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Bridging Theory and Practice: Designing Immersive VR Environments for Legal Education

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Abstract

Clinical legal education (CLE) relies on experiential, practice-based learning, yet guidance remains limited on how immersive virtual reality (VR) should be designed and evaluated for law-clinic demands. Grounded in experiential learning, this study identifies and prioritises design criteria for immersive VR environments intended for VR-supported CLE and examines conceptual links among core design dimensions. A two-round Delphi study was conducted with 20 experts from Türkiye representing law (information technology law and criminal law) and instructional technology / VR design. Twenty-nine initial criteria, derived from educational and clinical VR design literature and contextualised for CLE tasks, were rated using a five-point scale and organised into seven dimensions covering realistic experience, interaction, diversity and variation, aesthetic and ergonomic design, universal design, scenario features, and software–hardware considerations. Expert judgments also indicated systematic interdependencies among dimensions, with realism centrally linked to other characteristics. The resulting framework is positioned as a foundation for development and empirical testing by translating criteria into implementable design requirements and measurable outcomes aligned with learning, performance, engagement, and transfer in CLE.

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Practitioner Notes

1. Adopt VR design approaches in legal education to strengthen practical learning experiences.
2. Prioritise realistic scenarios and user-friendly environments when designing VR applications for legal education.
3. Align VR integration with pedagogical objectives to ensure educational relevance and instructional coherence.
4. Examine how VR can be adapted to theory-based legal teaching in order to support knowledge acquisition and skill development.
5. Promote collaboration between legal and IT institutions to expand the use of VR in training and professional development.

Keywords

Immersive VR, Virtual environment design, Clinic education, Delphi technique, Legal education

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Introduction

Law schools face growing pressure from the legal profession and external stakeholders to demonstrate stronger links to real-world practice (Şimşek & Aygün, 2020). At the same time, legal education has long been criticised for privileging doctrinal and theoretical instruction over experiential and practice-oriented learning (Sanmartin & Niemi, 2023). Clinical legal education (CLE) offers a pedagogically grounded response by embedding learning in practice-like settings and integrating legal theory with professional application. CLE encompasses approaches that may not always be explicitly labeled "clinical," yet share a common emphasis on learning through experience. Originating from medical training, the clinical model refers to hands-on learning in which students work with simulated or real clients or engage alongside legal professionals (Duncan, 2005; Brozovic, 2023; Evans et al., 2017; Giddings, 2013). Law clinics serve as educational settings where students identify, investigate, and apply knowledge in contexts that partially mirror professional legal realities (Franz, 2023), supporting competencies such as case development, client interviewing and counseling, legal writing, courtroom advocacy, evidence presentation, judicial examination, and opening and closing statements (Voskobitova, 2021). In practice, experiential learning in CLE is commonly enacted through simulations, role-playing, case-based learning, client interviews, and courtroom exercises (Brozović, 2023; Kemp et al., 2016; Voskobitova, 2021).

Because CLE is fundamentally experience based, effective educational practices in this domain should support learning, performance in practice tasks, transfer to new cases and settings, and sustained engagement during demanding activities. Virtual reality (VR) is a promising tool for these aims because it can provide immersive, interactive, and replicable practice opportunities in realistic settings, supporting legal reasoning, ethical awareness, and procedural skills in a safe and lifelike environment (Yadav, 2025). VR has also been associated with educational benefits such as three-dimensional understanding, concreteness for abstract concepts, exploration of complex systems, and enhanced motivation and transfer through natural interaction (Samala et al., 2025). However, despite the historical use of technology in legal education and studies on non-immersive tools (Öngöz et al., 2017; Ryan, 2020), immersive VR in legal education remains underexplored. Doğan and Şahin (2024b) identified very limited research linking legal education and VR, indicating a gap regarding immersive VR environments and CLE.

This gap is amplified by the fact that clinical VR research has predominantly focused on healthcare (Aura et al., 2015; Birckhead et al., 2019; Chittaro et al., 2017; Cook et al., 2010; Fertleman et al., 2018; Harrington et al., 2018; Rovira & Slater, 2017; Stavropoulos et al., 2017; Ventola, 2019), while design standards for clinical virtual environments remain insufficiently defined (Birckhead et al., 2019). In Türkiye, CLE has attracted growing attention; the Ministry of Justice's 2015 Judicial Reform Strategy set an objective to develop legal clinic methods, and the Union of Turkish Bar Associations includes law clinics among standards for legal education (TBA, 2017). As CLE initiatives expand, there is a practical need for a pedagogically defensible, context-aware basis for designing VR-supported CLE experiences.

Accordingly, this study employed a Delphi method with an interdisciplinary expert panel in Türkiye to identify key design criteria for immersive VR environments used in law clinics and to examine the conceptual relationships among the resulting design dimensions. Expert-derived criteria are valuable here because they convert professional expectations and local constraints into explicit design requirements that can guide development and subsequent empirical testing, supporting a shift from confirming generic VR features toward contextualised refinement, informed decision making, and the development of a research roadmap. In line with the aim of the study, the following research questions were addressed:

1. Which immersive VR design criteria are prioritised by experts as essential for VR-supported CLE in law clinics?
2. How do experts conceptualise the relationships among key design dimensions?

Literature Review

Experiential Learning

Experiential learning refers to learners' active engagement in authentic contexts through which knowledge, skills, and affective competencies are developed via direct and meaningful experience (Kolb, 1984; Morris, 2020). A central mechanism in this process is reflection: professional learning is strengthened when learners continuously examine their actions, outcomes, and decisions in light of experience (Giddings & Weinberg, 2020). Consistent with this view, İspir (2025) notes that as novice lawyers accumulate experience, their capacity for intuitive decision-making improves. From this perspective, CLE provides a natural pedagogical platform for translating legal theory into practice by offering structured opportunities for action, feedback, and reflection within practice-like tasks. Experiential learning also implies a clear design requirement: learning environments should be deliberately designed to support knowledge construction. Such environments may take the form of authentic real-world settings or virtual simulations that recreate aspects of reality that may be difficult to access directly (Samala et al., 2025; Winn, 1993). This perspective highlights the pedagogical relevance of VR for CLE, as it can offer realistic yet controlled settings in which learners repeatedly engage in practice-like tasks and develop professional competencies.

Furthermore, this theoretical grounding clarifies what effective VR-supported CLE should aim to achieve. Effectiveness should not be reduced to usability alone; rather, it should be evaluated in terms of whether VR supports experiential learning cycles that enable meaningful action, timely feedback, purposeful reflection, and transfer to future cases. Accordingly, the next subsection conceptualises VR as both a technological and experiential phenomenon, focusing on experiential qualities such as presence, interaction, feedback, and realism that can shape learning, performance, transfer, and engagement in CLE contexts.

Virtual Reality in Legal Education

Virtual Reality (VR) refers to an electronic simulation environment experienced through devices such as head-mounted displays and wearable technologies, enabling interaction within immersive three-dimensional environments (Coates, 1992). Beyond hardware centred definitions, VR can also be understood as an experiential phenomenon, characterised by a sense of *being there* in real or simulated environments (Reeves, 1991). This experiential emphasis is particularly relevant to CLE because the pedagogical value of VR depends on the quality of the learner experience rather than the mere presence of technology. Immersive VR can support knowledge acquisition and construction by enabling learners to interact with lifelike scenarios and observe the consequences of their actions in a controlled environment (Zhong et al., 2025). This potential has contributed to the growing adoption of VR across educational institutions for training and learning purposes (Çoban et al., 2022; Rojas-Sánchez et al., 2023). In practice-oriented contexts, immersive VR can further strengthen experiential engagement through interaction, realism, and immediate feedback via sensory channels (Doğan et al., 2024; Doğan & Şahin, 2024a).

Recent discussions also suggest that legal education must evolve to meet the demands of the digital age by placing greater emphasis on practice-based training (Nath et al., 2025). Several studies have explored the use of VR in legal education (Vargas Murillo et al., 2024). Rocheleau et al. (2025) examined the effectiveness of role-playing during a virtual court trial for increasing knowledge and empathy among criminal justice students, reporting gains in knowledge but no meaningful change in empathy. Xing et al. (2025) present VR as an accessible and cost-effective alternative to physical moot courts, highlighting its potential to widen access to experiential learning and support practical legal training at scale. Within this emerging evidence base, Doğan et al. (2024) reported that immersive VR positively influenced flow in legal education, and Cho et al. (2024) emphasised that the success of VR applications in legal education is closely related to realism, presence, perceived ease of use, and learning outcomes. However, despite these studies on VR use in legal education, the literature still lacks a clear account of which design features determine the educational quality of VR for CLE. In other words, research has begun to demonstrate that VR can be useful, but there remains limited guidance on how to design and evaluate VR to meet the specific pedagogical and professional demands of clinic-based learning.

If VR's educational promise in CLE rests on immersion, feedback, and interaction, design principles must specify how these features should be operationalised to support clinical tasks, professional judgment, and transfer, rather than merely producing a realistic scene. For this reason, the next subsection synthesizes educational VR design principles and frameworks as the most direct pathway from VR as an experiential medium to criteria that can guide development and empirical testing.

Virtual Environment Design

Table 1 summarises the key studies and frameworks that inform educational VR design and collectively point to recurring design requirements such as immersion, interactivity, realism, presence/agency, feedback, usability, accessibility (universal design), scenario authenticity, and representational fidelity (Chavez & Bayona, 2018; Doğan, 2021; Doğan & Şahin, 2024a; Koivisto et al., 2018; Makransky & Petersen, 2021; Mulders et al., 2020; Radianti et al., 2020; Suh & Prophet, 2018).

Table 1

Design features

Study	Design features (summary)
Chavez & Bayona (2018)	Interactivity, immersive interfaces, realistic environments; clear instructions, usability, autonomy, navigational tools, presence-related features, evaluation mechanisms, flexible configuration options
Makransky & Petersen (2021)	Presence and agency; immersion levels, control mechanisms, representational fidelity (for transfer)

Koivisto et al. (2018)	Embed learning objectives in design; authentic scenarios; interaction with characters and environment; meaningful options; continuous feedback; high-quality graphics/audio
Mulders et al. (2020)	Align immersive features with instructional design goals; immersion, interactivity, imaginative engagement
Suh & Prophet (2018)	Technological stimuli (visual/auditory/haptic, tracking, fidelity) evoke engagement, immersion, presence, flow, situated cognition, psychological ownership
Radianti et al. (2020)	Realistic environments; instructional guidance; immediate feedback; knowledge testing; role-playing; interactive exploration; user decision-making; user-to-user interaction
Doğan (2021), Doğan & Şahin (2024a)	Immersion, diversity, software–hardware compatibility; aesthetic and ergonomic design; universal design for accessibility; user guidance; usability; retesting scenarios; reducing expertise barriers

Table 1 indicates that educational VR design principles are well documented; however, the literature provides limited empirical guidance for translating and prioritizing these principles in discipline-specific settings, such as VR-supported CLE, where clinical tasks, ethical obligations, and professional communication norms impose additional constraints and quality expectations. In response, the present study identifies key design criteria for immersive VR environments used in legal clinics and organizes these criteria into a comprehensive model to guide the design and evaluation of VR-supported CLE experiences. This contribution moves beyond confirming generic VR features by offering a contextualized refinement aligned with the pedagogical and practical requirements of legal clinics.

Methodology

The Delphi Technique was selected as the methodological foundation for this study because designing immersive VR environments for CLE requires the integration of interdisciplinary expertise spanning law, instructional design, and educational technology. Known for its interactive and iterative nature, this technique aims to build consensus and may involve multiple rounds (Cyphert & Gant, 1970; Rockart & Morton, 1975). The technique gathers expert insights within a specific domain, facilitates consensus, and informs predictions or decisions (Nworie, 2011). According to Dalkey (1972) and Fowles (1978), the key attributes of the Delphi Technique include anonymous participation, statistical aggregation of responses, and controlled feedback. Once opinions are collected anonymously using structured instruments, the responses are statistically analyzed. The outcomes are then shared with the group through a process called controlled feedback. Based on this feedback, the data collection instruments are revised and the cycle is repeated. This iterative process is vital for achieving group consensus (Nworie, 2011). Given the limited empirical evidence and the absence of framework, the Delphi method offered a systematic and reflective approach for eliciting, refining, and validating expert judgments. Its iterative and feedback-driven nature not only supports the identification of consensus on complex issues but also facilitates the development of theoretically grounded models through collective reasoning (Green, 2014; Skulmoski et al., 2007).

Selection of Experts

The panel was formed through criterion sampling, a purposive sampling approach in which participants were selected based on predefined criteria aligned with the study's aims. In total, 20 field experts from Türkiye were included as panelists, as professionals and academics with expertise relevant to CLE and immersive VR design. Given the interdisciplinary scope of this study, combining legal expertise with instructional technology and VR design perspectives, a heterogeneous panel of 20 experts was considered appropriate as suggested by Bozkurt (2013).

The Delphi procedure was administered in Turkish to ensure conceptual clarity and to enable participants to express nuanced judgments in their native language. For transparency and replicability, the English terminology used in the manuscript was aligned with the Turkish wording used in the Delphi materials; where necessary, terms and items were translated with attention to conceptual equivalence (For example, the Turkish wording 'seçeneklerin/eylemlerin çeşitliliği' was translated as 'diversity and variation in available choices and actions' to retain the emphasis on branching decision paths, and 'konuşmaların baloncuk olarak gösterimi' was aligned with 'display of dialogues as speech bubbles' to reflect the intended multimodal access within the VR interface).

The selection criteria ensured complementary expertise across two profiles. The legal profile required an undergraduate degree from a Faculty of Law and either academic specialisation in information technology law or professional legal practice. The instructional technology/VR design profile necessitates graduate-level qualifications, such as a master's or doctoral degree in instructional technology, along with demonstrated experience pertinent to the design of immersive VR learning environments. Accordingly, the qualification requirement at the graduate level was applicable to the instructional technology/VR design profile, whereas the legal profile was characterized by training within the legal domain and pertinent professional or academic experience in the field of law. Table 2 presents an overview of the panelists and their respective qualifications. Thirteen panelists have expertise in virtual environments and instructional design, while the remaining seven specialise in Information Technology Law and Criminal Law (n = 20).

Table 2

Delphi Panelists

Panelists	Degree	Expertise
1-2-3-4-5-6-7-8-9	Ph.D	VR Design, Instructional Design
10-11-12-13	Ph.D	Information Technology Law, Criminal Law
14-15-16-17	Master	VR Design, Instructional Design
18	Master	Information Technology Law, Criminal Law
19-20	Undergraduate	Information Technology Law, Criminal Law

Delphi Process

To systematically identify and validate design criteria for immersive VR environments in law clinics, this study implemented a two-round Delphi process. The two-round structure was adopted to support convergence on both the content and the relative importance of the criteria while maintaining a transparent decision logic for refinement and validation.

Establishing and Sharing the Criteria

Before the Delphi rounds began, an initial pool of evaluation criteria was established to guide expert judgments. This pool was derived from an extensive review of empirical and theoretical studies on instructional and technological design of VR environments, particularly in educational and clinical contexts (Chavez & Bayona, 2018; Doğan, 2021; Doğan & Şahin, 2024a; Koivisto et al., 2018; Makransky & Petersen, 2021; Mulders et al., 2020; Radianti et al., 2020; Suh & Prophet, 2018; Wohlgenannt et al., 2019). Drawing on these sources, eight dimensions and twenty-nine initial criteria were identified to represent both pedagogical and technological components of immersive VR design for law clinics (Table 3). To ensure a common interpretive frame across the panel, the criteria were presented with written descriptions clarifying what each item meant and how it could operate within VR-supported CLE tasks, enabling experts to evaluate the same underlying construct rather than divergent interpretations.

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Table 3

Linking CLE-grounded requirements with VR/Educational design criteria (initial pool shared with the Delphi panel)

Dimension	CLE criteria (domain-grounded requirement)	Author (year)	VR/Educational criteria (design feature)	Author (year)	Example in a VR-supported legal clinic	Justification / decision logic (how the criterion was derived and why it matters)
Realistic Experience	Authenticity of clinical tasks and practice conditions; professional reasoning in practice-like settings	Grimes (1996); Voskobitova (2021)	Realism in characters, virtual environment, voice-overs, animations, and scene transitions	Chavez & Bayona, 2018; Doğan & Şahin, 2024a; Makransky & Petersen, 2021; Radianti et al., 2020	Realistic Experience	Authenticity of clinical tasks and practice conditions; professional reasoning in practice-like settings
Interaction	Client interviewing /counseling; courtroom advocacy and procedural participation	Voskobitova (2021); Duncan (2005)	Voice interaction; controller-based interaction; interaction with virtual characters; interaction with virtual objects/environment	Chavez & Bayona, 2018; Doğan & Şahin, 2024a; Koivisto et al., 2018; Makransky & Petersen, 2021; Radianti et al., 2020; Suh & Prophet, 2018	Student questions a client avatar, submits exhibits, objects to opposing counsel, and responds to the judge's prompts.	CLE learning is enacted through communication and procedural action; VR design principles emphasize interaction as the mechanism enabling active learning rather than passive observation
Diversity and Variation	Exposure to varied cases/clients and professional judgments; developing adaptable strategies	Grimes (1996); Evans et al. (2017)	Variety of characters/environments/objects; variation in choices/actions	Doğan & Şahin, 2024a; Koivisto et al., 2018; Radianti et al., 2020	Different client profiles and case types; branching options that change outcomes (e.g., settlement vs. trial)	CLE competence develops through repeated engagement across varied scenarios; VR education research highlights variation/branching as supporting decision-making and broader skill transfer
Aesthetic Design	Clear professional communication and comprehensible materials in authentic settings	Giddings (2013); Evans et al. (2017)	Aesthetically pleasing court environment; interface elements (interface and dialogue representation elements)	Chavez & Bayona, 2018; Doğan & Şahin, 2024a; Koivisto et al., 2018; Radianti et al., 2020	Aesthetic Design	Clear professional communication and comprehensible materials in authentic settings

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Dimension	CLE criteria (domain-grounded requirement)	Author (year)	VR/Educational criteria (design feature)	Author (year)	Example in a VR-supported legal clinic	Justification / decision logic (how the criterion was derived and why it matters)
Ergonomic Design	Students must sustain practice without interface barriers that disrupt clinical flow.	Brozović (2023); Evans et al. (2017)	Responsive controller performance; ease of control; adequate spatial design	Chavez & Bayona, 2018; Doğan & Şahin, 2024a; Makransky & Petersen, 2021; Wohlgenannt et al., 2019	Controllers respond reliably; navigation does not cause fatigue; and interaction zones align with the courtroom layout.	Clinical VR design work emphasizes ergonomics/usability to prevent "technology friction" from undermining learning.
Universal Design	Inclusive access to clinical learning opportunities (communication and navigation)	Evans et al. (2017); Giddings (2013)	Dialogues as speech bubbles (visual); voice-over support (audio); controller or physical movement (physical)	Chavez & Bayona, 2018; Doğan & Şahin, 2024a; Radianti et al., 2020; Suh & Prophet, 2018	Hearing-impaired users rely on captions; low-vision users rely on voice-overs; navigation supports different mobility needs.	CLE values equitable participation; universal design in clinical VR supports accessibility and ensures criteria apply across diverse learners
Scenario Features	Structured clinical workflow and reflective practice; iterative rehearsal aligned with clinical outcomes	Grimes (1996); Schön (1983)	Scenario info in/out of VR; retry option; realistic development; difficulty levels; user-shaped scenarios	Chavez & Bayona, 2018; Doğan & Şahin, 2024a; Koivisto et al., 2018; Mulders et al., 2020; Radianti et al., 2020; Suh & Prophet, 2018	Scenario Features	Structured clinical workflow and reflective practice; iterative rehearsal aligned with clinical outcomes
Software-Hardware Features	Feasibility and scalability of clinic-based implementation in institutional settings	Barry et al. (2000); Susskind (2017)	Affordable software costs; easy-to-use equipment	Chavez & Bayona, 2018; Doğan & Şahin, 2024a; Makransky & Petersen, 2021;	Low-cost deployment per station; minimal setup time for instructors; reliable devices	CLE innovations must be implementable; VR adoption depends on cost/usability constraints, so feasibility criteria are necessary to translate "good design" into "deployable design."

Each panelist was provided with detailed written descriptions explaining what each criterion represented and how it might operate within a VR-supported legal clinic. For example, realism was defined as enhancing users' sense of presence, whereas interaction was characterised as facilitating authentic communication and procedural practice in virtual court scenarios.

Round 1: Initial Evaluation

Following the establishment of the criteria, a structured survey was distributed in person to all experts. During the briefing session, participants received additional oral clarification regarding the Delphi process and the study's educational aims. They were informed that their evaluations would contribute not only to establishing the most critical VR design features but also to exploring how these elements collectively shape experiential learning in virtual legal environments. In Round 1, experts rated the importance of each criterion using a five-point Likert scale, labeled "not important," "slightly important," "moderately important," "important," and "very important." The feedback collected in the first round was statistically analysed to refine the items for the second round.

Round 2: Refinement and Exploring Conceptual Relationships

In the second round, 20 criteria (after excluding nine that did not meet the consensus threshold) were redistributed to the same expert panel for further evaluation. Experts again rated each item on the same scale and were asked to analyse the conceptual relationships between the criteria, identifying which design elements might influence or depend on others, for example, whether interactivity enhances realism.

Analysis and Consensus Determination

The quantitative analysis aimed to determine the degree of agreement among experts regarding the importance of each design criterion. Measures of central tendency and dispersion including arithmetic mean, median, mode, standard deviation, and interquartile range were computed (Bozkurt, 2019). To define consensus, two numerical thresholds were established (Green et al., 1999; Hsu & Sandford, 2007):

- A minimum of 80% agreement among participants, and
- A median score of at least 4.0 on the five-point Likert scale.

Items that satisfied both criteria were considered to have reached consensus. After the first round, nine criteria failed to meet these thresholds and were therefore excluded. The remaining twenty criteria were re-evaluated during the second round, and all achieved consensus. Because the panel's evaluations demonstrated strong convergence and conceptual stability, a third Delphi round was deemed unnecessary.

In addition to the quantitative data, a short open-ended section was included in the second-round survey to capture experts' reflections on the relationships among the seven dimensions (e.g., interactivity, realism, diversity, etc.). Experts were asked to indicate which dimensions might influence or be influenced by others, for instance, interactivity→realism or diversity→realism. These directional responses were then examined collectively to identify recurring patterns of interdependence between design dimensions. This approach provided insight into the structural relationships within the framework rather than narrative justifications.

The interpretation of these short relational inputs followed the general logic of Delphi textual analysis as described by Vegas and Basili (2005), where expert inputs are descriptively analysed and synthesised to enhance conceptual understanding. In line with their principles:

- When multiple experts indicated the same directional relationship (e.g., interactivity → realism), that relationship was accepted as a verified linkage.
- If only one expert proposed a specific relationship, it was accepted only if it aligned conceptually with the theoretical logic of VR-based learning environments.
- Relationships that lacked conceptual clarity or conflicted with the majority view were disregarded based on the panel's evaluations

This procedure ensured that the qualitative phase contributed systematically to the identification of meaningful interconnections among the core dimensions of VR design. The integration of quantitative and qualitative findings produced a comprehensive understanding of expert consensus. Quantitative analysis confirmed which design criteria were universally considered important, while the qualitative responses revealed how the key dimensions conceptually interacted within the framework.

Results

First Delphi Round

The criteria identified during the initial round of the Delphi study were rated for their significance by the expert panelists. Table 4 summarizes the criteria that met the established consensus and median thresholds in the first round.

Table 4

Statistical summary of the first Delphi round

Criteria	%	Median
Realistic Experience		
1. Ensuring realism in characters	90	5
2. Ensuring realism in the virtual environment	90	4.5
3. Ensuring realism in voice-overs *	65	4
4. Ensuring realism in animations	80	4
5. Ensuring realism in scene transitions *	70	4
Interaction		
6. Interaction with voice *	55	4
7. Interaction with the controller	95	4
8. Ability to interact with characters *	50	3.5
9. Ability to interact with the virtual environment and its objects	85	4

Diversity and Variation		
10. Diversity of virtual characters *	35	3
11. Diversity of the virtual environment *	25	3
12. Diversity of virtual objects	80	4
13. Variation in the choices and actions available in the virtual environment	80	4
Aesthetic Design		
14. The virtual environment (court environment) should be aesthetically pleasing *	60	3.5
15. Aesthetic elements such as interface and dialogue representation elements in the virtual environment *	45	3
Ergonomic Design		
16. Ensuring the responsiveness of the controllers	90	4
17. Providing ease of control within the virtual environment	95	5
18. Ensuring that the virtual application area is sufficiently spacious	80	4
Universal Design		
19. Displaying dialogues in the scenario in the form of speech bubbles (visual)	80	4
20. Providing voice-over for the dialogues in the script (audio)	80	4
21. Offering the option of movement through both controller and physical movement in the virtual environment (physical).	85	5
Scenario Features		
22. Providing information about the scenario within the virtual environment	80	4
23. Providing information about the scenario outside the virtual environment *	10	3
24. Offering the opportunity to retry the scenario *	40	3
25. Realistic creation of the scenario	100	4
26. Providing difficulty levels in scenarios	90	4
27. Shaping scenarios according to user choices	80	4.5
Software-Hardware Features		
28. Affordable software cost	80	4
29. Easy-to-use equipment	90	4.5

Note. The percentage (%) represents the total of scores rated as 4 and 5 by the panelists on the five-point Likert-type scale.

* Items eliminated in the first round

A review of Table 4 reveals the consensus levels and median values for the 29 criteria evaluated across eight dimensions at the conclusion of the first Delphi round. Notably, the Aesthetic Design dimension, along with all associated criteria, was excluded from further consideration due to falling below the predetermined consensus threshold. In addition, criteria 3, 5, 6, 8, 10, 11, 14, 23, and 24 were eliminated at this stage of evaluation because they did not meet the required consensus level (<80%) and median score (<4).

Second Delphi Round

During the second round of the Delphi process, the 20 criteria that had achieved consensus in the first round were re-evaluated by the expert panelists in terms of their importance. An overview of these criteria, including their consensus levels and median values as determined in the second round, is presented in Table 5.

Table 5

Statistical summary of the second Delphi round

Criteria	%	Median
Realistic Experience		
1. Ensuring realism in characters	95	5
2. Ensuring realism in the virtual environment	100	4.5
4. Ensuring realism in animations	90	4
Interaction		
7. Interaction with the controller	95	4
9. Ability to interact with the virtual environment and its objects	90	4
Diversity and Variation		
12. Diversity of virtual objects	90	4
13. Variation in the choices and actions available in the virtual environment	95	4
Ergonomic Design		
16. Ensuring the responsiveness of the controllers	95	5
17. Providing ease of control within the virtual environment	95	5
18. Ensuring that the virtual application area is sufficiently spacious	90	4.5
Universal Design		
19. Displaying dialogues in the scenario in the form of speech bubbles (visual)	90	4
20. Providing voice-over for the dialogues in the script (audio)	90	4
21. Offering the option of movement through both controller and physical movement in the virtual environment (physical).	90	5
Scenario Features		
22. Providing information about the scenario within the virtual environment	90	4
25. Realistic creation of the scenario	100	5
26. Providing difficulty levels in scenarios	100	4
27. Shaping scenarios according to user choices	85	5
Software-Hardware Features		
28. Affordable software cost	90	4
29. Easy-to-use equipment	95	5

The percentage (%) represents the total of scores rated as 4 and 5 by the panelists on the five-point Likert-type scale.

Based on the data presented in Table 5, the 20 criteria were retained after re-evaluation by the expert panelists, as they met the predefined consensus threshold of at least 80% agreement and a median score of 4 or higher. As a result, the virtual environment is now defined by seven dimensions and 20 essential criteria. The interrelationships among these dimensions, as determined by the expert panel's evaluations, are illustrated in Figure 1.

Figure 1

Relationships Between VR Design Dimensions

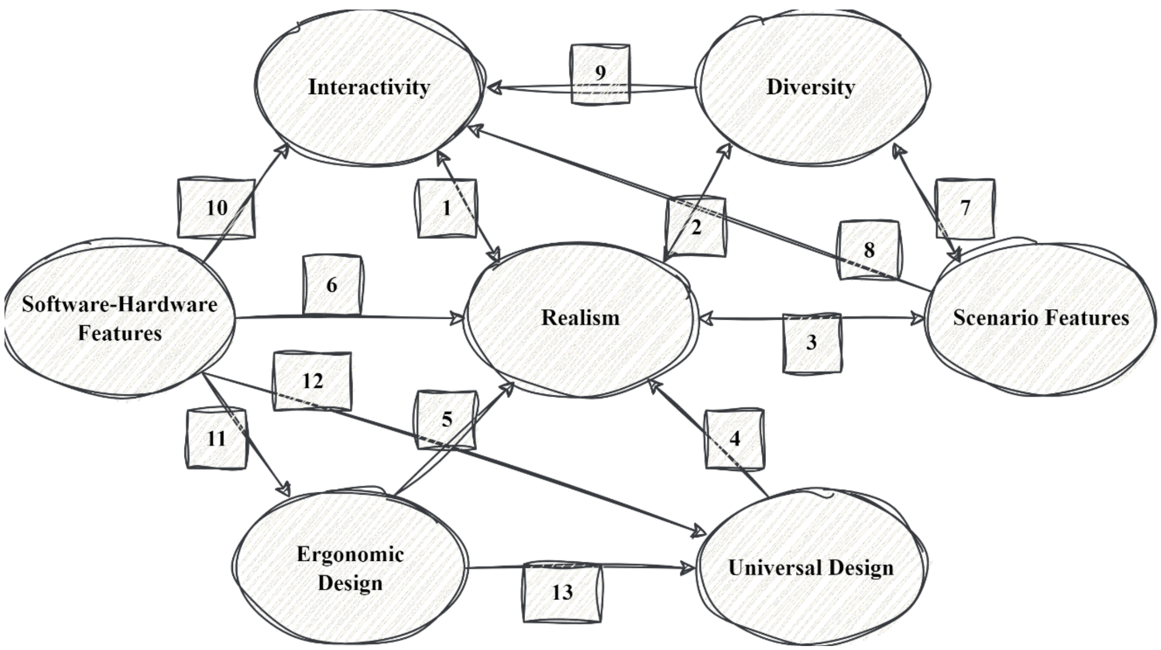

Figure 1 depicts the interconnections among the virtual environment design dimensions derived from expert opinion, yielding 13 relational paths. Realism emerged as a hub construct, interrelated with all other characteristics. The expert panel agreed that interactivity, diversity, scenario features, universal design, ergonomic design, and software-hardware features directly shape the realism of the virtual environment. In turn, interactivity is influenced by realism, diversity, scenario features, and software-hardware features (paths 1, 8, 9, and 10), indicating that meaningful interaction depends not only on the fidelity of the experience but also on environmental variety, scenario quality, and technological capability. Diversity is influenced by realism and scenario features (paths 2 and 7), while scenario features are reciprocally shaped by diversity and realism (paths 3 and 7), suggesting a tightly coupled design logic in which authentic scenarios and rich environments co-develop with perceived realism. Universal design is affected by ergonomic design and software-hardware features (paths 12 and 13), and ergonomic design is primarily impacted by software-hardware features (path 11), highlighting the enabling role of technical infrastructure in accessibility- and usability-related outcomes.

These relationships indicate how the finalised criteria can operate as an integrated design system for CLE rather than as isolated features. Consistent with this interpretation, an immersive VR environment was developed in line with the CLE-specific immersive VR criteria, and law students reported a stronger sense of flow while working on case-based activities in the criteria-driven immersive VR setting (Doğan et al., 2024). Given that experiential learning requires learners to actively engage in authentic contexts and reflect on their experiences to support professional learning (Kolb, 1984; Ueno, 1993; Schön, 1983), and that immersive VR can support knowledge construction and learning transfer through mechanisms such as immersion, presence/agency, and representational fidelity (Makransky & Petersen, 2021; Shelton & Hedley, 2004; Winn, 1993), the observed increase in flow can be interpreted as a meaningful indicator of sustained engagement aligned with the intended outcomes of CLE. Accordingly, these criteria can be considered functional for supporting experiential learning outcomes in CLE, particularly skill development and application in authentic legal tasks, and transfer to new cases and contexts.

Discussion

This study clarifies the design features required to develop immersive VR environments that can meaningfully support practice-oriented learning in legal clinics. Using a Delphi process with 20 experts spanning VR design, instructional design, information technology law, and criminal law, the study moved beyond a generic inventory of VR features by producing a prioritised and context-sensitive set of criteria aligned with the pedagogical demands of CLE. Of the 29 criteria evaluated in Round 1, nine were excluded because they did not meet the predefined consensus thresholds, whereas the remaining 20 criteria reached consensus in Round 2. Given this convergence under the decision rules specified in the Methods section, an additional round was not required. This pattern is consistent with the nature of Delphi research in heterogeneous panels, where complete unanimity is not always expected, and where stable convergence provides a credible basis for finalisation.

At the level of the virtual environment, the finalised criteria emphasise realism, interactivity, diversity, ergonomic design, universal design, cost-effectiveness, and ease of use. These findings align with prior VR education research that highlights realism and interaction as central conditions for educational value (Cho et al., 2024; Doğan & Şahin, 2024a; Makransky & Petersen, 2021; Mulders et al., 2020; Radianti et al., 2020; Wohlgenannt et al., 2019). The importance of diversity is also consistent with the idea of media richness discussed by Suh and Prophet (2018), suggesting that varied elements and options can strengthen engagement and the quality of experience. In addition, the prominence of ergonomic and software–hardware considerations is in line with prior emphasis on practical feasibility, such as the choice of open-source software and the need for an adequate physical application area (Dela Cruz & Mendoza, 2018). In CLE these pragmatic features directly influence whether learners can repeatedly engage with clinic-like tasks in a safe, sustainable, and accessible manner, which is central to experiential learning cycles.

Beyond environment-level features, the results highlight the critical role of scenario characteristics. The criteria identified by experts emphasise scenario realism, comprehensive scenario information, adjustable difficulty aligned with user proficiency, and scenario progression that responds to user choices. These emphases align with Doğan and Şahin (2024a), who argue that scenario structure is a core driver of instructional value in VR-based learning. They are also consistent with work underscoring the importance of clear guidance and informative elements within educational VR environments (Wohlgenannt et al., 2019) as well as the value of meaningful decision-making opportunities (Radianti et al., 2020). In the broader simulation literature, realistic and authentic scenarios are repeatedly associated with improved learning (Cho et al., 2024; Cook et al., 2010; Koivisto et al., 2018; Rizzo et al., 2011). In CLE, this scenario emphasis is particularly consequential because scenarios function as the mechanism through which learners rehearse procedural steps, practice professional communication, and make decisions under practice-like constraints while remaining in a controlled and replicable learning setting.

A key contribution of this study lies not only in identifying criteria but also in clarifying how core dimensions relate as an integrated system. Realism emerged as a foundational condition shaping the feasibility and educational value of other dimensions. This finding resonates with evidence that realism supports immersion (Dalgarno & Lee, 2010) and with work connecting immersion and interactivity to learning processes in immersive environments (Makransky & Petersen, 2021; Suh & Prophet, 2018). The expert-derived relationships further indicate that interactivity depends on realism, diversity, scenario features, and software–hardware capabilities; that diversity and scenario features are mutually reinforcing with realism; and that universal design and ergonomic design are enabled by software–hardware features. This system's view matters for practice because it converts a list of criteria into coherent decision logic. When resources are constrained, design efforts can be staged by focusing on enabling conditions that unlock multiple outcomes, rather than optimising isolated features that cannot function effectively without supporting foundations.

Thus, from a CLE standpoint, these results provide a defensible basis for defining what effective VR-supported clinical training should achieve and the design conditions most likely to support those aims. Experiential learning requires active engagement in authentic contexts and reflection on consequences for professional learning (Kolb, 1984; Morris, 2020; Schön, 1983; Ueno, 1993). The criteria identified here operationalise this pedagogical requirement by specifying how a VR environment should be designed to enable practice-like activity that is robust, educationally meaningful and able to be revisited over time. In this sense, the criteria should be treated as a foundation for development and testing rather than an endpoint. Each criterion can be translated into design requirements, such as clarifying what the environment must include to support realistic procedural practice, and into measurable outcomes, such as indicators of learning, performance, transfer, and engagement assessed in subsequent studies. The framework, therefore, supports a research roadmap through which future work can experimentally examine how changes in specific design dimensions influence CLE-relevant outcomes in case-based tasks.

Finally, the focus on law clinics was deliberate because CLE is a practice-oriented model closely aligned with experiential learning. While traditional clinics provide valuable opportunities to apply legal theory to realistic cases, access is often constrained by ethical, logistical, and institutional considerations. Immersive VR offers a way to safely replicate and repeat these experiences, supporting the development of legal, cognitive, and interpersonal competencies under controlled conditions. Although the criteria identified in this study are grounded in the needs of CLE, the broader structure of the framework is potentially applicable to other practice-based domains in higher education where authentic, high-stakes experiences are essential. At the same time, transfer to other domains should be approached as contextual adaptation, given that scenario structures, professional norms, and task demands vary across disciplines. In this sense, the law clinic functions as a contextual anchor, and the framework provides a structured basis for designing and empirically testing VR-based experiential learning across different practice-oriented settings.

Conclusion and Implications

This study contributes to the emerging literature on immersive VR in CLE by identifying key design features for VR-supported legal clinics through a structured expert consensus process. Relatively few studies have translated educational and clinical VR design principles into a coherent, context-sensitive set of criteria that is explicitly anchored in the pedagogical requirements and practice conditions of law clinics. The contribution of this study lies in contextualizing and refining design criteria for CLE, and in organising them as a model that can guide both development decisions and subsequent empirical testing.

Across the Delphi rounds, the study refined an initial pool of 29 criteria into a finalised set of 20 criteria organised across eight dimensions. At the scenario level, the results emphasised informative elements within the virtual environment, fidelity to reality, difficulty adjustment aligned with learner proficiency, and outcomes that vary based on user responses. At the environment level, the results highlighted realism, interaction, diversity, ergonomic and universal design principles, as well as the importance of affordability and user-friendly interfaces. Taken together, these outcomes support the view that immersive VR for CLE should be designed as a pedagogically purposeful system rather than as a technically impressive simulation, with design choices aligned to the experiential and practice-oriented logic of clinical learning.

Theoretical Implications

The framework reinforces and extends educational VR design scholarship by showing how multiple design dimensions jointly shape the feasibility and educational value of immersive learning experiences in a practice-based domain. By drawing on interdisciplinary expert judgment to identify and organize key criteria, the study provides a structured basis for theory-building around how instructional priorities and immersive environments can be aligned to support outcomes relevant to CLE, including learning, performance, and transfer in case-based activities. The interconnections among dimensions also advance the discussion beyond which features matter toward how features work together, offering a conceptual structure that future studies can use to formulate testable hypotheses about mechanisms linking design decisions to experiential and professional learning processes.

Practical Implications

For practice, the criteria identified in this study provide actionable guidance for educators, instructional designers, and developers seeking to design or evaluate VR-supported clinic experiences. The emphasis on affordability and user-friendly interfaces supports institutional decision-making for sustainable adoption, while attention to ergonomic and universal design foregrounds the potential for repeated participation and accessible engagement. Legal and information technology institutions may also use VR environments designed in line with these criteria for professional training, particularly for rehearsing procedures and communication in safe but practice-like conditions. In short, the framework supports practical development by clarifying how design decisions can be staged when resources are limited and by indicating the minimum conditions required for clinic-like learning in immersive environments.

Translating the Criteria into Design Requirements and Measurable Outcomes

The finalised criteria can be operationalised as implementable design requirements and corresponding measurable outcomes, enabling the framework to inform both development and subsequent empirical testing. First, realistic experience can be translated into requirements such as credible character behavior, context-appropriate audio–visual cues (e.g., voice-overs), coherent scene transitions, and procedural fidelity in courtroom or clinic settings. These requirements can be evaluated through indicators of immersion and presence as well as performance on procedural tasks embedded in the simulation. Second, interaction can be operationalised through multimodal input and manipulation options (e.g., voice interaction, controller-based actions, and interaction with virtual characters and objects), allowing learners to rehearse communication and procedural steps. These features can be evaluated through task completion accuracy, decision quality, frequency and quality of user actions, and evidence of transfer to novel case variations.

Third, diversity and variation can be operationalized by offering multiple character profiles, object sets, and environmental variations, together with alternative choices and actions that yield different consequences. This dimension can be evaluated through learner ability to adapt strategies across different case configurations, as well as improvements in decision-making across varied scenarios. Fourth, aesthetic design can be translated into a visually coherent court environment and clear interface elements (e.g., interface and dialogue representation elements) that support comprehension without distracting from the task. Outcomes can be assessed through usability indicators, perceived clarity of information presentation, and sustained engagement during case activities.

Fifth, ergonomic design can be implemented through responsive controllers, intuitive control mappings, and adequate spatial design of the application area to minimise friction during repeated practice. This dimension can be evaluated using usability metrics, error rates attributable to control issues, physical comfort, and the smoothness of procedural execution over time. Sixth, universal design can be operationalised through multimodal access to information and flexible navigation options (e.g., visual speech bubbles, audio voice-over support, and controller-based or physical movement-based navigation). These features can be evaluated through participation and usability indicators across users with varying needs and preferences, as well as evidence that learners can complete equivalent tasks regardless of modality choice.

Seventh, scenario features can be implemented through realistic scenario progression, comprehensive information provided inside and outside the VR environment, adjustable difficulty aligned with learner proficiency, opportunities to retry, and branching pathways shaped by user choice. These requirements can be evaluated through learning gains across repeated attempts, improvements in procedural performance, and decision-making quality under increasing challenge levels. Finally, software–hardware features can be operationalised through affordable software decisions and easy-to-use equipment that reduce implementation barriers and support scalability. Outcomes can be assessed through deployment feasibility indicators (e.g., setup time, stability, and instructor workload) and adoption-related measures relevant to institutional implementation.

Limitations and Future Research

Several limitations should be considered when interpreting these findings. First, the Delphi panel comprised 20 experts; although intentionally interdisciplinary, the results reflect the judgments of this specific group. Panels with different professional profiles or varying levels of familiarity with CLE and immersive VR may identify different criteria. Second, the framework is grounded in expert consensus and was designed to support development and evaluation; its educational value ultimately depends on implementation and testing in authentic instructional settings. The criteria have already been used to design an immersive VR environment for CLE, and preliminary evidence suggests that law students reported a stronger sense of flow during case-based activities conducted in the criteria-driven VR setting (Doğan et al., 2024). This prior application supports feasibility and learner experience; however, it does not establish comprehensive evidence of learning gains, performance improvement, or transfer across diverse CLE tasks and learner populations. Third, the criteria were developed for VR-supported legal clinics in a specific institutional and cultural context; while many of the dimensions are relevant to other practice-based fields, transfer should be approached as contextual adaptation, given that scenario structures, professional norms, and task demands vary across disciplines. Finally, constraints related to hardware availability, software costs, physical space, and instructional staffing may affect the extent to which the criteria can be realised, influencing scalability across institutions.

Building on these limitations, future research should examine how immersive VR environments designed in line with the identified criteria influence outcomes aligned with CLE and experiential learning, including performance on procedural tasks, the quality of legal reasoning in case work, and transfer to novel scenarios. Future studies should also move beyond learner experience indicators such as flow by incorporating multi-source evidence, including performance-based assessments, rubric-based evaluations of procedural competence, and system log data capturing decision-making, interaction patterns, and improvement across repeated attempts. In addition, research should explore whether the relative importance of specific criteria varies according to user characteristics and prior experience with VR and CLE-related practice, and whether different learner profiles benefit from different design emphases (e.g., higher guidance versus higher autonomy). Design-based research embedded in real CLE courses could iteratively implement and refine the criteria while documenting practical constraints, instructor workload, and institutional feasibility, particularly with respect to software–hardware limitations and scalability. Finally, cross-context replications are needed to adapt and test the framework in other practice-based higher education domains and institutional settings, clarifying which criteria remain stable across contexts and which require domain-specific refinement.

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Supervision, Project administration. Ferhan Şahin: Conceptualisation, Methodology, Validation, Formal analysis, Data curation, Writing - Original Draft, Writing - Review & Editing

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