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Collaboration, Creativity and Compassion in a Digital Society

Towards a process framework for Virtual Reality integration in higher education: An educator-centred synthesis

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Virtual Reality (VR) continues to be promoted as a transformative technology for experiential, human-centred learning, yet its integration into mainstream education remains limited and unevenly understood. Prior work on VR in education has tended to examine isolated instances of adoption such as a single deployment, a single set of barriers, or a single evaluation of learning outcomes, without articulating what VR integration means as a sustained, practice-oriented process for the educators who plan and sustain it. Drawing on three connected studies from a broader research project, i.e. a systematic literature review, educator VR exposure sessions and planning interviews, and in-the-wild classroom implementation and reflections, this paper synthesises findings across the whole research programme to propose and articulate a three-phase process framework for VR integration: (a) VR Awareness and Exposure, (b) VR Integration Planning and (c) VR Implementation, Practice and Reflection. Rather than a linear adoption pathway, the framework is shown to operate cyclically, with implementation experience continuously reshaping planning and awareness, and presents a working definition of pedagogically supportive VR integration. The cross-cutting synthesis presented in this paper is a conceptual and practical resource for educators, learning designers and researchers.

Keywords: Virtual Reality, educator perspectives, VR integration process framework

Introduction

Virtual Reality (VR) offers promising potential for supporting experiential, human-centred learning across higher education, where experiential and human-centred approaches are increasingly emphasised (Cummings & Bailenson, 2016; Dalgarno & Lee, 2010). Despite this promise, VR adoption in mainstream classrooms remains limited (Bawa & Bawa, 2023; Jin et al., 2022), constrained by cost, technical fragility, cybersickness, and a persistent lack of scalable, curriculum-relevant content (Jensen & Konradsen, 2018; Kavanagh et.al., 2017; Marougkas et al., 2024). A less visible but equally consequential gap concerns whose voice shapes our understanding of VR integration. Empirical research on VR in education has predominantly foregrounded student-facing outcomes and system-level evaluations (Radianti et al., 2020), leaving comparatively little attention on how educators themselves perceive, plan for, and enact VR within the everyday constraints of authentic teaching practice (Khukalenko et al., 2022; Pirker et al., 2020). Where educators are consulted, studies tend to capture narrow instances such as through an attitude survey; a single-session evaluation rather than tracing how educators' understanding of VR develops across the process of becoming aware of it, planning for it and experiencing it in their classroom practices over time. This paper addresses that gap by drawing together findings from three studies conducted across a research programme examining educator perspectives on VR integration into education, and asks a synthesising overarching question that sits above it: what does VR integration actually look like as a process for educators, from first VR exposure through to sustained classroom practice? In answering this question, the paper's contribution is conceptual as well as empirical: it proposes a conceptual process framework that has not previously been presented as a standalone piece of work, distinct from the empirical papers on the systematic review, the VR exposure and planning study, and the in-the-wild implementation study that have each been reported separately.

Background: Fragmented accounts of VR integration

The case for a process view of VR integration emerges from three converging observations in the literature and in this research programme's own findings. First, a systematic review of 38 primary studies on emerging technologies (Artificial Intelligence, Learning Analytics, and Extended Reality) in higher education found that Extended Reality technologies, including VR, remain the least studied of the three technology groups, and that

approximately 75% of studies employed purely quantitative methods with none relying solely on qualitative approaches (Sembey et al., 2024). This imbalance leaves the field with limited insight into how educators make sense of VR as a pedagogical tool, as distinct from measuring its effects on learning outcomes. Second, where educator perspectives have been studied, they are typically captured at singular or specific instances, most often immediately after a one-off exposure to VR, rather than traced across the fuller arc of deciding whether, how and when to bring VR into a course. Yet sustained technology integration, including VR integration, is known to depend on factors such as instructor confidence, institutional support, and perceived pedagogical value that unfold over repeated cycles of use, not a single encounter (Alfalah, 2018). Third, research on classroom implementation has tended to treat barriers such as cost, technical glitches and cybersickness as a fixed checklist, rather than as considerations that interact with and are reshaped by the pedagogical and classroom orchestration choices educators make in practice (Mikropoulos & Natsis, 2011). Taken together, these observations suggest that the field lacks an explicit, empirically grounded account of VR integration as a process unfolding over time and shaped by educators' evolving awareness, planning decisions and lived deployment and implementation experiences, which is the focus of this paper.

Methodological basis for the synthesis

This synthesis draws on three studies conducted within an interpretivist, qualitative research programme (Saunders et al., 2019), using reflexive thematic analysis (Braun & Clarke, 2021). Study 1 was a systematic literature review following Kitchenham's (2004) procedures, screening 3,038 research studies down to 38 primary studies to establish the state of the art in VR and other relevant emerging technologies such as Artificial Intelligence and Learning Analytics in higher education (Sembey et al., 2024). Study 2 combined first-person VR exposure sessions with semi-structured interviews involving 15 educators (12 teachers and three learning designers); first capturing their impressions of a VR simulation and associated curriculum-case ideation (Sembey et al., 2026c), then, with the same cohort, examining the practical considerations shaping their willingness and capacity to plan for VR integration (Sembey et al., 2026a). Study 3 examined an in-the-wild VR lesson implementation on accessibility and inclusive technology design, co-designed and co-delivered across seven two-hour sessions to 390 students by a teaching team of 13 educators, drawing on post-implementation educator interviews and embedded researcher observations (Sembey et al., 2026b). The analysis presented revisits the findings of all three studies together, asking how they relate to one another as stages in an evolving process of how educators make sense of, plan for and practise VR-supported teaching.

Three phase process framework for VR integration

Across the three studies, VR integration in education is shown to unfold as a staged, iterative, and educator-centred process, comprising three interconnected phases: (a) VR Awareness and Exposure, (b) VR Integration Planning, and (c) VR Implementation, Practice and Reflection. Each phase is grounded in a distinct empirical study, and each phase both informs and is reshaped by the others.

Phase 1: VR awareness and exposure

This phase concerns how educators come to understand what VR is and what it might offer their teaching. The systematic review established the broader landscape, revealing that current research emphasises technological effectiveness and quantitative student outcomes, with limited attention to educator-centred perspectives or authentic classroom enactment (Sembey et al., 2024). Direct VR exposure sessions extended this picture: when 15 educators experienced a first-person VR simulation depicting a person with disability, all reported strong emotional engagement and empathy for the simulated user. Analysis identified four themes shaping educators' impressions: emotional evocation, sense of immersion, health and accessibility concerns such as cybersickness and head-fitment issues and the need for structured VR orientation before use (Sembey et al., 2026). From these sessions, 10 curriculum cases emerged, mapping potential VR applications onto stages of the human-centred software engineering lifecycle, from empathy-building through to AI-avatar-supported requirements elicitation and inclusive prototype evaluation. While disability simulations should be interpreted cautiously as they cannot fully reproduce the complexity and nuance of lived experiences, the experience provided educators with an opportunity to reflect on VR functions, how they make sense of VR as a technology and subsequently interpret its pedagogical relevance to their teaching curriculum.

Phase 2: VR integration planning

The second phase concerns how educators translate awareness into workable classroom decisions. Interviews with the same educator cohort identified 21 practical considerations, organised into three themes: technology access and provisioning, pedagogical considerations, and VR design and sourcing considerations (Sembey et al., 2026a). Educators consistently prioritised health, safety and comfort, institutional technical support and the difficulty of sourcing curriculum-specific VR content, weighing options such as building content in-house, outsourcing development, or adapting free-to-use simulations. These considerations were then operationalised into co-designed teaching resources such as a VR lesson plan, a post-VR reflection guide, a VR access and troubleshooting guide, a deployment checklist, safety and ethics protocols and an equipment check form, developed in collaboration with a university learning-design team for an undergraduate IT Professional Practice unit in an Australian higher education institution (Sembey et al., 2026). This phase demonstrates that educators do not simply adopt VR technologies, they actively negotiate pedagogical alignment, accessibility, institutional support, classroom logistics and learner wellbeing before committing to classroom use, positioning planning as an act of pedagogical orchestration rather than technological deployment.

Phase 3: VR implementation, practice and reflection

The third phase concerns how VR integration is enacted, adapted and reflected upon once it reaches the classroom. The in-the-wild deployment of the co-designed VR lesson focussed on building awareness of IT accessibility and inclusive design, surfaced 10 facilitators of successful delivery, including sufficient headset availability, readily available technical support, and multi-station classroom configurations, alongside seven barriers, including connectivity issues, uneven student reception, and the logistical and orchestration burden placed on educators (Sembey et al., 2026b). Embedded researcher observation surfaced a further, largely unacknowledged dimension of this phase: the hidden labour of VR integration, comprising the substantial behind-the-scenes work of charging and configuring headsets, loading simulations, pairing controllers, and continuous in-session troubleshooting. This labour, together with the finding that the effectiveness of VR integration relies less on headset quantity than on how the classroom experience is orchestrated i.e. headset rotations between students, discussion facilitation, and guided reflection, reframes implementation as fundamentally a classroom-orchestration and workforce-capability challenge than hardware-provisioning issue. Notably, this phase also showed clear evidence of iterative improvement: educators reported that delivery became “more manageable” across repeated sessions, illustrating that implementation is not a single instance but a capability that develops through reflective repetition.

Cyclical relationship between phases

Although presented sequentially for clarity, the three phases are not linear. Implementation experience continuously reshapes subsequent planning and renews educators’ awareness of VR’s affordances and limitations. For example, the barriers encountered during classroom delivery in the implementation phase feed back into how the educators plan future VR deployments and what aspects of VR’s potential and limitations they emphasise in awareness-building activities for new educators. Planning, in turn, guides and operationalises implementation, while implementation and reflection feed back into refining planning and reframing awareness, as shown in Figure 1.



Figure 1. Conceptual framework for VR integration process

This cyclic relationship highlights how educators continually make sense of, adapt and enact VR within authentic teaching contexts. In doing so, the framework complements existing technology adoption models by focussing on the practical, iterative work of integrating VR into teaching practice. Synthesising findings across the three phases, we define pedagogically supportive VR integration as an intentional, educator-led and

context-sensitive multi-phase process comprising of VR awareness and exposure, VR integration planning, and VR implementation, practice and reflection. This process prioritises educators' perspectives, instructional practices, and disciplinary alignment, grounded in authentic classroom contexts and learners' needs, over technology-driven or novelty-led adoption.

Considering the three studies together as a programme surfaces patterns that are not visible within any single study alone. First, health, safety and workload considerations recur across all three phases in different forms: as *anticipated concerns* during exposure (cybersickness, head-fitment), as *planning priorities* (safety protocols, technical support provisioning), and as *lived realities* during implementation (the *hidden labour* of equipment handling and troubleshooting). This recurrence suggests that wellbeing and workload are not discrete barriers but a thread that needs to be actively managed throughout the entire VR integration process. Second, the role of direct, first-hand experience recurs as a mechanism of learning at every phase: educators' own VR exposure shaped their planning priorities, co-designing teaching resources deepened their operational understanding, and delivering repeated implementation sessions helped strengthen confidence and capability over time. This suggests that professional learning for VR-supported teaching requires multifaceted support through educator-facing training resources and support documentation as well as structured opportunities for educators to directly experience, rehearse and iterate on VR use in authentic classroom settings. Third, across all three phases, educators consistently reframed VR integration challenges as questions of orchestration and human support rather than technology per se. For example, equipment and content-sourcing difficulties were addressed through VR lab partnership and adaptation decisions rather than purchasing decisions alone, and classroom delivery challenges were addressed through facilitation and rotation design rather than acquiring more headsets. This consistent reframing across the studies strengthens the case that VR integration in education is best understood, researched and resourced as an orchestration and capability-building challenge.

Implications for practice, research and policy

For educators, the proposed VR process framework implies that VR needs to be positioned as pedagogical infrastructure integrated into curriculum design, rather than an optional or novelty add-on. It also implies that educator facilitation skills, such as framing VR lessons, managing shared equipment and conducting post-lesson debriefs, should be treated as a core professional competency requiring dedicated development on a par with technical familiarity with the hardware itself. For VR researchers, the framework implies that VR research should treat awareness-building, planning, and implementation as interconnected units of analysis rather than isolated study designs. Researchers evaluating a single VR deployment might usefully ask what awareness and planning preceded it, and what feedback loop it is likely to generate for future practice that might create more value than creating each VR deployment as a bounded, self-contained event. For institution administrators and policy makers, the recurring finding of hidden labour across the implementation phase implies that sustainable VR integration requires explicit institutional investment in support infrastructure, co-facilitation models and workload recognition, as it cannot be assumed that logistical and technical coordination will be absorbed informally by already-stretched teaching teams.

Limitations and future work

This synthesis is based on studies situated within a single geographic context (Australia) and disciplinary focus (Computing education) with relatively small educator cohorts (13-15 participants across the empirical studies). The proposed conceptual framework should therefore be treated as an initial, empirically grounded, educator-centred conceptualisation rather than a validated model. Future work should examine whether the three-phase, cyclical structure holds in other disciplines and whether it can function as a practical planning tool to assist pedagogically supportive VR integrations in authentic educational settings.

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