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PAPER

The Motivational Architecture of Mobile Virtual Reality: An Evidence-Informed Structural Model for Enhancing Art Education

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ABSTRACT

This systematic literature review (SLR) develops an evidence-informed structural model to explain how mobile immersive virtual reality (IVR) design conditions influence student motivation and teaching effectiveness in higher art education. Using a theory-based approach and Design and Development Research (DDR) principles, the study searched major academic databases, including Scopus, Web of Science, and ERIC, to identify and analyse 19 key studies published from 2021 to 2025. The results show a dual-pathway mechanism. Positive psychological factors, such as presence and sense of agency (SoA), boost different parts of Keller's ARCS motivation model (Attention (A), Relevance (R), Confidence (C), Satisfaction (S)). At the same time, the model identifies a negative pathway in which hardware problems, additional cognitive load, and cybersickness lower student C and S. Together, these findings yield 10 testable ideas and show that technology features alone do not ensure learning transfer. In conclusion, real teaching effectiveness depends on clear instructional design choices. This framework offers essential practical guidance for art educators by recommending the systematic integration of mobile IVR configurations within studio-based, scaffolded critique, defence, and revision cycles.

KEYWORDS

immersive virtual reality (IVR), higher art education, student motivation, ARCS, presence, sense of agency (SoA), teaching effectiveness

1 INTRODUCTION

Digital transformation has changed higher education, moving away from traditional, instructor-focused teaching toward more dynamic, technology-driven approaches [1]. In higher art and creative education, this shift presents both challenges and opportunities, as teaching must now consider complex spatial, aesthetic, and creative dimensions [2]. Studio-based art education has traditionally

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depended on physical environments, tangible media, and in-person formative critique to develop artistic competence, spatial literacy, and aesthetic sensibility [3]. Nevertheless, geographic, financial, and logistical constraints associated with maintaining specialised studios and accessing global cultural artefacts have created a pressing need for scalable digital alternatives.

Immersive virtual reality (IVR) has attracted considerable academic attention (A) for its ability to overcome physical constraints by generating computer-based, three-dimensional environments [4]. Within these environments, students can engage with complex artistic objects, simulated realities, and virtual exhibitions. By integrating visual, auditory, and tactile stimuli, IVR creates interactive workspaces that facilitate active experimentation, reflective learning, and creative problem-solving.

Mobile virtual reality (Mobile VR), which uses a system that works with smartphones, makes immersive learning much more accessible. Unlike expensive, high-end VR setups that require special equipment and space, Mobile VR is scalable, portable, and flexible. This means art classes can go beyond the limits of a traditional classroom [5]. Although Mobile VR offers many possibilities for higher education in the arts, using it in real teaching situations has revealed a key challenge [3]. A study [2] reported that immersive environments provide students with a strong sense of presence and control. These environments enable engagement with 3D spaces, experimentation with digital sculpture, and exploration of virtual galleries without concerns about material waste or errors. However, research frequently indicates that such benefits may be constrained or negated by practical challenges.

The primary concern involves the technological and physiological friction inherent in Mobile VR hardware, which often results in usability challenges, emotional frustration, and acute physiological discomfort, including cybersickness, dizziness, and eyestrain [6]. A review of current research shows there is a major gap in theory and structure. Although many studies describe the general benefits of VR in science and engineering, there is little work that clearly explains how Mobile VR design affects student motivation and teaching success in higher art institutions.

This systematic literature review (SLR) aims to develop an evidence-informed framework that explains how Mobile VR design conditions influence student motivation and teaching effectiveness in higher art education. The study identifies key Mobile VR design factors and examines their positive and negative motivational effects within art learning environments. Furthermore, the review synthesises empirical evidence to construct a structural framework that elucidates the relationship between Mobile VR-supported motivation and improved teaching effectiveness in higher art education.

2 METHODOLOGY

2.1 Research design

A theory-driven, evidence-informed conceptual research approach was employed, guided by the principles of design and development research (DDR). DDR emphasises the systematic study of the design, development, and evaluation of instructional programmes, processes, and models [7]. As this investigation centres on the early-stage development of an explanatory framework, rather than empirical testing of operational software, the research logic is based on identifying structural components and analysing their systemic relationships. The research design integrates SLR protocols with DDR modelling principles. Instead of viewing the literature search solely as retrospective, the SLR process is used as an empirical evidence-gathering tool to isolate, define, and connect components within a structural model.

2.2 Data sources and search strategy

This study utilised targeted searches within comprehensive academic databases and specialised indexing systems, including “Scopus”, “Web of Science (WoS)”, and “ERIC”. These platforms were selected to identify interdisciplinary research at the intersection of human-computer interaction, educational psychology, and art education. Boolean operators were used to connect three main keyword groups: Mobile VR technologies, motivational variables, and higher art education. To ensure comprehensive coverage of emergent structural concepts in this interdisciplinary domain, database searches were supplemented with snowball sampling. The process incorporated backward citation tracking, which involved screening the reference lists of retrieved papers, and forward citation tracking, which entailed examining newer studies that cited these papers. This supplementary strategy aimed to identify foundational validation models, such as the cognitive affective model of immersive learning (CAMIL), as well as contemporary empirical field studies. Table 1 shows the search strategy and database used in the SLR method.

Table 1. Search strategy and database used for SLR

Database	Search Field	Search Keywords and Title
Web of Science	Topic (TS)	TS = (“mobile virtual reality” OR “virtual reality” OR “VR”) AND (“art education” OR “design education” OR “higher education”) AND (“motivation” OR “engagement” OR “ARCS” OR “self-efficacy”) AND (“presence” OR “agency” OR “embodiment” OR “cognitive load” OR “cybersickness”)
Scopus	Title-Abs-Key	TITLE-ABS-KEY ((“mobile virtual reality” OR “virtual reality” OR “VR”) AND (“art education” OR “design education” OR “higher education”) AND (“motivation” OR “engagement” OR “ARCS” OR “self-efficacy”) AND (“presence” OR “agency” OR “embodiment” OR “cognitive load” OR “cybersickness”))
ERIC	Keywords + Abstract	((“mobile virtual reality” OR “virtual reality” OR “VR”) AND (“art education” OR “design education” OR “higher education”) AND (“motivation” OR “engagement” OR “ARCS” OR “self-efficacy”))

2.3 Inclusion and exclusion criteria

We defined specific inclusion and exclusion criteria before the screening process, which helped us focus on papers that evaluated structural mechanisms and excluded descriptive or non-academic articles.

Inclusion criteria.

1. The study included only peer-reviewed documents such as papers, periodicals, and books.
2. Only documents published in English were included.
3. The selection covered documents published between 2000 and 2026.
4. Studies examining how VR influences and contributes to teaching were included.
5. The study included research focused on higher education.
6. Both qualitative and quantitative studies, as well as review papers, were included.
7. The study also considered theoretical and conceptual papers.
8. Papers with clear methods and data analysis techniques were included.
9. There were no geographic restrictions for inclusion or exclusion.
10. Only fully accessible articles were selected.

Exclusion criteria.

1. The study did not include media blogs or news articles.
2. Articles that were not fully accessible were excluded from the study.
3. Studies published outside the defined period were excluded.
4. Studies involving augmented and virtual reality were excluded.
5. Duplicate records were excluded.
6. Peer-reviewed papers that did not make significant contributions were excluded from the study.

2.4 Selection process and analysis technique

The article selection process was designed to follow the transparency and traceability principles in the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework. This approach ensures that other researchers can reproduce and verify the data collection steps. A double-blind screening protocol was implemented to reduce selective citation bias and minimise interpretive drift during evaluation. Two independent reviewers evaluated the titles and abstracts of the identified records against the selection criteria. Figure 1 shows the Prisma diagram.

The final methodological phase involved developing a conceptual model grounded in DDR principles. Key variables were operationally defined to differentiate constructs such as Presence and Sense of Agency (SoA) as distinct parameters. The 19 core evidence entries (E1–E19) were then mapped to specific structural relationships and classified into three evidence levels: Level A (higher education evidence), Level B (art and design studio evidence), and Level C (cross-domain theoretical validation). The consolidated evidence was subsequently formulated into 10 testable propositions (P1–P10), which represent mediation pathways, suppressive load effects, and instructional moderators for future empirical validation.

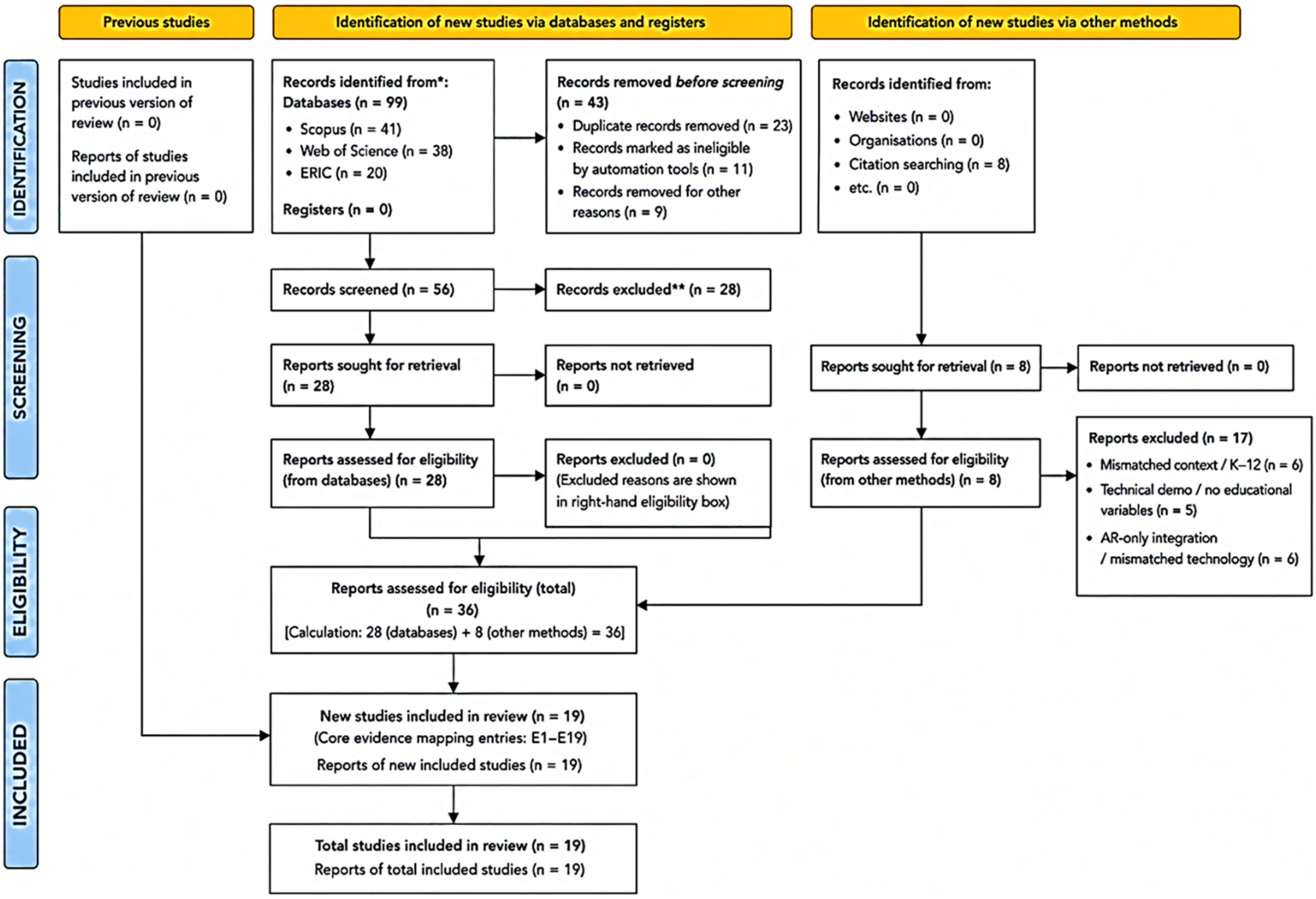

Fig. 1. PRISMA diagram

3 SYSTEMATIC REVIEW AND RESULTS

3.1 Impact of IVR on art pedagogies

Immersive virtual reality is a computer-generated three-dimensional environment where students can interact, explore, and experience objects as if they were physically present [2]. It helps keep students engaged by letting them assess realistic environments through simulated content and context. IVR uses visual, auditory [5], and tactile elements to create an immersive setting that enhances learner engagement and experience [8]. IVR can help maintain, update, and present historical records in ways that support cultural authenticity and preserve cultural heritage [9]. IVR can also be used in architectural and interior design to highlight social and cultural features that might not be covered in traditional classes. It encourages creativity, innovation, and motivation, helping art students find new ways to explore and express their ideas about the world [10, 11]. It provides students with immediate feedback, which promotes creativity and innovation through iterative learning cycles, reflection, journaling, and remaking within a multi-dimensional framework [12]. The use of a standard rubric ensures transparency and consistency, while the "seeing and acting" scale enhances situational interest, deeper learning, and engagement with minimal inconsistency [13].

3.2 IVR and classroom engagement

In educational settings, fostering active student engagement is a central responsibility of the instructor. A stimulating environment transforms passive participation into active involvement, facilitating the representation of real-life objects through IVR technology [13]. Instructors incorporate visual, auditory, and spatial elements to enhance both cognitive and emotional aspects of the content. Furthermore, IVR is used to cultivate curiosity by motivating students through intrinsic engagement in digital sculpture, experimentation, virtual painting, and the design of immersive installations [14]. This experimental freedom enables students to explore their latent capabilities, fostering self-actualisation; all these opportunities are accessible through IVR in art education [15]. Similarly, IVR enhances peer and instructor interaction, maintains engagement through live feedback loops, and supports the advancement of artwork to higher levels of maturity [16].

3.3 IVR and teaching effectiveness

Using IVR helps make teaching and learning more engaging, inclusive, interactive, and holistic [17]. IVR lets educators combine different types of content and context, which supports experiential learning [18]. When students reflect on what they learn, they are better prepared for their future careers [19]. Interactive, real-world learning materials help students develop important skills. IVR also supports students with different cognitive abilities. Its multi-modal and accessible features make IVR an important tool for teaching and learning [20].

3.4 IVR and students' motivation

Motivation is generally regarded as an intrinsic drive, yet it requires external stimuli to remain active and effective. IVR enhances motivation by enabling the exploration of creative possibilities, novel experiences, and heightened realism within virtual environments [18–20]. For students in the performing arts, experimentation with colours, tools, textures, and sculpture within a three-dimensional virtual environment fosters curiosity, autonomy, and emotional engagement. These processes also contribute to reduced student anxiety and increased confidence (C) [21]. The ARCS model suggests that technology can boost students' motivation, help them participate in learning, and build their C and satisfaction (S). Research shows that ARCS-based approaches have a positive effect on teaching, assessment, design, measurement, content, and understanding of context [30]. When using IVR with the ARCS model, immersive experiences improve A, performance, C, and S. The effects of IVR are not always straightforward, so it can influence student motivation and engagement in different ways. Studies also show that higher interactivity increases motivation and engagement.

3.5 Constructivist learning theory (CLT)

Constructivist Learning Theory posits that learners develop knowledge through interaction, experimentation, and reflection within their environment. IVR aligns with CLT principles by facilitating exploration, exploitation, manipulation, and interpretation of artistic works in a sophisticated, simulated environment [10, 14]. This approach also draws on appreciative inquiry and inquiry-based learning mechanisms, in which learners build upon prior successes, manage projects based on past experiences, and collaborate with peers to achieve process actualisation [11]. Additionally, IVR supports the think-pair-share principle, encouraging students to engage in critical thinking and peer collaboration. CLT further emphasises the importance of social interaction in learning, participation in immersive art galleries, and the discovery of meaningful insights. These elements collectively facilitate authentic learning experiences by linking theoretical concepts with practical applications, thereby enhancing understanding of complex and abstract processes [14, 17].

The model works through several key operators are: Instructional Design Inputs, Psychological Affordances, Motivational States (ARCS), Suppressive Costs, and Multidimensional Effectiveness Metrics. For clarity and reliable testing, each layer has clear definitions, boundaries, and indicators. The study established operational definitions for the key indicators, as presented in Table 2.

Table 2. Construct and working definition

Construct Category	Core Construct	Working Definition and Scope	Operational Indicators	Boundary Exclusions
Instructional Design Conditions (Inputs)	Mobile VR Parameters	A configurable bundle of hardware and instructional variables mapped directly to course objectives.	System latency, tracking accuracy, field of view, feedback frequency, and scaffolding scripts.	Avoid treating VR as a simple binary variable.
Psychological Affordances (Mechanisms)	Presence	The subjective intensity of feeling “being there” within and co-existing with the virtual space.	Igroup Presence Questionnaire (IPQ), ITC-SOPI, or gaze/viewport dwell time indicators.	High presence does not automatically guarantee learning transfer.
	SoA	The subjective feeling that one’s actions reliably produce expected outcomes.	Sense of Agency Scale (SoAS), mismatch logs, and objective error/failure counts.	Action-outcome congruency must be maintained to avoid cognitive strain.
Student Motivation (ARCS Dimensions)	A	A motivational state of focused curiosity and sustained cognitive task engagement.	ARCS A subscale, time-on-task, and behavioural participation frequency.	A gains alone does not guarantee C or S.
	R	Perceived personal value and alignment of the activity with professional goals.	ARCS R subscale, meaning-making prompts, and self-expression scores.	Mismatched or non-authentic tasks fail to generate R.
	C	Beliefs about one’s capability to succeed and control instructional progress.	ARCS C subscale, self-efficacy scales, and error recovery rates.	Strongly undermined by disorientation and interface friction.
	S	Subjective S with the process, outputs, and willingness to continue.	ARCS S subscale, affect ratings, and peer recognition metrics.	Requires shareable intermediate products and clear feedback.
Potential Costs (Suppression Sources)	Cognitive Load and Discomfort	Working memory strain and sensory conflict symptoms caused by device interaction.	NASA-TLX, Leppink scale, and Simulator Sickness Questionnaire (SSQ).	Must separate intrinsic load from hardware-induced extraneous friction.
Teaching Effectiveness (Outcomes)	Multidimensional Effectiveness	Integrated evidence of instructional-process quality and tangible learning gains.	Process: Critique quality and revision depth. Outcome: Rubric-rated artefact quality.	Do not rely on single self-report measures or isolated grades.

4 RESULTS AND DISCUSSION

The review of the selected literature identifies five main themes that show how Mobile VR adoption relates to teaching effectiveness. Instead of looking at these themes separately, the DDR approach links them together as key parts of an instructional process.

4.1 Immersive and simulated learning environments

Mobile VR changes traditional art instruction in higher education from passive viewing to active, hands-on experiences. With virtual studios, dynamic galleries, and 3D workspaces, Mobile VR lets art students adjust spatial scale, explore different perspectives, and see how lighting affects their work [22].

4.2 The impact of immersive affordances in arts studio

Mobile VR supports teaching by drawing on CLT and embodied cognition. Research shows that in art education, students learn best when they can work with forms, try out different designs, and think critically in a real-world setting [23].

4.3 Dual-pathway dynamics in classroom engagement

Literature studies identify a critical dual-pathway mechanism through which Mobile VR influences student classroom behaviour. The positive pathway involves rich sensory feedback and active participatory control, which transform passive learners and promote heightened emotional and cognitive engagement. Such an open experimental environment fosters curiosity and provides a secure, risk-free context in which students can manipulate digital sculptures or create virtual paintings without concern for material waste or public failure [23–24]. However, along the negative pathway, occurrences of tracking latency or interface mismatches rapidly compromise engagement.

4.4 Teaching effectiveness

A key finding from the SLR is that increased psychological immersion does not necessarily lead to improved instructional effectiveness or learning transfer. The synthesis identifies significant performance inconsistencies across empirical studies. Although immersive environments consistently generate high situational interest and initial affective engagement, their influence on deeper understanding, aesthetic reasoning, and skill transfer is inconsistent [25]. Mobile VR setups often let students wander freely or just watch, giving them a strong sense of presence but not much real artistic skill. To teach effectively, it is important to build clear instructional tools like rubrics, focused prompts and feedback tracking right into the virtual environment [26].

4.5 ARCS framework

Deconstructing motivation into the distinct ARCS dimensions (A, R, C, and S) reveals pronounced asymmetries across these dimensions [27–28]. Immersive technology features are particularly effective in eliciting immediate perceptual arousal, thereby increasing A. In contrast, C and S are identified as especially fragile psychological states. C depends on how easy the system is to use, how predictable it feels, and whether students can clearly track their progress. If students get lost or experience tracking delays, their C drops quickly. In the same way, R does not come from the technology alone. It relies on real tasks that connect virtual work to each student's artistic goals and sense of professional identity. Because of this, combining ARCS into a single overall motivation score can mask these important differences.

4.6 Path-evidence mapping matrix

In order to ensure transparency, traceability, and strict compliance with the PRISMA reporting guidelines, Table 3 aligns each hypothesised structural relationship with its corresponding core empirical and theoretical evidence entries (E1–E19) identified in the systematic review.

Table 3. Path–evidence mapping matrix (E1–E19)

Model Relationship (Path)	Core Claim (Testable Statement)	Representative Evidence (E#)	Boundary Conditions/ Counterevidence (Summary)
IVR immersion/interactivity → Presence	Experimental studies/ systematic reviews	E1, E2, E6, E14	Without alignment to learning objectives, IVR may enhance experience but not transfer.
Action–outcome congruency → Agency	Experiments/HCI studies	E2, E3, E5, E13	Latency/mismatches can increase extraneous load and reduce C.
Presence → ARCS—A	Experiments/ classroom studies	E1, E2, E3, E6	Increased A does not guarantee increases in C or S.
Agency → ARCS—C	Experiments/ mechanism studies	E2, E3, E7, E8, E14	High failure rates or frequent disorientation can reduce C.
Extraneous load/interface friction → ARCS—C/S (negative)	Multi-day/field studies	E2, E5, E13	Scaffolding and interface simplification can mitigate effects; sensitive groups should be stratified.
ARCS dimensions → Engagement/persistence	Educational psychology studies	E11, E15, E19	Dimensions may diverge; model them separately rather than as a total score.
Engagement/self-efficacy → Teaching effectiveness	Course studies/educational psychology	E2, E3, E5	Opaque evaluation criteria weaken the translation from engagement to effectiveness.
Task evidence structure moderates: Motivation → Teaching effectiveness	Art education/ classroom studies	E19, E11	Conversion is weaker under unguided roaming and without a feedback loop.
Scaffolding density moderates: IVR conditions → Load/C	Instructional design studies	E1, E2, E5, E6, E13	Over-scaffolding may suppress exploration and agency.
Individual differences moderate overall effects	Individual-difference studies	Prior ability and cybersickness susceptibility influence benefits and risks	Model as interaction terms and/or covariates in empirical tests.

4.7 Thematic analysis and conceptual framework

The study used NVivo for thematic analysis to identify the main themes in the context and content. Table 4 shows the results of this analysis.

Table 4. Thematic analysis

Main Theme	Sub-Themes	Extracted Meaning from the Text	Supporting References
IVR in Higher Art Education	Immersive and simulated learning environments	IVR creates computer-generated three-dimensional environments where students interact with artistic objects and simulated realities to enhance experiential learning.	[4, 5, 6]
	Multi-sensory engagement	IVR integrates visual, auditory, and tactile stimulation to increase learner engagement and artistic experience.	[5, 6]
	Virtual artistic spaces	IVR supports virtual studios, galleries, exhibitions, and 3D artistic workspaces for experimentation and creativity.	[7]
	Cultural preservation and authenticity	IVR preserves and presents cultural heritage and historical artistic records in immersive forms.	[8]
	Creativity and innovation enhancement	IVR develops artistic imagination, innovation, motivation, and new artistic philosophies.	[9, 10]
Impact of IVR on Art Pedagogies	Student-cantred and interactive pedagogy	IVR transforms traditional teaching into interactive, contextual, and learner-cantred pedagogical practices.	[4, 10]
	Constructivist learning through experimentation	Students actively construct knowledge through exploration, experimentation, and reflective artistic practices in virtual environments.	[11]
	Personalised and flexible learning	IVR enables customised learning experiences based on student needs, interests, and expectations.	[7]
	Contextual and historical learning	IVR allows immersive historical visits, cultural simulations, and virtual galleries that enhance contextual understanding.	[12, 13]
	Interdisciplinary collaboration	IVR promotes collaboration among students from architecture, animation, design, and fine arts for collective problem-solving.	[13, 14]
	Innovative assessment practices	IVR supports virtual exhibitions, immersive installations, formative assessment, and instant feedback mechanisms.	[16, 17]
IVR and Classroom Engagement	Active student participation	IVR transforms passive learning into active participation through interactive and immersive activities.	[18]
	Cognitive and emotional engagement	Visual, auditory, and spatial elements increase both emotional and cognitive involvement.	[18]
	Curiosity and intrinsic engagement	Students become motivated through experimentation with digital sculpture, virtual painting, and immersive design.	[19]
	Freedom from fear and anxiety	IVR provides safe environments where students can experiment without fear of criticism or failure.	[20]
	Peer and instructor interaction	IVR strengthens collaboration, communication, and feedback among peers and instructors.	[22, 25]
IVR and Teaching Effectiveness	Improved teaching-learning process	IVR makes teaching more engaging, inclusive, integrative, and understandable.	[23]
	Experiential learning opportunities	Students learn through repeated practice, reflection, and immersive experiences.	[24, 25]
	Skill development and artistic refinement	Simulated artistic environments support practical skill enhancement and artistic competence.	[14]
	Accessibility and inclusivity	IVR supports students with diverse cognitive abilities and special educational needs.	[9, 19]
	Integration of theory and practice	IVR bridges conceptual learning with practical artistic applications.	[24]

(Continued)

Table 4. Thematic analysis *(Continued)*

Main Theme	Sub-Themes	Extracted Meaning from the Text	Supporting References
IVR and Students' Motivation	Enhancement of intrinsic motivation	IVR stimulates creativity, persistence, participation, and academic engagement.	[26]
	C and competence development	Immersive environments increase students' C, competence, and self-belief.	[27]
	Curiosity and autonomy	Students gain autonomy and curiosity through interaction with virtual artistic tools and environments.	[25, 28]
	Emotional connection with learning	Three-dimensional immersive experiences strengthen emotional attachment to learning.	[28]
	Reduction of anxiety	IVR minimises fear of failure and supports self-expression through creative experimentation.	[20]
CLT	Knowledge construction through interaction	Students construct knowledge through experimentation and interaction with immersive environments.	[9, 13]
	Inquiry-based and reflective learning	IVR supports inquiry, exploration, and reflective artistic practices.	[10, 15]
	Collaboration and peer learning	Learners collaborate, share ideas, and develop projects collectively.	[15]
	Think-pair-share learning approach	IVR encourages critical thinking, peer discussion, and collaborative interpretation.	[13]
	Authentic and meaningful learning	IVR links theoretical concepts with practical artistic experiences to understand complex processes.	[17, 13]

5 DISCUSSION

The evidence-informed framework developed in this study demonstrates that integrating Mobile VR into higher art education is a complex, multidimensional process rather than a straightforward progression. Although initial sensory immersion effectively promotes short-term student engagement, achieving sustained teaching effectiveness requires carefully structuring positive psychological affordances to counteract physiological and design-related barriers. Applying the CAMIL to these dynamics, the structural framework elucidates the persistent "experience–transfer dissociation" observed in creative studios. Although spatial immersion and high representational fidelity consistently elicit immediate perceptual arousal and A, substantial learning gains and the development of artistic competence are contingent upon action-outcome congruency and the quality of structural design inputs. Furthermore, analysis of motivational dynamics using the ARCS model indicates that students C and S are particularly fragile. These states are readily diminished by hardware-induced interface friction, lack of navigational guidance, or cybersickness. Therefore, enhancing teaching effectiveness requires moving past simple, unguided roaming. Art educators must actively embed Mobile VR within explicit studio-based pedagogical loops such as critique, defence, and revision cycles complemented by transparent evaluation rubrics and targeted, adaptive scaffolding.

6 CONCLUSION, RECOMMENDATIONS AND FUTURE STUDIES

This literature review presents a structural model grounded in evidence, showing that Mobile VR features alone do not guarantee better learning. Instead, their impact depends on psychological factors that influence ARCS motivation and teaching effectiveness. To improve studio-based higher art education, institutions should move beyond unguided, showcase-only virtual experiences. Instructional designers are encouraged to include Mobile VR activities in clear critique, defence, and revision cycles, ensure that actions and outcomes are closely linked, and address issues like cybersickness and interface problems. Future research should move this framework beyond explanation and test it as a working model. Researchers can use longitudinal or repeated-exposure studies to manage novelty effects and apply structural equation modelling to examine conditional paths, group differences, and individual differences across various art fields.

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