Data and Metadata. 2025; 4:468
doi: 10.56294/dm2025468

ORIGINAL

Analyzing University Dropout Rates in E-Learning and the Potential of Artificial Intelligence to Reduce Them: A Case Study of French Universities

Análisis de las tasas de abandono universitario en el aprendizaje electrónico y el potencial de la inteligencia artificial para reducirlas: un estudio de caso de las universidades francesas

Atmane EL HADBI[1] ✉, Mohammed Hatim RZIKI[1], Yassine JAMIL[1], Mohamed Khalifa BOUTAHIR[2,3], Hamid BOURRAY[4], Driss EL OUADGHIRI[1]

[1]Laboratory of AI, Faculty of Sciences, Moulay Ismail University of Meknes. Morocco.
[2]National School of Artificial Intelligence and Digital Berkane. Morocco.
[3]Engineering science and technology laboratory, IDMS Team, Faculty of Sciences and Techniques, Moulay Ismail University of Meknes. Errachidia, Morocco.
[4]Systems Theory and Computer Science Team, Faculty of Sciences, Moulay Ismail University of Meknes. Morocco.

Cite as: El Hadbi A, Hatim Rziki M, Jamil Y, Khalifa Boutahir M, Bourray H, EL Ouadghiri D. Analyzing University Dropout Rates in E-Learning and the Potential of Artificial Intelligence to Reduce Them: A Case Study of French Universities. Data and Metadata. 2025; 4:468. https://doi.org/10.56294/dm2025468

Submitted: 25-02-2024 **Revised:** 19-06-2024 **Accepted:** 28-10-2024 **Published:** 01-01-2025

Editor: Adrián Alejandro Vitón-Castillo

Corresponding author: Atmane EL HADBI ✉

ABSTRACT

During the COVID-19 pandemic, students worldwide faced unprecedented disruption, forcing educators to swiftly transition to remote teaching. In French universities, strong political support at both national and institutional levels facilitated the deployment of digital tools such as learning management systems (e.g., Moodle), collaborative platforms (e.g., Google Meet, Microsoft Teams, Zoom), and social networks. While this shift highlighted the importance and critical role of digital technologies in education, it also raised significant concerns about the quality of online learning, the learning process, and the assessment of knowledge and skills. This case study explores the perceptions of students at Sorbonne Paris Cite Universities regarding the effectiveness of e-learning. Results from a Multiple Correspondence Analysis indicate that system usability and its positive impact on learning are key to the perceived success of e-learning. However, university dropout rates in this context stem from a combination of factors influencing student engagement. Addressing these challenges requires comprehensive solutions involving multiple stakeholders, including organizations, educators, and learners.

Keywords: E-Learning; Intelligent Tutoring Systems; Personalized E-Learning; Artificial Intelligence; E-Learning Dropout Rates; Sorbonne Paris Cite University; Case Study in French University; Multiple Correspondence Analysis; Remote Learning.

RESUMEN

Durante la pandemia de COVID-19, los estudiantes de todo el mundo se enfrentaron a una interrupción sin precedentes, lo que obligó a los educadores a una rápida transición a la enseñanza a distancia. En las universidades francesas, el fuerte apoyo político tanto a nivel nacional como institucional facilitó el despliegue de herramientas digitales como los sistemas de gestión del aprendizaje (por ejemplo, Moodle), las plataformas de colaboración (por ejemplo, Google Meet, Microsoft Teams, Zoom) y las redes sociales. Si bien este cambio puso de relieve la importancia y el papel fundamental de las tecnologías digitales en la educación, también suscitó importantes preocupaciones sobre la calidad del aprendizaje en línea, el

proceso de aprendizaje y la evaluación de conocimientos y habilidades. Este estudio de caso explora las percepciones de los estudiantes de la Universidad Sorbona París Cite sobre la eficacia del aprendizaje en línea. Los resultados de un Análisis de Correspondencias Múltiples indican que la usabilidad del sistema y su impacto positivo en el aprendizaje son claves para el éxito percibido del e-learning. Sin embargo, las tasas de abandono universitario en este contexto se derivan de una combinación de factores que influyen en el compromiso de los estudiantes. Abordar estos retos requiere soluciones integrales que impliquen a múltiples partes interesadas, incluidas organizaciones, educadores y alumnos.

Palabras Clave: E-Learning; Sistemas de Tutoría Inteligentes; E-Learning Personalizado; Inteligencia Artificial; Tasas de Abandono del E-Learning; Universidad Sorbona París Cite; Estudio de Caso en Universidad Francesa; Análisis de Correspondencias Múltiples; Aprendizaje a Distancia.

INTRODUCTION

In reaction to the problems of the digital age, educational institutions, especially in France, have been forced to adopt new strategies as a result of the global educational landscape's upheaval. E-learning has grown rapidly, giving students the chance to take classes from home via the internet, frequently at a lower cost. The use of digital learning platforms in French universities has increased significantly since the country's lockdown in March 2020. To maintain academic continuity, universities like Sorbonne Paris Cite University use platforms like Moodle and teamwork tools like Zoom and Microsoft Teams.

Beginning in March 2020, the French government halted all in-person instruction due to the COVID-19 outbreak. The goal of this choice was to safeguard educators and students while maintaining the flow of instruction. Platforms for remote learning were swiftly implemented, and educators and administrators modified these techniques to satisfy the demands of the academic community.

Global examples like Massive Open Online Courses (MOOCs) and websites like Coursera and Udemy have shown that it is possible to provide high-quality, easily accessible courses to a wide audience. These tutoring programs, which are frequently free and accessible to a broad audience, let students interact with a range of subjects through readings, videos, tests, and discussion boards.

But the move to online learning poses important queries concerning the efficacy, applicability, and consequences of e-learning for student achievement. Several studies conducted recently have looked at the sustainability and acceptance of MOOCs in an effort to encourage their long-term use in the provision of high-quality education. Four main theoretical associations were found by applying Multiple Correspondence Analysis (MCA) to 54 studies conducted between 2015 and 2021. These studies collectively analyzed over 19,600 responses. These findings highlight the significance of uncovering hidden connections in order to gain a deeper understanding of the functionality and application of MOOCs.

At Sorbonne Paris Cite University, an ongoing study investigates student perceptions of remote learning and the challenges they encountered after a year of pandemic-driven online education. Despite these challenges, most participants expressed a preference for hybrid learning over purely online education, noting that it is more effective but cannot entirely replace face-to-face instruction. These findings emphasize the need for continued investment in educational technologies, particularly in intelligent tutoring systems that can enhance learning and adapt to students' individual preferences. The scope of this study includes:

- Overview of e-learning in France and the associated challenges
- The methods and materials used, including Multiple Correspondence Analysis
- The tools and resources employed
- Specific subsections include a description of the dataset and the analysis of results.
- Results analysis and findings explanation
- Challenges of e-learning in France and proposes strategies for improvement.
- Summary of the findings and their implications.

The COVID-19 epidemic of 2020 compelled French universities to switch to online instruction. Digital access problems continued even though several universities had moved their courses online in preparation for the lockdown. While some students battled with subpar equipment, others lived in places with spotty internet access. Universities made an effort to address these issues by offering computers and internet vouchers, but because hybrid education lacked a defined structure for implementation, the digital gap continued to be a major worry.

Although there were occasionally technical issues like platform overload and internet outages, the majority of students continued their education using the digital platforms that their universities supplied. Teachers found it confusing to transition from in-person education to online learning. Many were forced to use novel

methods and strategies without clear guidelines, which put additional psychological strain on teachers and children.

Even though e-learning platforms were familiar to many educators, the epidemic showed that these resources were frequently neglected. The incident made people wonder how well digital tools can assist learning during a crisis and how best to modify lesson plans to maintain pedagogical continuity in the face of such setbacks.

Many teacher-researchers encountered difficulties during the epidemic, especially in learning how to use e-learning platforms and selecting the best digital resources for their courses. The degree of familiarity with the offered solutions and the degree to which pupils assimilated them determined the variations in these challenges. Due to the functional and organizational limitations that students encountered during the pandemic's peak, organizing students' work also became more difficult. Educational institutions made every effort to help teacher-researchers via phone calls, emails, meetings, and in-person encounters in an effort to address these challenges.

In 2020–2021 academic year, in-person instruction was still the norm at French institutions; nevertheless, with the advent of digital technology, remote working practices became more common. However, due to the crisis' suddenness, it was challenging for stakeholders to act swiftly and decisively to maintain educational continuity. For teacher-researchers used to more conventional teaching techniques, the forced switch to continuous remote learning presented difficulties. A sort of remote supported self-training resulted from the lack of planning for customized training. In addition to the physical distance, this division also affected society and education.

Both students and teacher-researchers must be heavily involved in e-learning, yet the synchronization of digital instruments frequently ignores crucial educational elements like comprehending, listening, and attention. For instance, video conferencing occasionally amounted to nothing more than audio calls. E-learning does not completely replace the in-person and remote learning paradigm that schools employ during times of crises. The limitations of digital tools and their sometimes misuse deterred educators and students from taking full advantage of online learning opportunities.

Even among students not impacted by the digital divide, isolation in front of screens was a common occurrence as they alternated between social media connections, videos, online coursework, and individual projects. It's quite difficult and exhausting to take online classes for a whole day. Shorter attention spans are possible, particularly in cases where programs and timetables were not adjusted for the crisis. The ability to discriminate between work and leisure time grew more difficult, which impacted motivation. It was more difficult to learn well when there was infrequent contact between classmates and teachers. Problems also resulted from teacher-researchers' over use of email communication, as they tried to stay in touch by bombarding students with documents and sending a lot of messages that were frequently impersonal. A 2020 study conducted by the National Observatory of Student Life in France found that some students found this technique to be difficult and intrusive.

Students had to continually decide how to handle the different tasks that were assigned to them or demanded of them; some of them had to come up with new coping mechanisms. Denny (2020) noted that this resulted in a rupture in educational continuity, with course content, instructional strategies, and learning processes deviating from pre-pandemic practices. Students who had no clear strategy and were not accountable for their own learning ultimately found it more difficult to adjust. Inequality increased subtly as a result of their lack of drive and mounting discouragement, which only made the gaps between students wider.

The issue of university dropout is complicated and costs the education community a great deal. This issue is made worse in the particular context of e-learning by obstacles like loneliness and trouble adjusting to online teaching techniques. Important queries need to be answered: Which certain e-learning elements are responsible for student dropout? What is the perception of online learning among Sorbonne Paris Cite University students?

Comprehending these dynamics is vital in order to steer educational policies and furnish pupils with efficacious support throughout their academic pursuits. Our objective is to determine the relationships, patterns, and behavioral patterns that influence students' e-learning experiences by examining the data that has been gathered from them. We seek to quantify the important components of online learning and produce insightful data by employing an analytical method that includes factor analysis and descriptive statistics. These results will serve as the basis for creating focused and efficient strategies to deal with university dropout in the particular setting of French universities.

We used multivariate analysis techniques in our work, specifically Multiple Correspondence Analysis (MCA), to get important insights into the variables influencing e-learning dropout rates at Sorbonne Paris Cite University.

METHOD

Multiple Correspondence Analysis (MCA)

A statistical method called multiple correspondence analysis (MCA) is used to look at the connections

between various qualitative variables. Principal Component Analysis (PCA) and MCA are comparable; however, MCA deals with qualitative variables rather than quantitative ones. The closeness between categories of qualitative variables and the related observations can be seen using this technique.

It's critical to construct a comprehensive disjunctive table prior to MCA. Each qualitative variable is divided into its several categories in this table, and each category is shown by a different column. The entire disjunctive table is then formed by marking the observations with a "1" in the relevant cells of the observed categories.

Based on the idea of inertia, the coordinates of the categories and the observations are computed using this table in an ideal representation space. Using Greenacre's method, the total inertia is modified to display illuminating percentages along the axes.

Researchers can focus on particular subsets of categories and still get a wide picture of the full dataset according to the approach developed by Greenacre and Pardo. This makes it easier to analyze the links between categories with greater focus.

Tables and graphs are included with the MCA findings. These are made up of the Burt table produced using the original data and the disjunctive table. We compute and display adjusted inertia, percentages of inertia, and eigenvalues. To offer a thorough analysis of the data, the squared cosines, principal and standard coordinates, and contributions are also calculated.

Graphs are necessary to comprehend MCA outcomes. Principal coordinates are used by symmetrical graphs to show the correlations between variables and data. Complex relationships can be interpreted more easily when observations' positions in reference to category vectors are analyzed, which is possible with asymmetrical graphs.

Tools and Ressources

Dataset details

In order to examine instances of university dropout in French institutions—specifically at Sorbonne Paris Cite University—during the shift to distant learning, a particular dataset was used for this study. The original dataset was modified to more effectively handle the issue of dropouts.

The information was gathered from a survey given to university students in France during the COVID-19 epidemic, when online education became a vital substitute for traditional classroom instruction. The research data and questionnaire can be found in the appendix.

With an emphasis on students' perceptions of the success or failure of this style of instruction, the study aims to investigate the phenomena of university dropout by examining their experiences with e-learning. Therefore, the information gathered is essential for comprehending the causes of university dropout, particularly in the setting of distance learning.

Findings analysis with R Software:

The R program will be used in our investigation to gather and examine the data. A thorough examination will be provided, emphasizing the several clusters that the Multiple Correspondence Analysis (MCA) revealed. In order to better comprehend students' attitudes and impressions of the system under review, each group will be described according to its unique features. We have successfully processed and interpreted the questionnaire data thanks to the R software.

RESULTS

Interpretation of findings and results comparaison:

In this section, we present the results obtained from the questionnaire responses, using the following variables:

- SQ3: E-Learning is easy to use (system quality)
- PU4: Overall, the chosen E-Learning tool is useful for me (perceived usefulness)
- ELS1: E-Learning is enjoyable (online learner satisfaction)
- LCA3: Computers make me feel uncomfortable (learner computer anxiety)

Analysis of the points by rows and columns (figure 1) reveals the presence of four distinct groups, each with specific project-related characteristics:

- Group 1 (Green): Students in this group feel very comfortable using computers (LCA3) and find the system very easy to use (SQ3).
- Group 2 (Red): Students in this group feel very uncomfortable using computers (LCA3) and find the system very difficult to use (SQ3).
- Group 3 (Orange): Students in this group do not feel comfortable using computers (LCA3) and find the system difficult to use (SQ3).
- Group4 (Blue): Students in this group feel comfortable using computers (LCA3) and find the system

easy to use (SQ3).

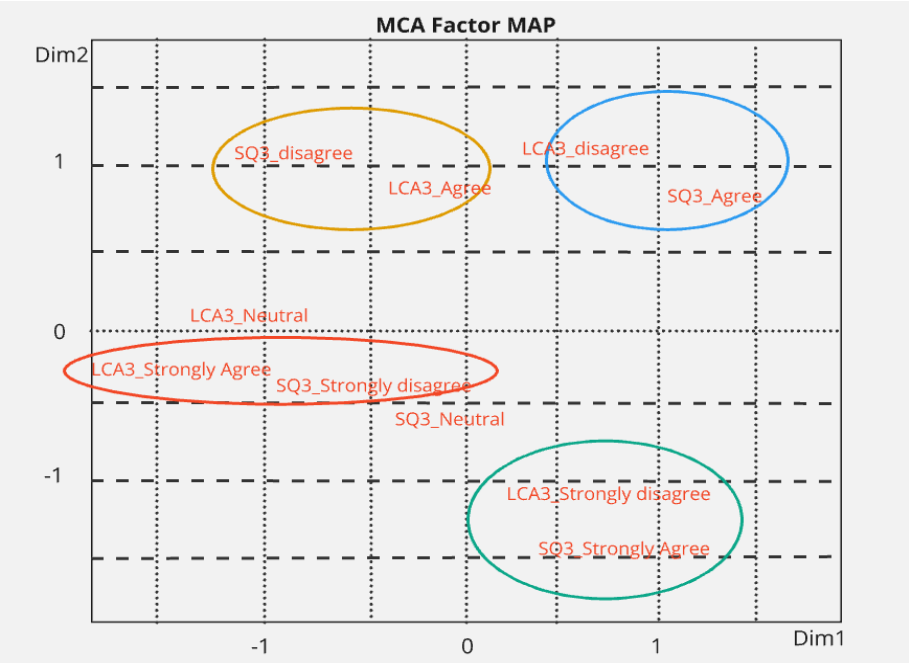

Figure 1. Graphical representation of results obtained for questions (SQ3, LCA3)

Analysis of the points by rows and columns (figure 2) reveals the presence of four distinct groups, each with specific project-related characteristics:

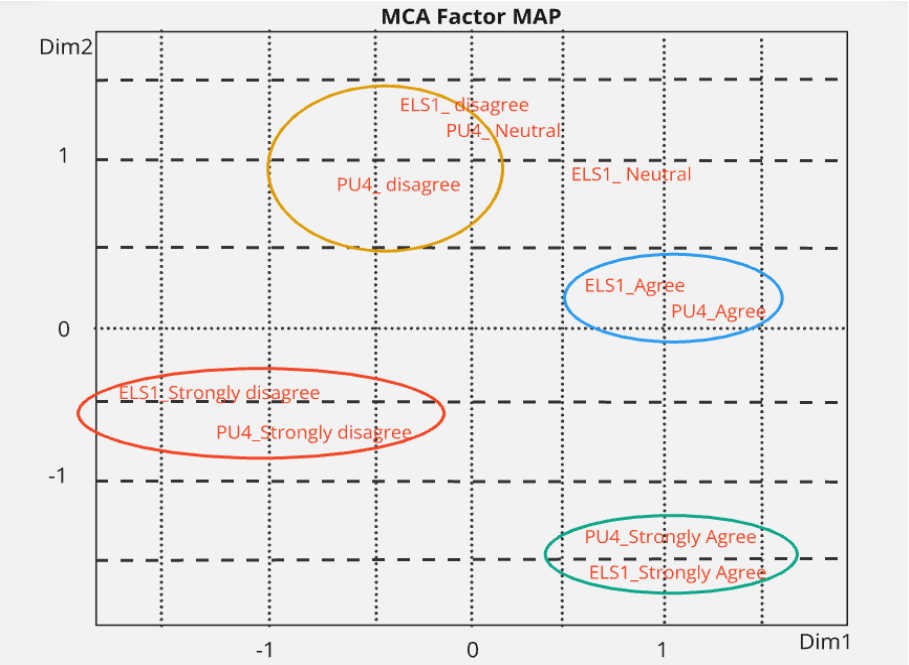

Figure 2. Graphical representation of results obtained for questions (ELS1, PU4)

- Group 1 (Blue): Students in this group consider the system to be very useful (PU4) and are very satisfied with the system (ELS1).
- Group 2 (Green): Students in this group consider the system to be very useless (PU4) and are very dissatisfied with the system (ELS1).
- Group 3 (Orange): Students in this group find the system useful (PU4) and say they are satisfied with the system (ELS1).
- Group 4 (Red): Students in this group find the system useless (PU4) and are dissatisfied with the system (ELS1).

https://doi.org/10.56294/dm2025468

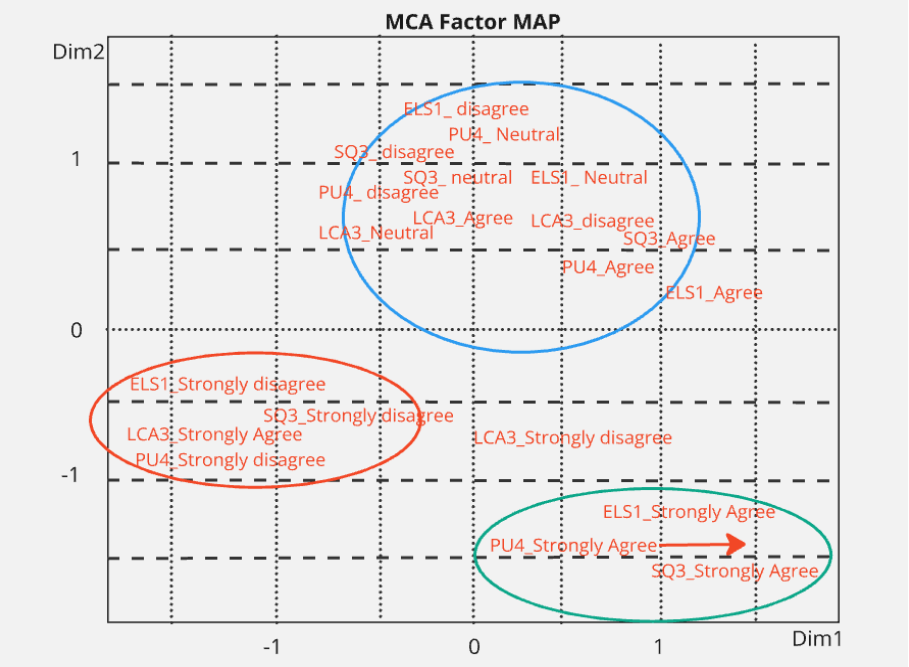

Figure 3. Graphical representation of results obtained for questions (SQ3, PU4, ELS1, LCA3)

An analysis of points by category reveals three distinct groups, each with specific characteristics linked to the projects evaluated.

- Group 1 (Green): Students in this group find the system very easy to use (SQ3), find it very useful (PU4) and are very satisfied with the system (ELS1).
- Group 2 (Red): This group is distinguished by strong disagreement about the usefulness of the system (SQ3), a perception of the system as very difficult to use (SQ3), marked discomfort with the computers (LCA3) and general dissatisfaction with the system (ELS1).
- Group3 (Blue): Students in this group have neutral opinions on all variables. They express no clear preference for ease of use (SQ3), comfort with computers (LCA3), usefulness (PU4) and satisfaction (ELS1).

Analysis and comparison of results

The results from the three figures provide an overview of students' perceptions of the e-learning system and reveal distinct groups based on their responses to various variables.

Figure 1 identifies four groups based on the ease of use of the system (SQ3) and comfort with computers (LCA3). Group 1 (green) finds the system easy to use and feels very comfortable with computers. Group 2 (red) finds the system very difficult to use and does not feel comfortable with computers. Group 3 (orange) finds the system difficult to use and is not comfortable with computers. Group 4 (blue) finds the system easy to use and feels comfortable with computers.

Figure 2 presents four distinct groups of students based on their perception of the system's usefulness (PU4) and their overall satisfaction (ELS1). The identified groups are: Group 1 (blue), where students find the system very useful and report being very satisfied; Group 2 (green), where students consider the system very useless and are highly dissatisfied; Group 3 (orange), where students find the system useful and are satisfied; and Group 4 (red), where students judge the system as useless and are dissatisfied.

Figures 1 and 2 also show distinct groups, but based on different combinations of variables. Figure 3 identifies three groups based on the ease of use of the system (SQ3), perceived usefulness (PU4), and overall satisfaction (ELS1). Group 1 (green) finds the system easy to use, very useful, and is highly satisfied. Group 2 (red) finds the system difficult to use, very useless, and is highly dissatisfied. Group 3 (blue) has neutral opinions on all variables. They do not express a clear preference regarding ease of use (SQ3), comfort with computers (LCA3), usefulness (PU4), and satisfaction (ELS1).

By comparing the figures, we observe that the green and red groups appear in all the figures, representing students with polarized perceptions of the system's usefulness, ease of use, and satisfaction. The variables of ease of use (SQ3), perceived usefulness (PU4), and satisfaction (ELS1) are central to the analysis across all figures, highlighting their importance in assessing the success of the e-learning system. Figure 2 includes an additional group compared to Figure 3, allowing for a finer distinction between neutral and negative perceptions. Figure 1 incorporates an additional dimension with computer anxiety (LCA3), revealing nuances in students'

perceptions based on their comfort with technology. Figure 3 shows three distinct groups, while figures 1 and 2 show four groups, indicating a more detailed and segmented analysis in the latter figures.

DISCUSSION

The Multiple Correspondence Analysis (MCA) reveals a significant relationship between "System Success" and the variables "Ease of Use" and "Positive Impact on Learning." This association suggests that students who perceive the system as easy to use and as having a positive impact on their learning tend to give higher ratings to "System Success." In other words, the system's user-friendliness and its beneficial effect on learning are key factors that influence the perception of e-learning systems' success. These findings highlight the importance of an intuitive user interface and a tangible contribution to learning in optimizing the success of e-learning initiatives.

University dropout in the context of e-learning in France stems from several interconnected challenges. Unequal access to technology, particularly to a reliable internet connection, represents a significant barrier. The lack of educational infrastructure designed to effectively support large-scale e-learning also compromises the overall learning experience. Social isolation, due to the absence of in-person interaction, can affect students' motivation and reduce their engagement in distance learning. Additionally, while the flexibility of e-learning is beneficial for some, it can also pose challenges in terms of time management and self-discipline.

Moreover, the lack of adequate training for teachers to effectively use digital tools can limit the success of online teaching. Educational content is not always adapted to digital formats, making learning less interactive and engaging. Language diversity can also be an issue, as many online resources are available primarily in English, which may exclude students who are less comfortable with this language. Finally, socio-economic inequalities exacerbate these challenges, as students from disadvantaged backgrounds often have less access to the resources necessary to succeed in an e-learning environment.

To address the issue of university dropout in France, several strategies should be considered. First, improving technological accessibility is essential, ensuring that students have adequate internet coverage and equitable access to the necessary infrastructure for e-learning. Additionally, reinforcing academic and technical support is crucial, with the introduction of online tutoring services and personalized assistance programs for students facing difficulties. To enhance the learning experience, educational programs should incorporate interactive and engaging elements to encourage active student participation.

Implementing data tracking systems to monitor learning progress would allow for the early identification of students at risk, enabling targeted interventions. Promoting collaborative learning through online platforms, virtual group projects, and discussion forums would further foster social interaction and knowledge sharing among students. Continuous teacher training is also critical to familiarize educators with digital tools and new teaching methodologies, ensuring high-quality instruction. Furthermore, diversifying educational content by making it available in multiple languages and adapting it to students' diverse cultural backgrounds would enrich the learning environment.

Enhancing the user-friendliness and intuitiveness of e-learning platforms is another priority, as a well-designed interface significantly impacts student engagement and satisfaction. Regular feedback from students should be considered to ensure ongoing improvements to these platforms.

Introducing flexible learning policies that allow students to progress at their own pace while balancing studies with other responsibilities would also be beneficial. Offering academic credits for extracurricular activities and practical skills could provide additional motivation for students to stay engaged. Developing partnerships with tech companies to supply discounted or donated equipment, along with specialized training, could further support students. Financial incentives, such as scholarships specifically for e-learning, should be introduced to help low-income students.

Artificial Intelligence (AI)-powered tutoring systems can also play a pivotal role in reducing e-learning dropout rates. These systems provide real-time, personalized learning support by adapting to individual students' needs and learning styles. AI-driven platforms can analyze vast amounts of student data to identify struggling learners early on and offer targeted interventions, such as customized practice sessions or explanations of complex topics. Moreover, AI tutors can be available 24/7, ensuring that students have access to help whenever they need it, which can be particularly beneficial for those balancing studies with other responsibilities. By offering continuous feedback, guidance, and encouragement, AI-powered tutoring systems can help to maintain student engagement and motivation, ultimately reducing the likelihood of dropout.

Finally, addressing socio-economic inequalities by providing devices and resources at little or no cost to disadvantaged students is vital. By adopting a comprehensive and proactive approach, France can significantly reduce university dropout rates and improve educational outcomes in the context of e-learning.

CONCLUSION

To address university dropout in France within the context of e-learning, a comprehensive and integrated

strategy is essential. Multiple Correspondence Analysis (MCA) highlights the significance of system user-friendliness and its positive impact on learning in determining the perceived success of e-learning platforms. An intuitive interface and a beneficial effect on learning are key drivers of how students assess the success of e-learning systems.

University dropout is influenced by multiple interconnected factors. Technological barriers, such as limited internet access and lack of necessary equipment, often impede student participation. Additionally, technical difficulties can prevent full engagement in online learning. It's important to recognize that dropout in e-learning in France is not an isolated issue, but a result of various interacting factors across multiple domains.

To effectively tackle this problem, several initiatives must be considered. First, extending internet coverage and improving connection quality, particularly in rural areas, is crucial. Providing low-income students with laptops, tablets, and other essential devices—potentially through partnerships with tech companies—will ensure equitable access to necessary tools.

Regular training programs for teachers to familiarize them with digital tools and e-learning pedagogical methods are also vital. Educational content should incorporate interactive, multimedia elements tailored to diverse learning styles to maintain student engagement. Alongside these efforts, online tutoring, individualized follow-up sessions, and support programs for struggling students must be made available.

The use of learning management systems to monitor student progress and identify those needing additional support is another important step. Promoting virtual study groups, online collaborative projects, and discussion forums will enhance social interaction and knowledge-sharing. Furthermore, educational materials should be offered in multiple languages and tailored to the cultural diversity of students.

Awareness campaigns promoting the benefits of e-learning, along with mentorship programs to help students stay motivated, are equally crucial. Providing scholarships and financial aid specifically for students from disadvantaged backgrounds will help ensure they have access to the resources they need for success. Finally, designing intuitive and ergonomic user interfaces, with student feedback guiding continuous platform improvements, is essential.

By implementing these solutions, France can significantly improve the e-learning experience, boost student engagement, and reduce university dropout rates. A proactive and integrated approach, supported by collaboration between educational institutions, the government, and civil society, is necessary to create sustainable and inclusive solutions.

REFERENCES

1. Alvarado MAG. Gentrification and Community Development: An analysis of the main lines of research. Gentrification 2023;1:2–2. https://doi.org/10.62486/gen20232.

2. Apumayta RQ, Cayllahua JC, Pari AC, Choque VI, Valverde JCC, Ataypoma DH. University Dropout: A Systematic Review of the Main Determinant Factors 2024. https://doi.org/10.12688/f1000research.154263.1.

3. Arias A, Linares-Vásquez M, Héndez-Puerto NR. Undergraduate Dropout in Colombia: A Systematic Literature Review of Causes and Solutions. Journal of Latinos and Education 2024.

4. Baena-Navarro R, Fernando-Bermúdez J, Carriazo-Regino Y. Digital empowerment of rural teachers: towards an innovative pedagogy in the 21st century. Management (Montevideo) 2024;2:24–24. https://doi.org/10.62486/agma202424.

5. Bolivar NM, Cardenas YT, Trujillo AM. The behavior of street vendors in the informal sector in relation to decision making as rational agents. Management (Montevideo) 2024;2:33–33. https://doi.org/10.62486/agma202433.

6. Caja SLM, Rivera MDPS, Esteban CM. Work performance and interpersonal relationships of nursing professionals. Review of the topic. Multidisciplinar (Montevideo) 2024;2:91–91. https://doi.org/10.62486/agmu202491.

7. Cancino V, Garzon ML, Hansen A, Brusca maria I. Evaluation of the preference and recommendation of dentists regarding the use of bamboo toothbrushes. Odontologia (Montevideo) 2024;2:125–125. https://doi.org/10.62486/agodonto2024125.

8. Caquimbo GA, Virgilito A, Saldaña J. Functional aesthetic rehabilitation and its impact on self-esteem. Odontologia (Montevideo) 2024;2:126–126. https://doi.org/10.62486/agodonto2024126.

9. Cardozo GT. Community development promoted by policies: an analysis from the perspective of gentrification. Gentrification 2023;1:3–3. https://doi.org/10.62486/gen20233.

10. Carranza ARR, Beltrán MAP de. Proposal for a survey to identify knowledge about hystercetomy, as well as its pre- and post-operative care. Multidisciplinar (Montevideo) 2024;2:93–93. https://doi.org/10.62486/agmu202493.

11. Castillo VS. Gentrification as a field of study in the last decade: a bibliometric analysis in Scopus. Gentrification 2023;1:5–5. https://doi.org/10.62486/gen20235.

12. Castillo-González W, González-Argote J. Workshops to convert the thesis into an academic article: an incentive to increase scientific production in universities. Odontologia (Montevideo) 2024;2:127–127. https://doi.org/10.62486/agodonto2024127.

13. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 319-340.

14. Díaz-Pacheco J, Cabanillas-Chávez MT. Nursing process applied to a preschooler with spinal muscular atrophy and chronic respiratory failure. Multidisciplinar (Montevideo) 2024;2:84–84. https://doi.org/10.62486/agmu202484.

15. Dwivedi DN, Mahanty G, Dwivedi V nath. The Role of Predictive Analytics in Personalizing Education: Tailoring Learning Paths for Individual Student Success. Enhancing Education With Intelligent Systems and Data-Driven Instruction, IGI Global; 2024, p. 44–59. https://doi.org/10.4018/979-8-3693-2169-0.ch003.

16. Dwivedi DN, Mahanty G, Khashouf S. Predictive Analytics for Reducing University Dropout Rates: A Machine Learning Approach. Exploring Youth Studies in the Age of AI, IGI Global; 2024, p. 186–202. https://doi.org/10.4018/979-8-3693-3350-1.ch010.

17. Dwivedi DN, Mahanty G. Predictive Analytics in Educational Outcomes: Analyzing High School Students' Performance in Mathematics. Adaptive Learning Technologies for Higher Education, IGI Global; 2024, p. 293–316. https://doi.org/10.4018/979-8-3693-3641-0.ch013.

18. Espinosa RDC, Caicedo-Eraso JC, Huerta ADE. Digital skills in the use of artificial intelligence tools for the formulation of formative research projects from the TECSIS Research Seminar. LatIA 2024;2:106–106. https://doi.org/10.62486/latia2024106.

19. Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. Educause Review.

20. Injante R, Chamaya K. Use of artificial intelligence in the detection of coffee rust: An exploratory systematic review. LatIA 2024;2:90–90. https://doi.org/10.62486/latia202490.

21. Injante R, Julca M. Detection of diabetic retinopathy using artificial intelligence: an exploratory systematic review. LatIA 2024;2:112–112. https://doi.org/10.62486/latia2024112.

22. Jesús UMP, Guillén AJ, Blanco MB, Hernández-Runque E. Consulting and advising business startups. Management (Montevideo) 2024;2:141–141. https://doi.org/10.62486/agma2024141.

23. Kumar A, Mishra K, Mahto RK, Mishra BK. A Framework for Institution to Enhancing Cybersecurity in Higher Education: A Review. LatIA 2024;2:94–94. https://doi.org/10.62486/latia202494.

24. León MP. The impact of gentrification policies on urban development. Gentrification 2023;1:4–4. https://doi.org/10.62486/gen20234.

25. Many H. Creating An Empowering Learning Environment in Higher Education: A Modelization of Enhancing Student Learning Experience. Canadian Journal of Educational and Social Studies 2024;4:48–66. https://doi.org/10.53103/cjess.v4i4.263.

26. Mendez NRC, Rodriguez MPG, Marta JAU, Rojas MG. Importance of social research in advertising and marketing. Management (Montevideo) 2024;2:95–95. https://doi.org/10.62486/agma202495.

27. Michalas, A., & Vretaros, P. (2023). Protecting medical emergency personnel through a framework for verifiable and privacy-preserving cross-border collaboration. ICT Systems Security and Privacy Protection, 82-94. https://doi.org/10.1007/978-3-031-54288-6_5

28. Navarro WS, Duque NEA, Ramirez FMB, Chaparro AMT. Strategic Analysis from a consulting context for the Super Kinder School Institution. Management (Montevideo) 2024;2:30–30. https://doi.org/10.62486/agma202430.

29. Nhleko NM, Aroba OJ, Chisita CT. A systematic review of information and communication technologies (ICTs) on student motivation: researchers' reflections on a selected higher education institution (HEIs). Global Knowledge, Memory and Communication 2024;ahead-of-print. https://doi.org/10.1108/GKMC-03-2024-0129.

30. Ortega P, Virgilito A. Zygomatic Implants: The importance of the correct choice of surgical technique. Odontologia (Montevideo) 2024;2:124–124. https://doi.org/10.62486/agodonto2024124.

31. Padmasiri P, Kasthuriarachchi S. Interpretable Prediction of Student Dropout Using Explainable AI Models. 2024 International Research Conference on Smart Computing and Systems Engineering (SCSE), vol. 7, 2024, p. 1–7. https://doi.org/10.1109/SCSE61872.2024.10550525.

32. Park, J. H., & Choi, H. J. (2009). Factors influencing adult learners' decision to drop out or persist in online learning. Educational Technology & Society, 12(4), 207-217.

33. Quispe L, Arauco E, Esteban CAM. Assessment of quality of work life and healthy lifestyles in nursing professionals: review of the conceptual framework and background. Multidisciplinar (Montevideo) 2024;2:92–92. https://doi.org/10.62486/agmu202492.

34. Ramirez EAB, Esparrell JAF. Artificial Intelligence (AI) in Education: Unlocking the Perfect Synergy for Learning. Educational Process: International Journal 2024;13:35–51.

35. Rico-Juan JR, Cachero C, Macià H. Study regarding the influence of a student's personality and an LMS usage profile on learning performance using machine learning techniques. Appl Intell 2024;54:6175–97. https://doi.org/10.1007/s10489-024-05483-1.

36. Shraim, K. (2024). Artificial Intelligence (AI)-Powered Tutoring Systems: Exploring Their Potential to Reduce Dropout Rates in E-Learning. In A. K. M. Azad & M. K. Hasan (Eds.), Artificial Intelligence in Education: Toward a Better Future (pp. 255–275). Springer. https://doi.org/10.1007/978-3-031-54288-6_15

37. Takács R, Takács S, Kárász JT, Oláh A, Horváth Z. Applying Q-methodology to investigate computer science teachers' preferences about students' skills and knowledge for obtaining a degree. Humanit Soc Sci Commun 2024;11:1–10. https://doi.org/10.1057/s41599-024-02794-z.

38. Valencia-Contrera M, Rivera-Rojas F, Villa-Velasquez J, Cancino-Jiménez D. Use of artificial intelligence in nursing. LatIA 2024;2:92–92. https://doi.org/10.62486/latia202492.

39. Valiente HP, Secreto B, Brusca MI. Evaluation of tooth angulation and vestibular bone table in anterosuperior teeth prior to immediate implant placement. Descriptive study with cone beams computed tomography. Odontologia (Montevideo) 2024;2:132–132. https://doi.org/10.62486/agodonto2024132.

40. Vasquez EKS, Benitez OKM, Vasquez CS, Vasquez ES, Vasquez JMAS. Antimicrobial effect of platelet lysate in the treatment of burn patients. Multidisciplinar (Montevideo) 2024;2:66–66. https://doi.org/10.62486/agmu202466.

FINANCING

The authors did not receive funding for the development of this research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Atmane EL HADBI, Mohammed Hatim RZIKI, Yassine JAMIL, Mohamed Khalifa BOUTAHIR, Hamid BOURRAY, Driss EL OUADGHIRI.

Data curation: Atmane EL HADBI, Mohammed Hatim RZIKI, Yassine JAMIL, Mohamed Khalifa BOUTAHIR, Hamid BOURRAY, Driss EL OUADGHIRI.

Formal analysis: Atmane EL HADBI, Mohammed Hatim RZIKI, Yassine JAMIL, Mohamed Khalifa BOUTAHIR, Hamid BOURRAY, Driss EL OUADGHIRI.

Research: Atmane EL HADBI, Mohammed Hatim RZIKI, Yassine JAMIL, Mohamed Khalifa BOUTAHIR, Hamid BOURRAY, Driss EL OUADGHIRI.

Methodology: Atmane EL HADBI, Mohammed Hatim RZIKI, Yassine JAMIL, Mohamed Khalifa BOUTAHIR, Hamid BOURRAY, Driss EL OUADGHIRI.

Project administration: Atmane EL HADBI, Mohammed Hatim RZIKI, Yassine JAMIL, Mohamed Khalifa BOUTAHIR, Hamid BOURRAY, Driss EL OUADGHIRI.

Writing - original draft: Atmane EL HADBI, Mohammed Hatim RZIKI, Yassine JAMIL, Mohamed Khalifa BOUTAHIR, Hamid BOURRAY, Driss EL OUADGHIRI.

Writing - revision and editing: Atmane EL HADBI, Mohammed Hatim RZIKI, Yassine JAMIL, Mohamed Khalifa BOUTAHIR, Hamid BOURRAY, Driss EL OUADGHIRI.

https://doi.org/10.56294/dm2025468

APPENDIX

Preview of JSON file content:


```
[
  {
    «Gender»: «Female»,
    «University «: «Paris Descartes»,
    «Level of studies»: «BAC+2»,
    «Videoconferencing systems»: «Zoom»,
    «Online learning platforms «: «Edx”,
    «PU1»: 4,
    «PU2»: 5,
```


Link to dataset used in this case study:
Link to download JSON File
Link to download Excel File (Xls generated from JSON)

https://doi.org/10.56294/dm2025468