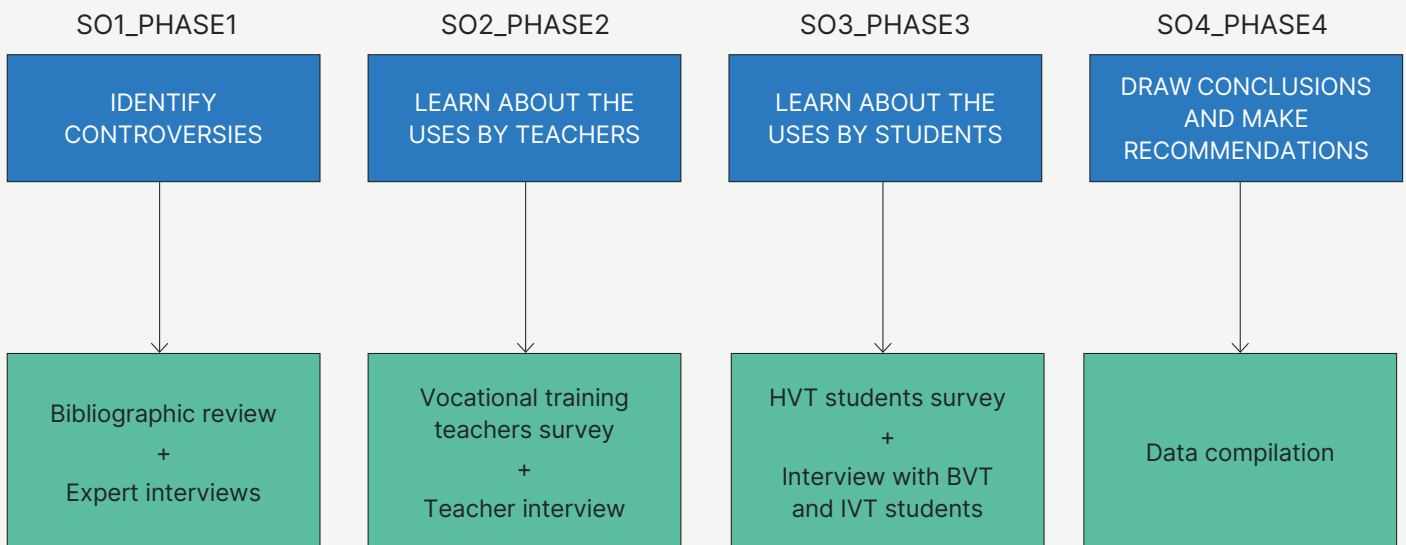
- **SO1.** Identify the main discussions and controversies surrounding the development of AI in vocational training.
- **SO2.** Understand how teachers use AI systems to support the educational process of vocational training students.
- **SO3.** Understand how vocational training students use AI systems.
- **SO4.** Draw conclusions and make recommendations.

Methodology

Throughout the research, quantitative research methods (surveys of teachers and students) and qualitative research methods (literature review,

interviews with experts, and in-depth interviews with teachers and students) were used to address these objectives.

Objectives and methodology



USES AND PRACTICES OF AI IN VOCATIONAL TRAINING



Limited empirical evidence

Systematic studies on the effects and transformations of AI at different levels of vocational education are limited, and there is little evidence recognized by the international scientific community. Debates on its uses, opportunities, and risks are highly polarized and poorly based on evidence of its effects on students, the learning process, or professional integration. Existing studies deal with contexts far removed from our own (especially in China) and focus on describing specific applications of AI and their potential benefits, with virtually no research on the impact of GAI on vocational training. For this reason, this is a pioneering study on AI in vocational training in Spain and a relevant, evidence-based contribution to the debate on the opportunities and risks of AI in vocational training. However, the novelty of the research is both its strength and its main problem. This is a limited study whose limitations must be acknowledged. It cannot provide a detailed analysis of the situation in the different professional families, the integration of AI at different levels of vocational training, the situation in different territories, or the interaction of AI with the educational policies of the autonomous communities.

For this reason, the specifications and nuances in this case are relevant and point to a need for

caution in interpreting and reading the results, which should be understood as a starting point for future research.

Old and new challenges

Despite the discourse on the disruptive potential of AI in education and the enormous challenge that GAI poses for the educational process, AI in vocational training does not introduce entirely new problems, but rather intensifies challenges that already exist in the education system. As with the advent of web search engines and the use of digital devices, AI tends to reproduce pre-existing inequalities, amplifying gaps associated with cultural capital, digital skills, and access to resources.

In this sense, the lack of coherent and consensual strategies, the low level of critical digital literacy among teachers and students, as well as the subordination of technological innovation to educational priorities, can spread biased patterns that reproduce social dynamics, such as increased inequalities in the choice of educational pathways, the continuation or abandonment of the educational process, or differences in the support provided to students in the use of digital devices depending on their family's socioeconomic situation.

One of the most significant concerns associated with GAI is the transformation of students' relationship with their educational process.

The need for a responsible approach to GAI in vocational training

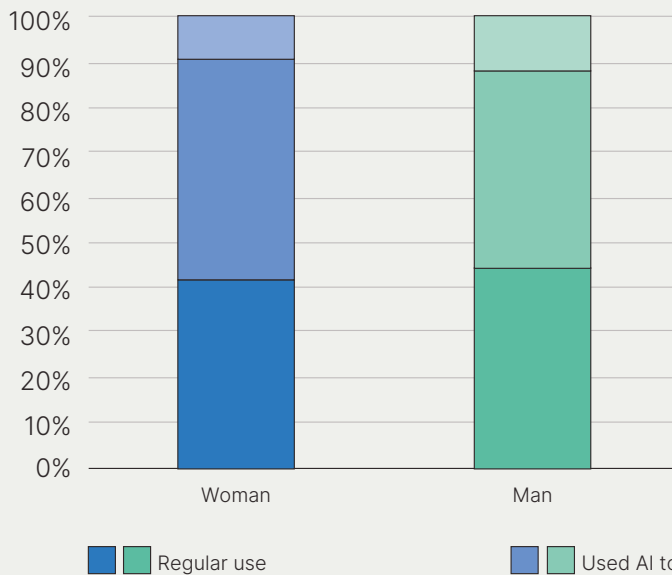
One of the most significant concerns associated with GAI is the transformation of students' relationship with their educational process, deep learning, and knowledge acquisition, as this technology is associated with automating task completion. This concern is cross-cutting across all educational fields and levels and intensifies a series of debates in vocational training on traditional forms of assessment, the updating of practical content, and the construction of meaning in the classroom.

In this regard, although both teachers and students value the use of this type of technology, they also identify the need to develop knowledge and critical thinking about how AI works and to

learn ways of working in the classroom on the responsible use of this technology, both for teaching and for sharing knowledge with students.

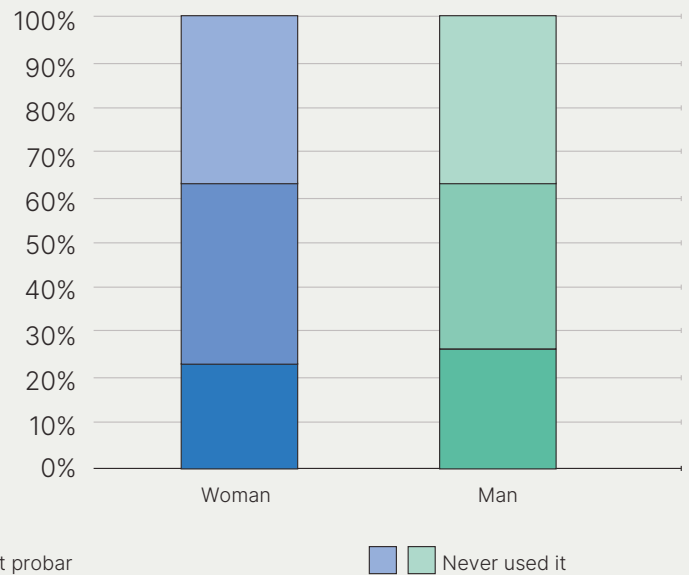
In the field of educational management, AI is recognized as having similar potential to other previously applied technologies, such as academic monitoring platforms or school management systems. The use of AI from this perspective could be very interesting for schools, as it would provide them with systematic information on professional, training, and specialization resources in the region. However, its use in guidance or support activities with students is viewed with great caution, due to the risk of replacing the expert judgment of teachers with opaque and biased algorithms that could stigmatize the most vulnerable students. Anything related to the introduction of automation systems in personalization and career guidance runs the risk of reproducing forms of stigmatization and social discrimination and is not recommended by experts or used by teachers.

Use of AI among students, by gender



Of the CFGS students surveyed, 43% frequently use AI, 46.5% say they have used it at some point to try it out, but not on a regular basis, and 10% have never used it.

Use of AI among teachers, by gender



A quarter of vocational training teachers surveyed (FPB, CFGM, and CFGS) frequently use AI. 38.1% say they have used it on occasion for testing purposes, and 36.4% say they have never used it.

Normalization and widespread use of AI among students and teachers

The results of the surveys and interviews show that the use of GAI (basically ChatGPT) is quite widespread, both among teachers and students, especially as they progress to higher levels. The introduction of this type of technology is taking place in a context of educational digitalization, in which, also as students progress to higher levels, the use of digital devices in the classroom or outside the classroom for educational activities is becoming normal.

However, despite the widespread use of free commercial AI systems for general use, there is no reference to the use of other AI systems specifically designed for educational purposes, either in the interviews or in the questionnaires, or among teachers or students. The use

of traditional web search engines (Google, Bing, Safari, etc.) is not associated with AI technologies, nor is the regular use of social media (TikTok, Instagram, etc.), meaning that debate and critical knowledge about these applications is not part of the discussion on AI in vocational training.

Uses of GAI among teachers to prepare materials and activities

More than 60% of vocational training teachers surveyed (basic vocational training, CFGM, and CFGS) say they have used tools such as ChatGPT, with similar rates among men and women. However, as mentioned above, this use intensifies as students progress to higher levels. It is important to note that although the use of GAI is around 50% among basic vocational training and CFGM teachers and 63.7% among CFGS teachers, its frequent use is much lower, and

Both teachers and students prefer human attention and personal contact in this type of issue, valuing the expert judgment of teachers.

is also more intense for GS vocational training. Among the Basic Vocational Training teachers surveyed, the regular use of GAI is 10.7%, among CFGM teachers it is 19%, and among CFGS teachers it is 29.6%.

The most common uses by teachers include the creation of rubrics, the design of activities, the writing of examples, and the search for teaching resources. Despite the positive assessment of its usefulness, there is a polarization between teachers who use it and those who do not, with those who use it pointing to the existence of reluctance on the part of those who do not.

In other words, systems that are not designed or evaluated for educational purposes are used, yet other specific and audited technologies with AI systems are not used for learning in vocational training. This may be due to the lack of validated

applications for use in vocational training, lack of access to these applications, or lack of awareness of them.

Critical outlook on GAI among teachers

The main reasons for its use are to optimize the time needed to prepare content, activities, and exams, the lack of resources to update specific vocational training content, and the difficulty of linking practical and theoretical learning. No reference is made to the automation of content creation or activity design, the standardization of learning, or the pedagogical model they follow. Despite their use of ChatGPT, explained by the reasons of efficiency and time optimization, teachers consider that the use of ChatGPT or other AI systems by students can be problematic for their learning and skills acquisition, associating widespread use among students with a lack of motivation and interest in their training process.

It is noteworthy that vocational training teachers hardly ever use these technologies to correct activities or offer tutoring and support. Both teachers and students prefer human attention and personal contact in this type of issue, valuing the expert judgment of teachers and highlighting the possible errors and biases that this automation could entail.

Common uses of GAI among CFGS students

At least 90% of CFGS students say they have used tools such as ChatGPT, with similar rates among men and women, 30 percentage points higher than among CFGS teachers. Despite this, regular use stands at 43%. These results therefore suggest that the use of GAI is widespread among CFGS students. No significant differences were observed by gender or parents' educational level, but there were differences by school type, especially in the likelihood of using GAI tools to prepare assignments, which is 35% in public vocational training centers, compared to less than 20% in private or charter schools.

The use of GAI tools among CFGS students varies greatly depending on the type of task. While 77% of students have used these tools to prepare assignments or essays, only a third do so regularly. For exam preparation, GAI has been used by 55.7% of students, who use this tool to summarize the content to be studied. Its use is low for writing emails to teachers, motivation letters, or CVs, as well as for educational or professional guidance. The use of ChatGPT for homework or assignments is noteworthy. More than 60% of the students surveyed consider it very likely or totally likely (60%). However, when faced with difficulties in doing their work, students would first turn to traditional web search

engines (such as Google or Safari, which also work with AI, although in this case the technology is part of the black box and is not associated with the use of AI systems), followed by asking classmates and, subsequently, GAI tools.

Significant relationship between the uses of GAI and other resources

It is interesting to note that there are statistically significant relationships between the likelihood of using ChatGPT or similar tools and the likelihood of using other resources. Students who would use GAI more to do their work are also the students most likely to seek support from classmates, traditional web search engines, and social media (such as Instagram or TikTok), integrating these types of technologies into the use of other digital tools and peer support. In other words, the likelihood of using GAI does not decrease from the likelihood of using other existing resources. However, this relationship is inverse to the likelihood of turning to books or manuals when encountering difficulties with assignments. The more likely students are to turn to books or manuals for the subject, the less likely they are to use GAI tools. The more accessible the information is to students, through books,

manuals, explanations in class, etc., the less they turn to ChatGPT or similar tools.

Less common uses of GAI among students in basic vocational training and CFGM

There are no statistical data available on usage among students in basic vocational training and advanced vocational training, but from interviews we can infer that GAI is used less, especially for homework and individual or group work. In these cycles, the connection and motivation of students with practical subjects is particularly relevant, as they do not see the point of using GAI.

GAI and the debate on assessment

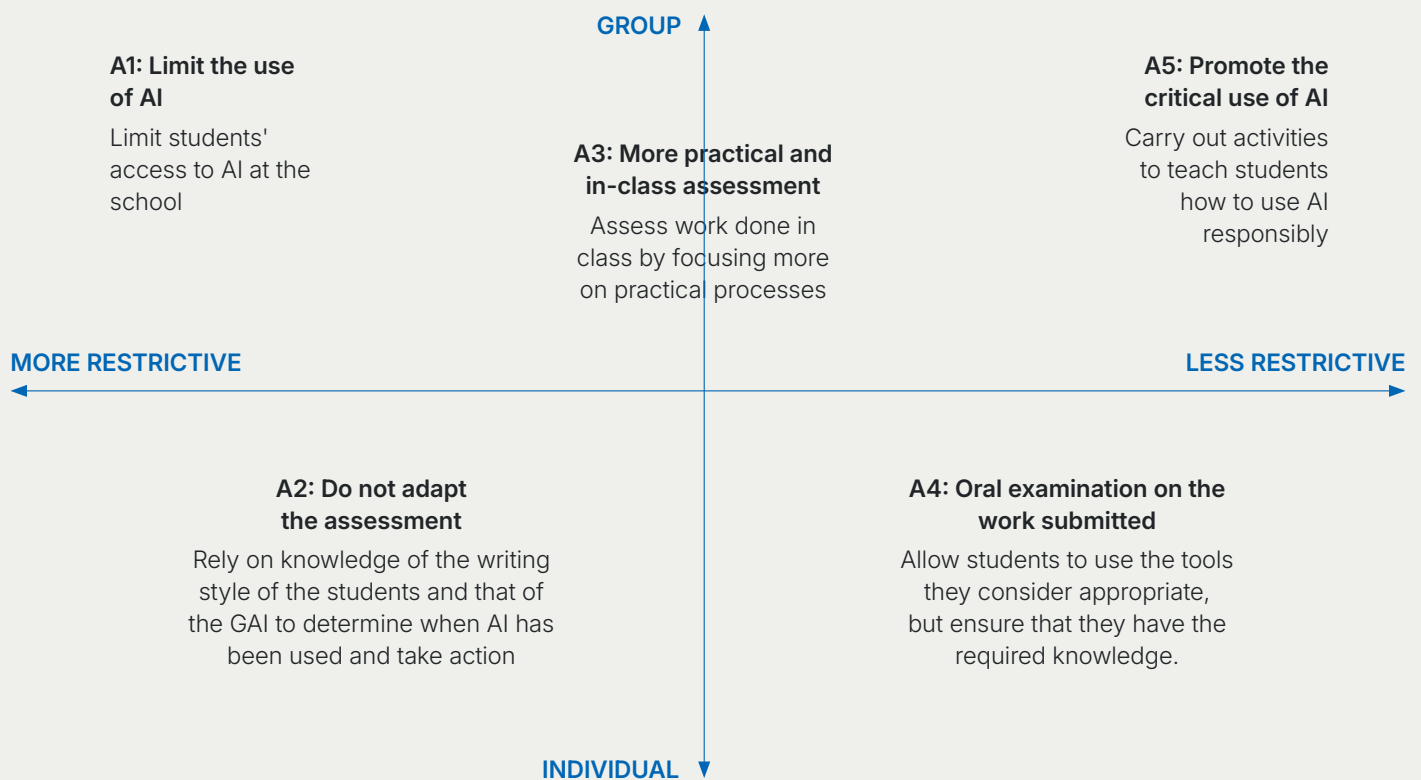
One of the most relevant debates among experts and teachers regarding the emergence of AI in vocational training and education in general concerns assessment processes, due to concerns about verifying the authorship of students' work. There is no unified position on this issue, but a series of strategies for adapting

Another debate and discussion that has intensified the use of AI in vocational training is the lack of motivation among students

to this technology have been identified that can be organized around two axes: the level of regulation (more or less restrictive) and the approach (individual or collective). The various strategies can be placed in the following chart.

GAI and the link between vocational training students and the educational process

Another debate and discussion that has intensified the use of AI in vocational training is the lack of motivation among students, as teachers interpret the widespread use of AI



among young people to carry out work and tasks as being related to a lack of motivation in their learning process. However, if we explore this issue in more detail, what we see is that when reference is made to 'lack of motivation', different issues are being referred to:

On the one hand, reference is made to a tension between the expressive link and the instrumental link in vocational training. From the teaching perspective, vocational training is associated with the acquisition of a set of instrumental skills for integration into the labor market. However, this is not the only function that students attribute to their vocational training, which is also associated with the possibility of continuing in the education system. Therefore, from this expressive link with the education system, specific professional learning is no longer a key issue.

On the other hand, lack of motivation also refers to the relationship between theory and practice in vocational training. One of the issues that most

motivates vocational training students, and this is especially relevant in basic vocational training and CFGMs, is the practical component of their studies. However, this practical aspect entails a series of tensions. On the part of the students, the practical aspect is experienced on a daily basis as something separate from the theoretical, with the theoretical being what is referred to in GAI. On the part of the teachers, there is a demand for constant updating of practical content, which is rapidly changing in the labor market, for which resources are not always available. This issue requires greater automation of the process of creating these materials, as well as their study and resolution. This issue also relates to assessment, as there is a vicious circle in which this content is presented as outdated by teachers and students, as well as by the job market, and the entire process is automated.

MOVING TOWARDS RESPONSIBLE AND EDUCATIONAL AI



This social debate, independent of the narratives promoted by large technology corporations, must be led by the educational community.

Based on the analysis of the study's results, ten recommendations are proposed to promote responsible AI, focusing on improving the vocational training system, the well-being of students and teachers, and social equity and justice.

1. Align AI with the priorities and challenges of vocational training, not the other way around

Beyond polarized utopian or dystopian positions on AI in education, ensuring the responsible development of AI in vocational training requires a reasoned, evidence-based debate. This social debate, independent of the narratives promoted by large technology corporations, must be led by the educational community, focus on the priorities

of vocational training, and adjust the possibilities offered by AI to those priorities (not the other way around).

2. Produce scientific evidence on the medium- to long-term effects of AI

There is little empirical evidence on the medium- to long-term effect of introducing AI systems in vocational training, in different professional fields and educational levels, or on the effects on the use of GAI among teachers and students. The medium- to long-term impact of these technologies on skills and competence acquisition during vocational training, student motivation, professional integration, improvement in teaching quality, and optimization of school organization is unknown. It is essential to collect and analyze scientific evidence on these issues.

3. Develop digital tools (using AI or other technologies) specific to vocational training content and learning

The use of GAI tools for developing teaching content and exercises, as well as for students to complete tasks and exercises, is widespread. However, these tools do not guarantee the accuracy of the content, do not respect copyright issues, nor do they guarantee the privacy of user data, which are essential issues in the field of education. It is necessary for the public administration to develop specific digital tools for vocational training that are audited, transparent, for educational purposes, and easily accessible, allowing this type of task to be carried out.

4. Develop digital skills for the critical and responsible use of GAI

There is a lack of knowledge and training on how AI works and its ethical, economic, social, and ecological implications, both among teachers and students. This issue has been identified by the educational community itself, which requires organized training strategies that enable the acquisition of critical and responsible digital skills at all levels of vocational training. Digital skills related to AI go beyond the use of tools and applications and involve the development of critical thinking about these technologies and the acquisition of strategies to deal with issues such as *fake news*, source verification, cyberbullying, and digital discrimination, among others.

5. Discuss center strategies on the uses and positioning of AI

Currently, despite the fact that the use of GAI has become normalized among teachers and students, especially in higher education, there are no clear guidelines or defined, unified strategies on this issue. In a situation of uncertainty about the role and effects of AI in education, the establishment of common criteria and positions defined by the teaching staff of vocational training centers is one of the few existing mechanisms for regulating this issue. The discussion, evaluation, and establishment of clear collective criteria on the use of AI to perform various tasks among teachers and students will make the introduction of these technologies more democratic, critical, and responsible.

6. Unacceptable risks in the automation of tutoring and guidance

The use of AI tools for personalizing learning and providing support throughout the training and job placement process is an issue that carries significant proven risks of reproducing biases and increasing inequalities. Mentoring and career guidance are processes that require personal connections and the professional experience of teachers and counselors, which therefore should not be automated.

7. Potential of AI to systematize local information and resources

Decision automation processes using AI systems can be very useful in helping vocational training centers access information about training, specialization, and job resources in their area. Those responsible for tutoring and guidance at centers should act as intermediaries between these AI systems and the needs of students, as it is teachers and guidance counselors who have the necessary expertise to select, evaluate, and convey information.

8. The potential of AI for bureaucratic tasks, without reproducing the digital gap

Another interesting possibility for introducing AI systems into vocational training centers has to do with everything related to administrative management and bureaucratic tasks. However, the applications used for this purpose must ensure data privacy, algorithm transparency, public ownership of software, and be accompanied by the possibility of performing the same processes manually, so as not to intensify possible injustices in access and use of digital systems by students and families. It is also necessary to monitor these processes to ensure that they do not lead to increased datafication and bureaucratization of the tasks performed by the center's professionals.

9. Provide additional resources to public vocational training centers

In order to optimally mediate between decision automation systems and students and their families, as well as select and adapt educational AI systems to the content of vocational training programs and work on critical and responsible thinking towards GAI in the classroom, additional resources are needed for public vocational training centers, which already suffer from insufficient resources for personalized tutoring, guidance, and student support.

10. Rethinking assessment, student engagement, the theory-practice relationship, and criteria for meaningful learning in vocational education

The emergence of GAI and its widespread use among vocational training teachers and students has highlighted a series of problems relating to four issues: (a) assessment processes; (b) student engagement and motivation; (c) the relationship between theory and practice; and (d) the establishment of criteria for defining relevant instrumental learning in a changing labor market. These problems and challenges are not the sole responsibility of GAI, even though it has intensified them. One of the main challenges that is emerging is therefore, rather than intensifying the use of and debate around AI, to take the emergence of GAI as an opportunity to rethink existing problems and break a vicious circle that GAI illustrates so well.

