

Invisible Frontier: Educational Transformation and Latent Dropout in Virtual Higher Education

(es) Frontera Invisible: Transformación Educativa Y Deserción Latente en la Educación Superior Virtual

(port) Fronteira Invisível: Transformação Educacional e Abandono Latente no Ensino Superior Virtual

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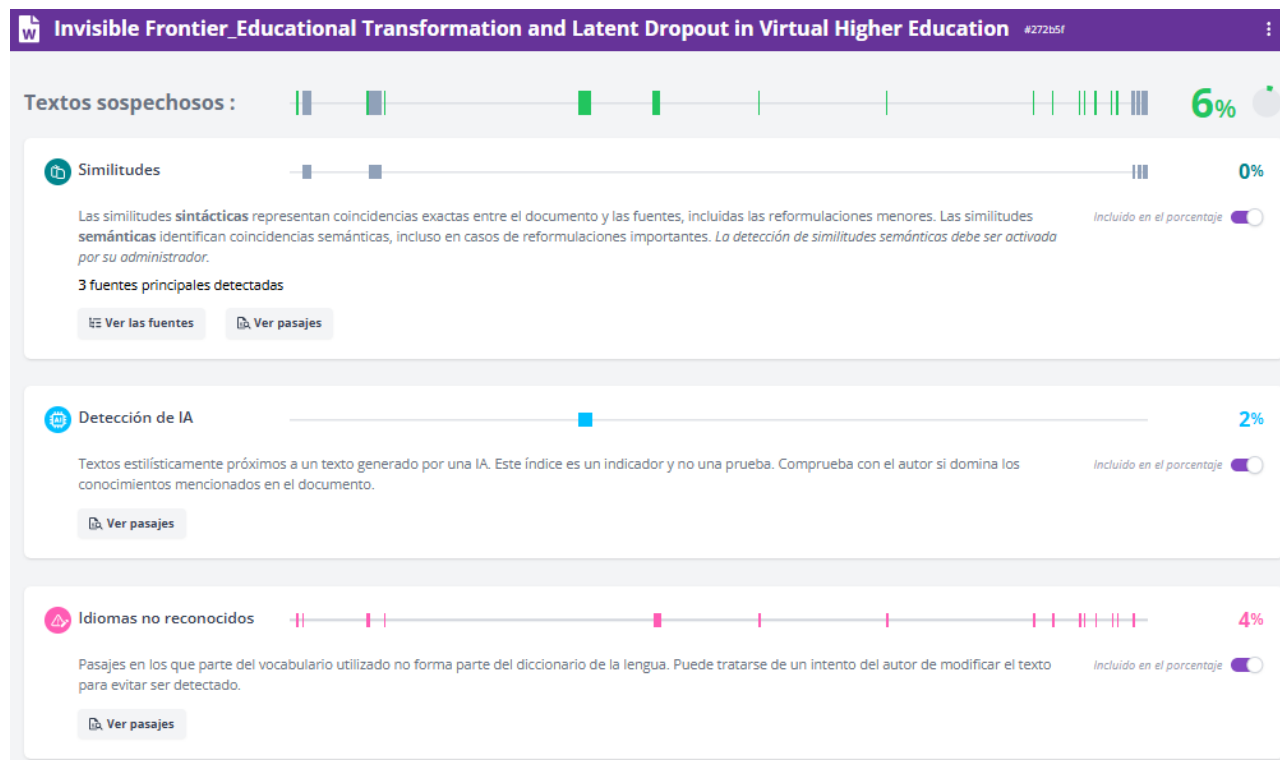
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Abstract

The article examines how administrative management and institutional support affect student retention in the virtual modality of the Corporación Universitaria Americana (C.U.A.). It builds on the idea of an "invisible border" that arises with digital flexibility and weakens the sense of belonging (Tinto, 1975). Using a qualitative approach based on internal documents, processes such as the PARE program are reviewed and compared with studies on learning analytics (Siemens, 2010). The findings point to a management approach that arrives late and fails to prevent dropout. In response, the Accompaniment and Traceability System (S.A.T. 2.0) is suggested, which uses live data and artificial intelligence to act before the student leaves. The goal is to achieve true virtual inclusion, leaving no one behind.

Keywords: *virtual dropout; administrative management; Learning Analytics; student retention, accompaniment.*

Resumen

El artículo examina cómo la gestión administrativa y el acompañamiento institucional afectan la permanencia de los estudiantes en la modalidad virtual de la Corporación Universitaria Americana (C.U.A.). Parte de la idea de una "frontera invisible" que surge con la flexibilidad digital y debilita el sentido de pertenencia (Tinto, 1975). Con un enfoque cualitativo basado en documentos internos, se revisan procesos como el programa PARE y se comparan con estudios sobre analítica del aprendizaje (Siemens, 2010). Los hallazgos señalan una gestión que llega tarde y no previene el abandono. Como respuesta, se sugiere el Sistema de Acompañamiento y Trazabilidad (S.A.T. 2.0), que usa datos en vivo e inteligencia artificial para actuar antes de que el estudiante se vaya. El fin es lograr una virtualidad que incluya de verdad, sin dejar a nadie atrás.

Palabras clave: *deserción virtual; gestión administrativa; Learning Analytics; permanencia estudiantil; acompañamiento.*

Resumo

O artigo examina como a gestão administrativa e o acompanhamento institucional afetam a permanência dos alunos na modalidade virtual da Corporación Universitaria Americana (C.U.A.). Parte da ideia de uma "fronteira invisível" que surge com a flexibilidade digital e enfraquece o sentimento de pertencimento (Tinto, 1975). Com uma abordagem qualitativa baseada em documentos internos, processos como o programa PARE são revisados e comparados com estudos sobre learning analytics (Siemens, 2010). As descobertas apontam para uma gestão que chega tarde e não previne o abandono. Como resposta, sugere-se o Sistema de Acompanhamento e Rastreabilidade (S.A.T. 2.0), que utiliza dados em tempo real e inteligência artificial para agir antes que o aluno desista. O objetivo é alcançar uma virtualidade verdadeiramente inclusiva, sem deixar ninguém para trás.

Palavras-chave: *evasão virtual; gestão administrativa; Learning Analytics; permanência estudantil; acompanhamento.*

Author Notes:

*The authors declare no conflicts of interest.
.A 10% Artificial Intelligence (AI) tool was used to format the data for the journal.*

Notas de los autores:

*Los autores declaran no tener conflictos de intereses.
Para la elaboración del documento se contrastó un 10% de Inteligencia Artificial (IA) para la adecuación de datos en formato de la revista.*

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Uma ferramenta de Inteligência Artificial (IA) de 10% foi utilizada para formatar os dados para a publicação no periódico.*

Introduction

Higher education is going through a profound change. Digitalization, together with the COVID-19 crisis, pushed universities to move from classrooms to screens in the blink of an eye. This leap forced them to rethink not only the way they teach, but also how the entire process is managed. The problem is that this transformation brings a harsh contradiction: virtuality promised to open doors to more people, but on a day-to-day basis it raises walls that no one sees and that push students to abandon.

At the American University Corporation (C.U.A.), this barrier is noticeable on two sides. On the one hand, the isolation that students feel when studying alone, without classmates nearby or casual chats, makes it more difficult for them to feel part of the university (Tinto, 1975). On the other hand, the systems to track their progress are still designed for when everyone was on campus. They work late, with reports that arrive when the damage has already been done, and without data at the moment to help see what is really happening (Siemens, 2010). Programs such as PARE try to help, but they come up against tools that do not capture dropout before it occurs (American University Corporation Board of Directors, 2021).

This gap between the administrative and the emotional leads to a key question: how do the management of the institution and its ways of accompanying influence whether students continue or leave their studies in the virtuality of the C.U.A.?

Understanding these barriers is no longer optional; it is urgent. We must leave behind a management that only acts when the problem explodes (Rivera et al., 2022) and move to one that anticipates and supports in time. The article reviews with a critical eye what is failing today and traces a path forward, incorporating data analytics to create a virtual education that truly works: sustainable, effective and close to the student on the other side of the screen.

The analysis is based on two conceptual pillars that give meaning to the Invisible Frontier and the failures in the virtual management of the C.U.A. Theory of Student Integration Vincent Tinto (1975) explained decades ago why some students stay and others leave: it all depends on how much they feel part of the university, both academically and socially. In person, that bond is built in the classroom, in the dining room, in the activities. In virtuality, that space disappears.

The Invisible Frontier is, precisely, that absence of integration. Without real interactions, without a living digital community, the student feels alone even if he is connected. Under Tinto's watch, dropout is not only because of low grades; it is because they do not belong. And in the C.U.A., extreme flexibility – without attendance, without fixed schedules – aggravates this disconnection.

Learning Analytics: From Data to Prediction (Siemens, 2010) proposed using the data left by students online—clicks, connection times, submissions, forums—to understand what is happening to them

and act before it is too late. That is learning analytics: not waiting until the end of the semester to see who failed, but detecting signs of risk from week 3.

In the C.U.A., current systems look backwards: monthly reports, final grades. But Siemens says you have to look ahead. With real-time data, the administration could know when a student stops entering, when he or she turns in late, or when he or she just opens the classroom and leaves. Thus, accompaniment is no longer reactive and becomes preventive.

Methodology

This study is framed in a qualitative approach of an interpretative nature, based on systematic documentary analysis and aimed at examining the relationship between institutional administrative management and student permanence in the virtual modality of the American University Corporation (C.U.A.). The design adopted is documentary-analytical with a descriptive-propositional scope, since it is not only aimed at characterizing the current state of institutional retention processes, but also at formulating a proposal for improvement based on the findings obtained.

From the epistemological point of view, the research is based on the interpretative paradigm, which conceives the institutional reality as a social construction that can be understood from the critical analysis of discourses, regulations and organizational practices. In this sense, the study does not seek to establish causal relationships of a statistical type, but to identify coherences, contradictions and gaps between the institutional regulatory framework, administrative practice and theoretical references on student permanence in virtual environments.

The unit of analysis corresponds to the institutional processes of management and student accompaniment in virtual mode during the period 2021–2024, a stage after the consolidation of virtuality as a structural strategy in higher education. The documentary corpus was selected through intentional sampling and is made up of official institutional documents (PARE Program Agreement, Management and Accountability Reports, budget execution reports and records of information assets), as well as indexed academic literature published between 2020 and 2025 on virtual dropout, student integration, learning analytics and artificial intelligence applied to higher education.

The methodological procedure was developed in four systematic phases. In the first phase, an exploratory review of the institutional documentary corpus was carried out in order to identify preliminary categories related to administrative management, student accompaniment, and follow-up mechanisms. In the second phase, thematic coding was carried out through qualitative content analysis, organizing the information into analytical categories defined a priori based on the theoretical framework (social integration, reactive management, predictive management, learning analytics, psychosocial support) and emerging categories identified during the in-depth reading of the documents. In the third phase, a process of theoretical

triangulation was carried out, contrasting the institutional findings with the conceptual models of Tinto (1975) and Siemens (2013), as well as with recent studies on post-pandemic retention. Finally, in the fourth phase, an interpretative synthesis was developed aimed at supporting the proposal for the Accompaniment and Traceability System (S.A.T. 2.0), evaluating its regulatory coherence and institutional viability.

To ensure methodological rigor, criteria of credibility, consistency, and analytical traceability were applied. Credibility was ensured through constant confrontation between institutional sources and specialized literature. Consistency was strengthened through systematic coding and the explicit delimitation of analytical categories. Traceability is guaranteed through the organized recording of the analysis process and the clear identification of the documents used. Since the study was based exclusively on public institutional information and official documents, it did not involve direct interaction with human subjects, so it is classified as risk-free research in accordance with current ethical regulations.

The scope of the study is descriptive-interpretative with a propositional component. The descriptive component allowed to characterize the current practices of retention in virtual mode and to evidence the existence of a gap between formal institutional commitment and the operability of monitoring systems. The propositional component is based on the comparative analysis of learning analytics models and the identification of opportunities for institutional improvement, which led to the conceptual formulation of S.A.T. 2.0 as a predictive management mechanism.

The study's limitations are recognized as the dependence on institutional documentary information and the absence of interviews or analysis of primary student data. However, the nature of the design allows us to offer a structural understanding of the phenomenon of latent dropout and to provide a technical basis for the need to evolve towards predictive management models in virtual higher education.

Matrix of Analysis Categories

In order to guarantee systematicity in the documentary analysis, a categorical matrix was constructed that guided the process of coding and organization of the information. The categories were defined based on the theoretical framework (Tinto, 1975; Siemens, 2013) and were complemented with emerging categories identified during the review of the institutional documents. The following table summarizes the analytical dimensions used:

Table 1
Matrix or analysis indicators

Central Category	Subcategories	Theoretical Source	Document Analysis Indicators
Student Integration	Social integration Sense of belonging Emotional accompaniment	Red (1975)	Institutional referrals to wellness, tutoring, student engagement, bonding strategies
Administrative Withholding Management	Reactive Institutional (PARE) Corrective (amnesties) strategies programmes measures	Contemporary educational management	Type of intervention (preventive/corrective), action times, coherence between standard and practice
Latent Defection	Early signs Academic risk Progressive disengagement	Post-pandemic literature	Evidence of follow-up to processes prior to abandonment, early warning records
Learning Analytics	Use of academic data Real-time monitoring Risk prediction	Siemens (2013)	Existence of digital tracking systems, interaction analysis, behavioral metrics
Predictive Management with AI (S.A.T. 2.0 Proposal)	Automated Risk Early Warnings Score Proactive Intervention	Advanced Analytics Models	Presence/absence of predictive technology tools, CRM integration, data-driven decision-making
Regulatory and Ethical Framework	Data protection Quality conditions Responsible use of AI	Law 1581/2012; Resolution 21795/2022	Coherence between technological proposal and current regulations

Methodological Integration of the Matrix

The above matrix allowed the analysis to be structured around dimensions consistent with the objectives of the study. Each institutional document was examined by identifying units of meaning related to the established categories. Subsequently, these units were coded and grouped according to recurrent patterns, which made it possible to evidence gaps between the formal institutional commitment and the actual operability of the accompaniment systems.

The use of this matrix strengthened the traceability of the analytical process, since it allowed to explicitly document how each finding was linked to a specific theoretical category. It also facilitated the triangulation between institutional evidence and academic literature, avoiding unsupported subjective interpretations. From the methodological point of view, the incorporation of a priori categories (derived from the theoretical framework) and emergent categories guarantees a balance between conceptual rigor and interpretative openness, an essential characteristic of qualitative content analysis in educational research.

Results and Discussion

The documentary-analytical analysis of the American University Corporation (C.U.A.) and the specialized literature yielded three main findings that explain the latent dropout and justify the need for transformation in virtual management.

Table 2
Matrix or impact on retention

Challenge	Description	Impact on Retention
Psychosocial Isolation	Digital flexibility weakens the sense of belonging and social integration. The lack of direct contact increases stress and anxiety in students.	Dropout is caused by emotional disconnection, not just by low grades (Teoría de Tinto, 1975)
Administrative Obsolescence	Management systems are not adapted to virtuality, lacking real-time data on student interaction (clicks, connection times, use of resources).	It prevents the early detection of latent dropout, limiting accompaniment strategies to being merely corrective.

The analysis confirms that administrative management in virtuality requires evolving from a reaction model to one of prediction and proactivity.

The Diagnosis: Accompaniment (tutoring and well-being) is valuable, but it comes up against the limitation of seeing only the final result, not the process. The intervention occurs when the difficulties are already acute.

The Propositional Solution: The answer is the integration of Learning Analytics and Artificial Intelligence. This is crystallized in the proposal of the Support and Traceability System (S.A.T. 2.0).

Function of S.A.T. 2.0: Use live data to generate early warnings and risk scores. This frees up tutors and welfare staff to focus on listening and human support, acting preventively before dropout.

The findings of this study, focused on the American University Corporation (C.U.A.), confirm and expand on trends identified in virtual education. The discussion focuses on the confrontation of the results with the theoretical models of Student Integration (Tinto, 1975) and Learning Analytics (Siemens, 2010), establishing the distinctive contribution of the S.A.T. 2.0 proposal as the mechanism to unify institutional commitment with predictive management.

1. Confirmation of the Integration Theory (Tinto, 1975) and its Psychosocial Implications

The study of the C.U.A. validates Vincent Tinto's model in the context of virtual higher education. Dropout is primarily due to the failure in social and emotional integration with the institution.

Confirmed Finding: The "Invisible Border" is the digital manifestation of this failure. The psychosocial isolation felt by this student population and the consequent loss of a sense of belonging are more significant barriers than strict academic performance.

Relationship with other Authors: This is consistent with post-COVID-19 research. Aristovnik et al. (2020) found that remote education triggered stress and anxiety in university students. Rivera et al. (2022) had already concluded that administrative management should be complemented with solid emotional support to ensure virtual retention.

Contribution of the Study: This article not only confirms that integration fails, but also identifies that the institutional problem lies in a misalignment of management. The extreme flexibility promised by the C.U.A. (without attendance or fixed schedules) aggravates the disconnection, turning the attempt to open doors into the creation of new invisible walls that technology must break down, not build.

2. Questioning Retrospective Management (Siemens Learning Analytics) and the AI Requirement

The study questions the effectiveness of traditional management models in virtuality by evidencing their reactive nature.

Questioning Finding: The institutional management of the C.U.A. operates under a retrospective and reactive paradigm. Systems such as SEDGA, initially designed for face-to-face learning, lack real-time data on student interaction, preventing the detection of latent dropout.

Relationship with the Siemens Model: This problem directly contradicts the principles of George Siemens (2010, 2013), who proposed the use of Learning Analytics to detect risk signals and act preventively. Salas De la Rosa (2024) also highlights the value of this analytics to reduce attrition.

Difference and Contribution of the Study: The main difference lies in the fact that the study proposes an operational and specific solution. The integration of analytics in S.A.T. 2.0 uses Artificial Intelligence (AI) to generate risk scores, automating proactive intervention. This aligns with the recommendation of Alamo (2024) and other studies (Delcker, Singh, et al., 2024) that validate retention strategies through Machine Learning (ML) and Big Data (BD) models to adapt educational interventions in real time, optimizing institutional support.

National Strategic Alignment: S.A.T. 2.0 is not only an internal need, but is in tune with the vision of higher education in Colombia. The Ministry of National Education (2025) has announced strategies and investments to integrate AI, confirming that the adoption of predictive technologies is a crucial step for the development of higher education in the country.

3. Strategic Inputs and Regulatory Compliance

The study contributes to the field with a proposal for strategic transformation and reaffirms the importance of the legal framework.

Table 3
Regulation Compliance

Category	Contribution of the Study
Strategic Contribution	The S.A.T. 2.0 proposal is the missing bridge to enhance PARE's formal commitment to predictive management. It transforms the flexibility of virtual education into closeness and real belonging, following the trends of modernization in university education (Loor Bravo et al., 2025).
Methodological Contribution	The use of the descriptive and propositional method allowed not only to diagnose the gap, but also to design a viable and thoughtful solution.
Regulatory Contribution	The study confirms that the <i>Learning Analytics proposal</i> is viable within the Colombian legal framework. Law 1581 of 2012 (Habeas Data) regulates the collection and use of data, requiring that technology be used as a bridge and not as a means of control. In addition, Resolution 21795 of 2022 supports the need to examine the conditions of quality and support in virtual environments. However, to ensure the ethical and transparent use of AI, the C.U.A. should follow the example of other higher education agencies (Agencia Distrital Atenea, 2025) that already adopt specific policies on data processing. This is critical to mitigate ethical challenges, such as the risk of algorithmic bias (Martínez-Márquez, 2023), ensuring that S.A.T. 2.0 promotes equity and inclusion.

Conclusions

This section brings together the final positions influenced by the documentary analysis of the study and the theoretical confrontation, and clearly establishes the validation of the working hypothesis, as required by the journal's regulations.

1. Validation of the Working Hypothesis:

The working hypothesis that guided this research postulates: "The permanence of students in the virtual modality of the American University Corporation (C.U.A.) is limited by the retrospective nature of its administrative management practices, despite having a formal institutional commitment to retention"

(Agreement No. 064-074 of the PARE, Management Reports) The findings derived from the critical review of the internal documentation and the specialized literature allow this hypothesis to be fully validated. The institutional commitment is clear and is reflected in the use of resources, but the operability of the management maintains an obsolete paradigm that acts on desertion when it is already imminent.

2. Final Positions and Determining Findings:

The following findings represent the final positions and conclusions of the study:

The "Invisible Border" as a Main Barrier

The main challenge of virtual education is not technological, but human. The "Invisible Border" is a palpable barrier that is evidenced in isolation, demotivation, and loss of a sense of belonging. This finding confirms the validity of Tinto's (1975) model in the digital environment: permanence depends on social and emotional integration with the institution, an aspect that digital flexibility tends to undermine if it is not actively managed.

The Gap Between Commitment and Operation

The existence of a critical dissonance between the proactive vision (the PARE Program) and reactive management practices is confirmed.

PARE's commitment is valuable, but traditional tracking systems (such as SEDGA) are not equipped to manage virtuality.

The institution continues to operate under a retrospective paradigm that focuses on reporting past data and applying late solutions (amnesties), rather than preventing abandonment.

The Need for Predictive Management

The results show that the institutional support of the C.U.A. needs to migrate towards predictive management, in line with Learning Analytics.

The lack of real-time data on student engagement prevents the identification of early signs of risk, a fundamental requirement of Siemens Learning Analytics (2013).

The intervention occurs when the difficulties have already become acute.

3. Contributions of the Study and Future Directions

The fundamental contribution of this study is the proposal of the Accompaniment and Traceability System (S.A.T. 2.0).

This proposal not only advocates technology, but also instrumentalizes it as a human bridge. Using real data and artificial intelligence to generate alerts allows tutors and the Wellbeing area to focus on emotional support and connection, transforming virtual flexibility into closeness and real accompaniment. The study demonstrates the feasibility of this transformation under the Colombian regulatory framework (Decree 1330 of 2019; Resolution 21795 of 2022) and Law 1581 of 2012 (Data Protection), reaffirming that technology should be a tool of support and not a means of control.

In conclusion, overcoming the Invisible Frontier in the C.U.A. requires integrating the formal commitment to a technological strategy that shifts the management paradigm from retrospective to proactive and predictive, thus ensuring that virtuality is a truly inclusive and sustainable model.

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