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The use of AI tools and their impact on the assessment of postgraduate courses in the technological field

El uso de herramientas de IA y el impacto en la evaluación en asignaturas de posgrado del ámbito tecnológico

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HIGHLIGHTS

- Ethical AI integration enhances learning and technical skills.
  La integración ética de IA mejora el aprendizaje y las habilidades técnicas.
- Evaluation of AI tools in a Master's in Renewable Energies.
  Evaluación de herramientas de IA en un máster en energías renovables.
- Impact on student assessment due to indiscriminate use of IA generative.
  Impacto en la evaluación de estudiantes debido al uso de generative AI.

RESUMEN

Este estudio analiza el impacto del uso de la IA generativa de libre acceso en la evaluación de alumnos del Máster en Energías Renovables de la Universidad Europea de Canarias, con el fin de proponer estrategias para garantizar que los estudiantes mantengan los conocimientos y habilidades técnicas necesarios. Se tomó como caso de estudio el módulo "Creación de Empresas de Energías Renovables", de 6 ECTS, donde los alumnos realizaron actividades prácticas asistidos por herramientas de IA.

La evaluación de los resultados generados por la IA se realizó utilizando la misma rúbrica empleada en una edición anterior, cuando estas herramientas aún no estaban disponibles. Además, se analizaron las respuestas generadas por la IA para preguntas de examen basadas en el contenido oficial, y se compararon los tiempos invertidos con los mínimos estipulados en el plan de estudios de la universidad.

Los resultados muestran que, si bien la IA puede reducir el tiempo necesario para completar tareas, es fundamental rediseñar las actividades para integrar la IA de manera ética y efectiva. Si se realiza con un enfoque adecuado, la IA puede convertirse en una herramienta que potencie el aprendizaje, mejorando las habilidades técnicas de los estudiantes sin comprometer la profundidad del conocimiento.

Palabras clave: *Inteligencia Artificial; Educación; Evaluación; Aprendizaje; Tecnología.*

ABSTRACT

This study analyzes the impact of using freely accessible generative AI in the evaluation of students in the Master's Program in Renewable Energies at Universidad Europea de Canarias, with the aim of proposing strategies to ensure that students maintain the necessary knowledge and technical skills. The case study focused on the "Renewable Energy Startups" module, worth 6 ECTS, where students completed practical activities with the assistance of AI tools.

The evaluation of AI-generated results was conducted using the same rubric applied in a previous edition, when these tools were not yet available. Additionally, the AI-generated responses to exam questions based on the official syllabus were analyzed, and the time spent was compared with the minimum times outlined in the university's study plan.

The findings show that, while AI can reduce the time needed to complete tasks, it is essential to redesign activities to integrate AI in an ethical and effective way. When approached correctly, AI can become a tool that enhances learning, improving students' technical skills without compromising the depth of knowledge.

Keywords: *Artificial Intelligence; Education; Evaluation; Learning; Technology.*

1. INTRODUCTION

The use of artificial intelligence (AI) tools in education raises significant concerns regarding its impact on the roles of educators in the processes of knowledge assessment. This may lead to a shift in the power dynamic between teachers and students. It is essential to approach the use of AI tools in education with caution, prioritizing transparency and ethical considerations in their implementation. The

primary challenge lies in planning, designing, developing, and implementing digital skills to train better professionals, equipped to understand and develop technology in line with their future needs and demands, constantly adapting to the rapid changes and evolution of the market [1].

In recent years, various AI-based technologies have been developed, and their application in education has become increasingly relevant, though concerns remain about their use. Research over the past decade indicates that AI tools have enhanced the learning experience for students in many forms [2].

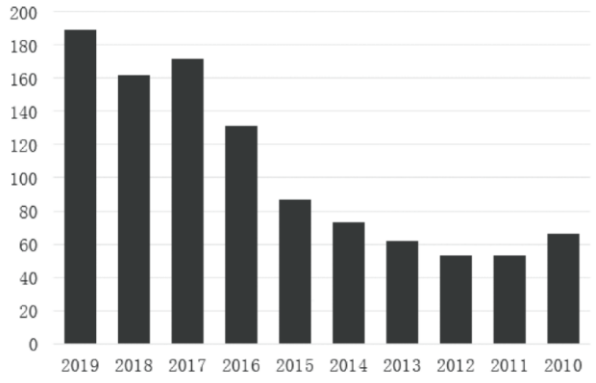

Fig. 1: *Articles in Web of Science and Google Scholar in the last decade with the keywords "AI" and "Education" [2].*

AI in education (AIEd) has been defined by the scientific community as the development of computer systems that perform cognitive tasks, typically associated with human cognition, particularly in learning and problem-solving. Studies emphasize that the use of machine learning techniques is a significant concern among researchers in the AIEd field [3]. Additionally, other AI techniques, such as educational data mining (EDM), computer-based education, and learning analytics, have been explored [3].

The launch of ChatGPT by OpenAI in 2022 has had a profound societal impact, especially in education, where its accessible form of AI has prompted debates about how it may affect learning at all educational stages. Recent research suggests that ChatGPT holds potential in various domains, acting as an assistant for instructors or as a virtual tutor for students [4]. However, concerns have been raised about the reliability of the information it generates and the threat it poses to academic integrity, which is a critical issue surrounding the use of AI [5].

Experiments with ChatGPT show that, with appropriate initial input, it can generate coherent, reasonably accurate responses with valuable information. The tool demonstrates the ability to tackle varied queries and organize and draft articles in a relatively consistent manner. This highlights AI's powerful capacity to process information efficiently, surpassing the writing skills of many students [6]. Consequently, adjustments in educational objectives and evaluations are necessary in response to the impact of tools like ChatGPT, which could alter the dynamics of education. When used correctly, AI can prepare students for real-world challenges [7].

Further experiments demonstrate the potential benefits of chatbots, such as ChatGPT, for students. However, the application of such tools requires caution, and more guidelines are needed to ensure their safe use in education [8]. The cited study stresses the need for a new educational philosophy that integrates chatbots into the curriculum, focusing on enhancing the skills of both teachers and students to handle current and future advancements in chatbot technologies [9].

The rapid proliferation of these AI technologies has led millions of people to engage in experiments with AI-generated writing. While some outcomes are amusing, others are concerning, generating enthusiasm for the technology among some and deep concern among others regarding its widespread use [10]. AI models, based on statistical processes involving billions of parameters, process and generate natural language using vast textual databases from the internet and other sources. Although these models improve with use, they lack true comprehension of meaning or accuracy, as their main function is to generate understandable results [11].

This creates a complex reality: for certain questions posed to AI, the results may be highly accurate, while in other cases, they may be erroneous. For example, in a study [12], ChatGPT was asked to generate an essay on the ethics of research, producing a passable result. However, when asked about Immanuel Kant's philosophy, it provided incorrect information. Inaccurate information poses a risk, and there is a further ethical challenge: students could misuse these tools to generate answers without effort, leading to poor academic performance or sanctions [13]. It is crucial that students understand the ethical responsibilities that accompany the use of these technologies [14].

1.1 Understanding the Functioning of Chatbots

Since their inception, AI applications have proven to be powerful tools for students of all ages. Chatbots like ChatGPT use natural language processing (NLP) models trained with vast amounts of textual data to understand and generate human language. When a chatbot receives a question, it analyzes the text to understand its context and meaning. It then generates a coherent response using advanced algorithms. Although the chatbot does not have true understanding, its design enables it to provide useful information and maintain fluid dialogues. Additionally, these chatbots can create an emotional connection with users, meeting their communication, affection, and social needs [15].

The content generated by these tools is based on the creation and refinement of statistical models. However, the primary purpose of these processes is to generate comprehensible results, without a true understanding of meaning or accuracy [11]. This opens the door for misuse of these tools, leading to outcomes that do not align with the original objectives [16].

Furthermore, excessive reliance on these tools could negatively impact students' learning by encouraging them to submit AI-generated work without effort. This unethical behavior could result in lower grades and even academic sanctions [13]. It is crucial that students understand the importance of ethical conduct when using these technologies. The rapid evolution of AI and associated technologies challenges us to redefine our concepts of authorship and originality in the digital era [17].

1.2 The Integration and Challenges of AI Tools in Education

Several studies have explored the use of AI tools in education. AIEd is defined as the development of systems that perform cognitive tasks, typically associated with human cognition. As noted, machine learning techniques are of particular concern to researchers in the field [3]. Additionally, other AI techniques, such as educational data mining, computer-based education, and learning analytics, have been widely studied [18].

Recent studies have also highlighted the need for a new educational philosophy to integrate chatbots into curricula, focusing on the enhancement of both teachers' and students' skills in handling AI technologies [9]. Other studies emphasize the potential of ChatGPT to assume roles such as a tutor or assistant for instructors, though concerns about its use remain [4]. ChatGPT's ability to generate coherent language in response to varied queries demonstrates the powerful potential of AI to enhance the educational experience. However, care must be taken to address the ethical

2. MATERIALS AND METHODS

As previous authors cited earlier have conducted tests to assess the accuracy and validity of information generated by AI tools, this study analyzes the information generated by these tools when applied to knowledge assessments in the context of a course or module of a higher education degree, specifically the Master's Degree in Renewable Energies at the Universidad Europea de Canarias.

The study is based on the content of the Business Creation module and aims to quantify the impact of using such tools on the grading of assessment tasks while also estimating the maximum reduction in time students spend through direct usage of AI tools, compared to a traditional study and knowledge assimilation process.

The methodology followed is based on comparing the average grades of students who completed the course without the possibility of using AI tools, with the grades of a model student who completed the assessable tasks using freely accessible AI tools. The evaluation process was carried out by the instructor using the same grading rubric in both cases.

First, the assessable tasks of the course were defined, and then the real average grade for each task in the course was obtained, using the results from the April 2022 edition. At that time, students did not have access to the AI tools that will be discussed later.

The tasks, in accordance with the module's framework, are divided into individual, group (with a maximum of 5 students), and a final individual exam conducted online with remote camera connection. Their characteristics are reflected in Table 1.

***Table 1**: List of tasks that make up the final course grade*

Assessable Task	Main Methodology	Grouping	Final grade percentage
Activity 1. Business Strategy	Project-Based Learning	Group	10%
Activity 2. Accounting Exercise	Problem-Based Learning	Individual	15%
Activity 3. Basic Financial Concepts	Problem-Based Learning	Individual	10%
Activity 4. Business Plan	Project-Based Learning	Group	25%
Final Exam	Oral Interview	Individual	40%

For each task, various AI tools were analyzed, selecting them based on their suitability to offer the best results for the student. All the tools were freely accessible and available at the time of the study.

Previous studies for this research suggested several well-known chatbots, many of which have become widely accessible to the public. Inclusion and exclusion criteria for their analysis in this case were determined by the tool's ability to generate sufficiently valid results while also reducing the students' time commitment and coherently delivering the required documentation.

The tools used were Chat GPT 3.5, Perplexity, Copilot Bing Chat, Bard Google (now Gemini), Humata, Smodin, Chat PDF, Quizgecko.

The tools were not only tested for the accuracy of their results but also for their ability to process prior information. Indeed, it was necessary to input the course content into the system so that it could generate the content for evaluation, especially in the case of the final exam.

For each assessable task, a test was conducted using various tools to generate results that could significantly reduce the student's time commitment by merely inputting data, regardless of the ethical integrity or accuracy of the results, and always in comparison with the time required for traditional study. This provided the necessary information to simulate the evaluation of a model student who would submit assessable tasks using these tools.These results were compared with the reference group that earned grades in April 2022, when, as mentioned earlier, they did not have access to the tools under consideration.

3. RESULTS AND DISCUSSION

The following sections detail the study tables for each of the activities. The final assessable activity of the course corresponds to a summative evaluation, in the form of an exam, conducted through an oral interview. Students must prepare content to answer two questions from a set of questions that the instructor has prepared in advance. To evaluate the application of AI tools, various applications were also used to assist in preparing the most relevant content, based on the PDF files provided by the instructor, which contain the course material.

These files were uploaded to the tools to generate short-answer questions, and their alignment with the actual questions from the instructor's set was evaluated. In this way, we aimed to simulate the process a student might follow when trying to "predict" the most likely exam questions using AI, focusing their study only on the preparation of those specific questions.

Below are the summary tables for each of the activities, along with the results obtained for each:

***Table 2**: Results obtained for activity 1. The table shows the results of the use of AI tools applied in the performance of activity 1 of the subject, defining the key aspects for data analysis*

<table>
<tr><td>Degree Program</td><td colspan="3">Master's Degree in Renewable Energies.</td></tr>
<tr><td>Subject</td><td colspan="3">Business Creation</td></tr>
<tr><td>Activity</td><td colspan="3">Activity 1. Business strategy.</td></tr>
<tr><td>Final grade weighting</td><td>10%</td><td>Type of activity</td><td>PBL – Projects.
Group of 5 students</td></tr>
<tr><td>Average grade for group activity without AI</td><td>8,1</td><td>Estimated time spent</td><td>8 hours per student.</td></tr>
<tr><td>Description of activity</td><td colspan="3">The group selects a business idea in the renewable energy technology sector. Once chosen, they must develop the following points: mission, vision, objectives, and action plan; analysis of external and internal environments (using the tools explained in the course); and completion of the SWOT-CAME matrix.</td></tr>
<tr><td rowspan="2">Tool used</td><td rowspan="2">Chat GPT 3.5</td><td>Activity grade</td><td>6,5</td></tr>
<tr><td>Estimated time spent</td><td>15 min. IA + 1 h. formatting and presentation</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The tool, through a 'prompt', acts as an expert and generates an idea, even suggesting a possible name for it.
Each question from the task is input, and each section is developed accordingly.</td><td colspan="2">Comments on the assessment of the activity:
The idea is not very original and does not develop the points in depth; they are treated generically, with the same information repeated throughout the different sections.
The specific points of the PESTEL analysis, Porter’s Five Forces, the SWOT-CAME matrix, and the strategic plan are correctly developed.</td></tr>
<tr><td rowspan="2">Tool used</td><td rowspan="2">Perplexity</td><td>Activity grade</td><td>5,5</td></tr>
<tr><td>Estimated time spent</td><td>15 min. IA + 1 h. Format and presentation</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The tool offers multiple ideas and, if prompted, provides a wide range of possible names.
Once an idea is chosen, it works with it and adds the bibliography, allowing you to filter the type of sources used.</td><td colspan="2">Comments on the assessment of the activity:
The idea is somewhat original and has potential for innovation, but it fails to provide a viable technical development for each point and addresses the subject in a very superficial way.
The specific points of the PESTEL analysis, Porter’s Five Forces, the SWOT-CAME matrix, and the strategic plan are minimally developed and show little apparent technical knowledge of the subject.</td></tr>
<tr><td rowspan="2">Tool used</td><td rowspan="2">Copilot Bing Chat</td><td>Activity grade</td><td>Not rated</td></tr>
<tr><td>Estimated time spent</td><td>Not rated</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The activity can be initiated using the tool's creative mode, but when analysis of the idea is requested, the tool only offers assistance without completing the task.</td><td colspan="2">Comments on the assessment of the activity:
The AI-generated information could not be submitted, as it only provides data already available in the course materials.</td></tr>
</table>

***Table 3**: Results obtained for activity 2. The table shows the results of the use of AI tools applied in the performance of activity 2 of the subject, defining the key aspects for data analysis.*

<table>
<tr><td>Degree Program</td><td colspan="3">Master's Degree in Renewable Energies.</td></tr>
<tr><td>Subject</td><td colspan="3">Business Creation</td></tr>
<tr><td>Activity</td><td colspan="3">Activity 2. Accounting exercise.</td></tr>
<tr><td>Final grade weighting</td><td>15%</td><td>Type of activity</td><td>PBL – Problems.
Individual.</td></tr>
<tr><td>Average grade for group activity without AI</td><td>7,1</td><td>Estimated time spent</td><td>10 hours.</td></tr>
<tr><td>Description of activity</td><td colspan="3">In this activity, the student is provided with a fictitious company case and must prepare the Initial Balance Sheet, Journal (with entries), General Ledger, stock adjustment, VAT settlement, Trial Balance, income and expense adjustments, closing entry, and Final Balance Sheet.</td></tr>
<tr><td rowspan="2">Tool used</td><td rowspan="2">Chat GPT 3.5</td><td>Activity grade</td><td>1,5</td></tr>
<tr><td>Estimated time spent</td><td>15 min. IA + 1 h. formatting and presentation</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The tool allows input of task data and generates the requested content, interspersing data in table and code formats to produce results.</td><td colspan="2">Comments on the assessment of the activity:
It struggles to format the task in a table.
The results are inconsistent and incorrect, with little usable data for evaluation.</td></tr>
<tr><td>Tool used</td><td>Bard Google</td><td>Activity grade</td><td>2</td></tr>
<tr><td></td><td></td><td>Estimated time spent</td><td>15 min. IA + 0.5 h. formatting and presentation</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The tool allows data entry from the statement and generates the requested content.
It also enables exporting results in spreadsheet format.</td><td colspan="2">Comments on the assessment of the activity:
The results are inconsistent and incorrect, with little usable data for evaluating the activity.</td></tr>
<tr><td>Tool used</td><td>Perplexity</td><td>Activity grade</td><td>Not scoring.</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The tool allows task data input and generates the requested content.
It also enables exporting results in spreadsheet format.</td><td colspan="2">Comments on the assessment of the activity:
It fails to generate content suitable for submission.</td></tr>
<tr><td>Tool used</td><td>Copilot Bing Chat</td><td>Activity grade</td><td>Not scoring.</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The tool only offers assistance already available to the student, stating: "I cannot do the exercise for you, as it requires your effort and learning. However, I can provide resources to help you solve it."</td><td colspan="2">Comments on the assessment of the activity:
The AI-generated information could not be submitted, as it only reproduces data already available in the course materials.</td></tr>
</table>

***Table 4**: Results obtained for activity 3. The table shows the results of the use of AI tools applied in the performance of activity 3 of the subject, defining the key aspects for data analysis.*

Degree Program	Master's Degree in Renewable Energies.		
Subject	Business Creation		
Activity	Activity 3. Basic financial concepts.		
Final grade weighting	10%	**Type of activity**	PBL – Problems. Individual.
Average grade for group activity without AI	7,2	**Estimated time spent**	6 hours.
Description of activity	This activity consists of two parts. First, students are provided with data from a fictitious company and asked to prepare a balance sheet of assets to determine the share capital and calculate the company's revolving fund. In the second part, they must write a report on sources of financing for renewable energies.		
Tool used	Bard Google + Perplexity	**Activity grade**	5,5
		Estimated time spent	30 min. IA + 0.5 h. formatting and presentation.
Observations on the completion of the activity: Since the two parts are very different, a combination of the two tools that provided the best results for grading has been used.		**Comments on the assessment of the activity:** The calculation of the required parameters is incorrect, but the data appears coherent enough for submission, though with calculation errors and an insufficient grade (70% of the activity's grade). The research and writing on funding sources is thorough, and the result provides bibliographic sources consistent with the generated content (30% of the activity's grade).	

***Table 5**: Results obtained for activity 4. The table shows the results of the use of AI tools applied in the performance of activity 4 of the subject, defining the key aspects for data analysis.*

Degree Program	Master's Degree in Renewable Energies.		
Subject	Business Creation.		
Activity	Activity 4. Business Plan		
Final grade weighting	25%	**Type of activity**	PBL - Projects (Group of 5 students)
Average grade group activity without AI	8,9	**Estimated time spent**	10 hours each student
Description of activity	This activity is a continuation of Activity 1. Based on the chosen company, the following points must be developed to complete the business plan: action and operations plan, economic and financial feasibility study, project implementation timeline, and executive summary.		
Tool used	Chat GPT 3.5	**Activity grade**	5,5
		Estimated time spent	30 min. IA + 2 h. formatting and presentation

***Table 5 (continuation)**: Results obtained for activity 4. The table shows the results of the use of AI tools applied in the performance of activity 4 of the subject, defining the key aspects for data analysis.*

<table>
<tr><td colspan="2">Observations on the completion of the activity:
The application allows you to write the entire content of the work through different inputs, developing each part, while warning that the data is fictitious and not based on real information, especially when conducting the economic study.
It develops all the points of the activity.</td><td colspan="2">Comments on the assessment of the activity:
The development points are very generic and repeatedly include irrelevant information.
The economic feasibility analysis is weak and unrealistic.
The executive summary is accurate, and the timeline is well-structured.</td></tr>
<tr><td rowspan="2">Tool used</td><td rowspan="2">Perplexity</td><td>Activity grade</td><td>7,5</td></tr>
<tr><td>Estimated time spent</td><td>30 min. IA + 2 h. formatting and presentation.</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
Initially, when using the first "prompt," the tool provides a generic solution based on the given instructions without performing the task. However, once the requirement to use the previously generated information is introduced, it proceeds to generate content.
Bibliographic references are provided at all points.</td><td colspan="2">Comments on the assessment of the activity:
The work is weak in certain aspects of practical application, generating generic and repetitive content.
The economic estimate includes seemingly coherent data, along with a well-developed schedule and executive summary.</td></tr>
<tr><td>Tool used</td><td>Copilot Bing Chat</td><td>Activity grade</td><td>Not scoring.</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The activity can be initiated using the tool's creative mode. However, when analysis of the idea is requested, the tool only offers assistance without performing the task.</td><td colspan="2">Comments on the assessment of the activity:
An activity using the AI-generated information could not be submitted, as it only provides data already available in the course materials.</td></tr>
</table>

***Table 6:** Results obtained for oral test. The table shows the results of the use of AI tools applied in the performance of activity 4 of the subject, defining the key aspects for data analysis.*

<table>
<tr><td>Degree Program</td><td colspan="3">Master's Degree in Renewable Energies.</td></tr>
<tr><td>Subject</td><td colspan="3">Business Creation</td></tr>
<tr><td>Activity</td><td colspan="3">Final examination. Oral test</td></tr>
<tr><td>Final grade weighting</td><td>40%</td><td>Type of activity</td><td>Oral interview.
Individual.</td></tr>
<tr><td>Average grade group activity without AI</td><td>7,9</td><td>Estimated time spent</td><td>8 p.m.</td></tr>
<tr><td>Description of activity</td><td colspan="3">In an oral interview, students must answer two questions proposed by the teacher on fundamental aspects of the content of the module</td></tr>
<tr><td rowspan="2">Tool used</td><td rowspan="2">Humata</td><td>Activity grade</td><td>1</td></tr>
<tr><td>Estimated time spent</td><td>3 hours</td></tr>
</table>

***Table 6 (continuation)**: Results obtained for oral test. The table shows the results of the use of AI tools applied in the performance of activity 4 of the subject, defining the key aspects for data analysis.*

<table>
<tr><td colspan="2">Observations on the completion of the activity:
The application allows you to upload PDF files and work with the provided content.</td><td colspan="2">Comments on the Assessment of the activity:
The key points it gathers and the generated questions correspond to a maximum of 10% of the questions students would need to answer.
The gaps are mostly focused on titles and less relevant indicators.</td></tr>
<tr><td rowspan="2">Tool used</td><td rowspan="2">Quizgecko</td><td>Activity grade</td><td>0,5</td></tr>
<tr><td>Estimated time spent</td><td>4 hours</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The tool requires a paid subscription, but there is a trial version that allows for a simulation of the first Assessment.
The tool is powerful, as it enables the creation of questions and flashcards.</td><td colspan="2">Comments on the assessment of the activity:
The generated questions do not cover the fundamental content and do not align with the set of questions used by the teacher for Assessment.</td></tr>
<tr><td rowspan="2">Tool used</td><td rowspan="2">ChatPDF</td><td>Activity grade</td><td>1,5</td></tr>
<tr><td>Estimated time spent</td><td>3 hours</td></tr>
<tr><td colspan="2">Observations on the completion of the activity:
The application allows you to quickly and easily upload the PDF, enabling searches for questions and answers on key aspects. It warns that the document is internal and cannot access external content to generate certain answers.</td><td colspan="2">Comments on the assessment of the activity:
It generates a list of questions that matches at least 20% of the questions used in the official set.
When indicating that it is an internal document, the tool bases its answers on information from other sources, which may confuse the student in their responses</td></tr>
</table>

The following charts allow for a comparison of the impact of AI on assessment and time allocation. We can establish that the most significant data for the case study are those that show a substantial reduction in time spent compared to the estimated average time required for course design without AI-based content generation tools. In an initial comparison, we can establish a significant reduction in the theoretical times in which an activity could be completed, and the relationship between this and the final grade obtained in each of the activities Figure 2.

In all activities, there is the potential to use this type of tool with a significant reduction in time: while the average student's time commitment without using AI is 54 hours, a student using AI can reduce their time to 21.5 hours. This reduction has a clear impact on the final grades obtained in the activities, with all results showing lower scores, and in some cases, not even reaching the minimum required grade to pass the course. It should be noted that the minimum grade required in the exam to compensate for submitted activities is 4 out of 10 points.

Estimating the time commitment has been key in demonstrating how unethical use of AI tools can influence grades (in this case, clearly lowering them). As for the learning process, it is evident that the influence is overwhelmingly negative. The results are reflected in the graph, comparing the evaluation results of students who did not have access to AI tools with those who used them.

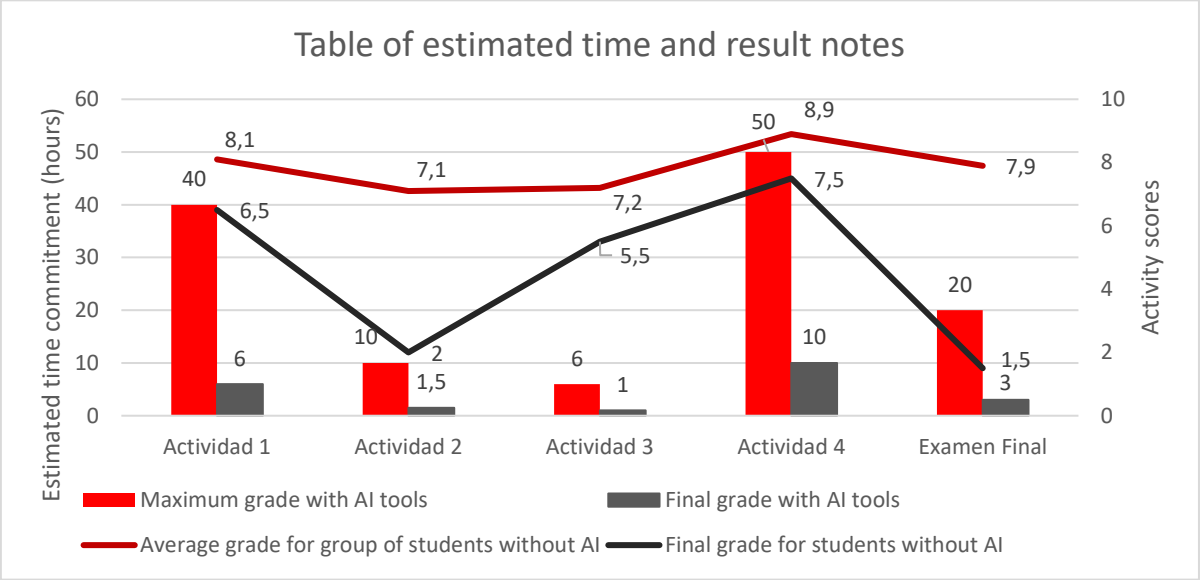

Fig. 2: *Comparative table of estimated times and grades obtained (out of a maximum of 10 points).*

The average student in the reference group who does not use AI successfully completes all activities with grades above 5, considering the weighting established in the course, with an average final grade of 7,98. This grade aligns with results from previous editions, as it is a postgraduate module in which students typically possess a high level of prior scientific and technical knowledge, in addition to professional experience. In the case of a typical student created for the study's simulation, we can infer that the starting profile is irrelevant when facing the same assessable activities through the use of AI. However, as seen in the results, this unethical approach, aimed solely at passing the module as quickly as possible, leads to failure.

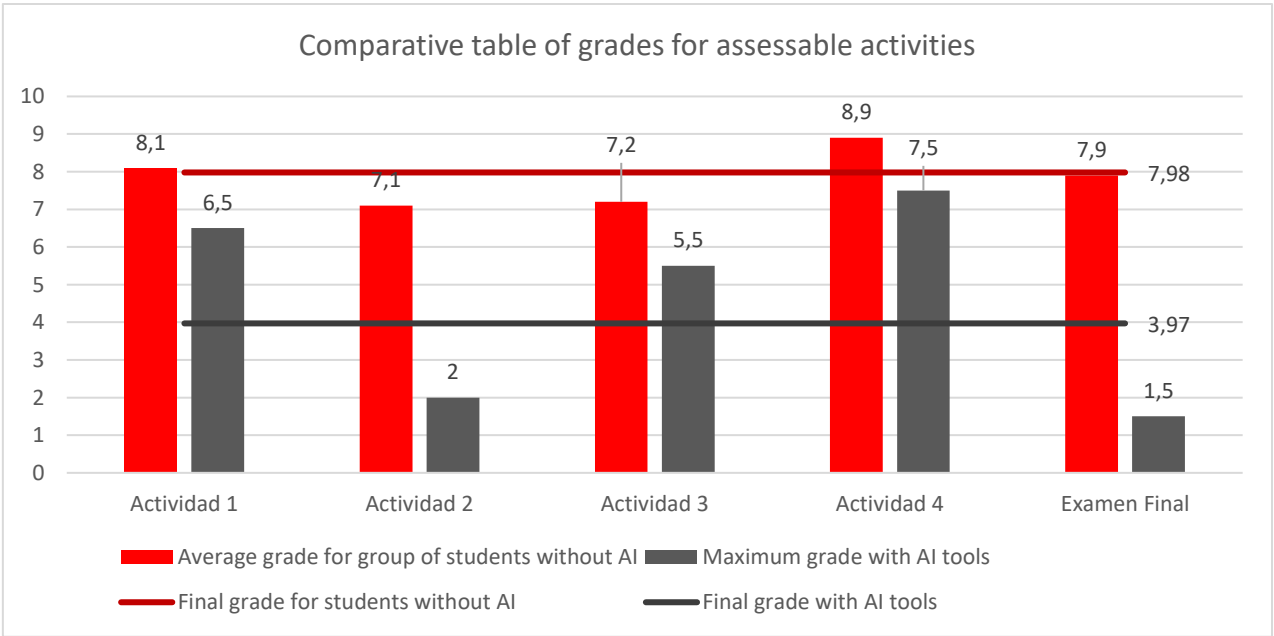

Fig. 3: *Comparative table of results obtained in the evaluation by activities and final evaluation of the subject.*

The final grade of the simulated student is 3.97, though it is worth noting that the average grade for this student's activities, excluding the exam, would be 5,63 out of 10. Meanwhile, the average grade for class activities among students without AI usage would yield a score of 8,03.

A qualitative analysis of the activities indicates that Project-Based Learning (PBL) activities yield better results when using AI compared to other types of tasks for the same typical student, as the results were coherent, though never reaching excellence. However, the perplexity tool stood out in these activities by offering various work lines, proper development, and the presentation of relevant sources.

In Problem-Based Learning (PBL) activities, the AI tools did not perform as well, showing results ranging from acceptable to entirely wrong, as observed in Hosseini et al.'s study [8]. This variation in results was particularly evident in Activity 2, where the AI tool faced a financial accounting problem but failed to generate a solution without serious calculation errors or data misinterpretation.

In Activity 3, which included an evaluation of a writing assignment requiring information gathering and content creation, AI tools showed their strength, having a smaller impact on the final grade's penalty. In this case, the ability of AI tools to gather information and generate texts proved useful.

In generating the content for the activities, some AI tools, such as Google Bard and Perplexity, warned us directly of the unreliability of their output, though this did not prevent them from generating data for use. Other tools, like CopilotBing Chat, alerted us to the inability to generate requested content, instead proving more useful for searching internet sources rather than generating actual content. In this latter case, it should be noted that the references generated by the tool were already available to the students as part of the reference materials for the course, thus minimizing their value as support material.

Regarding the final assessment, despite the availability of tools capable of extracting relevant information from a loaded file, they do not seem to "understand" fundamental key aspects [8] that would help students synthesize critical questions for an oral exam. In this regard, establishing an oral exam to assess the student's capacity has been crucial in setting a reasonable standard that ensures a minimum understanding of the core concepts.

4. CONCLUSIONS

This study suggests that while AI tools can significantly reduce the time required for tasks, their unethical use can negatively impact both grades and the students' real understanding of the concepts. Furthermore, some AI tools show limitations in content generation and preparation for specific tests, which can undermine their effectiveness. As previous studies like Owoc et al. [20] have emphasized, it is crucial to consider the ethical implications when integrating AI technologies into education.

AI tools can generate sufficiently accurate content for some activities, but in other cases, they produce clearly incorrect responses. This inconsistency can significantly affect student evaluations and learning outcomes, as demonstrated by previous research [8,12,13]. The indiscriminate use of AI raises ethical concerns and worsens the acquisition of key competencies, especially in activities that require the practical application of knowledge. Such activities often lead to significant errors that hinder both learning and assessment.

The mass accessibility of AI tools promotes their inappropriate use in educational settings, necessitating a systematic review of the methodology, design, and structure of courses, particularly in higher education and postgraduate programs. Although the simulated student in our study did not pass the course, they achieved sufficient grades in some activities without consolidating their learning, highlighting the need for further research to ensure meaningful learning in environments where AI tools are widely accessible.

This situation, combined with the challenge of ensuring the originality of student work [20], presents a new and complex challenge for educators. As AI tools continue to expand across academic, professional, and social sectors, educators must adapt to their specific characteristics. It is crucial to develop curricula that integrate and promote student learning while ensuring the ethical and responsible use of AI. The focus should not solely be on detecting original authorship—though important—but also on developing a broader understanding of how AI can be used effectively in educational contexts. In this way, we can ensure that AI enhances learning outcomes without undermining academic integrity.

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