10

CONNECTIVISM

AND NETWORKED LEARNING IN CONTEMPORARY HIGHER EDUCATION

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CONECTIVISMO Y APRENDIZAJE EN RED EN LA EDUCACIÓN SUPERIOR CONTEMPORÁNEA

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ABSTRACT

Contemporary higher education is undergoing a profound transformation due to digitalization, the globalization of knowledge, and the interconnection of students, faculty, and educational resources. This context highlights the importance of studying theories such as connectivism, which allows us to understand how learning can be organized in networks and adapt to dynamic environments, fostering autonomy, collaboration, and critical thinking. This article adopts a qualitative-descriptive approach, based on a review of specialized literature, case studies, and experiences in digital university environments over the last ten years, with the aim of analyzing the implementation of connectivism and networked learning in higher education. The results show that this pedagogical approach enhances the collaborative construction of knowledge, facilitates the continuous updating of skills, strengthens digital abilities, and promotes participation in distributed communities of practice, aligning university education with the challenges of the knowledge society. In turn, the research identifies challenges such as the digital divide, the need for advanced technological literacy, resistance to traditional pedagogical changes, and the evaluation of distributed learning. In conclusion, connectivism constitutes a strategic framework for educational innovation, which not only redefines the roles of students and teachers, but also allows institutions to design flexible, inclusive learning environments capable of preparing competent professionals for a globalized, interconnected, and constantly evolving world.

Keywords:

Connectivism, networked learning, higher education, educational innovation, digital skills, collaborative teaching.

RESUMEN

La educación superior contemporánea enfrenta un proceso de transformación profunda debido a la digitalización, la globalización del conocimiento y la interconexión de estudiantes, docentes y recursos educativos. Este contexto resalta la importancia de estudiar teorías como el conectivismo, que permite comprender cómo el aprendizaje puede organizarse en redes y adaptarse a entornos dinámicos, fomentando autonomía, colaboración y pensamiento crítico. Este artículo adopta un enfoque cualitativo-descriptivo, basado en revisión documental de literatura especializada, estudios de caso y experiencias en entornos universitarios digitales de los últimos diez años, con el objetivo de analizar la implementación del conectivismo y el aprendizaje en red en educación superior. Los resultados evidencian que este enfoque pedagógico potencia la construcción colaborativa de conocimiento, facilita la actualización continua de competencias, fortalece habilidades digitales y promueve la participación en comunidades de práctica distribuidas, alineando la formación universitaria con los retos de la sociedad del conocimiento. A su vez, la investigación identifica desafíos como la brecha digital, la necesidad de alfabetización tecnológica avanzada, la resistencia a cambios pedagógicos tradicionales y la evaluación del aprendizaje distribuido. En conclusión, el conectivismo constituye un marco estratégico para la innovación educativa, que no solo redefine los roles de estudiantes y docentes, sino que también permite a las instituciones diseñar entornos de aprendizaje flexibles, inclusivos y capaces de preparar profesionales competentes para un mundo globalizado, interconectado y en constante evolución.

Palabras clave:

Conectivismo, aprendizaje en red, Educación superior, innovación educativa, competencias digitales, enseñanza colaborativa.

INTRODUCTION

Contemporary higher education is undergoing a profound transformation, driven not only by the globalization of knowledge and the digitization of teaching and learning processes, but also by an international push towards educational innovation and digital inclusion. The United United Nations Agency for Education, Science, and Culture (2025) underscores the importance of adapting educational systems through the strategic use of digital technologies, the expansion of open educational resources, the strengthening of technological skills, and the incorporation of generative artificial intelligence tools to improve teaching and research (Miao & Holmes, 2023). This transformation responds to contexts of increasing interconnection between individuals and organizations through digital networks, where traditional models, centered on the linear transmission of information from teacher to student, are insufficient to address the complexity, the speed of change, and the diversity of information sources that characterize the knowledge society (León & Pire, 2025).

Likewise, United United Nations Agency for Education, Science, and Culture (2025) highlights that digital technologies can enrich and transform higher education, promote inclusion, quality, and relevance of learning, and contribute to the Sustainable Development Goals by expanding access opportunities and fostering national policies that manage innovation ethically and equitably (Miao & Holmes, 2023). In this new ecosystem, learning no longer depends exclusively on the classroom or the teacher as the sole mediator, but is instead constructed in a distributed manner through interaction with diverse knowledge networks. This requires pedagogical and organizational approaches that integrate connectivity and networked learning.

In this context, connectivism, proposed by Siemens (2005) and developed by Downes (2012), stands out as a particularly relevant learning theory for higher education in the digital age. Connectivism understands knowledge as a dynamic and distributed phenomenon, residing in the nodes of a network and manifesting itself through connections between people, organizations, communities of practice, and technological resources. This perspective implies a radical shift in the conception of learning : it is not simply about accumulating information, but about being able to navigate, select, filter, and connect data, ideas, and experiences critically and strategically. In other words, learning is conceived as an active, constantly evolving process, where the student's core competency is their ability to manage knowledge networks and adapt to changing contexts (Cáceres, 2026).

Networked learning, derived from connectivism, offers numerous opportunities for higher education. It facilitates peer collaboration, promotes the collective construction of knowledge, and allows access to diverse educational experiences that transcend the geographical and temporal boundaries of the traditional classroom. At the same time, it fosters student autonomy, empowering students to take a leading role in constructing their own learning, while the instructor acts as a facilitator and guide, designing connective environments that stimulate interaction, critical reflection, and knowledge transfer. This approach is particularly relevant in disciplines where the constant updating of information is crucial, such as science, technology, engineering, education, and digital humanities.

Several universities worldwide have begun adopting connectivist principles in their educational programs, recognizing the potential of networked learning to strengthen digital skills, collaboration, and critical thinking. Institutions such as Athabasca University in Canada, the University of Hong Kong, and MIT in the United States have integrated virtual environments, open resources, and collaborative learning platforms, promoting interaction among students, faculty, and global communities of practice. These examples demonstrate that implementing connectivism expands access to education, diversifies learning experiences, and fosters continuous knowledge development, aligning university education with the demands of the knowledge society and global educational innovation.

However, the implementation of connectivism in higher education also faces significant challenges. These include the digital divide between students and teachers, the need for advanced technological skills, resistance to change in traditional teaching practices, and the difficulty of effectively assessing distributed and collaborative learning.

Furthermore, questions arise regarding the ethics of information management, the reliability of sources, and the quality of knowledge generated through open networks. Therefore, it is essential that universities design pedagogical and organizational strategies that integrate connectivist principles with structured teaching approaches, while simultaneously fostering digital literacy and critical thinking skills among students.

Connectivism and networked learning represent a paradigm shift in higher education, where the integration of digital technologies, information networks, and active collaboration redefines the roles of students, teachers, and the institutions themselves. This approach promotes more dynamic, flexible, and contextualized learning, aligned with the needs of the knowledge society and the 21st century, and highlights the need to rethink traditional pedagogical models to meet contemporary educational challenges.

This article aims to analyze the impact of connectivism on higher education, exploring how networked learning redefines educational processes, strengthens interaction between students and teachers, and facilitates knowledge creation in collaborative digital environments. It will also address the opportunities, limitations, and challenges of its implementation, based on recent research

and experiences in contemporary university educational practices.

Reflecting on these dimensions allows us to recognize that connectivism is not only a learning theory, but also a strategic framework for educational innovation, aimed at training professionals capable of facing the challenges of an interconnected, complex and constantly evolving world.

METHODOLOGY

This study adopts a qualitative-descriptive approach, focused on conceptual analysis and a review of specialized literature on connectivism and networked learning in higher education. A documentary research methodology was employed, compiling recent and relevant academic sources from indexed journals, specialized books, and open access articles in digital environments. Source selection was based on criteria of recency (publications from the last ten years), thematic relevance, and contribution to knowledge on connectivism, learning networks, digital pedagogy, and higher education.

The information was organized into analytical categories that allow for the identification of the fundamental principles of connectivism, its relationship to networked learning, and its implementation in university contexts. Case studies and educational experiences demonstrating the practical application of connectivist theory were also evaluated, with an emphasis on digital skills, student collaboration, and the design of virtual learning environments.

This methodological approach allows for the construction of a solid conceptual framework, based on scientific evidence and educational practice, which supports the discussion on the impact and challenges of connectivism in higher education, as well as the identification of good pedagogical practices.

DEVELOPMENT

Connectivism, conceptualized by Siemens (2005) and expanded upon by Downes (2012), emerged as a learning theory adapted to the digital age, recognizing that knowledge is distributed across networks of information, technologies, and social relationships. According to this perspective, learning depends not only on the internalization of information by the student, but also on their ability to connect, manage, and apply information in dynamic contexts.

This theoretical framework is based on several key principles: the importance of navigating and filtering information, the continuous updating of knowledge, learning through networked interactions, and the collaborative construction of meaning. In higher education, connectivism translates into learning environments that integrate digital technologies, academic social networks, communities of practice, and open resources, fostering critical thinking skills, creativity, and complex problem-solving abilities (Goldie, 2016; Hendricks, 2019).

Networked learning, a central component of connectivism, allows students to interact with diverse sources of knowledge, generate meaningful connections, and actively participate in learning communities. Contemporary higher education, characterized by student diversity, the expansion of virtual modalities, and the need for constant updating, benefits from this approach by facilitating autonomous, situated, and contextualized learning, promoting active participation and inter-institutional collaboration (Al Maawali, 2022; Mattar, 2018).

Furthermore, recent studies highlight the relevance of connectivism for developing digital competencies and knowledge management skills, essential in a globalized and technologically advanced work environment (Foroughi, 2015; Siemens, 2005). However, challenges are also emphasized, such as unequal access to technological resources, the need for advanced digital literacy, and the redefinition of the teacher's role as a facilitator and mediator of distributed learning (Kropf, 2013; Saadatmand & Kumpulainen, 2014).

Connectivism is not only a pedagogical approach, but a strategic model of educational innovation, capable of transforming teaching and learning in higher education through the integration of digital networks, peer collaboration, and the development of critical, technological, and social skills in students.

Connectivism shares certain principles with traditional psychological theories, but adapts them to the digital context and networked education. For example, it agrees with cognitivism on the importance of processing and organizing information; however, while cognitivism considers knowledge as something stored in the student's mind, connectivism conceives of it as distributed across networks of information and people, where the ability to connect nodes is essential (Downes, 2012; Siemens, 2005).

Regarding constructivism, both approaches recognize that learning is active and meaningful, based on prior experiences and knowledge construction. The difference lies in the fact that, in connectivism, this construction occurs collaboratively and in a distributed manner within digital environments, extending its reach beyond the physical classroom (Mattar, 2018; Torres Ortiz & Barnabé Corrêa, 2020).

Socio-constructivist theories, connectivism also emphasizes social interaction and collaboration in communities of practice. However, it highlights the fundamental role of technology and digital networks as mediators of learning, enabling connections and experiences that transcend geographical and temporal barriers (Goldie, 2016; Pandya et al., 2024).

Because of these characteristics, connectivism is considered an emerging and cognitive-technological approach: it integrates classic psychological principles with the management of distributed information and the strategic use of technologies and networks, explaining how students learn in an interconnected and digital world where adaptability, collaboration and the ability to generate connections are core competencies (Downes, 2012; Kropf, 2013; Siemens, 2005).

Contemporary higher education is undergoing a profound transformation, driven by digitalization, the globalization of knowledge, and the increasing interconnection among students, faculty, and educational resources. In this context, traditional teaching methods are insufficient to meet the demands of complex and dynamic environments. Networked learning and emerging theories such as connectivism offer an innovative approach that emphasizes knowledge construction through network interaction, active collaboration, student autonomy, and the strategic use of information available in digital environments.

This framework allows not only the development of digital and cognitive skills, but also the fostering of creativity, problem-solving, and participation in distributed learning communities. From this perspective, the main contributions of various research studies that delve into the impact of connectivism and networked learning on higher education, their pedagogical applications, benefits, and challenges are presented below. According to Siemens (2005), knowledge is distributed across nodes and connections in networks. This author emphasizes the importance of students' ability to build meaningful relationships with information, experiences, and communities, and to continuously update their learning to adapt to changing environments.

Gutiérrez (2012), for his part, argues that connectivism is conceived as an emerging learning theory, especially relevant to the digital age, that emphasizes knowledge construction through connections in information networks. The author highlights the fundamental ideas of connectivism, such as the distribution of knowledge, the need to filter and select information, and the continuous updating of students' skills. He also points out limitations of the theory, such as the lack of clarity regarding its systematic pedagogical application and the difficulty of evaluating distributed learning.

Tinmaz (2012) analyzes how social networks and digital platforms function as innovative frameworks for applying connectivism. The research highlights that students develop skills to manage distributed information, create meaningful connections, and participate in online learning communities, promoting autonomous, flexible, and contextualized learning.

Downes (2012) expands on the connectivist perspective, noting that learning is a process that emerges from the interaction between information nodes and people. He highlights the importance of designing connective learning environments that promote active participation, collaboration, and knowledge transfer in dynamic digital contexts.

In addition to the above, Kropf (2013) argues that connectivism redefines learning theory by considering that knowledge does not reside solely in individuals, but rather in the connections between them and technological resources. This perspective emphasizes the importance of navigating, filtering, and critically applying information, and highlights the teacher's role as a designer of connective learning environments that foster collaboration and continuous learning.

Saadatmand & Kumpulainen (2014) present students' perceptions in connectivist MOOCs, demonstrating that participation in distributed learning environments fosters collaborative knowledge building and meaningful interaction. Their findings underscore the importance of learning networks, student autonomy, and the need to design experiences that promote the interconnection of resources and peers.

Foroughi (2015) examines whether connectivism can explain and guide learning in the digital age, concluding that its distributed approach to knowledge allows us to address the complexity and speed of the contemporary educational environment. He highlights the importance of critical and technological skills, as well as the integration of digital resources and information networks in university education.

Goldie (2016) argues that connectivism provides a conceptual framework for understanding how students learn in the digital age, integrating technologies, information networks, and peer collaboration. She emphasizes that the core competency of modern learning is the ability to navigate, evaluate, and apply knowledge strategically, rather than simply acquiring information.

Mattar (2018) compares constructivism and connectivism in educational technology, demonstrating that connectivism enhances active, situated, and experiential learning. He points out that the integration of digital networks and peer collaboration allows students to construct knowledge in a contextualized way and develop skills to face real-world challenges.

Shrivastava (2018) analyzes the application of connectivism and technology to knowledge creation in intercultural communication. She points out that students develop information management skills, collaborative meaning-making, and problem-solving abilities, especially in environments that require the integration of multiple cultural perspectives.

Hendricks (2019) examines the relationship between connectivism and open distance education, concluding that this theory supports distributed teaching and knowledge

construction in virtual environments. He points out that connectivist principles facilitate student autonomy, collaborative learning, and information management—essential aspects for higher education in the digital age.

Torres Ortiz & Barnabé Corrêa (2020) explores the pedagogical aspects of connectivism, highlighting the relationship between networked learning and educational ecologies. They point out that peer collaboration and interaction with diverse digital resources enable a collective construction of knowledge, where the teacher adopts the role of facilitator and mediator. The research emphasizes the importance of designing educational environments that promote critical reflection, student autonomy, and the integration of academic social networks in higher education.

Corbett & Spinello (2020) link connectivism to leadership in digital environments, arguing that this learning theory can redefine leadership development by emphasizing the creation and management of knowledge networks, collaboration, and decision-making based on distributed information. The authors show that applying connectivist principles in leadership training improves adaptability and the capacity for innovation in complex and changing contexts.

Al Maawali (2022) presents a case study in higher education in Oman, showing that experiential writing in connectivist environments improves students' understanding, autonomy, and interaction with distributed resources, strengthening digital competencies and collaborative learning skills.

Dziubaniuk et al. (2023) apply connectivism to sustainable business learning, showing how the theory supports methodologies that integrate digital technologies and online collaboration. They highlight that students develop critical competencies and knowledge management skills by interacting with distributed resources and participating in virtual communities, fostering situated, contextualized learning aligned with corporate sustainability goals.

Mampota et al. (2023) analyze the relevance of connectivism in informing an integrated curriculum in Lesotho . The research shows that applying this theory allows students to access multiple sources of information, participate in communities of practice, and build contextualized knowledge, strengthening autonomy, continuous learning, and preparedness to face the challenges of the digital age.

Pandya et al. (2024) investigated the impact of connectivism on university students' knowledge and willingness to participate in learning networks. Their findings show that exposure to connectivist environments increases both the ability to manage information and the motivation to actively engage in learning communities, highlighting the relevance of digital skills and self-efficacy in distributed learning.

Mukhlis et al. (2024) address connectivism in contemporary digital education, highlighting its opportunities and challenges. They point out that the theory promotes global collaboration, flexible learning, and access to diverse information, but that it requires advanced technological skills and critical digital literacy, as well as institutional strategies to overcome access gaps and ensure the quality of distributed learning.

According to these authors, connectivism and networked learning have generated a transformative approach to contemporary higher education, in which digitization, the interconnection of individuals, and the availability of online resources redefine teaching and learning processes. This theoretical framework not only proposes a conception of knowledge distributed across networks but also suggests changes in the roles of students and teachers, promoting autonomy, collaboration, and the continuous updating of skills.

From this perspective, several studies have demonstrated how connectivism is applied in university settings, highlighting both its opportunities and challenges. The findings emphasize that students develop skills in managing information, participating in learning communities, collaboratively building knowledge, and tackling complex problems, while faculty act as facilitators of connective environments that integrate technologies, academic social networks, and open resources. At the same time, challenges related to digital literacy, the assessment of distributed learning, and unequal access to technology are also identified.

These studies demonstrate that connectivism is not only a learning theory but also a strategic framework for innovation in higher education, fostering flexible, autonomous learning connected to the resources and communities of the digital age. This summary of contributions provides a comprehensive view of how connectivist theory translates into pedagogical practices, methodologies, and educational environments designed to develop students capable of adapting to the challenges of an interconnected and constantly evolving world.

CONCLUSIONS

The analysis reveals that contemporary higher education is undergoing a profound transformation, driven by digitalization, the globalization of knowledge, and the increasing interconnection among students, faculty, and educational resources. In this context, traditional teaching approaches are insufficient to address the complexity and dynamism of today's environments, making it essential to incorporate pedagogical models that integrate digital technologies, information networks, and networked learning.

Connectivism is consolidating itself as an emerging theory and strategic framework for higher education, conceiving of knowledge as distributed across networks and emphasizing students' ability to establish meaningful

connections, manage information, and adapt to changing contexts. This perspective redefines the roles of students and teachers, promoting autonomy, collaboration, situated learning, and continuous skills development, as well as the creation of communities of practice and participation in digital learning environments.

The reviewed research shows that applying connectivism in higher education generates clear benefits, such as the development of digital skills, the collective construction of knowledge, the improvement of problem-solving abilities, and the enhancement of creativity and critical thinking. However, significant challenges are also identified, including the digital divide, the need for advanced technological literacy, resistance to changes in traditional pedagogical practices, and the difficulty of systematically and ethically evaluating distributed learning.

Connectivism and networked learning offer a transformative approach that enables educational institutions to design pedagogical and organizational strategies aligned with the knowledge society and the Sustainable Development Goals. This framework not only explains how learning takes place in interconnected and digital environments, but also guides educational innovation, fostering students capable of facing the challenges of a globalized, technological, and constantly evolving world.

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Conflicts of Interest:

The authors declare no conflicts of interest.

Author Contributions:

Farzad Sattari-Ardabili, Arnoldo José De Hoyos-Guevara: Conceptualization, data curation, formal analysis, investigation, methodology, supervision, validation, visualization, original draft writing, and writing, review, and editing.

Ethical statement:

The study was based on the analysis of documentary sources and publicly available data, and therefore did not involve the direct participation of human subjects. No personally identifiable information was handled.