Innovation in Higher Education: Learning Styles and Effectiveness of Face-to-Face and Virtual Modalities in the Development of Human Talent

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Abstract

Higher education faces the challenge of training competent human talent in a globalized, changing and technologically mediated environment. This study examines the relationship between learning styles and the effectiveness of face-to-face and virtual modalities, analyzing their impact on the development of human talent. A mixed methodology was applied in Latin American university institutions, evaluating academic performance, perception of efficacy and the development of transversal competencies. The results suggest that innovative higher education must adapt to learning styles and strategically combine both modalities to maximize the student's potential.

Keywords: *Higher Education, Learning Styles, Virtual Modality, Face-To-Face Modality, Human Talent, Educational Innovation.*

Introduction

Today, higher education faces one of the greatest challenges in its history: adapting to technological, social, and economic transformations that redefine the way knowledge is learned, taught, and transferred. This evolution not only responds to the advance of information and communication technologies (ICTs), but also to the need to train professionals with skills that allow them to perform in complex, uncertain and globalized environments (García-Peñalvo & Corell, 2020). The emergence of new educational modalities, especially the accelerated growth of virtual education as a result of the COVID-19 pandemic, has called into question the effectiveness of the traditional face-to-face model, and has opened the debate on which modality contributes more efficiently to the comprehensive development of human talent.

Human talent, understood as the set of capacities, skills, attitudes and values that allow people to generate value in work and social contexts, must be considered as the articulating axis of any innovative educational policy. In this sense, universities have the responsibility not only to transmit content, but also to promote critical thinking, autonomy, creativity and digital competence, key aspects in the fourth industrial revolution (World Economic Forum, 2023). To achieve this, it is necessary to recognize that students learn in different ways and that learning styles play a fundamental role in the effectiveness of any educational modality.

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Various studies have shown that the alignment between the student's learning style and the didactic strategy used can have a positive impact on their academic performance, motivation, and commitment to the training process (Mamani-Torres et al., 2021; Hernández-Hernández & Flores-Luevano, 2022). However, many educational programs continue to adopt a uniform logic, without considering these individual differences or taking advantage of the potential offered by virtuality for the personalization of learning.

In this context, there is a need to comparatively analyze the face-to-face and virtual modalities in the light of learning styles, in order to identify which combination is more effective in strengthening university human talent. It also seeks to understand how these modalities can complement each other to offer more inclusive, adaptive, and oriented educational experiences aimed at the development of skills for life and work in the knowledge society (Ramírez-Montoya et al., 2021).

Therefore, this study is proposed as a contribution to educational innovation at the higher level, by empirically exploring how learning styles interact with the educational modality and how this relationship affects the development of human talent. This perspective is particularly relevant for institutional decision-making in the post-pandemic era, where hybrid and flexible models seem to be consolidating themselves as a sustainable and effective alternative for university education (Bozkurt, 2022).

Theoretical Framework

Innovation in higher education requires a comprehensive approach that encompasses both learning styles and the effectiveness of educational modalities. To do this, it is essential to understand the conceptual bases that support each of these elements.

Learning Styles

Learning styles refer to students' individual preferences for processing, interpreting, and organizing information. From a cognitive perspective, it is understood that not all students learn in the same way, and that adapting pedagogical methods to these styles improves academic performance and motivation (Hernández-Hernández & Flores-Luevano, 2022).

Among the most influential models is that of Felder and Silverman, which proposes dimensions such as active-reflective, sensory-intuitive, visual-verbal and sequential-global. This model has been widely used to identify learning profiles in university contexts, including in virtual environments (Guerrero et al., 2021).

Dimension	*Characteristics of Style 1*	*Style 2 Features*
Active vs. Reflexive	Prefers to learn by doing	Prefers to think and reflect
Sensory vs. Intuitive	Learn with facts and hard facts	Prefers theories, ideas, and concepts
Visual vs. Verbal	Use images, charts, and schematics	Learn best with written or spoken words
Sequential vs. Global	Understand step by step, in an orderly manner	Learn in big jumps and connections

Table 1. Dimensions of the Felder and Silverman Learning Styles Model

Source: Adapted from Felder & Brent (2021); Guerrero et al. (2021).

Knowledge of these styles allows the teacher to personalize learning environments, especially on digital platforms where it is possible to offer multiple content formats (Ramírez-Montoya et al., 2021).

Educational Modalities: Face-to-face, Virtual and Hybrid

Face-to-face education has traditionally been valued for its direct interaction, immediate feedback, and building social relationships. However, virtual education, powered by digital technologies, has gained ground due to its flexibility, accessibility, and scalability (Bozkurt, 2022). This modality offers tools that allow asynchronous learning, personalized monitoring and the incorporation of gamified environments.

On the other hand, the hybrid modality, which combines the best of both, is emerging as the most promising, as it facilitates a student-centered education that is adaptable to their needs (García-Peñalvo & Corell, 2020).

Feature	*Face*	*Virtual*	*Hybrid*
Social Interaction	Loud	Limited	Moderate
Flexible working hours	Casualty	Loud	Stocking
Technological adaptability	Casualty	Loud	Loud
Student autonomy	Stocking	Loud	Loud
Competency-based assessment	Traditional	Scanned	Mixed

Table 2. Comparison Between Educational Modalities

Source: Adapted from Ramírez-Montoya et al. (2021); Bozkurt (2022).

Educational Innovation and Human Talent Development

Innovation in education is linked to the strategic use of pedagogical and technological resources to transform teaching-learning processes. At the university level, it also involves curricular redesign, challenge-based learning, the inclusion of soft skills and training for employability (Salinas & Marín, 2021).

Human talent, on the other hand, represents an essential resource for economic and social development. Their training requires more than technical knowledge: it demands critical thinking, socio-emotional skills, ICT management, and ethical commitment (World Economic Forum, 2023).

In this sense, educational innovation must be aimed at training well-rounded graduates, capable of adapting to changing environments, collaborating in diverse teams, and solving complex problems, which can only be achieved if the diversity of learning styles is considered and the possibilities of each educational modality are taken advantage of (Ramírez-Montoya et al., 2021; Guerrero et al., 2021).

Methodology

This study is based on a mixed methodological approach, which integrates quantitative and qualitative elements to analyze the relationship between learning styles, educational modalities (face-to-face and virtual) and the development of human talent in university students. The choice of a mixed design responds to the need to understand both statistical patterns and subjective

perceptions of the educational process (Creswell & Creswell, 2022).

Research Design

A mixed sequential exploratory design was adopted, which consists of a first quantitative phase followed by a qualitative phase to complement and interpret the results obtained (Fetters et al., 2020). This design was chosen due to the complexity of the phenomenon studied, which involves individual, contextual and techno-pedagogical variables.

Phase	*Type of focus*	*Techniques used*	*Main Purpose*
Phase 1	Quantitative	Closed surveys	Identify patterns between styles, modality, and performance
Phase 2	Qualitative	Semi-structured interviews	Deepen teachers' perceptions of effectiveness and innovation

Table 3. Characteristics of the Methodological Design

Source: Authors' elaboration based on Creswell & Creswell (2022); Fetters et al. (2020).

Population and Sample

The population was composed of undergraduate students from public and private universities in Colombia, Mexico and Peru. A non-probabilistic sampling was applied for convenience, given the interest in accessing students with experience in both educational modalities.

Country	*Total Respondents*	*Average age*	*Dominant modality in the institution*
Colombia	150	22 years old	Virtual
Mexico	140	21 years old	Hybrid
Peru	130	23 years old	Face
Total	**420**	—	—

Table 4. Student Sample Distribution

Source: Authors' elaboration (2025).

Likewise, 30 teachers (10 per country) selected under criteria of teaching experience in virtual mode and training in educational innovation were interviewed.

Instruments

Three main instruments were used:

1.   **Learning styles questionnaire** based on the Index of Learning Styles (ILS) model by Felder and Silverman, validated for use in Spanish-speaking environments by Guerrero et al. (2021).

2.   **Modal efficacy perception scale**, designed with 10 items in Likert format (1 = strongly disagree, 5 = strongly agree), addressing autonomy, satisfaction, communication and perceived outcomes.

3.   **Key competence assessment rubric**, adapted from Ramírez-Montoya et al. (2021), which measures creativity, critical thinking, collaborative work and digital skills.

Data analysis

In the quantitative phase, descriptive statistical techniques (means, frequencies) and inferential analyses were used:

- **ANOVA** to compare academic performance between different learning styles and modalities.

- **Linear regression** to determine the influence of learning style and modality on the development of competencies.

The data were processed with **SPSS v.27 software**.

In the qualitative phase, the interviews were recorded, transcribed and analyzed by **thematic coding**, using the **Atlas.ti 9** software, identifying emerging patterns on perception of efficacy, use of ICT, and curricular adaptation.

Validity and Reliability

Pilot tests were carried out with 30 students to validate the instruments. The Cronbach's alpha of the efficacy scale was **0.87**, indicating high internal reliability (Hernández et al., 2021).

As for the validity of the content, it was reviewed by three experts in university pedagogy and educational technology, who recommended minor adjustments in wording and clarity of items.

Results

The results of the study made it possible to establish significant relationships between **learning styles**, **educational modalities** (face-to-face and virtual) and the **development of human talent** in terms of key competencies. The main findings are presented below, divided into five sections: prevalence of learning styles, perception of modal effectiveness, academic performance, development of competencies and qualitative analysis of the teaching experience.

1. Distribution of Learning Styles

Of the total of 420 students surveyed, a high prevalence of active style **(38%) was observed**, followed by **reflective (31%), visual (18%)** and **global (13%)** styles. These data coincide with previous studies in university environments that point to the predominance of active styles in careers oriented towards professional practice (Guerrero et al., 2021).

Learning style	Frequency (n)	Percentage (%)
Active	160	38.1%
Reflexive	130	31.0%
Visual	75	17.9%
Global	55	13.1%
Total	**420**	**100%**

Table 5. Frequency Of Identified Learning Styles

2. Perception of Effectiveness by Modality

The perception questionnaire revealed statistically significant differences ($p < 0.05$) in the assessment of each modality according to the student's learning style. **Reflective** and **verbal** styles showed greater affinity with the virtual modality, while active and **visual styles** felt

more comfortable in face-to-face environments (Hernández-Hernández & Flores-Luevano, 2022).

Style	Face-to-face modality (medium)	Virtual Modality (Medium)
Active	4.3	3.6
Reflexive	3.7	4.4
Visual	4.2	3.5
Global	3.8	4.0

Table 6. Average Assessment of Effectiveness by Modality According to Learning Style

Likert scale: 1 = Very low efficacy, 5 = Very high efficacy

3. Academic Performance by Modality

The ANOVA analysis showed that the average academic performance was slightly higher in students who studied under hybrid mode (M = 4.3/5) compared to those who studied only in face-to-face (M = 3.9/5) or virtual (M = 3.7/5) mode, with statistically significant differences (F = 6.82; p < 0.01).

Educational modality	Overall average (out of 5.0)	Standard deviation
Face	3.9	0.52
Virtual	3.7	0.61
Hybrid	4.3	0.47

Table 7. Comparison of Academic Performance By Educational Modality

These data are consistent with recent research that states that hybrid learning, well implemented, can offer greater opportunities for deep and contextualized learning (Bozkurt, 2022; Ramírez-Montoya et al., 2021).

4. Development of Key Competencies

The competency assessment rubric showed that students in hybrid mode obtained better results in competencies such as **autonomy**, **creativity** and **collaborative work**, especially those with reflective and global learning styles.

Competence	Face	Virtual	Hybrid
Autonomy	3.6	4.2	4.5
Creativity	3.8	3.7	4.4
Critical thinking	3.9	4.1	4.5
Collaborative work	4.2	3.5	4.3
Digital skills	3.7	4.5	4.6

Table 8. Average Number of Competencies by Modality (Scale From 1 To 5)

The results support the importance of combining synchronous and asynchronous strategies adapted to learning styles and the teaching context (Salinas & Marín, 2021).

5. Qualitative Analysis: Teacher Perception

Interviews with 30 teachers revealed three relevant emerging categories:

1.   **Adaptive pedagogical innovation**: The majority indicated that personalization of content according to the student's style improves motivation.

2.   **Technological challenges**: Many teachers recognized limitations in the effective use of virtual platforms due to lack of prior training.

3.   **Preference for hybrid models**: It is perceived that mixed models allow greater pedagogical flexibility and improve meaningful interaction.

Featured Quote:

 "Students who combine face-to-face sessions with virtual resources tend to develop greater autonomy and digital skills than those who only attend traditional classes." (Teacher interviewed, Mexico, 2025)

Conclusions

The findings of this research show that **innovation in higher education** must be approached from a comprehensive perspective that contemplates both the **diversity of learning styles** and the **pedagogical effectiveness of face-to-face, virtual and hybrid** educational modalities. University institutions, in their mission to train competitive human talent, must overcome traditional standardized approaches and move towards more flexible, personalized, and technologically integrated pedagogical models (Ramírez-Montoya et al., 2021).

First, the results confirm that **there is no single superior modality absolutely**, but that the effectiveness of learning depends to a large extent on the **fit between the student's learning style and the learning environment**. Students with active and visual styles showed better performance and greater perception of efficacy in face-to-face environments, while those with reflective and verbal styles benefited more from the advantages of virtuality, such as autonomy, asynchronous learning, and access to multiple digital formats (Guerrero et al., 2021; Hernández-Hernández & Flores-Luevano, 2022).

Secondly, it was evident that **the hybrid modality offers a balanced and adaptable environment**, which makes it a solid alternative for the development of key competences of the 21st century, such as critical thinking, autonomy, creativity and digital skills. This result coincides with recent studies that position hybrid education as a strategic post-COVID-19 solution to ensure educational quality, inclusion, and resilience (Bozkurt, 2022; García-Peñalvo & Corell, 2020).

In addition, from the point of view of pedagogical innovation, the use of **virtual platforms, multimedia resources, project-based learning and competency-based assessment** makes it possible to design training experiences aligned with the expectations of the labour market and the challenges of digital transformation (Salinas & Marín, 2021; World Economic Forum, 2023). However, to achieve effective implementation, it is essential to train teachers in digital skills, instructional design and analysis of educational data.

Finally, it is concluded that the **development of human talent** in the university context requires a strategic combination of: a) a pedagogical approach focused on the student and their learning styles, b) the relevant use of educational technologies, and c) a flexible educational model that combines the best of face-to-face and virtuality. This triad is presented as a decisive factor in preparing professionals with adaptive, resilient skills capable of generating innovation in a

globalized world.

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