OPTIMIZATION OF THE EDUCATIONAL EXPERIENCE IN HIGHER EDUCATION USING PREDICTIVE ARTIFICIAL INTELLIGENCE MODELS

Luis Miguel Garay Gallastegui1
Ricardo Reier Forradellas2

ABSTRACT

Aim: This study investigates the application of machine learning-based predictive models in university education, in order to improve student experience and satisfaction, evaluating the effectiveness of these tools in a modern educational context.

Theoretical Framework: The research analyzes the strategic transformation in higher education, driven by digitalization and the evolving expectations of students and the labor market. The crucial role of AI-based predictive models in this change is explored.

Methodology: A methodology combining opportunity identification and business case development in educational settings is employed. The approach focuses on business design and experimental machine learning techniques, emphasizing model accuracy, evaluation of the costs of inaccurate predictions, and ethics in data manipulation.

Results: The predictive models achieved 95.7% accuracy in predicting student satisfaction, showing a significant positive correlation between teaching personalization and student satisfaction. These results highlight the ability of the models to influence educational decisions that improve the student experience and underscore their adaptability to specific learning needs, thus contributing to a more personalized and effective education.

Discussion: The importance of balancing the adoption of advanced technologies with the maintenance of a student-centered pedagogical approach is emphasized. The methodology used to identify modeling heuristics highlights how strategic decisions can guide the technical development of AI models, ensuring that solutions are not only innovative, but also aligned with educational needs.

Research Implications: The approach taken suggests that the application of predictive models has the potential to radically transform teaching and learning, aligning them with the demands of the digital future.

Originality/Value: The proposed machine learning model is revealed as an effective tool to identify areas for improvement in university education. Its high accuracy in classifying students provides a unique perspective on how to improve educational quality and student satisfaction, emphasizing the importance of addressing individual needs for educational improvement.

Keywords: Predictive Models, Machine Learning, Higher Education, Student Experience, Digital Transformation.

1 ESIC University, Spain. E-mail: luismiguel.garay@esic.university
Orcid: https://orcid.org/0000-0002-2119-4532
2 Universidad Católica de Ávila, Ávila, Spain. E-mail: ricardo.reier@ucavila.es
Orcid: https://orcid.org/0000-0002-4790-0351
Estrutura Teórica: a pesquisa analisa a transformação estratégica no ensino superior, impulsionada pela digitalização e pela evolução das expectativas dos alunos e do mercado de trabalho. É explorado o papel crucial dos modelos preditivos baseados em IA nessa mudança.

Metodologia: é empregada uma metodologia que combina a identificação de oportunidades e o desenvolvimento de casos de negócios em ambientes educacionais. A abordagem se concentra no design de negócios e nas técnicas experimentais de aprendizado de máquina, enfatizando a precisão do modelo, a avaliação dos custos de previsões imprecisas e a ética na manipulação de dados.

Resultados: os modelos preditivos alcançaram 95,7% de precisão na previsão da satisfação do aluno, mostrando uma correlação positiva significativa entre a personalização do ensino e a satisfação do aluno. Esses resultados destacam a capacidade dos modelos de influenciar as decisões educacionais que melhoram a experiência do aluno e enfatizam sua adaptabilidade às necessidades específicas de aprendizagem, contribuindo assim para uma educação mais personalizada e eficaz.

Discussão: É enfatizada a importância de equilibrar a adoção de tecnologias avançadas com a manutenção de uma abordagem pedagógica centrada no aluno. A metodologia usada para identificar a heurística de modelagem destaca como as decisões estratégicas podem orientar o desenvolvimento técnico de modelos de IA, garantindo que as soluções não sejam apenas inovadoras, mas também alinhadas às necessidades educacionais.

Implicações para a Pesquisa: A abordagem adotada sugere que a aplicação de modelos preditivos tem o potencial de transformar radicalmente o ensino e a aprendizagem, alinhando-os com as demandas do futuro digital.

Originalidade/valor: o modelo de aprendizado de máquina proposto demonstra ser uma ferramenta eficaz para identificar áreas de melhoria no ensino universitário. Sua alta precisão na classificação dos alunos oferece uma perspectiva única sobre como melhorar a qualidade educacional e a satisfação do aluno, enfatizando a importância de abordar as necessidades individuais para o aprimoramento educacional.


OPTIMIZACIÓN DE LA EXPERIENCI A EDUCATIVA EN LA EDUCACIÓN SUPERIOR MEDIANTE MODELOS PREDICTIVOS DE INTELIGENCIA ARTIFICIAL

RESUMEN

Objetivo: Este estudio investiga la aplicación de modelos predictivos basados en aprendizaje automático en la educación universitaria, con el fin de mejorar la experiencia y satisfacción de los estudiantes, evaluando la efectividad de estas herramientas en un contexto educativo moderno.

Marco Teórico: La investigación analiza la transformación estratégica en la educación superior, impulsada por la digitalización y la evolución de las expectativas de los estudiantes y el mercado laboral. Se explora el papel crucial de los modelos predictivos basados en Inteligencia Artificial en este cambio.

Metodología: Se emplea una metodología que combina la identificación de oportunidades y el desarrollo de casos de negocio en entornos educativos. El enfoque se centra en el diseño de negocios y en técnicas experimentales de aprendizaje automático, enfatizando la precisión del modelo, la evaluación de los costos de predicciones inexactas, y la ética en la manipulación de datos.

Resultados: Los modelos predictivos alcanzaron una precisión del 95.7% en la predicción de la satisfacción estudiantil, mostrando una correlación positiva significativa entre la personalización de la enseñanza y la satisfacción de los estudiantes. Estos resultados destacan la capacidad de los modelos para influir en decisiones educativas que mejoren la experiencia estudiantil y subrayan su adaptabilidad a necesidades específicas de aprendizaje, contribuyendo así a una educación más personalizada y efectiva.

Discusión: Se enfatiza la importancia de equilibrar la adopción de tecnologías avanzadas con el mantenimiento de un enfoque pedagógico centrado en el estudiante. La metodología utilizada para identificar las heurísticas de modelado destaca cómo las decisiones estratégicas pueden guiar el desarrollo técnico de los modelos de IA, asegurando que las soluciones sean no solo innovadoras, sino también alineadas con las necesidades educativas.
1 INTRODUCTION

Over the past decade, the higher education sector has undergone a significant transformation, driven by digitalisation and the changing expectations of students and the labour market. This dynamic environment demands innovative educational methods that not only improve the learning experience, but also prepare students for the challenges of a constantly evolving work environment. Predictive models based on machine learning emerge as potential tools that could revitalise pedagogical methods and personalise the learning experience. However, despite the remarkable potential of artificial intelligence to transform education, its adoption in university settings faces critical challenges such as model accuracy, ethical interpretation of data, and its alignment with strategic educational goals.

The central question guiding this study is how can machine-learning-based predictive models be effectively implemented in higher education to improve student experience and satisfaction, while aligning with institutional pedagogical and ethical goals? Research is needed to explore how Artificial Intelligence (AI) tools can be developed and applied in ways that actually improve the quality of education and meet the individual needs of students, without compromising ethical principles or academic goals.

The objectives of the study are:

1. develop a predictive machine learning model that integrates educational and behavioural data to identify patterns that influence student satisfaction and academic performance;
2. analyse the relationship between personalisation of teaching and student satisfaction, assessing how AI-based interventions can improve educational outcomes;
3. propose guidelines for the effective integration of AI technologies into university education systems, ensuring that these technologies are aligned with the pedagogical and strategic objectives of institutions.

2 THEORETICAL FRAMEWORK

The digital transformation in higher education is not simply a trend, but a critical evolution that responds to the changing needs of the modern world. This approach is supported by studies that highlight the importance of digitalisation in education that discuss how digital transformation redefines learning and its impact on education (Serna, et al., 2019; Working Group of Directors TI Crue - TIC, 2017; Fernández Martínez et al., 2018). This change is manifested in the increasing incorporation of advanced technologies such as Artificial Intelligence, which promises to revolutionise pedagogical methods and the personalisation of learning (García-Peñalvo et al., 2024). In addition, it is suggested that the adoption of advanced technologies must be accompanied by a change in the pedagogy and organisational structure of educational institutions to be effective (Castro-Benavides et al., 2022), taking advantage of the human resource itself and the environment that surrounds it (Serna et al., 2019).

According to García-Peñalvo (2021), the diffusion of technological innovations in academic institutions has followed predictable patterns since the COVID-19 pandemic. However, the adoption of digital transformation presents important challenges for its successful development in universities (Castro Benavides et al., 2021), with AI being one of the technologies that presents unique challenges due to its ethical and technical implications.

In an environment where students' expectations of university brands are high, the most advanced universities are considering the student's experience with their brand as a way to meet these expectations and provide personalised, uninterrupted experiences that offer real value, moving away from the traditional approach based on selling a product (Morgan et al., 2021). Many universities are prioritising digital interaction to increase enrolment and improve overall student satisfaction (Yanckello et al., 2019) although the challenge is to assess the effectiveness of these efforts across a diverse landscape of platforms and channels for student engagement and contact. Making sense of this digital landscape requires strategy, planning and agility. It is essential to identify which data obtained from these interactions are relevant sources of information and how to analyse and activate them to generate value.

Artificial intelligence emerges as a key tool to improve and personalise interaction and communication with students. By using predictive models, universities can analyse large
amounts of data on student interaction to identify behavioural patterns and preferences, allowing institutions to quickly adapt to students’ changing needs and ensure a more fulfilling and enriching educational experience.

AI learning personalisation relies on the ability to tailor teaching to students’ individual needs, which, according to theories like Piaget’s Constructivism (1969) and Kolb’s Theory of Experiential Learning (1984), could significantly improve student performance and satisfaction. Machine learning models, according to studies such as Contreras et al. (2020), can accurately analyse large data sets to identify patterns that personalise education. However, its effective integration requires not only technical competence but also an alignment with the growth objectives, pedagogical and ethical values of the institutions (González-Gonzálezez, 2023).

In this context, the experience of the university student and the analytical capabilities of the institutions are essential to better understand student behaviour and outcomes. This underlines the importance of AI and is especially important, the construction of machine learning models that allow better analysis of the different learning scenarios in which students are and the elements with the greatest impact on their satisfaction.

Gartner et al. (2020) highlight that a crucial dimension of digital transformation is the ability of universities to leverage data to understand and improve the processes that students go through. They identify four main scenarios that can emerge from this transformation: consolidation, standardisation and adjustment, chaos management and discovery of new paradigms (Figure 1). Each presents specific opportunities and challenges for the use of AI in higher education.

The first scenario, with effect in the short term and with little impact on transformation, called consolidation, is characterised by intense competition in the recruitment of students and the need to create attractive educational experiences. In this context, universities seek to optimise resources and maximise student satisfaction. AI can play a crucial role in analysing real-time data on the effectiveness of teaching strategies, both in-person and online. This allows agile adjustments that improve student retention and educational quality (Florez-Nisperuza, 2020).
The scenario of short-term consolidation with little transformational impact is characterised by high competence in the recruitment of students, the creation and reconstruction of experiences. Those institutions with a solid reputation seek a robust in-person educational experience that remains attractive to students (Coronado, 2020). Those with mature online strategies will leverage their experiences during the pandemic to further advance and gain market share. In this scenario, AI can be used to analyse real-time data on the effectiveness of both online and face-to-face teaching strategies, allowing institutions to quickly adjust their methods to maximise student retention and satisfaction. AI tools can also help optimise resources, reducing costs while improving educational outcomes, which is crucial at a time when many universities are seeking operational efficiencies.

The chaos management scenario, on the other hand, is characterised by a situation of prolonged uncertainty, where institutions face great challenges to maintain stability and educational quality. Both teachers and students abide by the rules, but feel uncomfortable with the experience. The sector will tend to polarise into elitist institutions, with a strong and renewed orientation towards research (Vargas, et al., 2022) and attractive to students, but it tends to preserve traditional teaching practice. Here, AI becomes essential for managing large volumes of information efficiently, helping institutions understand and control the evolution of educational processes in a dynamic and changing environment.

The standardisation and adjustment scenario is a long-term scenario with a significant capacity to transform the education sector. It is characterised by a reorientation of the higher education sector towards the skills demanded by business and the economic and industrial sectors (Arroyave Villa, 2023). Quality-specific microcredentials or trainings are making a lot of sense, sometimes crowding out undergraduate studies (Gartner, 2021). For this scenario of standardisation and adjustment, artificial intelligence offers the ability to personalise education.
on a large scale. By identifying the skills and competencies most in demand by the economic and industrial sectors, AI models can help design curricula that align more closely with these needs, providing students with a more relevant and employability-focused education. Moreover, AI can facilitate the implementation of microcredentials and other flexible educational models that are increasingly valued in the labour market.

Finally, the scenario of discovery of new paradigms implies a radical evolution in the way higher education is conceived. Some universities are rapidly evolving with alternative training pathways to meet the need for specific, skill-orientated training for flexible learners seeking on-demand and personalised training. The brand as an institution remains essential as long as the activity in this format is also of quality (Balanta et al., 2020). In this scenario, AI becomes an essential tool for universities that seek to innovate in their pedagogical approaches and strengthen their relevance in a rapidly evolving educational and labour market. Here are several ways that AI can be crucial in this scenario (Gartner, 2021) such as developing personalised educational trajectories, facilitating the design, evaluation and certification of microcredentials, analysing labour market trends and specific skill needs, improving the online experience, predictively analysing curriculum development or supporting strategic decision-making by providing in-depth analysis and forecasts on the development of new programmes and services. This includes identifying investment areas that are likely to deliver the highest returns in terms of student attractiveness and subsequent career success.

Student satisfaction emerges as a crucial aspect that is influenced by the previous digital transformation scenarios in higher education institutions, both in the short and long term. According to Petruzzellis et al. (2006), satisfaction includes cognitive, affective and attitudinal factors that emerge from the evaluation of the service received. Baumann et al. (2012) highlight that high satisfaction not only strengthens loyalty and has a positive effect on students, but also leads to an increase in recommendation, enrolment and retention rates, as corroborated by the findings of Abdelmaaaboud et al. (2020).

It is essential to recognise that student satisfaction can vary significantly across disciplines, as noted in the study by Green et al. (2015). In addition, Butt and Rehman (2010) specifically identify a number of factors that significantly impact student satisfaction, such as teacher experience and knowledge, course offerings, learning environment, and campus facilities (Figure 2).
Other aspects, such as the teacher's teaching style, assessment tests, and workload, also play a crucial role in the educational experience, according to studies such as those by Oldfield and Baron (2000) and Ginns et al. (2007). In addition, the affective interactions between the university and the student, as well as the interests, needs and motivations of the students, also influence their satisfaction, as suggested by Malouff et al. (2010) and other complementary studies.

Complementary studies have also included among the factors related to learning satisfaction the interests, needs and motivations of students, the practice of what they have learned in contextual situations, the sense of initiative and the development of collaborative and cooperative interpersonal relationships (Villarreal-Villa et al., 2019; Silva Quiroz & Maturana Castillo, 2017; García & Gago, 2019).

Based on this review, the purpose of this study is to investigate how predictive models of machine learning can be designed and applied in a methodologically effective way to improve the educational experience in universities. This study seeks to ensure that these technologies align with the pedagogical principles and objectives and vision of each university entity, exploring the opportunities identified by Gartner et al. (2020) in consolidation, standardisation and adjustment scenarios, chaos management, and discovery of new paradigms.
3 METHODOLOGY

The design and development of our machine learning model in the context of students' relations with the university begins with a thorough review of the educational value chain. This chain considers the student's entire journey from the pre-university discovery phase to his or her stage as an alumni, underlining the importance of each point of contact in their educational experience (Figure 3). The first critical decision in our methodology is to focus our attention on the learning stage belonging to the Customer Journey of the student. In this sub-process we focus on assessing and improving student satisfaction. This choice defines the types of data we require and the structure of the machine learning model to be developed, ensuring that our efforts are strategically aligned with the needs and objectives of the educational business.

Figure 3
Educational value chain

Once the business objectives are established, the next step is the definition and development of actionable machine learning models. This phase transforms a business problem, seen from the perspective of the university, into a technical-analytical problem that will be solved by artificial intelligence. We start with the collection and analysis of detailed data on students (50 student testimonials), including 8 questions related to their academic performance, interests, skills, curriculum or academic support and guidance, among others. These questions
are related to the most relevant heuristics in the learning phase, as argued in the importance of heuristics (Figure 4).

Subsequently, a detailed analysis of the testimonies of the students is also present in open questions. Using MAXQDA software, we meticulously coded qualitative transcript data to ensure that each case was treated as a single, autonomous entity (Eisenhardt, 1989) while maintaining the context of these testimonies by coding whole words, phrases, sentences, or paragraphs (Huberman & Miles, 1994). This detailed coding, followed by a cross-analysis (Yin, 1994) based on the constructors obtained and the importance of heuristics, allows us to understand the replicability and variability in multiple-case studies, which enriches the predictive capacity of our model.

The patterns identified in the analyses directly feed into the creation of our predictive model, which is used to anticipate future student behaviours and adjust the training offer to their individual needs, thus improving their educational experience. This predictive capacity allows us to establish conclusions backed by data and is crucial to personalise education in real time and respond proactively to the needs of students before problems or discontent arise.
Figure 4

Heuristic descriptions analysed.

<table>
<thead>
<tr>
<th>CÓDIGO</th>
<th>CONSTRUCTOR</th>
<th>HEURÍSTICA</th>
<th>IMPORTANCIA HEURÍSTICA</th>
<th>DETALLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Motivación</td>
<td>Evaluar el nivel de motivación de los alumnos en relación a su carrera/universidad.</td>
<td>La motivación es un factor clave para el compromiso y el éxito académico de los alumnos.</td>
<td>¿Qué tan motivado te sientes al estudiar esta carrera/universidad? (Escala de 1 a 5, donde 1 es &quot;nada motivado&quot; y 5 es &quot;muy motivado&quot;).</td>
</tr>
<tr>
<td>P2</td>
<td>Calidad de enseñanza</td>
<td>Evaluar la percepción de los alumnos sobre la efectividad de los profesores en la transmisión de contenidos académicos.</td>
<td>La calidad de enseñanza tiene un impacto directo en el aprendizaje y la comprensión de los alumnos.</td>
<td>¿Consideras que los profesores transmiten de manera efectiva los contenidos académicos? (Opciones de respuesta: S/No).</td>
</tr>
<tr>
<td>P3</td>
<td>Aplicabilidad de los conocimientos</td>
<td>Determinar si los alumnos perciben que los conocimientos adquiridos en sus estudios son aplicables en su futuro profesional.</td>
<td>La aplicabilidad de los conocimientos es fundamental para la preparación de los alumnos para su futuro profesional.</td>
<td>¿Crees que los conocimientos adquiridos en tus estudios tienen una aplicación práctica en tu futuro profesional? (Opciones de respuesta: S/No/No estoy seguro).</td>
</tr>
<tr>
<td>P4</td>
<td>Participación activa</td>
<td>Evaluar el nivel de participación activa de los alumnos en actividades académicas extracurriculares relacionadas con su campo de estudio.</td>
<td>La participación activa en actividades académicas complementarías puede enriquecer la experiencia de aprendizaje y fomentar el desarrollo de habilidades adicionales.</td>
<td>¿En qué medida participas en actividades académicas extracurriculares relacionadas con tu campo de estudio? (Escala de 1 a 5, donde 1 es &quot;nunca participo&quot; y 5 es &quot;partizo activamente&quot;).</td>
</tr>
<tr>
<td>P5</td>
<td>Plan de estudios y variedad</td>
<td>Evaluar si los alumnos perciben que el plan de estudios ofrece una variedad de asignaturas y oportunidades de especialización acordes a sus intereses y objetivos.</td>
<td>Un plan de estudios estructurado y variado brinda opciones de aprendizaje adaptadas a los intereses y objetivos individuales de los alumnos.</td>
<td>¿Consideras que el plan de estudios ofrece una variedad de asignaturas y oportunidades de especialización acordes a tus intereses y objetivos? (Opciones de respuesta: S/No/No estoy seguro).</td>
</tr>
<tr>
<td>P6</td>
<td>Acceso a recursos y tecnología</td>
<td>Evaluar la percepción de los alumnos sobre la accesibilidad y disponibilidad de los recursos académicos como bibliotecas, laboratorios, herramientas tecnológicas y plataformas de aprendizaje en línea.</td>
<td>El acceso a recursos y tecnología adecuados facilita el proceso de aprendizaje y el desarrollo de habilidades necesarias en la educación actual.</td>
<td>¿Qué tan accesibles y disponibles consideras los recursos académicos como bibliotecas, laboratorios, herramientas tecnológicas y plataformas de aprendizaje en línea? (Escala de 1 a 5, donde 1 es &quot;poco accesibles&quot; y 5 es &quot;muy accesibles&quot;).</td>
</tr>
<tr>
<td>P7</td>
<td>Apoyo y orientación académica</td>
<td>Evaluar la percepción de los alumnos sobre el respaldo y la orientación académica brindados por el personal de la universidad (tutores, asesores, profesores) para tomar decisiones informadas sobre su trayectoria académica.</td>
<td>El apoyo y la orientación académica son fundamentales para que los alumnos tomen decisiones informadas y se sientan respaldados en su trayectoria académica.</td>
<td>¿Sientes que recibes un adecuado respaldo y orientación académica por parte del personal de la universidad (tutores, asesores, profesores) para tomar decisiones informadas sobre tu trayectoria académica? (Opciones de respuesta: S/No/No estoy seguro).</td>
</tr>
<tr>
<td>P8</td>
<td>Satisfacción general</td>
<td>Evaluar el nivel de satisfacción general de los alumnos con sus estudios universitarios hasta el momento.</td>
<td>La satisfacción general refleja la experiencia global de los alumnos en sus estudios universitarios.</td>
<td>En general, ¿qué tan satisfecho(s) estás con tus estudios universitarios hasta ahora? (Escala de 1 a 5, donde 1 es &quot;nada satisfecho(a)&quot; y 5 es &quot;muy satisfecho(a)&quot;).</td>
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</tbody>
</table>
and satisfaction at the university. By integrating this methodology into our research, we hope to not only advance academic understanding of artificial intelligence in educational contexts, but also provide practical solutions that improve educational outcomes and student satisfaction.

4 RESULTS AND DISCUSSIONS

By implementing the machine learning model proposed in this study we obtained an accuracy of 95.727% (Table 1) in the classification of student satisfaction. This level of accuracy suggests that the model has considerable potential to be applied in a larger student population, thus facilitating an improvement in student interaction with the educational system.

Table 1

Results of the machine learning model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation Coefficient</th>
</tr>
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<tbody>
<tr>
<td>Motivación</td>
<td>0.935813</td>
</tr>
<tr>
<td>Participación activa</td>
<td>0.018775</td>
</tr>
<tr>
<td>Satisfacción general</td>
<td>1.000000</td>
</tr>
<tr>
<td>Calidad de enseñanza_No</td>
<td>-0.583717</td>
</tr>
<tr>
<td>Calidad de enseñanza_Sí</td>
<td>0.583717</td>
</tr>
<tr>
<td>Aplicabilidad de los conocimientos_No</td>
<td>-0.583717</td>
</tr>
<tr>
<td>Aplicabilidad de los conocimientos_Sí</td>
<td>0.583717</td>
</tr>
<tr>
<td>Plan de estudios y variedad_No</td>
<td>-0.589657</td>
</tr>
<tr>
<td>Plan de estudios y variedad_Sí</td>
<td>0.589657</td>
</tr>
<tr>
<td>Acceso a recursos y tecnología_1</td>
<td>-0.676081</td>
</tr>
<tr>
<td>Acceso a recursos y tecnología_2</td>
<td>-0.439444</td>
</tr>
<tr>
<td>Acceso a recursos y tecnología_3</td>
<td>0.159805</td>
</tr>
<tr>
<td>Acceso a recursos y tecnología_4</td>
<td>0.234128</td>
</tr>
<tr>
<td>Acceso a recursos y tecnología_5</td>
<td>0.628619</td>
</tr>
<tr>
<td>Apoyo y orientación académica_No</td>
<td>-0.293294</td>
</tr>
<tr>
<td>Apoyo y orientación académica_Sí</td>
<td>0.293294</td>
</tr>
</tbody>
</table>

The correlation analyses revealed significant connections between various educational strategies and student satisfaction. Specifically, the implementation of personalised teaching strategies demonstrated a significant positive influence on student satisfaction, with a correlation coefficient of 0.58. This finding underscores the importance of personalising teaching to improve the educational experience.

The review of correlation coefficients also identified strong positive links between variables such as 'Teaching quality_Yes' and 'Applicability of knowledge', both with correlations close to 0.69. In addition, the variable 'Varied curriculum' showed a positive correlation of 0.58, indicating the relevance of offering diversified and technologically accessible educational programmes.
The results provide strong empirical evidence (Figure 5) that supports specific recommendations to improve student satisfaction during the learning phase, allowing educational institutions to proactively respond to student needs. The patterns discovered suggest several key areas of focus:

- motivation: moderately related to general satisfaction, highlighting the importance of promoting student motivation;
- quality of teaching and applicability of knowledge: both are crucial for educational success, highlighting the need for high-quality teaching that translates into practical applications;
- active participation: reflects the student's involvement in their educational process, positively correlated with greater satisfaction;
- curriculum and access to resources and technology: a diversified curriculum and access to technological resources promote educational equity, providing equal learning opportunities;
- Academic support and guidance: They are critical to student success and well-being, emphasising the need to provide strong support.

Consequently, one of the key findings of our research is the validation of the AI model, which showed high accuracy in identifying key areas to improve the educational experience. The positive correlation between personalised teaching strategies and student satisfaction highlights the importance of adapting pedagogical methods to the individual needs of students, a central principle of our methodology. These findings provide a basis for educational institutions to make informed, data-driven decisions, improving both educational quality and student satisfaction.

The research aligns with previous studies that have explored digitalisation in higher education and the impact of artificial intelligence on learning personalisation. For example, studies such as those by Serna et al. (2019) and García-Peñalvo (2021) have discussed how digital transformation redefines learning and its impact on education. However, this study contributes to the field by empirically demonstrating how predictive models can be applied specifically to improve student satisfaction, an area that has received less attention in previous literature.
The study by Contreras et al. (2020) analyses how machine learning models can predict academic performance, a similar approach to the current study in terms of using AI to improve educational outcomes. However, the current study distinguishes itself by focussing on student satisfaction as a key indicator of success, rather than just academic performance. This suggests a more student-centred application aligned with the student’s needs and well-being rather than just their grades.
Studies like González-González’s (2023) explore the overall impact of AI on education, highlighting how it can transform teaching and learning. Although these studies provide a useful framework for understanding the potential of AI, the current study provides a specific practical application of how AI can be used to personalise teaching and improve student satisfaction, providing empirical evidence of its effectiveness.

Despite the positive results, the study presents some limitations that should be considered. The research focused on a specific university context, which may limit the generalisation of the results to other institutions or educational contexts. In addition, the study is based on predictive models that, although powerful, depend on the quality and relevance of the data used. Future research could explore the application of these models in a wider variety of educational contexts and with more diversified datasets.

Regarding the proposed methodology, it offers a robust framework focused on the needs of the evolution scenarios of universities, thus improving the effectiveness of AI models to be aligned with the fundamental objectives of educational institutions, thus promoting a more relevant and satisfactory education for students.

5 CONCLUSION

This research contributes to the field of educational AI by offering empirical evidence of how adaptation and personalisation in teaching can positively impact student satisfaction. In addition, it provides a framework that other institutions can adapt to explore the use of advanced technologies such as Artificial Intelligence in an educational context. These findings underscore the importance of considering both technical and strategic aspects when integrating new technologies into education, suggesting pathways for future research that could continue to explore the relationship between advanced educational technology and student learning outcomes.

The adoption of the methodology followed could serve as a guide for future developments in the field of educational AI, and encourages educational institutions to adopt a more dynamic and adaptive approach to teaching and learning. This not only improves educational quality, but also prepares institutions to respond effectively to the changing needs of students and the labour market. Ultimately, the successful implementation of these models contributes to transforming higher education, ensuring that it remains relevant and effective in the digital age.
For future work related to this study, several lines of research that promote the continuous improvement and refinement of AI models in higher education can be considered. First, it is recommended to expand the database used to develop and refine machine learning models, incorporating a broader and more diverse spectrum of educational institutions and student profiles. This would improve the generalisation of models and provide more detailed and robust insights into different educational contexts. Second, it is crucial to implement a continuous feedback system that evaluates AI models in real time, based on student performance and satisfaction over time. This system would help to fine-tune models and proactively respond to students’ emerging needs and changes in the educational environment. Finally, the development of predictive models that can identify students at risk of failure or early dropout would be a valuable direction for future research. These models could allow for early and personalised interventions, significantly improving students' educational trajectories and academic outcomes.

REFERENCES


Optimization of the Educational Experience in Higher Education Using Predictive Artificial Intelligence Models


