DIGITALEDUCATIONREVIEW

Exploring Teachers' Views on Using Immersive Virtual Reality for Teaching History

Elisa Serrano-Ausejo[1]
[1] Umeå University, Sweden, elisa.serrano@umu.se, https://orcid.org/0000-0001-7744-779X

ABSTRACT

Immersive Virtual Reality (iVR) is increasingly being used in education for its ability to recreate vivid, realistic environments that enhance engagement and motivation. In history education, iVR is often considered when fostering emotional connection and empathy. However, its potential to support critical historical thinking, such as analysing sources, evaluating perspectives, and understanding bias, is less often emphasised. This study differentiates between emotional and analytical uses of iVR in the history classroom. It investigates teachers' perceptions of iVR in history education, with a focus on how those perceptions shape pedagogical goals, motives, and implementation strategies. Guided by Affordance Theory and Leontiev's Activity Theory, the research adopts a qualitative design based on in-depth semi-structured interviews with twelve history teachers who have implemented iVR in their classrooms. Participants were selected based on their expertise in history education, experience with iVR for teaching, and alignment with competency-based curricula. Through thematic analysis, the study found significant variation in teachers' strategies and aims, closely linked to their digital competence and the perceived affordances and constraints of iVR. Teachers with higher competence aimed for more complex tasks, such as student-led content creation and applied knowledge, while others focused on motivation and visualization. Some educators expressed concerns that poorly scaffolded iVR content risks oversimplifying historical narratives and promoting passive learning. The findings suggest that the effective use of iVR in history education depends less on the technology itself and more on how it is contextualized, critically framed, and pedagogically enacted.

KEYWORDS: Immersive virtual reality, History teaching, History education, Historical consciousness, Historical thinking, Immersive learning.

1 INTRODUCTION

'Teaching history requires navigating back and forth between different poles: between transmitting knowledge, enabling historical thinking or building up identity, between history and the past as well as between history and memory' (Gautschi et al., 2019, p. 348). These challenges affect students on two levels: cognitively, through the methodological framework of history as a discipline, and psychologically, through processes of identity formation, ideological influence, and meaning making. As a result, the goals of history education today have shifted to prioritize the development of historical thinking (HT), in the methodological domain, and historical consciousness (HC), in the psychological (Gómez-Carrasco et al., 2021; Körber, 2015; Popa, 2022). It also includes promoting greater tolerance and cross-cultural understanding, as well as aligning history education with universal human rights and a democratic order (Council of Europe, 2018). This clear departure from traditional goals, which often focused on fostering patriotism and nationalism (Carretero, 2012; De Wever et al., 2011; Metzger & McArthur Harris, 2018), challenges teaching approaches and creates opportunities for more rigorous criticism and self-reflection (Wineburg, 2001).

These shifts in historical education call for new teaching methodologies with a focus on competence development. The digital transformation in society offers possibilities for diverse teaching approaches, while also creating new challenges for stakeholders, particularly the need for digital competence and technology acquisition in schools (Fransson et al., 2020). As Kalolo (2019) notes, this transformation creates 'a responsibility to ensure that all related digital technologies are as contextually and culturally relevant as possible for all citizens' (p. 351). However, studies reveal that teacher digital competence is often underdeveloped, and 'teachers demand pedagogical support to create quality teaching and advocate the

incorporation of technologies in the actual work methodology of all subjects, not in a segregated way' (Basilotta Gómez et al., 2022). These efforts are unlikely to succeed without adequate teacher training.

Among the various digital tools being explored, immersive virtual reality (iVR) is gaining particular attention in education, including history instruction (The Business Research Company, 2023). While previous studies (e.g., Nygren & Vikström, 2013) have noted the benefits of digital archives for critical thinking, the specific role of iVR in developing historical competencies like HT and HC remains underexplored. Moreover, concerns about the emotional intensity of iVR and the commercial orientation of much available content raise questions about its pedagogical suitability for fostering critical historical analysis (Kazlauskaitė, 2022). Considering the dual aims of history education, to develop both HT and HC, and the scarcity of research on iVR's role in fostering historical competencies (Serrano-Ausejo & Mozelius, 2024), this study explores the perspectives of twelve teachers who have experience implementing iVR in history education. By examining why they engaged in the demanding process of training, planning, and implementing iVR, this study aims to contrast emotional and analytical uses of iVR in the history classroom and to investigate teachers' perceptions of iVR in history education, with a focus on how those perceptions and their digital competence shape pedagogical motives and implementation strategies.

This study addresses two research questions:

(1) What are the perceived affordances and constraints of immersive virtual reality in history teaching from a teacher's perspective, and how do these influence classroom objectives and pedagogical strategies?

(2) How does teachers' training shape teachers' objectives and design of the teaching activities in history education?

2 BACKGROUND AND PREVIOUS RESEARCH

Teaching history today involves Historical Consciousness (HC) and Historical Thinking (HT) in much of the Western world (Popa, 2022). These two concepts are complex in their definitions and have been interpreted in various ways (Thorp, 2014). To clarify the framework of this study, the concepts of HC and HT are operationally defined as follows.

Rüsen (2012) defined HC as 'a mental activity of interpreting the past for the sake of understanding the present and expecting the future' (p. 525). Hence, HC involves personal reflection and the reconstruction of history to understand the past in relation to the present and future. It is part of human identity, as individuals choose to identify with some ideas and reject others, which grounds ideologies and orientations in life. Other frameworks, such as Seixas's (2017), emphasise the disciplinary dimension of historical understanding and are complementary to Rüsen's focus on interpretation and orientation. Since individuals' ideological positions ultimately influence the communities and societies to which they belong, HC also implies social engagement and collective meaning-making. This study emphasises differences between HC and memory, as HC should ideally be grounded in scientific knowledge, deep analysis, and reflection. These characteristics position HC as closely linked to HT. However, Axelsson points to the difficulty of studying HC 'since it is an immaterial notion and that it is not obvious how it relates to its manifestations' (in Thorp, 2014, p. 20).

HT refers to a person's ability to critically examine previous narratives and to analyse and contextualise sources (Seixas and Morton, 2013; Wineburg, 2001). A postmodern vision of history recognises the existence of dominant narratives shaped by power and its interests (Trouillot, 1995), often intended to manipulate rather than reveal truth. Hence, HT is closely related to critical thinking, although it has its own specific features, such as a focus on historical causation, perspective-taking, and understanding change

and continuity over time (Seixas, 2013). These practices help learners understand historical time beyond the linear development of biological time and instead engage with the interpretive processes used by historians.

While HC and HT are distinct, they are also interrelated. HT develops disciplinary skills such as source evaluation and historical reasoning, while HC involves broader interpretive and identity-forming processes. Ideally, HT supports the development of HC by grounding reflection in evidence-based analysis and structured interpretation.

2.1 Supporting students' history competencies

HT and HC have become important competencies targeted by history education research (Gómez-Carrasco et al., 2021). A central question in the literature is how teachers can effectively foster these competencies (Popa, 2022). This section focuses on previous research that seeks to disentangle teaching practices oriented toward that goal.

Following widely recognised models, such as those by Seixas and Morton (2013) and Wineburg (2001), the study by Wilke et al. (2023), which explores HT in Flemish education, divides HT into four domains: the first refers to the necessary knowledge that helps learners situate events in a historical frame; the second introduces source analysis; the third involves revising and elaborating historical representations through historical reasoning such as cause–consequence, contextualisation, or multiperspectivity, which implies acknowledging the different perspectives of different historical actors, historians or contemporaries and consequently the admission of possible alternative narratives (Munslow, 2016); and the fourth relates to the capacity to critically connect past, present, and future, which requires an understanding of the 'interpretative and generated nature of history.'

This final domain aligns with Rüsen's concept of HC, reinforcing the assertion by Rodríguez-Mediana et al. (2021) that 'the differences between Historical Thinking and Historical Consciousness are diffuse' (p. 506). HT can be encouraged by 'critical reasoning about sources in light of historical questions, reflecting about causality, historical contextualization or continuity and change' (Wilke et al., 2022, p. 102115). These authors also concluded that there are limitations in HC's ability to foster democratic citizenship, which might reflect difficulties in transferring knowledge from the past to current events, drawing a strong boundary for a well-shaped HC that promotes responsibility toward the future.

Nygren and Vikström (2013) used the phrase 'digital revolution and a democratic possibility' (p. 51) to describe the availability of digital archives for historians and students. Today, this is undeniable, and digital archives are expected to bring new opportunities into the classroom. Perceived as open learning environments, these databases are believed to support critical thinking and favour methodological understanding (Nygren & Vikström, 2013). They can be valuable allies in fostering HT, as they offer multiple affordances closely tied to reflection and analysis. These archives provide an abundance of sources, which may offer diverse perspectives and enable source criticism, shifting the focus from narrative to object or evidence.

Some scholars have highlighted the constraints of iVR in relation to reflection and abstraction (Egea-Vivancos & Arias-Ferrer, 2021), as source criticism is usually not achieved, and reconstructions reduce the need for creativity. On the contrary, iVR appears to pose a risk of emotional bias or influence (Kazlauskaitė, 2022), with users potentially absorbing historical narratives not as generated and interpreted but as objective truths. These narratives may shape users' understanding of history, ideology, or argumentation, and influence their HC by providing a historical identity that connects their present to the past or future. While

HC may be nurtured through democratic values and human rights education, it is not inherently aligned with them and may also develop in authoritarian or ideologically biased directions.

In this study HT is operationalized through competences such as source analysis, perspective-taking, argumentation, and evidence-based reasoning. Similarly, HC is reflected in emotional engagement with the past, narrative construction, and personal connection to historical experiences. These concepts provide the analytical lens for interpreting teachers' descriptions of pedagogical uses of iVR. Rather than being referenced explicitly in the interviews, HT and HC emerge through teachers' accounts of how students interpret, feel, and act upon historical scenarios.

3 THEORETICAL FRAMEWORK

This study applies Affordance Theory to understand history educators' choices in using immersive virtual reality (iVR), examining how they integrate the technology into teaching. Developed by Gibson, Affordance Theory suggests that environments offer action possibilities, or affordances, based on their usability and the user's ability to perceive them (Gibson, 1977; Bower & Sturman, 2015). Norman (2013) expanded on this theory by differentiating between real and perceived affordances, the latter being of particular interest in educational settings, where teachers act on what they believe the technology enables.

Norman also introduced the concept of constraints (1999), which he categorised as physical, cultural, semantic, and logical. These distinctions are useful for understanding how educators interpret iVR's potential. Physical constraints refer to limitations such as equipment availability or fixed features in virtual environments, which often cannot be adjusted in classroom implementation. Cultural constraints involve societal or institutional norms that define what content is considered appropriate, often restricting ethically or politically sensitive materials. Semantic constraints guide teachers to use iVR purposefully, aligning its application with meaningful pedagogical aims rather than recreational or entertainment-based goals. Logical constraints relate to what is realistically achievable based on the knowledge and digital skills of both teachers and students, thus shaping how iVR is applied in practice. Together, affordances and constraints offer a useful lens for understanding how teachers perceive the possibilities and limitations of iVR in relation to their pedagogical goals and the institutional and cultural contexts in which they work.

While Affordance Theory highlights what technology offers or restricts, it does not fully explain the pedagogical motivations behind its use. For this, Leontiev's Activity Theory (Figure 1) provides a complementary lens, capturing how teachers move from intention to implementation. According to Leontiev (1986), the process of teaching design unfolds in a hierarchical structure where the motives reflect the teacher's underlying purpose that becomes specific structured goals in the next planning step. The technology is motivated, enacted and operationalised due to perceived affordances and constraints, i.e., what the teacher expects that can or cannot be achieved, and ultimately shape the teaching design (Nardi, 1996).

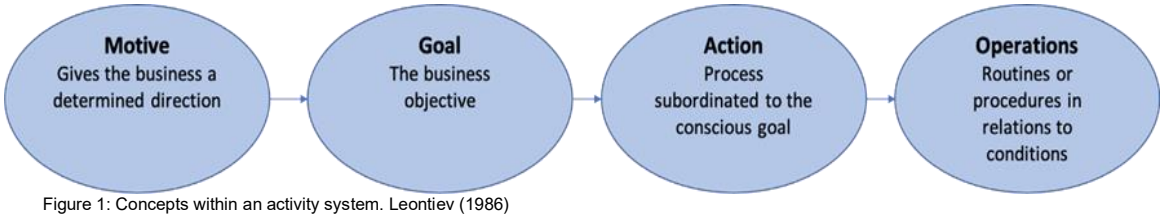

Figure 1: Concepts within an activity system. Leontiev (1986)

Activity Theory explains how these affordances and constraints influence the step-by-step process of teaching design, from initial motivation to classroom operations. It captures how teachers navigate external factors (e.g., resource availability) and internal factors (e.g., their pedagogical goals) to integrate iVR

effectively. By linking the technological possibilities highlighted in the Theory of Affordances with the practical decision-making processes described in Activity Theory, this framework provides a foundation for answering the research questions since it reveals not only what motivates teachers to use iVR but also how they address the challenges and opportunities it presents in their teaching design. However, it is only through implementation that the outcomes reveal the extent to which the results align with the teacher's initial intentions. That is why this study has searched for informants with previous experience in implementing iVR in history teaching. Other variables affecting the implementation were also considered, such as the external support, technology availability, digital competence of the teacher and the students.

4 METHODOLOGY

A qualitative research approach was employed to explore and understand the reasoning behind educators' choices, with semi-structured interviews serving as the data collection method. The semi-structured interview guide aimed at exploring informants' motives and goals for using iVR, their actions and approaches to operationalizing the technology in the classroom, and the influence of educators' digital competence on their teaching design.

4.1 Method

Purposive (critical case) sampling (Cohen et al., 2018) was employed to align informants with the research objectives, ensuring data reliability. Three inclusion criteria guided the selection (see Table 1), using snowball sampling and internet searches to identify suitable candidates. Snowball sampling involved seeking recommendations from individuals knowledgeable about the topic, which brought diverse perspectives on iVR adoption and revealed its limited implementation in classrooms.

Inclusion criteria	Exclusion criteria
Experience in history education	Lack of experience in history education
Experience in iVR for history education	Lack of experience in iVR within history education
National context with focus on history competencies	Context without focus on history competencies

Table 1. Defined inclusion and exclusion criteria.

4.2 Sampling and Data Collection

Informants from various countries were selected in order to include teachers' concerns about students' competence development rather than national curriculum approaches. National curricula reviews confirmed that key competencies in history were (or should have been) included in informants' perceptions of history teaching. Also teachers with roles more specific in the discipline of history, such digital historians or history iVR researchers were included, aiming to get variation in the data. Finally, twelve history educators were interviewed. After the twelth interview, the depth and variablity in the information was sufficient to answer the research questions and therefore further interviews were not considered. Sufficiency in the data was considered reached when both HT and HC were covered by the informants, and the pros and cons of the technology were significantly present.

All informants gave informed consent. The informants were anonymized, identified as Id. 1 to 12. General description of the sample can be found in Table 2.

ID	1	2	3	4	5	6	7	8	9	10	11	12
From	Spain (SP)	USA	UK	USA	Sweden (SW)	SP	USA	SW	SP	SP	SP	SP
Levels	k12	k12	k12	k12	Museum	k12	k12	k12	k12	k12	k12	k12
Tech	Low-cost (LC)	Class VR	Oculus (OC)	Class VR	OC	LC	Oc	None	LC/ Oc	LC/ OC	LC	LC / OC
Digital comp.	High	High	Low	Low	High	High	High	Low	High	High	High	High
External support	0	0	High	High	x	0	0	0	0	0	0	0

Table 2: Characteristics of the informants

Informants 1 and 6 were recruited through snowball sampling at a Spanish conference specialised in technology of education. Colleagues aware of their expertise in iVR and history education recommended them. Both demonstrated high digital competence and were actively engaged in research. Similarly, Informant 3 was recruited through a Scottish university initiative focused on iVR integration in history education, and used iVR for immersions in historical places such as medieval churches and castles, and to perform plays with their students which could be visualised through the headsets. Informants 2 and 4 were approached through contact information available on a commercial iVR-for-education brand's website (Class VR), which facilitated the interviews. These devices are already prepared for classroom use. The level of difficulty is lower, and the need for digital competence from the teacher's perspective is also reduced.

Informant 5, recruited via snowball sampling, worked in a Swedish museum rather than formal k12 education. With a background in education, research, and direct interaction with students participating in museum iVR activities, her testimony was valuable for understanding iVR's role in informal educational settings, and mostly due to her access and systematic observations to a large sample of history-iVR users (many of them students in the k12 system).

Informant 7 was identified through an online search due to their notable digital presence, indicating high digital competence. Informant 8, recruited from a Swedish Facebook group for history teachers, showed interest in iVR's potential benefits despite lacking the resources or expertise to implement it. While his contributions excluded operational aspects, his motives for adoption enriched the data.

Informants 9, 10, 11, and 12 were contacted through a Telegram group for Spanish history teachers. Informant 9, a French primary teacher, contributed digital expertise through his role at the Spanish Council of Education, where he developed digital plans and teacher certifications. Informant 10, a secondary school geography and history teacher, utilized advanced technologies like 3D printers and augmented reality. Informant 11 incorporated cardboard headsets into history and art history lessons, and Informant 12 held a leadership role in a research organization digitizing cultural heritage, coupled with experience in higher education teaching.

Digital competence was categorized as high for teachers who implemented iVR independently, and low for those who relied on external support. High-competence teachers demonstrated autonomy in setting up and integrating iVR into their pedagogy, often adapting it to specific learning goals. In contrast, low-competence teachers depended on technical staff or pre-designed materials and used iVR more as a visual aid than as a tool for active learning. This distinction reflects how digital competence influences not only access to technology but also the depth of its pedagogical use.

The interview questions were designed to explore four key areas (Table 3). The first area focused on planning and implementing iVR in teaching, examining informants' reasons for adopting iVR, their previous experiences with the technology, and how they designed iVR-based activities. The second area addressed

opportunities and challenges, allowing informants to reflect on the perceived benefits of iVR, its limitations, and the factors that influenced its success in their classrooms. The third area explored competence development and institutional support, delving into teachers' digital competence, the role of school policies in encouraging or hindering iVR adoption, and discussions among colleagues regarding its use. Finally, the interviews also investigated future perspectives and recommendations, where educators shared their advice for others considering iVR integration and suggested potential improvements for more effective implementation in history education.

Key areas	Description	Question
Planning Implementing	Motives, previous experiences, and designing iVR-based activities.	What they do
Opportunities Challenges	Perceived benefits, limitations, and beliefs.	What they think
Digital competence	Teachers' digital skills, impact of school policies, and collaboration among colleagues.	What they can do
Future perspectives	Educators' insights into best practices, future improvements, and recommendations	What they would like to do

Table 3: Four key areas in the semi-structured interview

Interviews were conducted in English and Spanish and transcribed verbatim. Interviews in Spanish were translated into English by the researcher for further analysis.

4.3 Data analysis

After 12 in-depth interviews, the data shows sufficient richness and conceptual depth to support the development of meaningful categories. In this context, the validity of the findings lies in the interpretative strength of the data and its alignment with the themes, illustrating variation across participants rather than repetition, which is consistent with the study's aim to explore diverse perspectives and with Braun and Clark vision of a reflective thematic analysis that aims to build meaning from the data (2019, 2023). Thematic analysis, as described by Clarke and Braun (2006), was used to identify patterns and themes in the qualitative data. Ely et al. (1997) emphasies the iterative nature of analysis, enabling active identification of areas of interest. Categories, defined as summaries of informants' responses or emotionally significant opinions (Ely, 1991), were prioritized based on relevance to the research questions during coding.

The data analysis followed a primarily deductive approach, with codes and categories generated inductively from the data, and themes informed by existing theory. The data were analysed using Braun and Clarke's (2006) six-phase thematic analysis. The process began with repeated readings of the transcripts to identify data-driven concepts, which were coded inductively. These codes were then grouped into categories that reflected patterns in participants' accounts. The development of themes was theoretically informed, guided by the predefined categories of the conceptual framework and their relevance to the research questions. Rather than discarding data that did not align, divergent cases were considered as part of the variation in experiences, consistent with the phenomenographic approach. NVivo 1.7.2 facilitated systematic coding and ensured traceability throughout the analytical process.

This deductive analysis identified the following primary themes: pedagogical and technological affordances, and semantic, physical, logical and cultural constraints. Section 4 will illustrate the data analysis with informants' quotations. These quotations serve as examples rather than direct evidence.

To enhance the transparency of the analysis, examples of the thematic analysis can be found in table 4.

Data extract	Codes	Categories	Theme
'Let them take their avatar, let them simulate a dialogue'. (Id. 10)	Programming skills	Students'digital competence	
'We create a virtual museum, which we gradually develop throughout the year. They create 3D content in three dimensions. (Id. 1)	Student-generated content	Students' creativity	Pedagogical affordances
'They will fight to see who has seen the most and who has understood better'. (Id. 1)	Competitive peer interaction	Competitive sharing of knowledge	
'Then when they take the headset off. Most teachers prefer to do a whole class discussion about what they saw, what they noticed'. (Id. 2)	Post-iVR Classroom discussion	Collaborative knowledge sharing	Pedagogical affordances
'It is good because as you move your head, that submarine moves from one side to the other. You choose the path you want to go'. (Id. 9)	Interaction and control	Embodied experience	
'What does it feel like to walk through the doors of that house? What's the size of that house feel like compared to the size of my house?'. (Id 2)	Spatial awareness	Presence	Technological affordances
'I didn't organize well enough... only one-third of students completed the task'. (Id. 6)	Perceived failure from the teacher	Pedagogical challenges	Cultural constrain
'We only have 10 iVR units for the whole school'. (Id. 4)	Equipment shortage	Lack of accessibility	Physicals constrain
'And I don't know how someone with a headset gets involved in the conversation or the drama or is it just the visual experience. Are they able to be active in the experience?' (Id. 3.)	Limited active engagement	Challenges of active participation	Semantic constrain

Table 4: Process of the data analysis with codes, categories and themes specified

5 FINDINGS

This section presents the results according to the affordances and constraints of iVR used for history education perceived by the teachers.

5.1 Affordances

Perceived affordances of technology are central to understanding teachers' motivations for implementing iVR in history education. These affordances relate to educators' motives for using the technology in relation to specific goals, and the specific ways iVR can be integrated into teaching.

5.1.1. Empowering student creativity and digital competence through iVR

Certain iVR applications enable students to create virtual content, fostering creativity, reflection, and advanced digital skills. Id. 9 said, 'if you don't turn the student into a creator, when I do an activity where they simply reproduce, then there is not pedagogical value'. Activities described by teachers involved students programming avatars and simulating dialogues, which engaged them in applying knowledge, designing interactions, and expressing ideas creatively. One teacher explained: 'Let them take their avatar, let them simulate a dialogue between two characters like that. They do it on their platform, they also include programming, if necessary, because in order for the character to say hello, you have to click and that has to be programmed'. These examples illustrate how students were encouraged to go beyond passive use of content, taking an active role in shaping the learning experience. Informant 4 also emphasized the value of interdisciplinary projects with iVR, such as developing virtual historical tours or dubbing historical characters, although he acknowledged that more teacher training and technological resources would be needed to support such initiatives.

Informant 10 involved AI to create a museum, which was then visualized through iVR technology. Similarly, Id. 1 stated, 'Almost every year we make a virtual museum that we do little by little during the year. In the end, this virtual museum is also a digital creation competition'. These examples indicate that iVR supports advanced competencies such as programming, filming, and virtual design. However, when asked about aligning these activities with history curriculum, informant 12 could only argue for digital learning, leaving curriculum alignment aside.

5.1.2. Understanding, contextualization, and interaction

Contextualization of content is among the most valued affordances of iVR. Informant 1 noted that iVR offers better contextualization than methods involving 3D printing, as it allows students to explore entire environments: 'It has shown to be more efficient than 3D reconstructions through a 3D printer because students could see the whole'. Similarly, Informant 10, who also used 3D printers, recognized iVR's potential to contextualize historical events, though not necessarily to support the classification of knowledge. The multilayer information of iVR environments would then enhance understanding by grounding abstract or intangible historical content in simulated, experiential settings.

The feeling of being in the past is increased by iVR facilitating multisensory experiences. Regarding to the view of a cathedral construction, informant 1 said: 'You are feeling it; you are listening to it. There is music, the blows of the stonemasons, or the screams of the people. You see yourself in that activity and you see what is happening (in the virtual environment). And in the end, you feel so, so inside'. Such immersion increases the sense of presence and interactivity with the historical simulation (Id. 2, 5, 11), as informant 5

observed: 'Students can actually go and just explore things by themselves. Like literally a personal moment and personal choice'.

Interaction can happen with the context but also with the historical artifacts. For example, informant 2 saw opportunities for learning when students can 'make that seal bigger with their controller so they can zoom in on it and make it appear larger. They can actually go inside of the seal'. This comment presents an affordance of the technology that allows to focus on and interact with historical artifacts that would otherwise be inaccessible. If the content design prioritises sources and evidence, the inquiry into primary sources is made possible here through technology.

The interaction happens also with the real world by communicating and sharing with others. Informant 2 noted, 'It is very, very difficult to get kids to not talk while they have the headset on because they want to share what they're seeing because they're just so excited about it'. However, this excitement can disrupt classroom management, as Id. 2 and Id. 1 pointed out, requiring teachers to tolerate more spontaneous behaviour. Discussions after iVR experiences were found to consolidate learning: 'They will fight to see who has seen the most and who has understood better. So, it is individual learning at first, and then it is the debate or consensus part among all of them' (Id. 1). Accordingly, teachers are expressing iVR to be a first step in the chain of actions which facilitates the understanding by immersing in a concrete experience which is followed by scaffolded analysis and reflection with peers. However, while some teachers appreciated the social potential of iVR, others saw it as a solitary visual experience that does not inherently foster sharing or cooperation (Id. 3, Id. 11).

5.1.3. Increased awareness, multiperspectivity, and historical imagination

Many informants recognized iVR's potential to enhance students' awareness of distant times, places and people. Informant 2 explained: 'Virtuality has taught us a lot about how we can learn from other people's experiences because we can put ourselves in the shoes or the eyes of somebody else at a different time period, at a different place, in a different location, and then compare and contrast it to what our everyday life is'. Similarly, Informant 3 suggested that iVR could help students better understand concepts such as poverty prior to the establishment of public health systems in England. These reflections point to how iVR can support deeper forms of thinking, encouraging learners to make connections between historical contexts and their own realities, and to reflect critically on social and temporal contrasts. She also argued that 'they (students) have internalised the history. It's come alive for them because they've reenacted it or retold it. It's become more tangible. They've grasped it'. Notably, this insight came from a teacher who was generally sceptical of educational technology, highlighting the potential impact of well-designed iVR experiences. However, the role of the teacher is critical: 'Teachers must make sure that the kids are reflecting on their experience. If they're not reflecting on their experience and sharing, if they're not processing it or analysing in any way, then I don't know what the point of the experience was exactly' (Id. 2).

iVR's potential to enhance multiperspectivity was highlighted by Id. 11: 'The nice thing would be to introduce them to that crowd that is going to jump over the Bastille. For them to live it and understand... Why did they take the streets? What would we claim, what would you claim if you were living in that context?'. In this case, the emotions of the crowd, the appearance and their anger can be well represented, what can be valuable as it is difficult to present by other means.

Historical imagination was another affordance of iVR, as students could explore historical objects in vivid ways. For instance, 'before we had virtual reality, it's... The houses had two rooms, and you slept in that room with your whole family. Who knows what pictures are coming up in their mind when you say those words. But when you can actually put them in a scene, and they can see the size of things, I think that helps

them gain a better understanding'. (Id. 2). However, informants 3 and 12 warned about the risk of providing pre-constructed images that could hinder independent thinking: 'They say it encourages historical imagination, but in reality, you are giving them the image, so they are not thinking about it for themselves' (Id. 12).

5.1.4. Visual and experiential learning

iVR might be supporting diverse learning processes, particularly benefiting students who struggle with traditional teaching environments. Informant 4 noted: '[...] some kids are... You could read something out of a book and they're going to remember every single word. And then you got this other student who needs something else to kind of get it. And this (iVR) to me kind of says a lot to them because they can actually see it'.

Students who prefer alternative teaching methods seem to gain motivation and engagement through iVR. Informant 2 shared: 'I just found that I got more out of my kids. I was able to personalize their learning more. When I use technology, I was able to get them excited about learning. When I use technology, I was able to hear more from my quiet students'. The teacher's observation reveals that students who are usually passive become more active during iVR sessions, suggesting that such environments may encourage greater interaction and participation among those who typically remain quiet in traditional educational settings. The use of immersive technology offers students a rich concrete historical experience, which appears to enhance participation, especially among quieter learners. Their increased willingness to participate indicates a progression through reflective observation and active experimentation, as they internalize the experience and begin to test new ways of expressing themselves within the learning environment.

Similarly, Informant 1 noted: 'They know that who behaves fine will use them [the headsets], so they have that motivation to behave', highlighting the technology as an effective incentive for reinforcing positive behaviours.

Also, variety in teaching methods is presented as another advantage of iVR by most of the informants. For example, informant 10 commented that 'One day I add gamification, another day I add a Kahoot, and another day I do that, and every day they say, let's see what he surprises us with', and added the factor of surprise and change as a value for teaching.

Despite these benefits, informant 7 acknowledged challenges in designing engaging and immersive iVR applications: 'We are going to need virtual reality education to truly be engaging and immersive for kids, it's going to have to not be clunky... Apps should be designed with a more open-ended principle to be pedagogically efficient, making special emphasis on this in order to support active learning competences, not just facts, but in a way, think historically'.

5.2 Constraints

Cultural, logical, physical, and semantic constraints are central to understanding challenges in implementing iVR in history education and exploring them also contributed to understand how they technology was enabled.

5.2.1. Cultural and logical constraints

Teachers highlighted issues with students' preparation and digital competence affecting their ability to effectively use iVR. Informant 2 explained, 'These groups are more prepared digitally speaking because I

have been in charge of them a lot during previous years', considering student preparation a key factor in deciding whether to use iVR. She also expressed concerns about equipment misuse: 'They have their own Chromebox, and they mistreat them horribly. [...] We don't want the same thing to happen to $10,000 worth of technology'. This concern also extends to classroom management. Informant 1 noted, 'It is more difficult to control the classroom than the iVR implementation itself', as students may lose track of their real-world surroundings, creating challenges for teachers.

Low digital competence among history teachers was another barrier. Many informants reported having to invest in personal training and resources, described by Informant 10 as 'a voluntary road someone takes at the expense of her own economic investment'. Informant 6 recounted a failed iVR activity where only a third of students completed the task, stating, 'I didn't organise well enough', and noting that teaching large groups with varied digital skills was particularly difficult.

A lack of preparation also creates hierarchical issues within schools. Informant 6 reminded: 'I had a student who presented an official complaint. It had never happened to me', explaining that external stakeholders often misinterpret failures as implementation flaws. She advocated for more tolerance of errors to encourage innovation, emphasizing the need for mutual support among staff.

Societal debates on the appropriate level of technology use in classrooms add another layer of difficulty. For instance, some iVR systems require mobile phones, often forbidden in schools. Informant 6 described a constant struggle: 'It is very, very difficult. I allowed them to use the phone in the classroom. This created a conflict with another teacher'. Even teachers with institutional support, like Informant 4, faced challenges when students had 'dramatic' reactions to technology-related issues.

5.2.2. Physical constraints

Equipment limitations were a common barrier, with teachers frequently citing a lack of devices (Fransson et al., 2020). Informant 4 reported having only 10 iVR units for the entire school, while others relied on lower-quality cardboard headsets purchased personally (Id. 1, 6, 9, 10). Informant 5 intended to implement iVR in the classroom, but it was impossible due to the lack of resources to acquire the necessary equipment.

Software shortages compounded these challenges. Suitable content for iVR was difficult to find, with much of it available only in English. Informant 10 remarked, 'That didn't work with my students because it was like too hard English'. Teachers using branded educational platforms faced fewer issues but still found the content insufficient. Informant 4 shared, 'We use this Class VR or whatever it's called... And it was really nice. Just felt like sometimes, you know, you're searching for stuff and can't quite find what you want. So, you always want more'. Informant 7 acknowledged challenges in designing, engaging, and gathering of iVR applications: 'We are going to need virtual reality education to truly be engaging and immersive for kids, it will have to not be clunky... Apps should be designed with a more open-ended principle to be pedagogically efficient, making special emphasis on this in order to support active learning competences, not just facts, but in a way, think historically'.

5.2.3. Semantic constraints

While some educators viewed iVR as a tool for experiential and active learning, others argued that it encouraged passivity. Informant 3 noted, 'There's a whole area about immersion that makes you passive', explaining that spatial boundaries in virtual environments limit exploration and free interaction. Her approach emphasized user-to-user interaction and the importance of shared learning experiences in history education.

Interactions were not always successful. Informant 11 described an activity where only one student used the iVR device while others watched passively on a screen. He observed, 'There is an important individual part of a protagonist who is the one who uses it, lives it, while the others were reduced to passive spectators'. He hoped for technology that would allow all students to share the virtual experience simultaneously. Limited social engagement reduced student motivation and failed to stimulate discussion. This semantic constraint, deeply linked here to physical limitations, highlights how restricted access to devices can undermine iVR's potential.

There are important semantic constraints in iVR content and how it is delivered. While video games and existing 3D content offer high levels of detail, they are not necessarily transparent or credible. The 3D reconstructions often rely on pre-existing models, and professionally made ones are scarce, increasing the risk that non-pedagogical or biased content dominates the learning experience (Id. 12). Informant 5 illustrated this concern when she remarked: 'They have reconstructed a church that doesn't exist, that we don't know where existed'. This reflects how immersive visuals can present fictional or speculative content as factual, misleading the viewer.

She also shared concerns about viewer passivity and interpretive ambiguity: 'So when people are coming alone to the exhibition like, you know, just strolling around by themselves, it was very rarely that people were coming out of the VR room and were getting themselves into the screen in order to read more about the artifact. So, these people, I have no idea what kind of ideas they got out with. If they maybe knew about the church or not'. Without active framing or contextual support, audiences may leave with unclear or incorrect impressions.

Further, Informant 5 highlighted how iVR can prevent understanding of elements like causation or multiperspectivity: 'And it's about very detailed stuff, but what is the bigger story I'm missing?' She stressed that, 'The bigger story somehow, which I find the most intriguing', is often absent. This 'bigger story' would include historical competencies such as understanding diverse perspectives, causes and consequences of an event, or even the big picture of change and continuation. She argued that iVR experiences can feel 'too easy, no effort needed', raising concerns that these experiences may lead to superficial engagement, where students passively consume rather than interrogate the past.

Informants 5 and 12 warned that iVR could weaken students' historical imagination by making them passive recipients of content instead of encouraging critical engagement. As such, the risk is not simply that students receive incorrect information, but that they perceive historical representations as fixed, objective truths.

6 DISCUSSION

To the best of my knowledge, this is the first study to explore teachers's objectives and motives for implementing iVR in history education, and how they put it into practice through their actions and operational strategies. It also examined the role of their digital competence in shaping both perception and implementation. Understanding these interrelations has revealed patterns connecting teachers' beliefs, strategies, and training (Gudmundsdottir & Hatlevik, 2018). The concepts of learning progression, experiential engagement, and social interaction emerged from the data as key to how teachers envisioned iVR-based learning. Aligned with Southgate et al. (2019), this clarified how teachers saw learning progression, iVR's role, and how collaboration or reflection shaped their motives and strategies for using iVR.

The findings show that the perceived affordances and constraints of iVR significantly influence classroom objectives and pedagogical strategies, directly addressing the first research question. Teachers view iVR as a tool to enhance student engagement, foster creativity, and develop both digital and historical

competencies. These motivations often stem from challenges in traditional teaching methods, such as limited motivation and passivity (Makransky & Petersen, 2021), difficulties in contextualizing historical content (Allison, 2008), and a lack of instructional variety (Guerrero et al., 2022; Harris and Haydn, 2006). Teachers highlighted how iVR can shift students from passive recipients of information to active participants in the learning process, engaging in tasks such as programming, content design, and reflecting on complex historical scenarios. When students create their own immersive materials, the process supports deeper learning through critical, creative, and applied thinking. These findings aligned with Kayaalp et al. (2024), who showed higher-order thinking skills when pre-service teachers constructed virtual museums. However, this potential is not always realized, especially when digital skill development is disconnected from history-specific outcomes.

In line with Gudmundsdottir & Hatlevik (2018), this study shows that teachers' digital competence plays a decisive role in how iVR is used in the history classroom, answering the second research question. Teachers with higher levels of digital competence tend to pursue more ambitious goals, such as enhancing students' own digital competence, fostering creativity through student-generated content, and supporting collaborative discussion. These educators are more likely to integrate iVR in ways that promote active learning, critical reflection, and even historical content creation. In contrast, those with lower digital competence tend to focus on iVR as a motivational tool or visualization aid, supporting basic comprehension. These results align with the digital-competence model for history teachers in iVR proposed by García-Martínez et al. (2024), which maps a progression connecting students' learning and teachers' iVR skills. Also, while limited digital competence can sometimes be offset by external support from assistants or school staff, digital competence remains a key factor in determining both the purpose and the complexity of the implementation, indicating that the perception of the technology is key for the teaching strategy.

The use of iVR is interpreted by many as a non-traditional pedagogical practice that activates experiential and active learning. In well-designed activities, students engage in immersive historical experiences, reflect on them, derive conceptual understanding, and apply their learning, engaging in a cycle of experiential learning. Teacher reflections showed that students who are typically passive often became more involved during iVR sessions, participating in discussions and debates that indicate progression through reflective observation and active experimentation.

Teachers were also drawn to iVR's capacity to emotionally engage students and provide multisensory access to historical content. This emotional immersion often compensates for the lack of pedagogical materials aligned with the history curriculum. However, reliance on emotionally rich, pre-designed content may limit opportunities for HT (Parong & Mayer, 2021). If not accompanied by reflection and collective problematisation, students may accept visual reconstructions as objective truth (Nachtigall et al., 2022), which risks undermining the development of historical imagination, multiperspectivity, and source criticism, key components of HT. It also points to a limitation of iVR: its difficulty in directing focus to individual historical artifacts. As Remolar et al. (2021) note, AR better isolates objects, supporting focused analysis, while iVR's multilayered environments can blur attention.These insights highlight the need to align iVR with curriculum goals, as it is argued by Squires (2012), who reminds that curriculum alignment is essential for quality education.

In response, teachers implemented strategies to align iVR with their pedagogical goals. Common approaches included embedding iVR into lesson sequences with preparatory instruction and post-activity reflection, using shared screens for collective engagement, and designing team-based tasks. These strategies were used to counter the individualistic nature of iVR and to promote collaboration and knowledge sharing. These actions often reflect iVR as mediating artifacts that support learning through contextualized, scaffolded experiences, and aimed to situate learning in a social and cultural setting.

These findings reaffirm that the success of iVR integration, at least at this point where content is often not pedagogically designed, is not inherent to the technology, but rather depends on how it is designed, contextualized, and enacted by teachers. Affordances and constraints are not fixed properties of the technology but are perceived and operationalized differently depending on the teacher's digital competence, pedagogical vision, and institutional context.

Regarding the validity of the findings, this study aimed to ensure internal validity through the intentional selection of teachers with direct experience implementing iVR in history education, the use of in-depth interviews, and a systematic thematic analysis guided by established theoretical frameworks. Although the sample was limited to twelve informants, the detailed nature of the qualitative data enhances the potential for transferability to similar educational settings and provided rich, nuanced insights into teachers' experiences. By providing an in-depth, contextualized understanding of how teachers perceive, adapt, and implement iVR in history classrooms, the study offers a foundation for further research and informed practice in this field.

There are also limitations. Twelve informants might not cover the overall landscape of iVR in history education, and several perspectives might remain underrepresented. The sampling method involved purposive selection through professional networks and educational initiatives, which, while effective for identifying active practitioners, made it difficult to reach the most experienced or innovative users, either because they are rare or not easily identifiable. Additionally, certain national contexts are more represented than others; for instance, Spain is more prominently featured, which may influence the transferability of the findings to other educational systems.

7 CONCLUSION

This study demonstrates that the implementation of iVR in history education is significantly shaped by teachers' perceptions of its affordances and constraints. These perceptions directly influence both their pedagogical motivations and the strategies they employ in classroom integration. Importantly, the findings highlight that teachers' digital competence is a critical factor in shaping instructional design, and further reveal a complex interplay between technological potential and actual practice. The study presents evidence of the varied motivations and operational uses of iVR, which in turn lead to differentiated impacts on student learning.

By uncovering this variability, the study contributes new knowledge to the field of educational technology in history education. It positions us to better understand why iVR's uses remains uneven and suggests that without aligning technological design with teachers' pedagogical aims and competencies, its opportunities and risks may remain unattended. This research thus advances our understanding of the mediating role of teachers in iVR integration. Moreover, it identifies three foundational educational dimensions, cognitive engagement, reflective learning, and socially mediated meaning-making, as relevant interpretive lenses for understanding how iVR supports learning processes in the history classroom.

However, the findings also point to research gaps. While emotional engagement through iVR may foster historical empathy and HC, its actual effect on critical HT, such as source criticism and multiperspectivity, remains underexplored. Future research should investigate the long-term cognitive and affective outcomes of iVR use, especially how emotional immersion influences students' capacity to interpret, question, and contextualize historical narratives. Only then can we determine whether iVR serves merely as an engagement tool or a substantive aid to historical understanding. Additionally, future research should consider how the narrative structures embedded in iVR content may support certain approaches to history.

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EXPLORANT LES OPINIONS DELS DOCENTS SOBRE L'ÚS DE LA REALITAT VIRTUAL IMMERSIVA PER A L'ENSENYAMENT DE LA HISTÒRIA

La Realitat Virtual Immersiva (iVR, per les seves sigles en anglès) s'utilitza cada vegada més en l'educació per la seva capacitat de recrear entorns vius i realistes que milloren la motivació i el compromís de l'alumnat. En l'ensenyament de la història, la iVR sovint es tracta pel seu potencial per fomentar la connexió emocional i l'empatia. No obstant això, la seva capacitat per donar suport al pensament històric crític, com ara l'anàlisi de fonts, l'avaluació de perspectives i la comprensió del biaix, es tracta amb menys freqüència. Aquest estudi contrasta els usos emocionals i analítics de la iVR a l'aula d'història. Investiga les percepcions del professorat sobre la iVR en l'educació històrica, centrant-se en com aquestes percepcions influeixen en els objectius pedagògics, les motivacions i les estratègies d'implementació.
Guiada per la Teoria dels *Affordances* i la Teoria de l'Activitat de Leontiev, la recerca adopta un enfocament qualitatiu basat en entrevistes semiestructurades en profunditat a dotze docents de història que han implementat la iVR a les seves aules. Els participants van ser seleccionats en funció de la seva experiència en educació històrica, el seu ús professional de la iVR en contextos educatius i l'alineació de la seva pràctica amb un currículum basat en competències. Mitjançant l'anàlisi temàtica, l'estudi va identificar una variació significativa en les estratègies i objectius docents, estretament vinculada a la seva competència digital i als *affordances* i limitacions percebuts de la iVR. Els docents amb una competència digital més elevada tendien a proposar tasques més complexes, com ara la creació de contingut per part de l'alumnat o l'aplicació del coneixement, mentre que d'altres es centraven en la motivació i la visualització. Alguns participants van expressar preocupació pel risc que continguts de iVR mal estructurats poguessin simplificar en excés els relats històrics i fomentar un aprenentatge passiu. Els resultats suggereixen que l'ús efectiu de la iVR en l'ensenyament de la història depèn menys de la tecnologia en si mateixa i més de com és contextualitzada, emmarcada críticament i aplicada pedagògicament.

PARAULES CLAU: Realitat virtual immersiva, Ensenyament de la història, Educació històrica, Consciència històrica, Pensament històric.

EXPLORANDO LAS OPINIONES DE LOS DOCENTES SOBRE EL USO DE LA REALIDAD VIRTUAL INMERSIVA PARA LA ENSEÑANZA DE LA HISTORIA

La Realidad Virtual Inmersiva (iVR, por sus siglas en inglés) se utiliza cada vez más en la educación por su capacidad de recrear entornos vívidos y realistas que mejoran la motivación y el compromiso del alumnado. En la enseñanza de la historia, la iVR suele abordarse por su potencial para fomentar la conexión emocional y la empatía. Sin embargo, su capacidad para apoyar el pensamiento histórico crítico, como el análisis de fuentes, la evaluación de perspectivas y la comprensión del sesgo, se aborda con menos frecuencia. Este estudio contrasta los usos emocionales y analíticos de la iVR en el aula de historia. Investiga las percepciones del profesorado sobre la iVR en la educación histórica, centrándose en cómo estas percepciones influyen en los objetivos pedagógicos, las motivaciones y las estrategias de implementación.
Guiada por la Teoría de los Afordances y la Teoría de la Actividad de Leontiev, la investigación adopta un enfoque cualitativo basado en entrevistas semiestructuradas en profundidad a doce docentes de historia que han implementado la iVR en sus aulas. Los participantes fueron seleccionados en función de su experiencia en educación histórica, su uso profesional de la iVR en contextos educativos y la alineación de su práctica con un currículo basado en competencias. A través del análisis temático, el estudio identificó una variación significativa en las estrategias y objetivos docentes, estrechamente vinculada a su competencia digital y a los afordances y limitaciones percibidas de la iVR. Los docentes con mayor competencia digital tendían a plantear tareas más complejas, como la creación de contenido por parte del alumnado o la aplicación del conocimiento, mientras que otros se centraban en la motivación y la visualización. Algunos participantes expresaron preocupación por el riesgo de que contenidos de iVR mal estructurados puedan simplificar en exceso los relatos históricos y fomentar un aprendizaje pasivo. Los resultados sugieren que el uso efectivo de la iVR en la enseñanza de la historia depende menos de la tecnología en sí misma y más de cómo esta es contextualizada, enmarcada críticamente y aplicada pedagógicamente.

PALABRAS CLAVE: Realidad virtual inmersiva, Enseñanza de la historia, Educación histórica, Conciencia histórica, Pensamiento histórico.