






REVIEW

Interdisciplinarity and immersive technologies in the teaching of social sciences: Teaching proposals for secondary education in virtual environments

Interdisciplinarietà y tecnologías inmersivas en la enseñanza de las Ciencias Sociales: Propuestas didácticas para la educación secundaria en entornos virtuales

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ABSTRACT

Introduction: secondary education requires innovative methodologies that promote the development of critical competencies in changing contexts. This study approached the teaching of Social Sciences from an interdisciplinary perspective mediated by immersive technologies, with the aim of proposing a methodological framework applicable to the Dominican curriculum.

Method: a documentary and curricular analysis was conducted using regulatory sources from the Ministry of Education and Culture (MINERD), specialized literature on interdisciplinarity, and educational experiences with emerging technologies. The methodological proposal was organized into four phases: interdisciplinary diagnosis, virtual environment design, active exploration, and reflective evaluation.

Results: the proposal made it possible to articulate conceptual, procedural, and attitudinal content through the use of immersive environments such as the educational metaverse. Teaching examples applicable to real-life teaching scenarios were identified, as well as the main ethical, technical, and pedagogical challenges of their implementation.

Conclusions: the integration of immersive technologies with an interdisciplinary approach favored the construction of contextualized, critical, and collaborative learning. However, its implementation requires ongoing teacher training, minimum technological requirements, and clear regulatory frameworks that guarantee equity and data protection.

Keywords: Interdisciplinarity; Immersive Technologies; Social Studies Teaching; Secondary Education; Metaverse; Pedagogical Innovation.

RESUMEN

Introducción: la educación secundaria requiere metodologías innovadoras que favorezcan el desarrollo de competencias críticas en contextos cambiantes. Este estudio abordó la enseñanza de las Ciencias Sociales desde una perspectiva interdisciplinaria mediada por tecnologías inmersivas, con el objetivo de proponer una estructura metodológica aplicable al currículo dominicano.

Método: se realizó un análisis documental y curricular a partir de fuentes normativas del MINERD, literatura especializada sobre interdisciplinarietà y experiencias educativas con tecnologías emergentes. La propuesta metodológica se organizó en cuatro fases: diagnóstico interdisciplinario, diseño del entorno virtual, exploración activa y evaluación reflexiva.

Resultados: la propuesta permitió articular contenidos conceptuales, procedimentales y actitudinales mediante el uso de entornos inmersivos como el metaverso educativo. Se identificaron ejemplos didácticos aplicables a escenarios reales de enseñanza, así como los principales desafíos éticos, técnicos y pedagógicos de su implementación.

Conclusiones: la integración de tecnologías inmersivas con enfoque interdisciplinario favoreció la construcción de aprendizajes contextualizados, críticos y colaborativos. No obstante, su implementación exige formación docente continua, condiciones tecnológicas mínimas y marcos normativos claros que garanticen la equidad y la protección de datos.

Palabras clave: Interdisciplinariedad, Tecnologías Inmersivas, Enseñanza de Ciencias Sociales; Educación Secundaria; Metaverso; Innovación Pedagógica.

INTRODUCTION

Today, immersed in a changing social landscape, the education system coexists with constant tensions between the traditional and the emerging. As highlighted in the research, the integration of ICT is not merely an addition but a “powerful and indispensable tool for driving radical change in education”.⁽¹⁾ Fuentes Morales et al.⁽²⁾ also emphasize that curriculum models must be updated globally to reflect “contemporary challenges,” suggesting that an unchanged education is destined for social stagnation. As indicated by some studies, resistance to change is a phenomenon observed in many teachers when new methodologies are introduced, highlighting the complexity of the educational innovation process.⁽³⁾

The classic forms of teaching, which have predominated for years, do not respond fully to current dynamics. With the advancement of technology, social demands, and new ways of relating to knowledge, the need to rethink how and what is taught is becoming evident. Particularly at the secondary level, where the foundations for personal and professional adult life are laid, the challenge is twofold. On the one hand, the curriculum must be adapted to contemporary realities; on the other, students must be trained to read their environment critically.^(4,5)

Social sciences play a key role in this regard. They do not merely teach facts or events from the past. They go further. They aim, or should strive, to educate citizens capable of understanding their place in the world, their communities, and history itself.⁽⁶⁾ But, of course, it is not enough to integrate more content or apply more complex assessments. A more profound change is needed, both methodological and epistemological. And this is where interdisciplinarity comes into its own. A perspective that allows connections to be woven between different types of knowledge, contexts, disciplines, and students’ experiences.^(7,8)

Added to this is a factor that cannot be ignored: the emergence of immersive technologies. The metaverse, for example, or augmented reality environments, have begun to emerge as tools with enormous pedagogical potential. Not only because of their visual appeal or novelty but because they foster active, situated collaborative experiences. These experiences can serve as a bridge for constructing complex and relevant knowledge. If articulated adequately with the curriculum, these technologies are not mere embellishments but real allies in more meaningful and critical teaching-learning processes.⁽⁹⁾

Therefore, this article aims to analyze how integrating immersive technologies can strengthen social science teaching with an interdisciplinary approach, especially at the secondary level. Through a critical review of the Dominican curriculum and recent educational experiences, it seeks to outline a methodological proposal that allows the potential of these virtual environments to be exploited without losing sight of the academic, ethical, and social goals of education.

DEVELOPMENT

Theoretical and conceptual framework

Interdisciplinarity in the teaching of social sciences

Talking about interdisciplinarity is nothing new, but it is not yet an established practice. It has been discussed for decades, sometimes with theoretical force, but without being fully translated into clear or applicable methodologies. In the case of social sciences in secondary education, this discussion is essential. Social knowledge requires a multifaceted, open approach combining history, geography, economics, and civic education knowledge. However, teaching remains fragmented, focused on isolated disciplines, often guided by memorization and without a real connection to students’ lives.^(2,4,6)

The Dominican curriculum guidelines recognize the need for an integrative approach. The MINERD document itself (2019) states that social sciences should be approached from a perspective that articulates conceptual, procedural, and attitudinal content about real-world problems from multiple dimensions: spatial, economic, historical, and civic.⁽⁶⁾ This articulation is operationalized through what Caballero (2001) called “interdisciplinary nodes,” understood as points of convergence between different disciplines that share an everyday object or

phenomenon.⁽⁸⁾ In other words, rather than adding content, it is about building relationships between them and seeking meaning, context, and interconnection.

On the other hand, based on an analysis of contemporary curricular experiences, it is argued that interdisciplinarity should not be assumed as a fad or a fixed model. Benejam⁽¹⁶⁾ has insisted that it is a process of transformation, which must adapt to the context, the subjects, and the challenges of the moment.⁽²⁾ In the same vein, Camilloni highlights that this perspective favors the development of complex and critical thinking beyond the transmission of closed or finished content.⁽⁷⁾ However, significant resistance still exists in practice: institutional rigidity, limited teacher training, and a lack of clear methodological strategies. Interdisciplinarity often remains mere rhetoric.⁽³⁾

Immersive technologies and the metaverse in education

At the same time, the emergence of immersive technologies—virtual Reality, augmented Reality, and metaverse environments—is generating new forms of representation, interaction, and knowledge construction. These are not simple digital tools. They are environments where students can explore, simulate, and interact with objects or spaces that are not available to them.

The metaverse is a constantly evolving virtual universe that integrates physical and digital Reality. Mystakidis⁽¹⁷⁾ describes it as a “post-reality universe,” while Delso Vicente et al.⁽¹⁸⁾ present it as a collective space that merges realities. Virtual Reality is a completely simulated environment that transports the user to immersive digital spaces, requiring specialized devices and high processing power.^(19,21)

Augmented Reality involves the interactive superimposition of virtual elements onto the real environment, operating in real-time through everyday hardware such as smartphones or tablets.^(19,20) On the other hand, virtual worlds are computer-generated environments that facilitate the feeling of presence and interaction and are sometimes considered part of the broader concept of the metaverse.^(17,21)

In the social sciences, this type of technology makes it possible, for example, to visit a historic city, recreate a geopolitical conflict, or visualize how the urban environment changes over time—all without leaving the classroom or even without a physical classroom.^(1,9)

Education based on immersive experiences facilitates a more integrated and experiential understanding of knowledge. Allowing a multisensory approach encourages deeper learning that involves the emotional, cognitive, and social aspects. According to Flores et al.⁽⁹⁾, these tools can be handy for promoting meaningful learning when combined with active and intentional strategies.⁽⁹⁾ It is not just a matter of using technology for the sake of novelty but of placing it at the center of a pedagogical model that values student participation in the construction of knowledge.

Intersection between technology, education, and interdisciplinarity

This opens up a key opportunity: to combine an interdisciplinary approach with immersive technologies.⁽²²⁾ Both strategies share a common logic: overcoming the linear and fragmented paradigm of knowledge.⁽²³⁾ By its very structure, the virtual world breaks with the traditional classroom sequence. It allows students to navigate between disciplines. It stimulates spontaneous connections and cross-disciplinary exploration.⁽²⁴⁾ And if this is planned as part of a coherent curriculum, it can become a powerful tool for teaching social sciences.⁽²⁵⁾

In this sense, the use of the educational metaverse strengthens interdisciplinary learning while also democratizing access to rich educational experiences. Students who cannot travel or access certain physical resources can now experience those environments virtually. This also raises new ethical and methodological questions that must be addressed, but the potential exists. It is undoubtedly a path that should be explored in depth.

Interdisciplinary methodological proposal in immersive environments

From interdisciplinary nodes to virtual space

The proposed methodological design is based on a critical but straightforward conviction: teaching social sciences in secondary education must connect with the present. This is not only a matter of updating the curriculum but also because the world in which students live is radically different from the one that structured the most common pedagogical practices. In this scenario, interdisciplinary nodes—as conceptualized by Caballero⁽⁸⁾—allow meaningful links to be established between classic disciplines such as history, geography, and civics, as well as other emerging areas of knowledge, including digital technologies.

The node-based methodology allows us to observe reality differently, building meaningful learning that integrates cognitive, procedural, and attitudinal dimensions.^(6,10) It is not just a matter of interconnecting content. Interdisciplinarity implies an ethical and pedagogical stance that questions hierarchies between disciplines and values situated, contextualized valuable knowledge for life.⁽¹¹⁾ This is enhanced when inserted into immersive environments. There, students do not just “study” a phenomenon but explore, inhabit, and discuss it.

Proposed methodological structure

We suggest a sequence articulated in four stages, adaptable to the Dominican curriculum and based on recent experiences of interdisciplinary educational innovation:

- **Diagnosis of the interdisciplinary node:** This starts with an analysis of the curriculum,^(4,6) the group's needs, and the environment. Based on a complex social problem—migration, urbanization, inequality, environmental conflict—the relevant knowledge from various disciplines is identified. Identifying these nodes is not spontaneous; it is constructed through collaborative teaching and critical reflection on the social reality of the student body.^(10,12)
- **Design of the virtual environment or selection of an existing platform:** The construction of immersive scenarios can be carried out on free platforms or platforms adapted to the institutional context. This requires a minimum level of digital literacy among teachers and a willingness to experiment and co-create with other colleagues.^(2,11) It is recommended to start with existing spaces such as Mozilla Hubs or CoSpaces and combine them with tools such as Padlet, ThingLink, or Genially, which allow the integration of geolocated, narrative, and visual content.^(13,144)
- **Exploration and construction of knowledge in the immersive environment:** Here, students work through research, problem-solving, and simulation. They create maps, record informational capsules, participate in virtual debates, design policies, or reconstruct historical events. This process stimulates multiple skills: critical analysis, oral and written communication, argumentation, collaborative work, and ethical information management.^(9,12,15) At this point, the teacher is a mediator, facilitator, and reflective observer.
- **Comprehensive assessment and critical metacognition:** Assessment in this proposal is not limited to the final product. Processes, participation, creativity, the ability to relate knowledge, and the ability to generate new questions are also valued. The use of digital portfolios, reflective journals, or shared rubrics as formative assessment tools is suggested.^(7,10,13) In this way, a final space for metacognition is promoted, where students recognize what they have learned and how they did it.

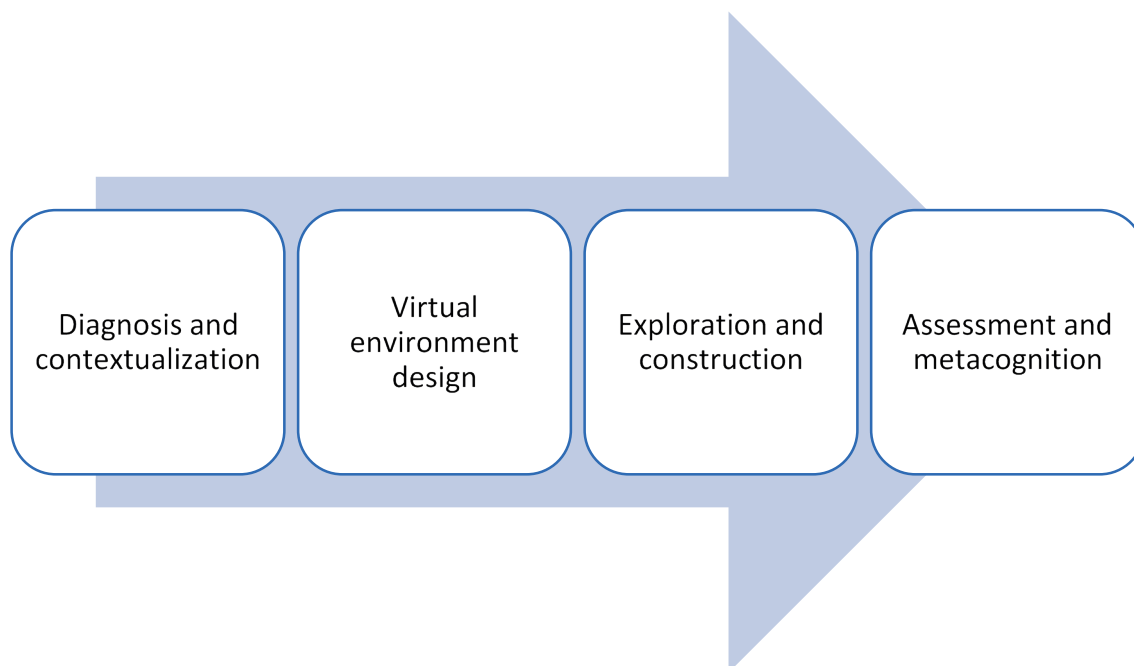


Figure 1. Proposed phases

Examples applied to the Dominican curriculum

Example 1: Territorial conflicts and global citizenship

Students enter a virtual environment representing a fictional space with geopolitical tensions. They must research historical background, negotiate in a simulated assembly, and propose resolutions. Historical, political, and ethical knowledge are linked. The activity encourages critical thinking and civic awareness.^(2,5,8)

Example 2: Urban transformations and social inequality

In this module, a contemporary Dominican city is simulated. Students explore areas with marked contrasts and analyze variables such as employment, access to water, and pollution. They then must design collaborative solutions. Knowledge of human geography, economics, civic education, and the environment is integrated.^(6,12,14)

Example 3: Colonial trade and intercultural relations

The triangular trade circuits in the Caribbean are recreated through an immersive journey along a historic maritime route. Students take on roles, analyze sources, and generate products that connect history with current debates on colonialism, racism, and global justice.^(4,8,10,13)

Ethical, pedagogical, and technical challenges

Talking about immersive technologies in the classroom sounds appealing, innovative, and even transformative. However, it also raises uncomfortable questions. There are barriers, limitations, and gray areas that cannot be ignored. It is not enough to have a digital platform and good connectivity. Fundamental, profound, educational transformation does not happen by magic. It occurs when there is reflection when the implications of introducing these tools into diverse, often unequal, fragmented contexts with their histories are considered. So, yes, there are challenges. And there are many.

One of the first obstacles is teacher training. Not just technical training. We discuss pedagogical, epistemological, and methodological preparation to integrate an interdisciplinary approach with immersive environments' intentional and critical use.^(10,11,27) Many teachers continue to teach from rigid disciplinary frameworks focused on content transmission. Changing this paradigm requires a profound, sustained training process that enables educators to work collaboratively, design complex experiences, and navigate the digital world with pedagogical meaning. However, it also means recognizing resistance: fear of making mistakes, lack of time, and limited institutional support.⁽³⁾

Added to this is the structural problem of the digital divide. Not all students can access adequate devices, stable connections, or safe learning spaces at home. Incorporating immersive technologies without addressing these inequalities can reinforce educational exclusion. Therefore, methodological proposals must be context-sensitive, flexible, scalable, and open to multiple access forms. Some low-consumption platforms, such as Mozilla Hubs, allow virtual reality experiences from basic browsers, which may be a viable alternative in resource-limited environments.^(1,14)

Another unavoidable aspect is digital ethics and data protection. When entering virtual environments, students—many of whom are minors—leave digital traces, generate content, and share ideas. It is necessary to guarantee privacy, informed consent, and the secure use of personal information by institutions and technology providers (9,15). Educational policies have not yet caught up with the speed at which technology advances. Amid this tension, there is a need for a pedagogy that teaches students to navigate the digital world with critical awareness and ethics.

From a technical standpoint, there are also limitations. Implementing immersive technologies requires a minimum infrastructure: stable connectivity, adequate devices, technical support, and access to secure platforms. However, more than technology, the real challenge is pedagogical design. Many mistakes in implementing digital resources stem from a superficial logic that places the tool above the content or the process. The metaverse or augmented reality can become mere entertainment without solid pedagogical mediation. Each experience must be aligned with clear educational purposes articulating knowledge, skills, and values.^(12,13)

There is a cultural and generational challenge: the critical literacy of students.⁽²⁶⁾ Although they are frequent users of digital environments, this does not mean they understand them in depth. They use them, yes. However, they do not always question, analyze, or reflect on what they consume or produce. This is where the social sciences come into play, providing the tools necessary to develop critical thinking about the technologies. It is not just about teaching history or geography in VR. It is also about thinking about what it means to live in a society mediated by algorithms, data, and simulations.

CONCLUSIONS

The integration of immersive technologies in the teaching of social sciences from an interdisciplinary perspective opened up a series of methodological opportunities that, until recently, were difficult to imagine within the traditional classroom. A proposal was developed that articulates content from different disciplines and considers students' cognitive, emotional, and ethical processes. It was not a matter of adding technology because it was fashionable. It was about how these tools, if used pedagogically, can facilitate deeper learning closer to students' reality.

The proposed methodological structure, organized into four phases, proved adaptable to the Dominican curriculum and useful for integrating complex social problems into active learning scenarios. And it was not just theory. Based on simulated experiences such as territorial debates or historical tours, the examples worked on showed that it is possible to link the metaverse, augmented reality, and social sciences without losing rigor or pedagogical intent.

However, its implementation presents challenges. These include teacher training, unequal access to technology, and the urgent need for regulatory frameworks to protect student privacy. Added to this is the importance of educating young people in technical skills and critical thinking about the technologies they use.

In this sense, what is proposed here is not a recipe. It is a foundation, a possible path that must be adapted to different contexts. However, it is also an invitation to rethink teaching from other perspectives, where the digital and the human are not separate but integrated with educational meaning.

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