

The Sociology of Training in the Digital Age: New Engineering and Professionalization

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ABSTRACT

This study aims to analyze how work digitalization and technological innovations influence the training engineering and professionalization processes in the Bachelor's degree in Sociology. A qualitative methodology based on Sociotechnical Discourse Analysis (SDA) was used to examine the relationship between technology and society and how these dynamics affect academic training in Sociology. The main findings reveal significant institutional resistance to adopting digital technologies (DT) and curricular changes, as well as a perception of digitalization as a temporary solution. Barriers such as gerontocracy, inadequate technological infrastructure, and an incentive system that discourages collaboration were identified. The conclusions underscore the urgent need to modernize the Sociology curriculum to include advanced digital competencies and foster a culture of innovation. It is recommended to implement pedagogical strategies that include the DT transversal use, continuous training programs for teachers, and a comprehensive curricular reform.

Keywords: work digitalization, digital competencies, educational innovation, digital sociology



Introduction

In the digital age, the rapid evolution of Digital Technologies (DTs), such as Artificial Intelligence (AI) and Big Data, has profoundly transformed the global educational and labor landscapes. These technologies have not only altered work dynamics but have also redefined the skills and competencies required across various disciplines, including Sociology. Digitalization has dismantled spatial and temporal barriers, enabling the creation of global communities and fostering cross-cultural connectivity. In this context, Sociology education faces the challenge of adapting to these changes to adequately prepare students for a continually evolving labor market characterized by globalization and technological advancement.

Despite widespread recognition of the importance of DTs, their effective implementation in Sociology programs remains limited. Significant barriers—such as institutional resistance to change, inadequate technological infrastructure, and the perception of digitalization as a temporary solution—hinder the integration of Digital Competencies (DCs) into the Sociology curriculum. These challenges underscore the urgent need for a comprehensive curricular reform that not only incorporates DTs but also fosters a culture of innovation and collaboration among faculty and students.

This article aims to analyze how the digitalization of work and technological innovations influence educational engineering and the professionalization processes within undergraduate Sociology programs. Based on this analysis, the article proposes pedagogical strategies to address the new challenges and competencies required in the current context. The goal is to provide a holistic vision that facilitates the modernization of the curriculum, equipping future sociologists for a digitalized and globalized labor market.

Theoretical framework

Digitalization of work and technological innovations in Sociology

The omnipresence of DTs has reshaped our social interactions and organizational structures, transforming us into digital data subjects regardless of our choice (Lupton, 2015). This process has altered both the workplace and personal relationships, fostering cross-cultural and trans-global connectivity (Evans, 2013). Inayah et al. (2023) emphasize that DTs increasingly replace human tasks with machines, necessitating an adaptation in educational skills and competencies. This shift highlights the need to prepare students for a continuously evolving labor environment, characterized by globalization and technological advancement (Jalal, 2024; Mesra et al., 2023).

DTs, such as AI and automation, have enabled the creation of digital communities that mirror traditional social formations, showcasing both their transformative capabilities and limitations in social innovation. AI and Big Data are redefining how data is collected, analyzed, and utilized, presenting both opportunities and challenges for Sociology and other disciplines, particularly in workforce adoption (Fussey et Roth, 2020; Torpey, 2020). The increasing complexity of DTs and their ability to automate processes raise questions about the transparency and comprehensibility of these systems (Fussey & Roth, 2020).

The rapid evolution of these technologies requires sociologists to develop new competencies to manage and analyze large volumes of data, continuously adapting to technological changes (Inayah et al., 2023; Jalal, 2024). It is crucial to enhance the quality of human resources so that they can effectively utilize these digital resources and stay updated with technological advancements (Pratiwi et al., 2020). The growing production and collection of digital data raise significant issues regarding privacy, security, and surveillance, highlighting the need for critical analysis and appropriate regulation of these practices (Jalal, 2024). Education must promote meaningful and effective interaction to mitigate the negative effects of these technologies (Torpey, 2020).



Training engineering and adaptation in the digital age

According to Niya et al. (2022) training engineering focuses on creating effective training solutions that facilitate the understanding and use of new technologies. Training engineering often incorporates modern educational technologies, such as 3D simulations and virtual reality, to create immersive learning experiences. This approach allows learners to practice in realistic scenarios, thereby enhancing their understanding and skills; it provides structured and effective training methodologies that enhance user engagement and understanding of new technologies. So, training engineering aids in bridging the gap between DTs and its users, ensuring smoother transitions and more effective utilization of these advancements.

In the digital age, training engineering must evolve to integrate DTs and innovative pedagogical approaches that prepare students for a dynamic professional environment. The transition to informational capitalism has profoundly transformed the social superstructure, replacing traditional ways of life and communities with new digital social formations (Evans, 2013). DTs have been seen as a solution to social fragmentation, providing digital spaces where communities can flourish and reorganize (Evans, 2013). However, digitally mediated communication also presents challenges, such as the stress generated by constant availability expectations and the need to balance work and personal life (Fussey & Roth, 2020).

Integrating DTs into curricula is essential for preparing students for an increasingly digitalized professional environment (Lupton, 2015). Training engineering should focus on how individuals' skills and networks are modified through social interaction and how this influences their ability to adapt to new work environments (Powell, 2017). The adoption of collaborative and open innovation models is crucial, allowing for greater flexibility and responsiveness to technological changes (Inayah et al., 2023; Powell, 2017).

The implementation of cooperative learning models in Sociology education can enhance collaboration and interaction among students (Inayah et al., 2023). Additionally, it is essential for faculty to foster a multicultural climate that promotes social and cultural justice for students (Jalal, 2024). The use of interactive multimedia in learning not only modernizes the educational process but also leverages students' familiarity with these technologies, transforming them into effective pedagogical tools (Noeryanti et al., 2023).

Training engineering in the digital age must incorporate digital tools and pedagogical methods, such as mobile learning, to provide flexibility and accessibility in education, fostering creativity and innovation among students (Qodr et al., 2021; Yusra et al., 2024). Additionally, AI-based learning models, such as ChatGPT, can personalize education and maximize individual learning, demonstrating the positive impact of emerging technologies in education (Yusra et al., 2024)

Sociology and the DTs era

Training in DCs for Sociology undergraduates is inconsistently applied across different regions and institutions. This variability is significant, with some universities, like Yogyakarta State University in Indonesia, integrating digital learning resources to enhance education. However, challenges persist, including technical limitations, insufficient DCs among educators, and network issues, which act as significant barriers to effective training (Pratiwi et al., 2020). In addition, there's an emerging recognition of the need to adapt Sociology curricula to the realities of a digitally-mediated world. Institutions in advanced economies are more likely to offer specialized courses in digital Sociology, emphasizing the critical use of DTs in research and analysis. This shift reflects a broader trend toward integrating DTs to understand digital environments' impact on social behaviors and structures (Lupton, 2013a; Lupton, 2013b).



Many Sociology departments struggle to implement effective digital pedagogies, often due to a lack of proper training for educators and the absence of high-quality, engaging digital content. This results in passive learning environments where students are not encouraged to actively engage with digital tools, which is essential for developing critical DCs (Pratiwi et al., 2020; Qodr et al., 2021).

Beyond theoretical knowledge, Sociology graduates must develop 21st-century skills such as communication, collaboration, critical thinking, and creative problem-solving to thrive in a digitalized world. However, there remains a gap in integrating these competencies into the curricula, especially in non-Western contexts (Inayah et al., 2023; Powell, 2017). However, it's crucial for sociologists to understand how digital platforms and algorithms impact social structures, inequalities, and human behavior (Carrozza, 2018; Lupton, 2013a). Programs need to focus not only on technical skills but also on critical analysis of digital cultures and the ethical implications of DTs.

There are significant opportunities for integrating digital tools into Sociology education. The field of digital Sociology is growing, emphasizing the importance of understanding how DTs shape social life, including the analysis of digital data and algorithmic influences (Lupton, 2013b; Yusra et al., 2024). Sociology must address the dual nature of DTs, balancing the opportunities for greater connectivity and social participation with challenges related to privacy, inequality, and surveillance (Torpey, 2020).

To stay relevant, Sociology programs must evolve to offer digital literacy, data analysis, and critical engagement with emerging technologies as central components of the curriculum. Educators need training to design and deliver blended learning models effectively, ensuring students gain both the technical skills and critical perspectives necessary for their future roles (Yusra et al., 2024).

Method

Objective

The research objective is to analyze how the digitalization of work and technological innovations influence the training engineering and professionalization processes within an undergraduate program in Sociology, and to propose pedagogical strategies that address the new challenges and competencies required in the current context. The research question is: How can the current training engineering in the Sociology program be adapted to respond to the new challenges and opportunities in the digital age labor market, and what pedagogical strategies can be implemented?

Ethical considerations

The research was conducted with attention to ethical considerations and equitable access. Informed consent was obtained from the program coordinator for the interview's execution and recording, and the study's objectives were clearly communicated. Additionally, the documents analyzed were requested through the Transparency and General Archives Coordination of the educational institution. ChatGPT was also used to ensure accurate English translation.



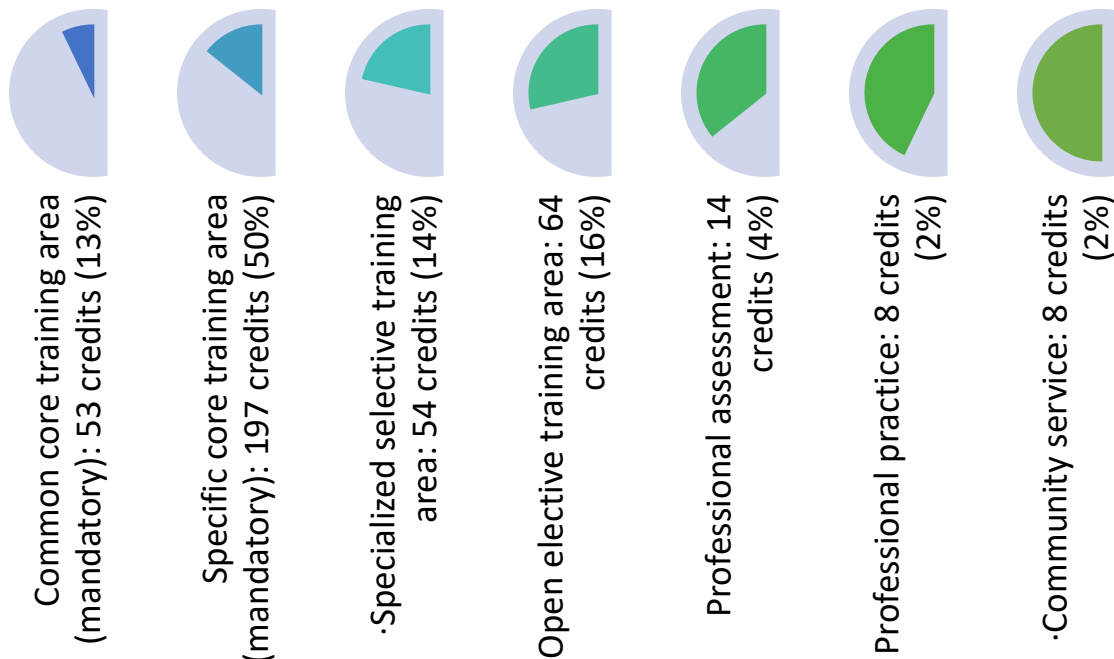
Study in context

The research was conducted within a Mexican institution's undergraduate Sociology program. This program aims to develop sociologists who embody ethical principles, creativity, and a commitment to social justice. Its mission is to train Sociology professionals who possess critical thinking, respect for sociocultural diversity, and ethical commitment, equipping them to contribute to social development from a humanistic perspective. The program's vision is to enhance the social and cultural environment through the active participation of students and graduates, with the goal of improving human development and quality of life within communities.

The program objectives include preparing sociologists skilled in theory, methodology, and research; training professionals to manage and engage with institutions and organizations; and fostering the enhancement of quality of life and human development in the social sphere. To achieve these goals, the curriculum comprises 398 credits, divided across 45 courses (Figure 1). These credits are earned through 380 hours of professional practice and 480 hours of community service. Professional assessment options include examinations, thesis projects, research papers, or graduation with distinction, among other choices.

Figure 1

Curricular Plan



Most students enroll in between seven and eight subjects per semester, amounting to around 60 credits. Each academic term requires a minimum of 30 credits and a maximum of 90. Concerning Social Service, students must complete 480 hours, typically achieved by dedicating four hours daily over six months. It is recommended to allocate an entire semester solely for this activity. Additionally, 380 hours must be completed, also at a rate of four hours daily for nearly four months. Like social service, it is advisable to dedicate a full semester to focus entirely on these practical activities.



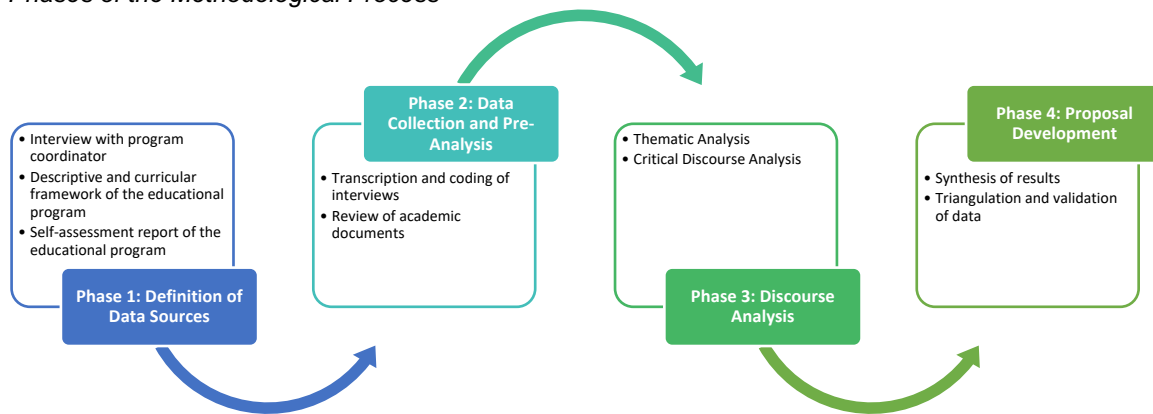
Description of methodological procedure

The research was conducted using a qualitative methodology, specifically through Discourse Analysis with a sociotechnical approach, enabling an examination of the interplay between technology and society. This approach clarifies how technological elements shape and are, in turn, shaped by discursive practices and social dynamics (Herzog & Ruiz, 2019). This type of discourse analysis explores how technologies and technical systems stabilize within society through interactions among various actors and the meanings attributed to the technology in question. This analysis is framed within the Social Construction of Technology (SCOT) theory, which examines the development and stabilization of technologies in relation to the interests and interpretations of diverse actor groups, such as researchers, industries, citizens, and governmental entities (Madsen et al., 2013). Such methodologies illustrate how disruptive events, such as the pandemic, accelerate these processes, creating opportunities for new arrangements and adaptations within the sociotechnical environment (Venkatachalam & Mishra, 2023).

For this investigation, Sociotechnical Discourse Analysis (SDA) seeks to define the dynamics of stability and change in the sociologist's profile with respect to their engagement with DTs. To achieve this, a methodological model comprising four phases was designed (Figure 2).

Figure 2

Phases of the Methodological Process



PHASE 1

First, the data sources to be used for the SDA were defined. The following were selected:

- Interview with the coordinator of the Sociology program. This will provide information on the institutional perception and vision regarding the integration of DTs into the program.
- Graduate and entry profiles of the Sociology program and the curricular map. This will allow analysis of how expected competencies and skills are structured and communicated, and how they align (or do not align) with the demands of a digitalized environment.
- The Accreditation and Certification in Social Sciences (ACCESISO)¹ 2023 self-assessment report. This provides an internal view of the challenges and areas for improvement identified in student training.

¹ The Association for Accreditation and Certification in Social Sciences, A.C. (ACCESISO) was founded with the purpose of improving the quality of teaching in Higher Education and promoting its development in Mexico. The ACCESISO is an autonomous organization that evaluates and accredits undergraduate programs in disciplines such as Political Science, Sociology, Social Work, International Relations, Anthropology, Public Administration, Geography, Communication, and History, as well as related fields.



The interview was conducted at the program's coordination office under a semi-structured approach. The interview structure covered topics related to the impact of the pandemic on education, faculty adaptation to DTs, changes in the labor market, DCs and the educational model, infrastructure and resources, and institutional policy (Table 1). During the interview. The interview, which lasted 58 minutes and 13 seconds, was recorded. It was conducted by two researchers, one with expertise in Educational Technology and the other with a background in educational sciences and educational policy.

Table 1

Interview Guide

Teaching Experience During the Pandemic	What was the experience and analysis of online teaching during the pandemic? How did students and teachers adapt to virtual classes?
Impact on Learning and Study Habits	What changes were observed in students' learning habits after the pandemic? How has the return to in-person learning been affected?
Teacher Resistance and Adaptation	What resistance or adaptation did you observe among teachers regarding technology use? Was there diversity in the platforms and virtual teaching methods used?
Dropout Rate and Performance	What changes were there in the student dropout rate? How does the "sin derecho" (SD) phenomenon affect students, and how is it managed administratively?
Impact of Technology on the Job Market	How does the intensive use of technology during the pandemic affect graduates' job profiles? Are there curricular adjustments to respond to these changing demands?
Assessment of Teachers' Digital Competencies	Has a digital competencies assessment been conducted for the teaching staff? How does the digital preparedness of teachers align with institutional goals?
Infrastructure and Technological Resources	What is the current state of infrastructure to support virtual and hybrid learning modalities? Are there sufficient resources to implement new educational modalities?
Current Educational Model and Updating Needs	How is the current educational model defined, and how does it align with job market needs? Are there plans to update the educational model to adapt to more flexible modalities?
Generational and Academic Administration	What impact does generational and administrative management have on academic and technological innovation?
Future Plans and Areas for Improvement	What could be improved in terms of administration, control, and teacher support in virtual environments? Are there plans to develop protocols or pedagogical models that support hybrid and virtual modalities?



Information related to the program was obtained from the University's publicly accessible website (<https://guiadecarreras.udg.mx/licenciatura-en-sociologia/>). The ACCESISO 2023 self-assessment report was retrieved through the relevant authorities; this report is part of the fourth accreditation by the ACCESISO (University of Guadalajara [UdeG], 2023).

PHASE 2

The interview was transcribed and coded using the qualitative software Atlas.ti 9; the same process was applied to the information regarding the program and the ACCESISO 2023 report (UdeG, 2023). The initial coding was based on predefined categories related to digitalization, DTs, competencies, and professionalization, as well as recurring themes concerning DCs and professional training. The coding was conducted by all three researchers. The codebook is presented in Appendix A.

PHASE 3

The thematic analysis aims to identify key themes in the discourses present in the interview and documents, such as the importance of DTs in training, curricular adaptation, and emerging DCs (Table 2).

Table 2

Thematic Discourse Analysis

Discourses analysed	Key themes	Subthemes
Interview	Influence of technological innovations and digitalization on competencies and graduate profiles	Challenges and adaptation during the pandemic DC
	Adaptation of training engineering to the challenges of the digital age	Curriculum restructuring Teaching modalities
	Pedagogical strategies to improve professionalization in a digitalized environment	Continuous training in CD Active and participatory methodologies
	Impact of DTs on training and professional practice	Digital revolution in sociology Challenges in implementing DT
Curriculum	Importance of DTs in training	Technological challenges and adaptation DC into the curriculum
	Curricular adaptation to the challenges of the digital age	Curriculum update Resistance to change
	Emerging DCs and professionalization	Development of general competencies and micro-competencies Professional ethics and responsibility
	Impact of DT	Transformation of the professional profile Infrastructure and resources



Discourses analysed	Key themes	Subthemes
ACCESISO 2023 Self- Assessment	Importance of DTs in training	Pandemic-induced transformation Training in DT
	Curricular adaptation to the challenges of the digital age	Necessary curriculum update New teaching modalities
	Emerging DCs and professionalization	Development of new competencies Ethics and professional responsibility in the digital context
	Impact of DTs	Automation and DT in Sociology Infrastructure and resource challenges

Subsequently, a CDA was conducted, examining the power relations, ideologies, and underlying assumptions (Van Dijk, 2016) in the discourses on the digitalization of work and professional training in Sociology. Special attention was given to how technological challenges and opportunities are represented, and how solutions or strategies are proposed (See Appendix B).

PHASE 4

The data analysis was validated through data triangulation (Flick, 2018). Triangulation was employed between interviews, academic documents, and discourse analysis to ensure the validity of the findings. The consistency of the data was evaluated across different sources to verify the coherence in the representation of problems and proposed solutions related to digitalization and DCs. Discrepancies between perceptions and observed realities were identified and analyzed, particularly in areas such as the preparation of faculty to use DTs and the adequacy of the curriculum to meet the demands of the current labor market.

Results

The analysis of the results provided a current overview of the Sociology training within the educational program. The thematic and critical discourse analyses revealed several challenges and opportunities in the Sociology curriculum.

POWER RELATIONS AND RESISTANCE

Digitalization is largely perceived as a forced transition, particularly within the context of the pandemic. This is evidenced by a sense of "model ambiguity" and a "relaxation in learning habits" among students and faculty. Here, institutional power structures are seen as an impediment to curriculum updates:



The use of a gerontocratic approach in administrative roles is identified as a barrier to the generational and technological changes needed. This type of resistance is related to a power structure that tends to prioritize political control over academic updates, highlighting a division of interests between faculty and university administrative policies:

«There is a sort of gerontocracy [...] which has hindered access to these new tools. A gerontocracy and a political criterion for obtaining positions. Those who hold positions [...] are not necessarily the best profiles ». (min 53:39)

Power relations are evident in the centralized control of personnel policies and academic training. Limitations in replacing retired faculty and vacancies authorized by the central government have reduced opportunities to integrate new DCs into the academic staff:

« The corresponding replacements are not being authorized because, although the university network continues to grow, the federal government is not creating new positions. » (University of Guadalajara, 2023, p. 17)

This control limits opportunities to rejuvenate the academic staff with profiles more aligned with current technological demands, directly impacting the program's capacity to adapt to digital advancements. On the other hand, the institutional discourse of the degree program emphasizes training professionals with critical and reflective capacities but faces structural limitations reflecting centralized power in the regulation of study plans and professional practices. Although the digitalization of academic and professional practices is not explicitly mentioned, the rigidity in credit requirements and curricular requisites suggests structural resistance to change, as seen in the study plan:

« It is strongly recommended that you carefully plan to complete these credits according to your possibilities and aspirations. » (Study Plan, p. 1).

This regulatory approach highlights strong institutional control over the timing and methods of knowledge acquisition, limiting flexibility and adaptation to new technological and digitalization demands in the labor field.

FORMATIVE IDEOLOGIES AND ASSUMPTIONS IN SOCIOLOGICAL PROFESSIONALIZATION

The discourse surrounding digital transformation (DT) and educational models reveals a view of digitalization focused more on practical necessity, with limited reflection on its transformative role. Reflecting on the rigidity of the competency-based model, it is noted:

« The whole topic of educational innovation, how it is managed, seems more like a matter of superficial legitimacy. » (min 40:40).

This quote denotes a critical stance towards institutional narratives of innovation, seen more as tools of legitimacy than as effective proposals. Here, DT is perceived as an externally imposed tool, not fully integrated into academic and curricular goals, reflecting an institutional ideology limited to superficial compliance. Furthermore, there is a recognized need to integrate specific skills:

« There's an important issue with [...] the digital revolution in data science. We need to train students in skills like handling Big Data resources, programming languages, programming foundations in Python, in R, right? That's a critical issue we need to discuss. Sociologists without data science skills are hard to imagine in the future. » (min 39:12)



This paragraph highlights the need to incorporate digital knowledge in data management as an essential characteristic for future sociologists. However, it also underscores the need to address emerging DTs such as Artificial Intelligence:

« We've already started to see cases of students using AI applications as a resource that goes beyond the guidance these tools provide—which is, of course, positive—but also as new forms of plagiarism for which we're unprepared. » (University of Guadalajara, 2023, p. 124)

Similarly, the ACCESISO report reflects a perspective that perceives digitalization as an abrupt change rather than an organic transformation in higher education, intensified by the pandemic context:

« The new university administration restructured PROFACAD and launched a different program, PROINNOVA [...] Although it is insufficient, one can say that all faculty members involved in the program have taken at least one course each year since then » (University of Guadalajara, 2023, p. 27).

This suggests that while there is a recognized need for updating, there remain barriers to digital training, as there is no assurance of faculty sensitivity to these issues through the PROINNOVA courses. Along these lines, there is also a need to incorporate new professional training areas gaining relevance in Sociology:

« The emergence and maturation of numerous fields of sociological research absent from the curriculum deserve study—even though they cannot all be included—such as the Sociology of violence and crime, the Sociology of the virtual and digital, the Sociology of childhood. » (University of Guadalajara, 2023, p. 105)

The program's mission and vision reveal an ideology of social justice, respect for diversity, and ethical commitment, focusing on the comprehensive development of students to address social challenges. However, the discourse does not address how technology might contribute to these goals in professional and educational contexts.

UNDERLYING ASSUMPTIONS ON TECHNOLOGICAL CHALLENGES

The lack of a clear structure for implementing and assessing technology in virtual learning highlights gaps in both regulatory frameworks and faculty training. This is underscored in discussions on educational models and digital competence:

« In your online class... it was expected that you would be connected at that time. So, [the instructor] might say, prove to me I didn't hold the class [...] How do you issue a digital absence, how do you predict it? [...] Administratively, professionally, how can you do it? [...] The closest thing to a face-to-face class is for the instructor to turn on their camera for the two hours the class is scheduled. But if the instructor doesn't do this, how can you ensure it? Under what pedagogical, not just administrative, criteria? Why would a class like that be more effective than an asynchronous one? [...] We need to design a pedagogical model that provides criteria for both teachers and students on how they should work. » (min 31:28).

This point emphasizes the perception of technology as an underutilized resource due to the absence of protocols and pedagogical criteria that would facilitate meaningful adoption. The underlying assumptions here include the notion that technology, while necessary, lacks adequate administrative, training, and pedagogical support to be truly effective.



In contrast, certain assumptions within institutional discourse suggest that the mere implementation of training programs or digital tools will ensure smooth adaptation. However, a lack of resources and adequate structural support limits the effectiveness of these initiatives

« Actions to overcome weaknesses [...] initiating the use of digital learning platforms, even in face-to-face courses, can help make these processes more transparent and, to that extent, improve them. » (University of Guadalajara, 2023, p. 126)

Additionally, the sudden transition to online platforms during the pandemic has affected the perception of technology as a lasting solution, underscoring a limited view of digitalization's strategic integration.

« A significant change in this indicator was the training in communication technologies and virtual teaching to address the consequences of the Covid-19 pandemic. Virtually all faculty members received training on tools like ZOOM, CLASS, ROOM, MEET, MOODLE, etc., many of which remain as practices that complement and extend in-person teaching. » (University of Guadalajara, 2023, p. 52)

The design of the professional practices and social service program also reflects a model that seems to assume technological skills will develop tangentially, rather than as a formal component of training. The requirement to complete hours in professional practices and social service, often in non-digitalized settings, limits the potential for learning in applied technologies. The mention of professional evaluation in conventional formats like theses or dissertations further suggests an implicit assumption that traditional methods suffice for graduation, without considering digital alternatives for assessment or presenting results.

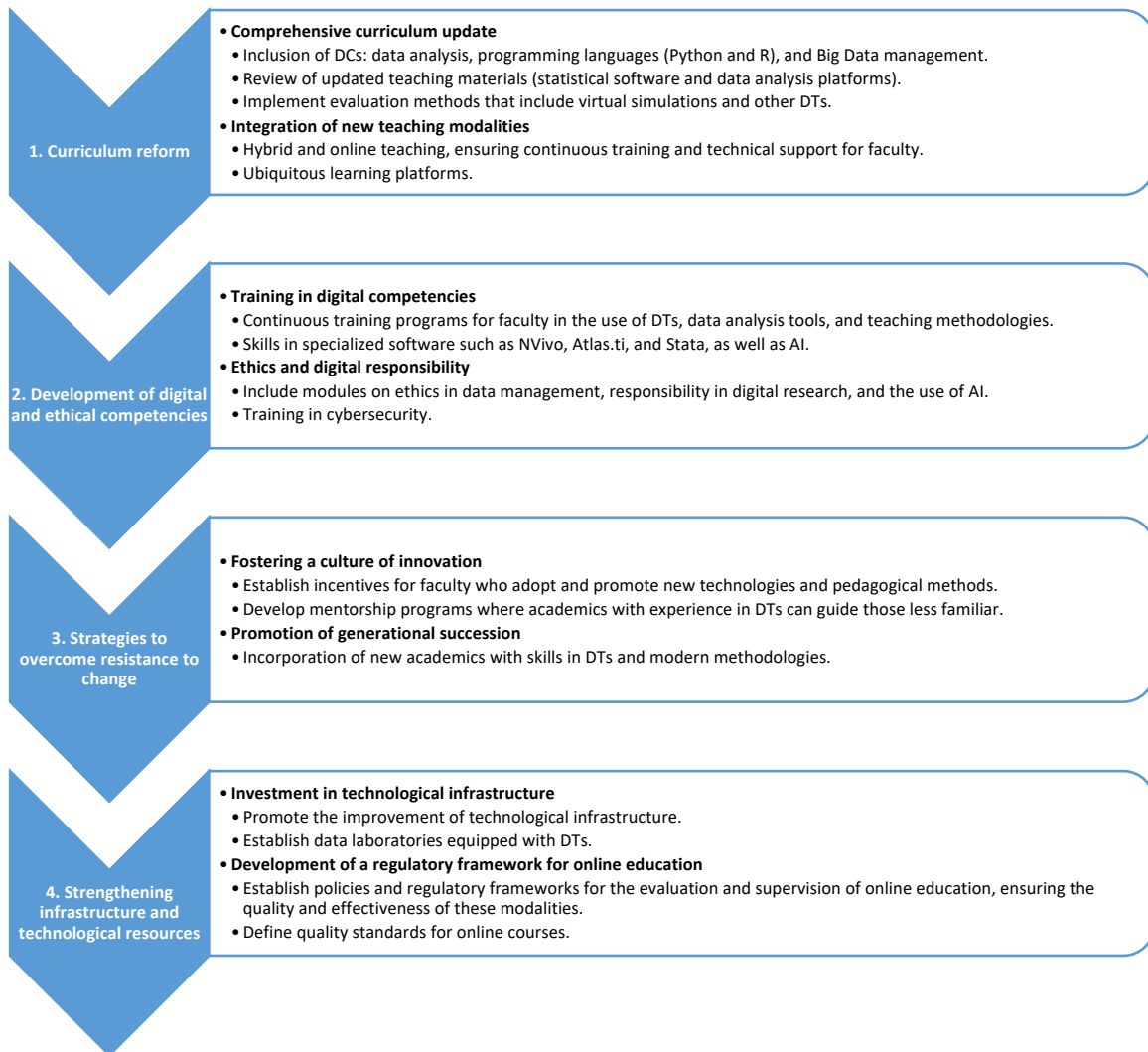
The ACD reveals a deep tension between the institutionally promoted discourse on technological innovation and the everyday practices within the Sociology department, where an ideology of structure preservation prevails alongside a lack of policies that holistically and effectively integrate digitalization.

To overcome these challenges, a shift in power structures and a strategic vision prioritizing digitalization and the development of technological competencies in the curriculum are essential. Taking into account the desired profile of sociologists in the labor market (e.g., Missman, 2023; American Sociological Association, 2024; TraitLab, 2024; Indeed, 2024) and the didactic-pedagogical needs in Sociology (Inayah et al., 2023; Pratiwi et al., 2020; Powell, 2017), a proposal for curriculum modernization and adaptation has been developed, consisting of four basic points (Figure 3).



Figure 3

Proposal for curriculum modernization and adaptation



The four points in this proposal (Figure 2) address challenges in power dynamics and resistance to change and digitalization:

- **Curriculum reform.** A comprehensive curriculum update, incorporating data analysis, programming languages (Python, R), and Big Data management, would equip students with technological tools increasingly essential in contemporary sociological practice. This would facilitate a smoother transition to digital environments, partially overcoming the “model ambiguity” of digitalization. Additionally, implementing hybrid and online teaching modalities could address the “relaxation in learning habits” by offering more dynamic and accessible forms of interaction and learning, challenging structural resistance to change.



- Development of digital and ethical competencies. Strengthening DCs and training in specific tools, such as NVivo and Atlas.ti, could help counteract perceptions of digitalization as a forced or superficial transition. Including modules on data management ethics and digital research responsibility responds to the critique that technology is perceived as merely a “legitimizing facade.” Furthermore, training in cybersecurity and digital ethics would prepare students and faculty to tackle the ethical and technical dilemmas arising with AI and other digital resources.
- Strategies to overcome resistance to change. Fostering a culture of innovation and establishing incentives for faculty who adopt modern technologies and pedagogical methods would help address the “significant faculty resistance to change.” Additionally, promoting generational renewal through the inclusion of academics with DCs and modern methodologies would counter the gerontocratic approach identified in the analysis, facilitating a continuous and relevant program update.
- Strengthening Technological Infrastructure and Resources. Investment in technological infrastructure and the creation of data labs equipped with DTs would provide the necessary resources for faculty and students to experiment and learn practically.

These four points directly address the critiques and challenges identified in the diagnostic analysis, promoting digitalization that is not only functional but also ethical, structural, and aimed at cultural and generational change within the Sociology department.

Discussion

The primary objective of this research was to analyze how the digitalization of work and DTs influence the training engineering and professionalization processes of sociologists and to design a pedagogical proposal to address the challenges faced by the educational program. The study on work digitalization and technological innovations in sociological training highlights both the challenges and opportunities to modernize the Sociology program to align it with the demands of the digital labor market. Findings reveal that power structures, institutional resistance to change, and curriculum rigidity have limited the effective integration of DTs into the Sociology curriculum, thereby hindering students' preparedness for a professional environment that increasingly requires digital competencies.

Comparing these findings with the literature, studies by Inayah et al. (2023) and Lupton (2015) agree that DTs have transformed social and labor structures, requiring an update in the competencies and skills that educational institutions need to teach. Lupton (2015) emphasizes that the ubiquity of DTs turns individuals into subjects of digital data, necessitating future sociologists' proficiency in Big Data analysis and management to understand social interactions in digital contexts. The lack of training in data analysis skills and programming languages, as evidenced in this study, suggests a significant discrepancy between the current curriculum and the skills demanded by the digital labor market. This shift implies that Sociology education must adapt to prepare students for a digitalized work environment characterized by cross-cultural and trans-global connectivity (Evans, 2013).

Power relations and resistance to change are significant barriers to the adoption of DTs and curricular changes, as observed in other studies (Carneiro & Francisco, 2019). However, it is essential to recognize that existe una variedad de perfiles de profesorado sobre la perceptions of DT (Hidalgo-Cajo & Gisbert-Cervera, 2022). Therefore, understanding the faculty profile is crucial in defining appropriate strategies. To overcome these challenges, fostering a culture of innovation is vital, including mentorship programs to guide those less familiar with these tools.



Furthermore, institutional resistance to adopting innovative technologies and pedagogical methods reflects an issue identified in other studies. Pratiwi et al. (2020) and Powell (2017) note that many Sociology departments struggle to implement effective digital pedagogies due to limitations in faculty training and the lack of digital content. This study confirms that updating efforts, such as the PROINNOVA program, have been insufficient in ensuring a meaningful adoption of these competencies. Evidence shows that the success of educational programs integrating DTs is closely related to faculty training in the use of DTs, such as AI and Big Data (Hidalgo-Cajo & Gisbert-Cervera, 2022). As Jalal (2024) states, the quality of human resources in educational institutions must be strengthened to ensure educators keep pace with technological advances. These technologies are redefining how data is collected, analyzed, and utilized (Fussey & Roth, 2020; Pratiwi et al., 2020).

Additionally, this study reaffirms the importance of including DCs and a critical analysis of the ethical and social implications of emerging technologies, as highlighted by authors like Fussey & Roth (2020) and Carrozza (2018). The growing presence of AI in academic and professional life, both as a support tool and as an ethical challenge, underscores the need to develop educational strategies to address issues such as AI-assisted plagiarism. Including modules on digital ethics and responsibility within the curriculum, as proposed in this research, is essential. Torpey (2020) also emphasizes the importance of training students in critical analysis of DTs and mitigating negative effects such as surveillance and inequality.

While the need to integrate DCs into training is acknowledged, the lack of resources and an adequate pedagogical model has hindered their implementation. This issue is evident in the limited curriculum reform and the absence of a comprehensive digital education policy, which not only affects the adoption of DTs in the educational program but often impacts the entire educational institution (Rojas et al., 2018). The development of regulations for the operability of new teaching and learning modalities has posed a significant problem, negatively impacting educational institutions (Baca & Acosta, 2021). This limitation constrains the scope of the educational program while simultaneously highlighting the failed strategies of educational policy in terms of DTs and the challenges faced by graduates in the labor market.

Regarding the pedagogical strategies to be implemented for the professionalization of sociologists in digitalized environments, the discussion leans toward a socio-constructivist and connectivist approach. In this context, Inayah et al. (2023) propose cooperative learning that develops the 4Cs: communication, collaboration, critical thinking and problem-solving, and creative thinking. This type of learning also fosters other skills related to multidisciplinary work in digital environments. Collaboration in virtual settings should integrate student-centered instructions, have a significant impact on real and social life, and incorporate a professional and civic digital profile (Lupton, 2015).

Given that digitalization is often perceived as a temporary solution rather than a long-term strategy, it is necessary to shift this perspective and recognize the potential of digitalization to enhance the quality of learning and prepare students for the current technological environment (Mesra et al., 2023). This can be achieved through a diversification of teaching modalities (Canaza-Choque, 2020) and the use of DTs such as AI, machine learning, Immersive Three-Dimensional Digital Environments (EDIT), or Augmented Personal Learning Environments (PLE). Additionally, methodologies such as Project-Based Learning (PBL), the use of MOOCs and online courses, and the use of social networks should be integrated, along with the development of personalized educational resources (Baca & Acosta, 2021).

Specifically, the current curriculum of the undergraduate Sociology program has a solid structure in terms of theoretical and methodological training for students. However, to meet the challenges of the digital age, it is necessary to effectively update and integrate these technologies at all levels of the curriculum Table 3 provides an example of how training engineering can be incorporated into the professional profile framework.



Table 3

Example of Effective Integration in the Curriculum

1. Core basic training area (mandatory)		
Area	Course	Description
Development of programming skills	Introduction to social research	Incorporate an introductory programming module in languages such as Python, enabling students to develop basic programming skills and apply them in data collection and analysis.
2. Specialized basic training area (mandatory)		
Integration of DTs in the study of sociological theories	Theoretical subjects (SO155 to SO161)	The teaching of sociological theories (e.g., Durkheim, Marx, and Weber) could be complemented by the use of digital simulations and virtual models to visualize and understand the practical application of these theories in contemporary contexts.
	World history (SO162)	Use augmented reality (AR) and virtual reality (VR) platforms to explore historical contexts and their influence on current social structures.
	Latin american history (SO163)	
	History of Mexico (SO164)	
3. Specialized elective training area		
Orientation in applied social counseling and intervention	Simulation models and social scenario construction (SO180)	Implement simulation technologies and modeling software to create social intervention scenarios.
	Social management and knowledge network management (SO182)	Integrate project management platforms and online collaborative networks (e.g., Trello) to simulate the management of social projects and the coordination of knowledge networks.
4. Open elective training area		
Exploration of emerging technologies and new methodologies	New information and communication technologies (SO233)	Understanding and application of emerging DTs such as AI, machine learning, Immersive Three-Dimensional Digital Environments (EDIT), and augmented PLEs.
	Model construction (SO222)	Introduce advanced simulation software and social modeling that allows students to build and analyze complex sociological models, simulating social and economic interactions in virtual environments.

As the literature suggests, digital transformation in sociological education requires a re-engineering of training that incorporates technological competencies, a critical review of the effects of DTs on social structures, and an ethical commitment to social justice and privacy. The findings of this research emphasize the need for structural policies that foster innovation, generational renewal, and curricular flexibility to adapt sociological training to the realities of the digital labor market.



Conclusion

The findings of this research highlight the critical need to transform Sociology training within a rapidly digitalizing context, where DCs and curricular adaptation are essential for proper professionalization. Institutional resistance to change, evident in traditional power structures and the perception of digitalization as a temporary solution, hampers curriculum modernization. This resistance impacts not only the integration of DTs but also the development of essential digital competencies, such as Big Data management, programming languages, and the use of qualitative and quantitative analysis tools in digital environments.

The proposed pedagogical strategy—including curriculum reform, strengthening of digital and ethical competencies, overcoming institutional barriers, and enhancing technological infrastructure—directly addresses the identified challenges. These strategies aim not just for a superficial adoption of technology but for a comprehensive and sustained transformation that will prepare sociologists to meet the challenges of a digital and globalized job market. Integrating collaborative learning models, simulation platforms, and artificial intelligence tools into the curriculum will enrich sociological training and foster a culture of innovation and technological adaptability.

Finally, this research underscores the urgency for educational policies that support this transformation, recognizing the pivotal role of DTs not merely as functional tools but as central elements for critically analyzing social structures. Incorporating these elements into the Sociology curriculum will enable future professionals to better understand the impact of digitalization on human behavior and social inequalities, thereby contributing to the development of a sociological professional profile that is both technically proficient and ethically aware in an increasingly digitalized world.

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Appendix A

Codebook

Category	Code	Subcode
Influence of technological innovations and digitalization on competencies and graduate profiles	Challenges and adaptation during the pandemic	Mismatch between curriculum plan Challenge of integrating DT Curriculum plan adaptation
	Emerging technological competencies	DT in Education Emerging competencies
Adaptation of engineering education to the challenges of the digital era	Curriculum restructuring	Curriculum update Teacher training in digital competencies
	Teaching modalities	Flexible teaching models Virtual modality In-person modality
Pedagogical strategies to improve professionalization in a digitalized environment	Continuous training in digital competencies	Curricular flexibility Use of digital platforms for control and monitoring
	Active and participatory methodologies	Project-based learning Problem-based learning Flipped classroom
Impact of automation, AI, and DT on education	Digital revolution in sociology	Automation and Data Science Impact on graduate competencies Challenges in technology implementation
Importance of DT in education	Technological challenges and adaptation	Digital adaptation Technological competencies Educational infrastructure
	Integration of digital competencies into the curriculum	Digital competencies Innovative curriculum Data science
Curricular adaptation to the challenges of the digital era	Curriculum update	Curriculum reform Hybrid modalities Content update
	Resistance to change	Resistance to change Gerontocracy Institutional inertia
Emerging competencies and	Development of general competencies and	Micro-competencies General competencies



Category	Code	Subcode
professionalization	micro-competencies	Digital Skills
	Ethics and professional responsibility	Professional ethics Digital responsibility Data management
Impact of automation, AI and digital technologies	Transformation of the professional profile	Profile transformation Data analysis New competencies
	Infrastructure and resources	Lack of resources Regulatory framework Digitalized education
Importance of DT in Education	Pandemic-driven transformation	Pandemic adaptation Educational technology Virtual teaching
	Training in digital tools	Digital training Virtual tools Technological competencies
Curricular adaptation to the challenges of the digital era	Necessary curriculum update	Curriculum reform Academic update Alignment with the market
	New teaching modalities	Hybrid approaches Pedagogical innovation Emerging technologies
Emerging competencies and professionalization	Development of new competencies	Emerging competencies Data analysis Programming
	Ethics and professional responsibility in the digital context	Digital ethics Professional responsibility Data management
Impact of automation, AI, and DT	Automation and new technologies in Sociology	Automation AI Labor Transformation
	Infrastructure and resource challenges	Technological infrastructure Insufficient resources Technological implementation



Appendix B

Critical Discourse Analysis

Interview		
Power relations and resistance to change	<p>Gerontocracy and resistance to change</p> <p>The discourse reveals a clear gerontocracy within the institutions, where decision-making and administrative control are dominated by a group of senior academics, leading to significant resistance to the adoption of new technologies and curricular changes. This group has maintained the status quo, preventing the entry of new ideas and educational approaches.</p>	<p>Underlying ideology</p> <p>There exists an ideology centered on conservation and power maintenance, where experience and seniority are valued more than innovation and adaptation to new technological contexts. This reflects a power structure that prioritizes stability and control over renewal and modernization.</p>
	<p>Individualized incentives</p> <p>The incentive system is highly individualized, discouraging collaboration and the collective development of new technological skills. Professors enroll in refresher courses only if direct incentives are provided, showing a lack of institutional commitment to collective professional development.</p>	<p>A culture of individual competition is promoted rather than collective collaboration, limiting the development of a robust and adaptive academic community.</p>
Ideologies on digitalization and technology	<p>Perception of digitalization as a temporary emergency</p> <p>The adoption of digital technologies during the pandemic was viewed more as an emergency solution than as an opportunity for long-term educational transformation. This perspective limits the possibility of structurally integrating technology into academic training.</p>	<p>It is assumed that traditional in-person education is the standard and that technology is a secondary and temporary alternative. This underestimates the potential of digital technologies to transform and enhance educational processes.</p>
	<p>Doubts about the effectiveness of virtual learning</p> <p>There is a perception that virtual learning requires a very specific and committed student profile, suggesting an undervaluation of students' abilities to adapt to digital learning environments. Additionally, the perceived lack of control over teachers in virtual settings is seen as an issue, reflecting a mistrust in the</p>	<p>There is a lack of confidence in the ability of students and professors to adapt to and fully benefit from online learning, reinforcing the idea that in-person education is superior.</p>



Interview		
	self-efficacy of teachers and students in these contexts.	
Technological opportunities and challenges	Integration of digital competencies in education	
	Although the need to integrate competencies such as data analysis, programming in Python and R, and Big Data management is acknowledged, these elements have not been incorporated into the curriculum due to a lack of resources and an appropriate pedagogical model to facilitate their implementation.	There is a lack of a long-term strategic vision for the integration of emerging technologies, limiting students' preparation for the digital labor market.
	Challenges of infrastructure and resources	
	The lack of adequate technological infrastructure is a significant obstacle to implementing new teaching modalities. This issue is further exacerbated by the lack of incentives and institutional support to improve professors' digital competencies.	It is assumed that the current infrastructure is sufficient or that investment in new technologies is not a priority, limiting opportunities for educational innovation.

Educational program		
Power Relations and conservation dynamics	Institutional control and resistance to change	Underlying ideology
	The document reflects a power structure that prioritizes stability and administrative control over innovation and adaptation to new realities. Despite technological advances and changes in the labor market, the Sociology undergraduate curriculum at udeg was last updated in 2007.	This lack of updating suggests a resistance to change and a preference for maintaining established practices. There is a clear preference for continuity and maintaining the status quo, reflecting a lack of institutional drive to modernize and adapt the curriculum to the new demands of the digital environment and labor market.
Ideologies on professional training and digitalization	Perception of Training as Static	
	The focus on traditional skills such as research and teaching, without significant mention of digital competencies, suggests that the program is still based on a traditional	It is assumed that professional training in Sociology does not require significant integration of digital technologies or new technological competencies, which could limit students' preparation for the modern



Educational program		
	<p>conception of sociological training. Digitalization and technological competencies are not presented as fundamental elements in student training.</p>	<p>labor market.</p>
	<p>Humanistic and ethical approach</p> <p>The emphasis on values such as tolerance, respect for sociocultural diversity, and commitment to social justice highlights an ethical and humanistic orientation in the training of sociologists. However, the lack of discussion on the role of technologies in social research and intervention suggests an absence of integration of these aspects within the ethical and professional framework of the program.</p>	<p>There exists an idealized view of sociological training that focuses on ethics and social justice but does not address how emerging technologies can be used to support these values in practical contexts.</p>
Technological opportunities and challenges	<p>Lack of digital competencies incorporation</p> <p>Although the document mentions competencies such as data analysis and interpretation, it does not specify the use of digital tools or modern methodologies such as Big Data analysis or programming in languages like Python and R. This suggests a disconnect from current trends in the field of Sociology, which increasingly require advanced technological skills.</p>	<p>The importance of digital and technological competencies in the training of sociologists is underestimated, potentially leading to inadequate preparation of students to face challenges in the digital labor market.</p>
	<p>Opportunities for modernization and curriculum reform</p> <p>The curriculum, last updated in 2007, reflects an urgent need for reform to include digital competencies and better prepare students for a changing labor market. However, the document does not provide a clear vision or strategic plan for this modernization, indicating a lack of institutional direction in this area.</p>	<p>The lack of proactive action suggests an ideology of passivity or inertia, where initiatives for curriculum modernization and the integration of new technologies are not considered a priority.</p>



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	Centralization and institutional control	Underlying ideology
Power relations and conservation dynamics	<p>The self-assessment report highlights a centralized control structure, particularly in the recruitment and selection processes for academic staff. Hiring and promotion decisions are regulated by general guidelines from the University, which limits the Department of Sociology's autonomy to make decisions tailored to its specific needs.</p>	<p>This centralization reflects an ideology of control and uniformity, prioritizing institutional coherence over local flexibility and adaptability. This can inhibit the department's ability to respond quickly to changes in the academic and labor environments.</p>
	<p style="text-align: center;">Resistance to change and gerontocracy</p> <p>The document mentions a "synchronization" in the retirement of professors, many of whom have been with the program throughout most of its 46-year history. The lack of authorization to replace these professors in the necessary proportion suggests an institutional reluctance to promote an effective generational transition.</p>	<p>There is an underlying assumption that experience and tenure are more valuable than innovation and renewal. This perpetuates a gerontocracy that may be resistant to integrating new perspectives, particularly those related to digitalization and emerging technologies.</p>
Ideologies on professional training and digitalization	<p style="text-align: center;">Digitalization as a crisis response</p> <p>The document acknowledges that the COVID-19 pandemic drove an "intense and massive training of staff in digital tools." However, this training seems to have been a crisis response rather than a proactive modernization strategy.</p>	<p>There is a perception that digitalization is a temporary or emergency solution rather than a necessary structural transformation. This may limit the adoption of digital technologies as an integral and permanent part of the curriculum and pedagogy.</p>
	<p style="text-align: center;">Lack of digital competency integration</p> <p>Despite the training mentioned, there is no clear strategy to systematically integrate digital competencies into the curriculum. This suggests a limited view of technology's role in professional training in sociology.</p>	<p>A conservative view perceives technology as an optional addition rather than a central component of modern education. This reflects an undervaluation of the importance of digital competencies in preparing sociology students for today's labor market.</p>
Technological opportunities and	<p>Inadequate response to declining demand</p>	<p>There is an assumption that issues related to demand and curriculum</p>



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challenges

The document mentions a persistent decline in demand for admission to the Sociology undergraduate program, partly attributed to the lack of curriculum updates. Although the need for modernization is recognized, the institutional response seems slow and lacking urgency

relevance will resolve themselves over time without proactive intervention. This could lead to a disconnect between educational offerings and labor market needs.

Opportunities for pedagogical innovation

Although the document acknowledges the importance of research and comprehensive education, it does not specifically address how digitalization could enhance these aspects. The absence of emerging technologies such as Big Data analysis, AI, or programming indicates a lack of strategic vision regarding technological opportunities.

There is a lack of alignment between the university's stated mission to be a "global reference for its high quality and commitment to society" and current practices. This suggests a disconnect between institutional rhetoric and the practical implementation of technological innovations.



Résumé / Resumen / Resumo

La sociologie de la formation à l'ère numérique : nouvelles ingénieries et professionnalisation

RÉSUMÉ

Cette étude vise à analyser comment la digitalisation du travail et les innovations technologiques influencent les ingénieries de formation et les processus de professionnalisation dans le cadre du diplôme de licence en sociologie. Une méthodologie qualitative basée sur l'analyse du discours sociotechnique (ADS) a été utilisée pour examiner la relation entre la technologie et la société, et comment ces dynamiques affectent la formation universitaire en sociologie. Les principaux résultats révèlent une résistance institutionnelle importante à l'adoption des technologies numériques (TD) et aux changements curriculaires, ainsi qu'une perception de la digitalisation comme une solution temporaire. Des barrières telles que la gérontocratie, l'insuffisance d'infrastructure technologique et un système d'incitations qui décourage la collaboration ont été identifiées. Les conclusions soulignent la nécessité urgente de moderniser le curriculum en sociologie pour inclure des compétences numériques avancées et promouvoir une culture d'innovation. Il est recommandé de mettre en œuvre des stratégies pédagogiques incluant l'utilisation transversale des technologies numériques émergentes, des programmes de formation continue pour les enseignants et une réforme curriculaire intégrale.

Mots-clés : digitalisation du travail, compétences numériques, innovation pédagogique, sociologie numérique



La sociología de la formación en la era digital: Nuevas ingenierías y profesionalización

RESUMEN

Este estudio tiene como objetivo analizar cómo la digitalización del trabajo y las innovaciones tecnológicas influyen en las ingenierías de formación y los procesos de profesionalización en la Licenciatura en Sociología. Se utilizó una metodología cualitativa basada en el Análisis del Discurso Sociotécnico (ADS) para examinar la relación entre tecnología y sociedad y cómo estas dinámicas afectan la formación académica en sociología. Los principales hallazgos revelan una resistencia institucional significativa hacia la adopción de tecnologías digitales (TD) y cambios curriculares, así como una percepción de la digitalización como una solución temporal. Se identificaron barreras como la gerontocracia, la falta de infraestructura tecnológica adecuada, y un sistema de incentivos que desincentiva la colaboración. Las conclusiones subrayan la necesidad urgente de modernizar el currículo de sociología para incluir competencias digitales avanzadas y fomentar una cultura de innovación. Se recomienda implementar estrategias pedagógicas que incluyan el uso transversal de tecnologías digitales emergentes, programas de formación continua para docentes, y una reforma curricular integral.

Palabras clave: digitalización del trabajo, competencias digitales, innovación educativa, sociología digital

A Sociologia da Formação na Era Digital: Novas Engenharias e Profissionalização

RESUMO

Este estudo tem como objetivo analisar como a digitalização do trabalho e as inovações tecnológicas influenciam as engenharias de formação e os processos de profissionalização na Licenciatura em Sociologia. Utilizou-se uma metodologia qualitativa baseada na Análise do Discurso Sociotécnico (ADS), que permite examinar a relação entre tecnologia e sociedade e como essas dinâmicas afetam a formação acadêmica em sociologia. Os principais resultados revelam uma resistência institucional significativa à adoção de tecnologias digitais (TD) e mudanças curriculares, bem como uma percepção da digitalização como uma solução temporária. Barreiras como a gerontocracia, a falta de infraestrutura tecnológica adequada, e um sistema de incentivos que desencoraja a colaboração foram identificadas. As conclusões destacam a necessidade urgente de modernizar o currículo de sociologia para incluir competências digitais avançadas e promover uma cultura de inovação. Recomenda-se implementar estratégias pedagógicas que incluam o uso transversal de tecnologias digitais emergentes, programas de formação contínua para professores e uma reforma curricular integral.

Palavras-chave: digitalização do trabalho, competências digitais, inovação educacional, sociologia digital